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CONSUMER ELECTRONICS AND HISTORICAL ANALYSIS OF THE IMPACT OF EFFECTIVE ADOPTION OF CLOUD COMPUTING IN HIGHER EDUCATION

Abstract:

Cloud computing in the Educational sector has immensely enhanced academic performance in the developed nations and the professional contributions may benefit the education strategy of Nigeria particularly in transforming the traditional education model to computer based virtual applications with a focus on e-pedagogy. Cloud computing remains a paradox and open to academic debate with respect to business adoption of its utility, and studies depict that cloud computing to an extent is still at its early incubation in institutions of higher learning; that also affirms the infancy of cloud computing in academia, and this has caused the dearth of a unified definition and understanding of cloud computing. However, this study will develop

academic definition and meaning of cloud computing with reference to institutional applications. This study will also explore the benefits of cloud computing in learning, and focus on the development of relevant models for resource usage in higher education institutions. Author shows that successful adoption of cloud computing by various educational institutions in Nigeria depends on their transition strategies in terms of resource acquisition and deployment. These strategies could form barriers in delivering effective teaching learning, and assessment of instruments encountered through migrating to the cloud. Hence this study is geared towards bridging the gap between the usage of cloud computing in education and effective delivery of educational services via the 'cloud' in Higher Education Institutions (HEIs) in Nigeria.

Keywords: cloud computing, Internet, Nigeria

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Significance of the study

Cloud computing seems to be largely gaining popularity both in the community and in the educational sector, but the impact it has created on HEIs has largely been unexplored especially in Nigeria one of the developing nations. This study will explore the impact of cloud computing in HEIs, the challenges users encounter in adopting the technology, and a proposed model to address the barriers encountered in the implementation of cloud computing. The successful and unsuccessful HEIs that adopt cloud services will be assessed and analysed by the use of Likert scale and statistical measurement. Despite the hype for cloud computing, so many people including academics especially in developing countries are still unfamiliar with its features, although they unintentionally adopt cloud computing in various ways. This study will also be an exploratory study to expose those features to the knowledge of the users. It has been noted by Abidi and Abidi that libraries worldwide are deficient in data flexibility, resource efficiency in information delivery, inter collaboration within libraries, and invariably expensive in management. [1] In this view, digital Cloud computing is developed on libraries and can be regarded as 'location independent computing'. This is a widely assessed resource pool, which enhances massive file storage, file sharing and easy accessibility of information. Cloud computing is regarded as an emergent form of technology inculcated in the educational sector of higher learning which includes the Universities especially in developing countries like Nigeria. In this regard, cloud-computing services are considered as influential factors and of immense value to educators in teaching-learning sector. Matthew in his observation, observes that the trend of migrating to the cloud system has been extended to the developing countries like Nigeria in recent times by most top cloud storage providers

such as IBM, Microsoft, MTN. HEIs in Nigeria would be examined by carrying out an in-depth investigation and exploration of the barriers against the adoption of cloud based services by these institutions.

Research Aims

The aim of this research is to explore the usage of Cloud computing and develop a conceptual model that addresses its Impact in HEIs. Research objectives are:

1. To explore the benefits of cloud services in HEIs in Nigeria
2. To assess the challenges in adopting cloud computing in HEIs Nigeria
3. To evaluate the impact of cloud computing usage in HEIs in Nigeria
4. To develop strategic model for effective adoption of cloud computing in HEIs in Nigeria
5. To develop benchmarking standard for cloud computing in Nigeria

Proposed contribution

This research is aimed at assessing the way cloud computing is being used in HEI in Nigeria, with the view of identifying the benefits, current usability scenarios and proposing a model for good practice and successful adoption of cloud computing to enhance teaching-learning in Nigeria as it affects HEI in Nigeria.

There are three basic contributions for this thesis

1. This thesis will provide a model to bridge the „gap“ in cloud computing implementations and devise the strategy for the deployment of cloud services in HEIs
2. The research will provide benchmarking standard for effective measurement index of cloud computing in HEIs in Nigeria
3. The research would develop conceptual model for effective adoption of cloud computing.

