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EXTENT OF CLOUD COMPUTING RESOURCES UTILIZATION FOR RESEARCH ACTIVITIES AMONG BUSINESS TEACHER EDUCATION STUDENTS IN COLLEGES OF EDUCATION IN SOUTH SOUTH, NIGERIA.

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Abstract

This study investigated the extent of cloud computing utilization for research activities by Business Teacher Education students in Colleges of Education in South-South, Nigeria. Specifically, the study examined the extent of utilization of cloud computing based on gender and ownership of institutions. Two research questions and two null hypotheses guided the study. A descriptive survey research design was adopted for the study. The population comprised 325 Business Teacher Education students in Colleges of Education in South-South, Nigeria. Census sampling technique was used to study the entire population. The instrument for data collection was a researcher-developed questionnaire titled Cloud Computing Questionnaire (CCQ), which had a Cronbach's alpha reliability coefficient of 0.943. Out of the 325 copies of the questionnaire administered, 317 were retrieved and used for data analysis. Mean and standard deviation were used to answer the research questions, while t-test was employed to test the null hypotheses at 0.05 level of significance. The findings revealed that Business Teacher Education students utilized cloud computing for research activities to a low extent, with a grand mean of 2.39 and standard deviation of 0.59. Specifically, WhatsApp, Facebook and YouTube were utilized to a very high extent, while Google Cloud Platform and Twitter were utilized to a high extent. However, other cloud computing platforms, including Microsoft Azure, Amazon Web Services, Dropbox, Oracle Cloud and LinkedIn, were utilized to a low extent, while Adobe Creative Cloud and Yammer were utilized to a very low extent. Further findings revealed that there was no significant difference in the mean ratings of students based on gender ($t = 1.781$, $p = 0.158$) and ownership of institutions ($t = 0.462$, $p = 0.644$). The study concluded that Business Teacher Education students utilized cloud computing for research activities to a low extent, irrespective of gender and institutional ownership. It was recommended, among others, that the Tertiary Education Trust Fund (TETFund) should provide modern cloud computing facilities to Business Education departments, while college management should organize seminars and workshops to improve students' knowledge and skills in utilizing cloud computing resources for research activities.

Keywords: Cloud computing, utilization, research activities, Business Teacher Education students, Colleges of Education.

Introduction

Business education is a vocational programme in tertiary institutions designed to equip the recipients with requisite skills needed for general employment as a teacher, office and business manager or as an entrepreneur. Business education exposes students to the principles, concepts, fundamentals, theories and processes of business. Business Education, according to Isu in Ubulom and Dambo (2016), is that education that deals with the acquisition of practical skills, knowledge and values that enable one to function effectively in the society. It is regarded as that aspect of education which leads to acquisition of practical and applied skills and basic scientific knowledge. Business education produces responsible, productive and self- reliant citizens. Business education should not be left out of the charge to exploit the potentials and transform the educational landscape of the tertiary institutions in Nigeria. With proper integration, business education programme will help improve the academic training of business educators who holds out the opportunity to revolutionize office automation, pedagogical methods and ensure quality education.

Under the requirement of quality education, in the teaching of business education courses in Colleges teachers must not only improve students' skills and solidify students basic knowledge of the different courses offered, but also to cultivate students' sense of innovation, application ability and exploration ability to provide students with intensive business practice opportunities. By building a platform for operation and calculation, it can integrate teaching, learning and doing; and comprehensively improve the quality of students. According to Anjali and Pandey (2013) cloud computing is practical. By enabling educational institutions to access global resources and analyze and store data over the internet for data analysis and storage. Instructors should focus on creating content to enable students understand and share their ideas.

The methods used in higher education to create, save, access, and exchange knowledge have changed as a result of the quick advancement of information and communication technologies. Cloud computing, which gives users internet-based access to computer resources, storage, software, and digital services without requiring these resources to be installed on individual machines, is one of the technologies driving this change. Cloud computing can provide flexible access to educational resources, group projects, data storage, and student-teacher communication. Adoption of cloud computing in education is linked to elements including technological infrastructure, perceived utility, usability, security, institutional support, and users' abilities, according to a recent systematic review (Alharbi et al., 2024).

The growing digitization of the research process is one way that cloud computing is relevant to research operations. Students enrolled in Business Teacher Education programs can use cloud-based tools to search and store literature, prepare research proposals, share papers, gather and manage data, communicate with supervisors, work with colleagues, and preserve research files. Additionally, cloud applications reduce reliance on a single computer or physical storage media by enabling access to study information across various devices and places. In view of Lovedeep, Jyoh and

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Harpreet (2017), cloud application resources tasks entails file storage, file sharing, email, order entries, inventories management and data collections among others. However, business teacher education students in order to carry out the listed tasks need to be able to utilize the cloud computing resources. G-Drive, Google Apps (G- mail, Google Docs and Microsoft cloud service), Drop box, t-cloud and sky drive are different types of cloud computing services which can be integrated into educational settings (Arpaci, 2017). The services give an opportunity to students and teachers to access, store, share, revise and retrieve files from multiple locations and devices to complete their task quickly. Clouds computing allow the students to share and study materials by offering collaborative learning environment, enable universal access to study the documents and also give an opportunity to interact with their classmates and teachers over the internet (Arpaci, 2017). Thereby, such activities may affect student academic performance. According to Heirsimran and Kamayani (2015), three major types of cloud computing service delivery models are: infrastructure as a service (Laas), platform as service (Paas), and software as a service (saas). Moreover, cloud computing comes in different deployment models viz private or internal cloud, community cloud, public or external cloud and hybrid cloud. In addition, Chentan, Basavaray and Sankalp (2016) opined that cloud computing can positively influence academic fields such as: interaction session, teamwork and flexibility. Furthermore, the importance of cloud computing in the field of education include: enhanced productivity and more efficient educational practices, reduced expenditures, increase in collaborative work, enhanced backup information, support in financial and HR management facilitating institutional accreditation and promoting lecturers' flexibility. Although factors like perceived usefulness, ease of use, facilitating conditions, internet connectivity, and technological skills are associated with the extent of use, recent data from Nigerian higher education shows that students use cloud computing for educational purposes (Omotayo & Ojesina, 2026). The use of cloud computing has an impact on the development of research and digital competencies needed in modern teacher education for students enrolled in Business Teacher Education programs. These students are required to do methodical research and exhibit the capacity to uncover pertinent information, arrange research materials, analyze information, and effectively explain findings. By offering platforms for document creation, online storage, collaborative editing, communication, and access to digital research resources, cloud-based applications can facilitate these tasks.

Evidence from South-South Nigerian colleges of education also demonstrates the increasing focus on digital infrastructures in research, with recent studies highlighting the value of digital tools, including as cloud computing, for enhancing research procedures in teacher education institutions. However, because students' experiences with digital technology can vary depending on their gender, cloud computing use may not be consistent among students. Therefore, gender is taken into account in this study as a demographic variable that can shed light on whether male and female Business Teacher Education students report using cloud computing for research activities at different degrees. The information that is now available is inconclusive: a 2024 Nigerian study of secondary school teachers in Cross River State found no significant correlation between gender and the use of cloud resources, but other studies have found that gender is a characteristic worth looking at when it comes to technology use. Instead of assuming that findings from instructors or other student groups apply to them, this discrepancy necessitates a special examination of gender among Business Teacher Education students and in the context of research operations.

Internet connectivity can be a major barrier to students using cloud services, according to earlier research on cloud-based learning. Additionally, research conducted in colleges of education has identified the availability and use of virtual and digital resources as areas that need to be addressed. Therefore, when analyzing the degree to which cloud computing is used for research, students' location inside the South-South zone may be significant. Therefore, there is a gap in the empirical research on whether location-related inequalities are reflected in the use of cloud computing for research among students studying business teacher education at the zone's colleges of education. Another factor that may offer a crucial foundation for comprehending the use of cloud computing is institutional ownership. Colleges of education may operate under various ownership arrangements, including federal, state, and private ownership. These institutional categories may vary in the ICT infrastructure, internet facilities, digital platforms, staff support, and opportunities for students to gain technological competencies that they offer.

The specific use of cloud computing for research activities by Business Teacher Education students, examined alongside institution ownership, is still not well documented. Research involving Colleges of Education in the South-South region has looked at digital and virtual resources across institutional settings. Therefore, there is a contextual and empirical gap about whether students' consumption varies based on the ownership of their schools.

The aforementioned gaps demonstrate the necessity of conducting an empirical investigation into the degree to which Business Teacher Education students at South-South Nigerian Colleges of Education use cloud computing for research purposes. Studies that have already been conducted have focused on cloud computing among college students, postgraduate students, instructors, and students in other educational settings; however, there hasn't been much focus on Business Teacher Education students in Colleges of Education and how they use cloud technologies for research. More precisely, there is not enough data to determine how much students' use of cloud computing for research activities in the South-South geopolitical zone is influenced by gender, location, and institutional ownership. In order to contribute context-specific knowledge that can guide the provision of digital infrastructure, student training, and institutional support for technology-enhanced research in Colleges of Education, this study aims to examine these variables and provide empirical evidence on the extent of utilization.