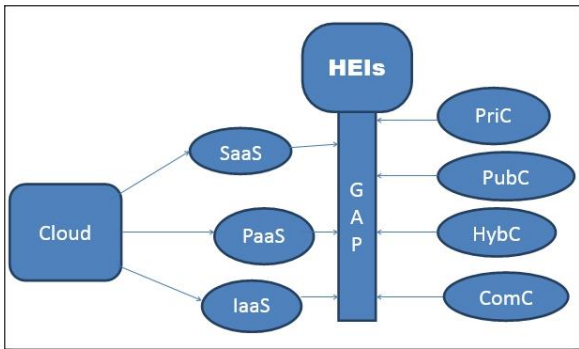


Figure 1.: Conceptual model

- PriC: Private Cloud, PubC: Public cloud
- HybC: Hybrid Cloud, ComC: Community Cloud
- SaaS: Software as a Service
- PaaS: Platform as a Service
- IaaS: Infrastructure as a Service
- HEIs: Higher Education Institutions
- Fig: Figure

Literature Review

Originally, Academics have been adopting cloud computing in different transformational forms of computing such as distributed computing, parallel computing, grid computing, utility computing, network storage mechanism, as well as the traditional computing either through the Internet or intranet, but now digital cloud computing virtualization is the key advancement in technology. The reason for these systems of computing is generally to deliver to the system user an integrated

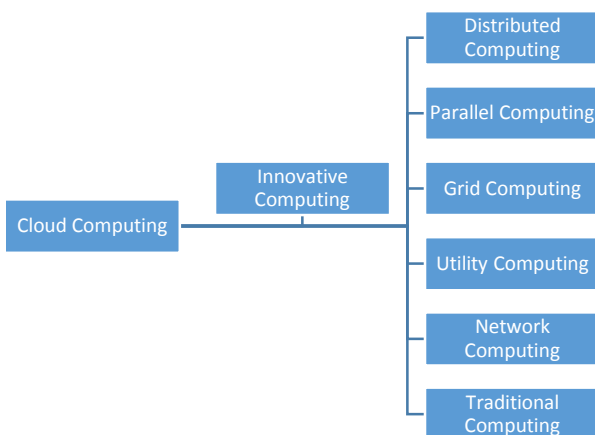


Figure 2.: Cloud computing developmental architecture

Cloud computing has improved educational provisions in Nigeria using the e-learning programmes tailored towards virtual applications. There is research evidence that Nigeria lack adequate infrastructures to facilitate effective cloud services at HEIs. The main problems were that of lack of energy management strategy, poor power supply and inefficient data storage facilities. Cloud computing provides platforms to bridge the gaps and improve the deficiencies of traditional ICT provisions through effective management of educational resources such as e-library, e-administration, e-management, e-portfolio and virtual e-driven support programmes. Cloud Computing is defined as "an emerging computer paradigm where data and services reside in massively scalable data centers in the cloud and be accessed from any connected devices over the internet. There is gap in this definition as it fails to consider the personalization of cloud computing within the organizational intranet or private virtual domain. On the other hand, Vaquero, L.M. et al in their view defined cloud computing as the process of providing computing infrastructure on the network by delivering application software over the Internet down to the user, irrespective of the user's location. From this definition, cloud computing is limited to a 'process' not considered as an application that renders services to the user, it also does not capture the enhanced storage capacity of cloud which provides medium of massive data storage as defined by Aziz that cloud computing is an enabler of a location where computing infrastructure, data, software and application is stored. Mell and Grance in The NIST and ITU Focus Group defined cloud computing as "a model for enabling network users' on-demand access to a shared pool of configured resources that can be rapidly provisioned and released to the

client without direct service provider instruction. National Institute of Standards and Technology (NIST) and the ITU Focus Group, 2012, p. 3. Cloud Computing provides opportunities for organizations to realize return-on-investment (ROI) through quality service delivery, infrastructure acquisition and improvement in the training of professional employees.