Statement of the Problem

By giving students easy access to online storage, scholarly resources, collaborative platforms, document-processing apps, and other digital services, the growing use of cloud computing has opened up new opportunities for enhancing research activities in higher education. Students enrolled in Colleges of Education's Business Teacher Education program are expected to acquire sufficient research skills and utilize modern technology efficiently when conducting scholarly research. However, just because cloud-based technologies are available does not guaranty that students would use them widely or successfully for research projects. There may be issues with students' knowledge of and ability to use cloud applications for managing research data, organizing and searching literature, storing research materials, working with supervisors and colleagues, creating research reports, and sharing research results. Rather than presuming that the growing availability of digital technologies automatically translates into effective research utilization, this situation makes it necessary to empirically determine the actual extent to which Business Teacher Education students use cloud computing for research activities in Colleges of Education in South-South Nigeria. Potential disparities related to location, ownership of institutions,

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and gender further complicate the issue. While students studying in different parts of the South-South geopolitical zone may encounter different conditions with regard to internet connectivity, electricity, digital infrastructure, and access to technological support, male and female students may have different levels of exposure to or experience with digital technologies. The availability of ICT infrastructure, institutional support, and chances for students to utilize cloud-based resources may also vary among federal, state, and privately held colleges of education. Although studies have examined technology utilization in education, there remains inadequate empirical evidence specifically addressing the extent of cloud computing utilization for research activities by Business Teacher Education students in Colleges of Education in South-South Nigeria, particularly with gender, location and institutional ownership considered as variables. The absence of such context-specific evidence makes it difficult to determine the actual level of utilization and whether these variables are associated with differences in students' use of cloud computing for research, thereby constituting the problem this study seeks to investigate.

Purpose of the Study

The purpose of this study determined the extent of cloud computing utilization for research activities by business teacher education students in colleges of education South South Nigeria. Specifically, it sought to:

1. Determine the extent of utilization of cloud computing for research activities by business teacher education students by gender in colleges of education south south Nigeria.
2. Determine the extent of utilization of cloud computing for research activities by business teacher education students by ownership in colleges of education south south Nigeria.

Research Question

The following research questions were formulated to guide the study:

1. What is the extent of utilization of cloud computing for research activities by business teacher education students in colleges of education south south Nigeria?

Hypotheses

The following null hypotheses guided the study and was tested at 0.05 alpha level of significance:

1. There is no significant difference in the mean ratings of male and female respondents on the extent of utilization of cloud computing for research activities by business teacher education students in colleges of education South South, Nigeria.
2. There is no significant difference in the mean rating of respondents in state and federal owned colleges of education in South- South, Nigeria on the extent of utilization of cloud computing for research activities by business teacher education students in colleges of education in South South, Nigeria.

Methodology

Descriptive survey research design was used for this study consists of 325 business teacher education students in colleges of education in south south, Nigeria. The study used census sampling technique. All the students were studied due to the small size of the population. The instrument used for data collection was designed by the researcher and titled "Cloud Computing Questionnaire (CCQ)" which was made up of two parts (I and II). Part I elicits the information on the respondents' personal data while part II was used to collect data for answering the research questions and testing the hypotheses. The cloud computing questionnaire had a Cronbach co- efficient of 0.943. The items on section II were defined on the internal scale. Copies of the questionnaire were administered on the 325 students studied but only 317 copies were retrieved and used for analysis.

Results

What is the extent of utilization of cloud computing by business teacher education students in colleges of education in south-south, Nigeria for research activities?

Data answering the research question are presented in Table 1.

Table 1: Mean and Standard Deviation of Responses on Utilization of Cloud Computing for Research by Business Teacher Education Students

S/N	Utilization of Cloud Computing	Mean	SD	Dec.
1.	Cloud Ways	2.20	1.11	LE
2.	Google Cloud Platform	2.53	1.16	HE
3.	Microsoft Azure	2.12	1.15	LE
4.	Amazon Web Service	2.25	1.08	LE
5.	Soft Choice	2.08	1.03	LE
6.	Drop Box	2.02	1.06	LE
7.	Adobe Creative Cloud	1.94	1.04	VLE
8.	Oracle Cloud	2.04	1.13	LE
9.	WhatsAPP	3.52	0.93	VHE
10.	FaceBook	3.33	1.03	VHE
11.	YouTube	3.44	0.90	VHE
12.	Twitter	2.55	1.13	HE
13.	LinkedIn	2.02	1.06	LE
14.	We Chat	2.18	1.16	LE
15.	Yammer	1.56	0.92	VLE
	Grand Mean	**2.39**	**0.59**	**LE**