Research definition of Cloud computing

The researcher defined cloud computing as an application that virtually deploys and manages services through the Internet or intranet to the end user. It is service-paying application that companies invest on due to cost reduction and effective service delivery to the users. The cloud services deployment is functionally measured by: efficiency in service delivery, effectiveness of platform and flexibility in the performance of infrastructure and cost benefit in service deployment. This concept of cloud computing can be represented using the Mathematical representations shown below:

Key representations: Cloud in HEIs (CHE), Public cloud (Pb), Private cloud (Pr), Hybrid cloud (Hb), Community cloud (Cm), Software (s), Infrastructure (i), Platform (p)

Assumptions

$$CHE = Pb + Pr + Hb + Cm \tag{1}$$

Similarly,

$$CHE = Pb = s+i+p \tag{2}$$

Where s, i, and p are represented as HEIs requirements

Alternatively,

$$Pb = f(s+i+p) \tag{3}$$

if $CHE = Pb$ and $f(s+i+p) = \text{functions}$

$$Pb = f[s + (i0) + (p0)] \tag{4}$$

Where $(i0)$ and $(p0) = 0$

This implies that HEIs only considered Service (s) as the cost effective requirement for the organisation otherwise, the loop may be applied to Hybrid as well as excluded if not viable

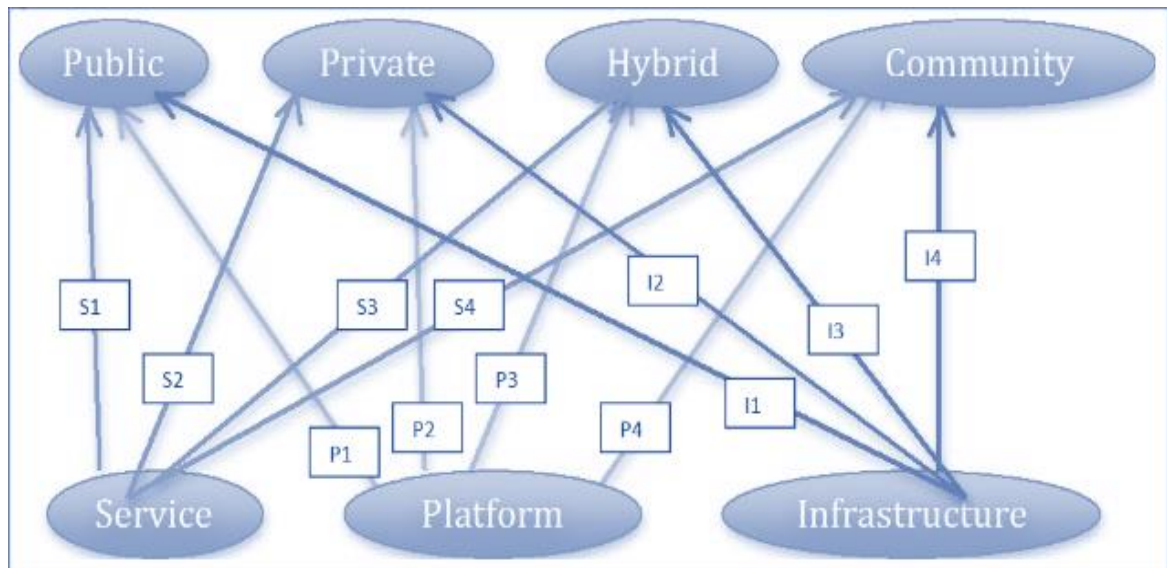


Figure 3.: Cloud computing definition representation

Blue Line: measures the benefit of cloud services based on SaaS using indicator 1,
Yellow lines: measures the benefit of cloud services based on PaaS using indicator 2,
Purple lines: measures the benefit of cloud services based on IaaS using indicator 3

Research questions strategy

Indicators such as Cost savings, efficiency in service delivery, and effectiveness of software deployment, storage capacity, performance and standards will be used to measure the first objective (RQ1s)

To measure the second objective, the PEST analysis will be employed, as indicators for identifying the challenges of cloud computing in HEIs

Evaluating the impact of cloud computing in HEIs, the indicators to be used are the SWOT analysis metric

By the end of this study, the researcher, the researcher will developed model for cloud computing implementation in HEIs.

Benefit of cloud computing

Literature have shown that the basic benefit of Cloud computing is cost savings in terms of deployment and management of services , by Menon and Anala, but lack evidence of benchmarking index and standardization. There is no evidence of professionalism within the cloud computing subject area, as it seems to include other specialist disciplines such as integration of ICT, Engineering and Applied Management Sciences with different background and professional expectations.

The cost reduction and pay as you use strategy has given cloud computing competitive edge above other provisions. In-house data centers and provision pay as you go synergy and the concept of renting IT infrastructures, services and platforms in order to achieve the maximum benefits of Cloud Computing using other ICT innovative strategy to create values and best practice. The financial reward to organizations cannot be over emphasized as most researchers focus on the acquisition of reduced rate of cost of installation, maintenance, training, software and hardware. Cloud being a visualized system of computing can

be regarded as resource bank holding various huge information, applications, services, IT infrastructure, which can be easily accessible as online-real-time via the web services and outsource to the user on-demand. Therefore cloud computing plays significant role in information service deployment and such facility provision is to a large extent essentially recommended to educational sector as it enhances learning through its visualization system, scalability, flexibility, and portability nature as academics access the information bank conveniently based on their demand. These computing resources are simply used on the Internet other than on various personal computers, yet all needed facilities are available.

With the evolution of cloud service, it is obvious that many organisations, countries migrate to the cloud efficiently because of its beneficial Conceptual, Economical, and technical benefit, which enhances business; an evident from 'Energy Saving Trust' employs analytics and cloud computing from IBM to help reduce domestic carbon footprints across the nation.

Conceptual efficiency of cloud service usage

The above entails the theoretical framework on cloud computing and how it supports efficiency in terms of cloud service provision and delivery while the key parameters to be considered will be in three areas regarded as the features of cloud computing; the Software as a Service (SaaS), Infrastructure as a Service (IaaS), and Platform as a Service (PaaS).

Infrastructure as a service (IaaS)

This service is commonly known to render the virtual machines, all the instances to the subscribed clients. Hence, IaaS is mostly concerned with carrying out mathematical

calculations of data, managing and storing unencrypted data and this is specifically a function of a computer server. It is regarded as a service from a sphere of low-level operations, which gives access to elasticity of IT resources. This means that service users have the capacity to increase or reduce the volume of service they need, therefore it reduces the cost of usage. Also the computing resources offered at this level are on the basis of 'pay per use'. According to Ciuffoletti, one of the products delivered by the IaaS includes; 'load balancing'. Load balancing means equal allocation of processed information to the clients over the computer network to avoid overflowing of information on a single client. An example of company adopting the IaaS is Amazon EC2.

Platform as a service (PaaS)

PaaS is solely concerned with constructing and developing programming and code testing software in the form of custom application and deployment of these services to the service users. It is a middle form between the IaaS (low-level functionality) and the SaaS (High level functionality). This makes PaaS be seen as a unique type of SaaS as it could be combined to provide application software to host the server over the cloud. In the same vein, it can be seen as a special type of IaaS being that IaaS combines with PaaS to design and develop hosting infrastructure and make the design available to the service user, as such the service user can design the application (using it as a template) uniformly either for his employees or for his clients to suit his desire. An example of a PaaS is Windows Azure.

Software as a Service (SaaS)

The SaaS is fondly seen to be a type of cloud service with the highest functionality (Hon, et al., 2011) because it provides the end product usage to the end user. SaaS supports application of the end-

user's modified application for instance by the use of 'Drop-Box' SaaS enables the end user stores their downloaded applications in the Drop box. The Drop box simply means where a service user stores his downloaded files or application. Also, SaaS as well supports the social network sites like Twitter, Facebook, web pages, Google applications etc. In recent times, the conceptual benefit of Cloud computing has attracted variety of meanings in the IT sector by various authors and is evidently shown in this thesis. As at 2009, a report from McKinsey & Co. disclosed as much as twenty-two different definitions of cloud computing including the typology of SaaS that describes;

Delivery stage: cloud computing has been defined as a platform which collaborates with the provider to manage and host IT infrastructure, and by the use of on-demand services deploy these infrastructure to the required applications. The platform through which cloud runs includes; the public cloud, private cloud, hybrid cloud, and community cloud.

I. Private cloud plan: this is a model exclusively owned by just one company or by a business unit, like Amazon VPC. The private cloud is more securely controlled, more expensive to manage and processed within the company. Information does not go beyond the cloud providers managing the service.

II. Community cloud plan: is a model owned and provided for a group of people with similar vision, mission and goal, usually managed by one or more organisation in the community. The cloud service is usually open and membership is required.