Source: Field Survey, 2024

Results from Table 5 show that WhatsAPP, FaceBook and YouTube with their mean ranging from 3.33 to 3.52 are utilized at a very high extent. The Table also reveal that Google Cloud Platform and Twitter with mean of 2.53 and 2.55 are utilized at high extent by business teacher education students for research activities. The result also reveal that Cloud Ways, Microsoft Azure, Amazon Web Service, Soft Choice, Drop Box, Oracle Cloud, LinkedIn and We Chat with their mean ranging from 2.02 to 2.25 are utilized at a low extent. However, items Adobe Creative Cloud and Yammer with mean of 1.94 and 1.56 are utilized at a very low extent by business teacher education students for research activities. The overall results show that business teacher education students utilized Multimedia files to a low extent as indicated by the grand mean of 2.39. A look at the results reveal that the means do not deviate so widely from the central mean.

Hypotheses

Hypothesis One

There is no significant difference in the mean ratings of the business teacher education students on the extent of utilization of cloud computing by gender. Data testing the hypothesis are presented in Table 2 .

Table 2: **Summary of t-test on Utilization of Cloud Computing by Gender**

S/N	Variables	Gender				t-value	p-value
		Male (n = 132)		Female (n = 185)			
		Mean	SD	Mean	SD		
1.	Cloud Ways	2.19	1.09	2.21	1.12	0.169	0.866
2.	Google Cloud Platform	2.65	1.13	2.45	1.17	1.542	0.124
3.	Microsoft Azure	2.22	1.15	2.04	1.15	1.347	0.179
4.	Amazon Web Service	2.32	1.07	2.20	1.09	0.962	0.337
5.	Soft Choice	2.16	1.07	2.03	0.99	1.014	0.311
6.	Drop Box	2.13	1.08	1.94	1.05	1.513	0.131
7.	Adobe Creative Cloud	2.02	1.09	1.89	1.01	1.036	0.301
8.	Oracle Cloud	2.11	1.17	1.99	1.10	0.925	0.356
9.	WhatsAPP	3.47	0.97	3.56	0.90	0.873	0.383
10.	Face Book	3.28	1.05	3.37	1.01	0.792	0.429
11.	You Tube	3.47	0.86	3.41	0.93	0.521	0.603
12.	Twitter	2.62	1.10	2.49	1.14	0.966	0.335
13.	LinkedIn	2.09	1.06	1.96	1.06	1.128	0.260
14.	We Chat	2.25	1.13	2.14	1.18	0.869	0.260
15.	Yammer	1.67	0.95	1.48	0.89	1.781	0.076
	Utilization of Cloud Computing	**2.44**	**0.63**	**2.35**	**0.58**	**1.781**	**0.158**

Table 2 presents the summary of t-test on utilization of cloud computing by gender. The Overall data (t = 1.781, p = 0.158) show that there is no significant difference in the utilization of cloud computing. The hypothesis stating that there is no significant difference in the mean ratings of the business teacher education students on the extent of utilization of cloud computing by gender is therefore upheld. This means that gender had no significant influence on the mean responses.

There is no significant difference in the mean ratings of the business teacher education students on the extent of utilization of cloud computing based on ownership of school. Data testing the hypothesis are presented in Table 3.

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Table 3: **Summary of t-test on Utilization of Cloud Computing based on Ownership of Schools**

S/N	Variables	Ownership of School				t-value	p-value
		Federal (n = 192)		State (n = 125)			
		Mean	SD	Mean	SD		
1.	Cloud Ways	2.17	1.11	2.26	1.11	0.698	0.486
2.	Google Cloud Platform	2.45	1.16	2.66	1.14	1.529	0.127
3.	Microsoft Azure	2.05	1.13	2.22	1.18	1.341	0.181
4.	Amazon Web Service	2.25	1.09	2.25	1.05	0.016	0.987
5.	Soft Choice	2.04	1.01	2.15	1.06	0.975	0.330
6.	Drop Box	2.05	1.06	1.98	1.06	0.514	0.607
7.	Adobe Creative Cloud	1.93	1.06	1.96	1.03	0.230	0.818
8.	Oracle Cloud	2.06	1.14	2.02	1.11	0.256	0.798
9.	WhatsAPP	3.49	0.96	3.58	0.88	0.808	0.419
10.	Face Book	3.31	1.02	3.37	1.04	0.470	0.639
11.	You Tube	3.39	0.91	3.50	0.89	1.046	0.296
12.	Twitter	2.47	1.17	2.67	1.05	1.575	0.116
13.	LinkedIn	2.10	1.09	1.89	1.01	1.669	0.096
14.	We Chat	2.28	1.18	2.04	1.12	1.776	0.077
15.	Yammer	1.58	0.92	1.53	0.91	0.475	0.635
	Utilization of Cloud Computing	**2.37**	**0.62**	**2.41**	**0.57**	**0.462**	**0.644**