III. Public cloud plan: this is an open cloud platform for public use with the benefit of no initial capital investment as argued by Astrova, an example of Public cloud is Google AppEng. [3]

IV. Hybrid cloud plan. Is a cloud platform that comprises of all the cloud models, or two cloud

models, (private, public, community). They share same synchronised services.

Development stage: at this stage, cloud computing provides programming language such as Bungee Labs for general purpose using on-demand service.

Application-led stage: by the use of Software as a Service (SaaS) applications is developed and deployed through cloud computing. This definition could be seen as an ill defined concept of cloud computing as it is centred solely on Software as a Service, whereas other platforms; IaaS and PaaS yet exist and will be captured in this study.

Economical efficiency of cloud service usage

Further explanation from Vaquero, L.M. et al, shows that the reason for the provision of the computing infrastructure on the network is to reduce the cost of hardware management as well as the cost of software resources. Similarly, cloud computing usage scales up moderate infrastructure for short period of time and at a very moderate cost. This as well depicts the elasticity of the cloud.

Technical efficiency of cloud service usage:

People adopt the file storage system as a form of cloud service usage in the cloud to maximize space, yet majority are left in ignorance of a comprehensive meaning of cloud computing as evidently shown by Audrey and Uwe who defines cloud computing as a central hub that allocates computing infrastructure and services to data centres, an enhancement of scalability, cost efficiency and the elasticity of computing. These three factors represent the technical benefit of cloud computing to the users. They also emphasised on the vital role of cloud computing on the fast growing IT generation, but argued the need for user awareness on the concept of cloud

computing including data privacy of user's data on the cloud. [4]

The Technical architecture of cloud is based on; the design of server (hardware) and the size of the infrastructure. Exploring the design of the server, the storage capacity is widely considered, the reduction in IT cost of running the server is effective and because cloud computing suffer on data explosion since organisations try to track information hence requires data harmonisation which looks at data migration from old to new platform and data transformation which is based on content (distinctiveness of data) management strategy. Cloud computing exerts a high performance of distributed computing. All the system software required by organisation to host their application software can be configured in a Virtual Machine or made available by the organisations' cloud Platform as a service provider (PaaS). Therefore the technicality of cloud service brings about its flexibility to the users especially who depend on their cloud providers' infrastructure and hardware to execute the needed software application.

Research Methodology

The approach of the research focused on qualitative and quantitative methods based on the emerging concepts of the discipline in developing economy, especially in Nigeria. The research will be focused on the following triangulation strategy, namely: case studies, interviews and questionnaire in order to provide a balance in data collection with respect to relevance and appropriateness.

Research Epistemology

The research will be carried out from management science perspective to position its epistemology. There are various theories considered such as critical reflection and constructive paradigm. The

Knowledge gap in the field of cloud computing may be attributed to some challenges such as professional expertise, technical competence, electricity and Internet connectivity [2]. The concept of knowledge management and knowledge science paradigm can be classified using critical reflective theories, constructive theories and stakeholder theories.

Knowledge Management in Cloud Computing

This concept of knowledge management paradigm can be seen as facilitator in mapping requirements for cloud computing in HEIs. Knowledge management repository plays transformation role in terms of mapping cloud computing storage and service requirements. Knowledge requirement and classification remains the key indicators for the growth.

Interpretivist

This philosophy advocates how expedient it is to explore and understand the various differences in human by regarding individual as a social actor. Hence it is more concerned with studies centred on beings than on object. Therefore, the researcher of this philosophy deciphers the meaning of people's thought, what they feel, how they verbally and non-verbally communicate then he puts up an interpretation derived from his understanding of these factors and because he builds his theory from the activities of human actors there would be a close rapport he develops with people, hence the chances of having a biased mind is high and this could affect his generating theory, but to avoid biasness, Flowers admonished a self-reflection be adopted for better understanding of inductive reasoning (theory building)

With this, the interpretivist builds a theory by starting with an observation, and from the observation, he inductively reasons a theory out,

hence an inductive research approach is adopted by this philosophy. They appreciate the existence of other realities and try to infer their own interpretation from those realities in the field of the researcher's experience. However, an interpretivist researcher does not generalise his inference unlike the positivist. Also because this approach is subjective, it therefore uses a 'qualitative' method in its data collection and analysis.

Inductive reasoning

This approach seems the most common form of reasoning adopted in educational research. In developing this, the Grounded theorists are of the context that theory should be tested by data collected and not to be tested from a hypothesis which was deductively formulated. In the same vein, Turney support this view of reasoning through a step-wise inductive research approach of semi-structured interview, conversion to text definition generation and testing, followed by formation of new theory and data validity.

Deductive reasoning

This is a reverse of the Inductive. It is generally considered an approach in which the research starts from a general view to a more specific view. It is as well informally known to be a top-down approach (waterfall) in the sense that the study first explores the theory, by hypothetical testing through observation, and finally confirms what was tested for, from an already existing theory. Heit and Rotello highlights that the confirmation of a hypothetical testing is deduced from a known fact (theory). This approach is akin to scientific studies and usually theory is developed and tested before data is collected as found in Saunders, et al. (2009).

Research methods

The basic research methods are the quantitative, qualitative, and other methods like mixed methods.

Quantitative method

The information generated through this method has to be numerical; therefore it is based on statistical data analysis. In this study, through the research questions, hypothesis is generated for proper data collection, and from the collected data, statistical analysis will be carried out to effect a conclusion. Although this study does not take a form of inductive approach, yet there will be a case analysis through the use of questionnaires.

Qualitative method

This involves visual, narrative data (non-numeric). It organises data into a narrative and usually explores a smaller population of sample size. Hence the data that is generated after analysis is not in a mathematical form. It takes a holistic form in analysis, akin to the social sciences. The basic aim of a qualitative research is to convey a comprehensive description of people's experiences and meanings derived out of their communication with variables (human, objects, things) under study.

Mixed method

Mix method relates to process and procedural data collection and analysis mechanism, which involve the combination of quantitative and qualitative research within a single study for the understanding of research problem(s). According to Axinn and Pearce the implementation of mixed method in a study grants the researcher the ability to use the advantage of one method to offset the disadvantage of the other method thereby produces a highly valued result of the study. Similarly, Bryman and Bell explains that a

researcher who does not use a single method such as qualitative or quantitative method, uses mixed method to support the research findings with a method derived from the research strategies. By mixing research methods in a study, comprehensive empirical documentation can be realised.

Adopted research method

It is the desire of the researcher to carry out research using a mixed method as it is classified as appropriate and relevant for a research of this nature. This is to say that both quantitative data and qualitative data will be generated through structured questions for questionnaire and semi structured interview. It is deemed appropriate as a single method and provides in-depth and rich data collection to address the research problems especially in this emerging discipline in the developing economies. The approach used in this research focuses on four distinctive methods of data collection strategy namely:

- Interviews
- Questionnaires
- Focus groups
- Case studies

The above Four methods were adopted due to lack of in-depth research evidence and literatures in the field as cloud computing is at its embryonic stage in developing countries. In addition, Yin (2013) supports the use of multiple cases to extract complex data especially where there is lack evidence in data collection and found triangulation as platform to generate research authenticity, reliability and validity in terms justification of in-depth applications for data collection strategy.

Case studies

Similar to ethnographic studies, case studies intensively examine individuals in an organisation

or in a particular location, but not a group per say, rather studies the activities and programs in which those individual are involved in. According to Merriam, case study is seen as a stepwise process to making inquiries. In accordance to Creswell, qualitative researchers most times study these types of case study; intrinsic (case which is of interest), instrumental (case with a particular or peculiar issue, like same language, hence it is used to clarify such), and collective case (cases that involve description and comparison).

Interviews

It is a method commonly applied in a qualitative research design. Interview could be structured (open-ended) or unstructured (semi-structured). Axinn and Pearce reveals that the flexibility nature of a semi structured interview enables the interviewee bring up new issues which the researcher is oblivious of, but will be of great importance to the researcher. Interview can be administered one-on one, to group of people commonly known as focus group, can be done over the telephone, and or through e-mail.