Table 3 presents the summary of t-test on utilization of cloud computing by ownership of school. The overall, data (t = 0.462, p = 0.158) show that there is no significant difference in the utilization of cloud computing based on ownership of schools. The hypothesis stating that there is no significant difference in the mean ratings of the business teacher education students on the extent of utilization of cloud computing based on ownership of schools is therefore upheld. This implies that ownership of colleges of education has no significant influence on the mean rating.

Discussion of Findings

Utilization of Cloud Computing by Business teacher Education Students

The data collected to answer research question 1 revealed that business teacher education students seldom utilize cloud computing for academics activities. However, the data presented in Table 1, showed that the students highly utilized WhatsAPP, Facebook, YouTube. Also, the following Cloud computing were utilized to a high extent, they are Google Cloud Platform and Twitter. Cloud Ways, Microsoft Azure, Amazon Web Service, Soft Choice, Drop Box, Oracle Cloud, LinkedIn and WeChat were utilized to a low extent; and Adobe Creative Cloud and Yammer utilized to a very low extent. The findings implies that even though the students use cloud computing to carry out some aspect of their academic work, they are however. Limited to very few academic activities. This has not presented business teacher education students as technologically compliant individuals in the modern society where technologies are gradually taking over in knowledge gain and ideas. The findings of the study are at variance with that of Dryli and Kinnaman in Vinyenya and Lata (2022), the internet enables students to find information as well as allowing them to think critically and creatively to become collaborative and cooperative workers and to solve problems. The final results of the hypothesis stated that there is no significant difference in the mean ratings of the business teacher education students on the extent of utilization of cloud computing by gender (t=

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1.781, p= 0.158). Since the p- value exceeded 0.05 level of significance, the null hypothesis was upheld. This shows that gender does not significantly influence business teacher education students' perceptions of cloud computing utilization.

This findings that both male and female students demonstrate levels of exposure to and usage of cloud computing technologies, this may be attributed to the increasing availability of internet resources, internet connectivity, mobile devices across Nigerian higher institutions which has helped bridged the gender gap in technology use. The findings align with recent empirical studies conducted in Nigeria. In a research carried out by Ogunlade and Adeyemi (2022), the researchers found no significant gender difference in students' use digital learning platforms in South West Nigeria. Similarly, Ibrahim and Wusa (2024) found that gender did not significantly influence students' adoption of cloud computing services in Northern Nigerian Tertiary Institutions. This study emphasized that access to infrastructure and institutional supports were major determinants of usage. Similarly, Okeke, Eze and Aukwu (2023) reported that male and female business education students possessed comparable competencies in the use of cloud based applications for academic collaboration.

The results of the hypothesis stated that there is no significant difference in the mean ratings of business teacher education students on the extent of utilization of cloud computing based on ownership of school when t= 0.462, p= 0.158. Since p- value of 0.158 is greater than 0.005 level of significance, the null hypothesis is accepted. Table 20, showed all the cloud computing tools are utilized by business teacher education students irrespective of the ownership of schools in similar ways. This could be attributed to infrastructures made available by the schools and students having access to them. This implies that any observed variation in students' ratings different school ownership types (Federal and state institutions) is not significantly and may be attributed to random variation rather than a systematic effect.

Conclusions

The study investigated the extent utilization of cloud computing for research activities by business teacher education students in colleges of education in South South, Nigeria.

1. From the study it was find out that business teacher education students utilized cloud computing to a low extent. Also, there is no significant influence in the utilization of cloud computing based on gender, location and ownership of schools.
2. The conclusion also showed that utilization of cloud computing facilities for research activities by business teacher education students does significantly depend gender and ownership.

Recommendations

Based on the findings of the study, the following recommendations were made:

1. Intervention agencies such as the Tertiary Education Trust Fund (TETFUND) should focus more on supply current and sophisticated cloud equipment various unit/ and business education department to enhance quality of learning.
2. Seminars and workshops should be organized for business education students by colleges of education management to assist them acquire the necessary knowledge of search skills for better cloud computing resources usage.

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