Questionnaire

This tool is a form of statistically designed questions, which the responses should be geared towards answering the research questions of the study. This is to say that the questionnaire should be structured in the way that would aid in the achievement of the aim of the study particularly to be able to measure the research questions correctly. Questionnaire can be in an open or closed form. When it's structured in a closed form, it takes a quantitative approach, whereas as an open form a qualitative and a risky approach.

Research Approach

This research would:

I. Develop analytical study to improve the current ways in which HEIs in Nigeria migrate to the cloud, with the focus on the impact of cloud computing in education, showing how this impact has influenced academic and learning in HEIs.

II. Carry out empirical study in education sector as a form of case studies and will be faced with difficulty in manipulating the characteristics of the organisation, however, the researcher will start up with a good framework so as to maximize the needed ideas.

III. Use multiple sources of information gathering technique for this study to be effectively carried out. The researcher would employ the use of interview, the use of questionnaire and documentation review.

Population

HEIs in Nigeria comprises of Universities, Polytechnics and Colleges of Education. This study will focus on twenty-five HEIs where eleven (11) Universities, eight (8) Polytechnics and six (6) College of Education will be randomly selected as shown in the Appendix 'Population Sample selection'.

The HEIs concerned in this study will be selected from each of the three geopolitical zones of Nigeria (southeast, south-south, southwest). The population of this study will basically consist of the users of cloud services in HEIs:

- Academic staff
- Non-academic staff (Administrative Staff)
- Technical staff
- Students user groups (Undergraduates or post graduates)

Research strategy and design

This research would be a multiple case study research because of the complexity of culture in

Nigeria and differences in the geopolitical zones and for the richness of data as single case cannot justify the selection of sample size. Yin, argued on the benefit of multiple case study and the requirements for its implementation as it involves the extent of research domain, application of research domain and the sample size requirement. This study supports triangulation because it captures case study, interview (semi-structured) and questionnaire (structured), hence the researcher would operationalize the study by the use of analytical approach (SPSS), multi-technique, of information gathering for this study to be effectively carried out.

Reliability and Validity

Reliability

The concept of reliability was supported by Golafshani as essential tools for positivist. Zhaojun and Kailash defines reliability as "The extent to which results are consistent over time and an accurate representation of the total population under study; and if the results of a study can be reproduced under a similar methodology, then the research instrument is considered to be reliable".

The present research in cloud computing has its key attribute of reliability from the nature of data consistency to measure the various domain of the cloud classification with the data having reliable research outcome.

Reliability according to Creswell is the consistency of the scores shown through the administered instrument. Hence, this study will adopt reliable measures to ensure consistency by:

- I. Administering closed questions, which would require definite responses.
- II. Using structured questions for interview sessions. This enables the researcher to maintain focus on achieving the set aims of the study. While

the respondents err their view within the question structured.

- III. Using SPSS a standardized tool to test the responses from the randomly selected sample.

Validity

Validity is defined in different context by different authors, but as Wainer and Barsottini describes validity in quantitative research as "construct validity". "The construct is the initial concept, notion, question or hypothesis that determines which data is to be gathered and how it is to be gathered". It is obvious that validity with reference to cloud computing must focus on the purported outcome in terms of research result.

To ascertain the validity of the scores from instrument that will be used in this study, the researcher will

- I. Identify the instrument to be administered
- II. Examine the earlier studies that have used SPSS and released their scores
- III. Critically examine the reason for using SPSS for the study
- IV. Critically ascertain if the instrument measures the supposedly variable intended to measure for validity.

Ethical consideration

This implies code of conduct expected to be put into consideration in carrying out a study. In a research study, ethical consideration is related to; collection of data, distributing the instrument for data collection and in reporting the study. In this regard the researcher of this study will consider ethical issues by avoiding;

Invasion of people's privacy In constructing the questionnaire, the researcher will avoid to ask questions which are irrelevant and would not be used. Therefore respondents' privacy will not be intruded.

Data Protection The responses that will be got from the administered questionnaire and interviews will be strictly used only for the purpose of this study. No information got from the respondents will be divulged to any one for a personal interest.

Reporting data The finding of this study is will be unadulterated, and will be reported exactly as derived from the analysis to be carried out. The researcher will wait for the questionnaire to be returned, and carry out analysis based on questions answered. Structured interview session will be organised by the researcher and the interviewees will be pre informed of the topic before the interview session resumes.

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