

CLOUD COMPUTING IN HIGHER INSTITUTIONS IN NIGERIA: IMPLICATIONS FOR EDUCATIONAL EVALUATION.

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ABSTRACT

Cloud computing is the in thing in information and communication technology (ICT) development that has made access to information cheap and accessible anywhere anytime. Nigeria being the most populous Black Country in the world has been identified as the one with the biggest ICT market in Africa. Cloud computing invariable is gaining grounds in Nigeria at a very fast rate. This paper therefore highlights how Higher institutions of learning can employ this new technology to their advantage if used carefully, the paper went further to state that Cloud computing is necessary in every aspect of university life, more so in evaluation where it makes the work much easier for students, lecturers and even administrative staff. The paper equally attempts to identify the implications of cloud computing for educational evaluation.

Keywords; Cloud computing, cloud ecosystem, educational evaluation

INTRODUCTION

Cloud computing refers to internet service where you subscribe for network storage space and computing resources instead of storing your data in your personal device. This way many people can make use of information stored in the "cloud" at the same time and from anywhere. As Huth and Cebula (2011) noted, the cloud makes it possible to access information without being in same location as the hardware that stores your data. This makes access to information inexpensive for individuals and small business organizations who cannot afford the hardware and software needs to set up complex IT units. With this technology as Harris (2015) opined, the cost of computation, application hosting, content storage, and delivery is reduced significantly. He stated that cloud computing has the advantage of broadening horizons across organizational boundaries. The National Institution of Standards and Technology in Wikipedia (2015) and The Office of the Privacy Commissioner of Canada (2015) listed some of the characteristic of cloud computing to include:

- i. On-demand self-service.
- ii. Broad network access
- iii. Resource pooling
- iv. Rapid elasticity
- v. Measured service

n-demand self-service: this indicates that customers, usually organization can request and manage their data without human contact with the service provider.

Broad network access: different applicants eg. Mobile phones, laptops, tablets, work stations can access stored information at the same time.

Resource policy: service providers can serve multiple consumers using a multi-tenant model as Wikipedia (2015) noted. Physical and visual resources to be assigned and reassigned to different consumers on demand.

Rapid elasticity: This as Techopedia (2015) stated refers to scalable provision or the ability of customers to request for additional space in the cloud, making cloud computing automatically available.

Measured service: organizations can pay for what they need at a time thereby reducing cost. This makes cloud computing very affordable to small businesses that ordinarily would not be able to foot the bill for their outfits.

Service Models

Cloud computing providers as Wikipedia (2015) noted offer their services according to different models. These include;

1. Infrastructure- as- a- service (IaaS); the infrastructure of any company according to Ume, Bassey and Ibrahim (2012) comprises of hardware, software, networking components, service and storage space. This platform allows a company to set devices independently and also to enjoy working in the visual world. This like the utility company allows a company to pay for what it needs both in data and space and more space is provided when needed. Examples of clouds that use this platform include: Amazon, Web service, Go Grid, 3tera etc.

2. Software- as- a- service (SaaS); In the SaaS model, (sometimes referred to as on- demand software) users are given access to application and database hosted on the cloud. Eric in Ume, et al explained that SaaS delivers a single application through the browser to thousands of consumers using multitenant architecture. Companies on this platform can share and access all the software delivery models remotely through web based internets as he said. Users according to Wikipedia (2015) do not manage the cloud infrastructure and platform where the application runs thereby eliminating the need to install and run the application on the cloud user's computers, this makes maintenance and support simply. The pricing model for SaaS application is usually monthly or yearly flat fee per user and scaled and adjusted as users are added or removed. The service is usually provided through a web portal and the users can gain access anywhere and anytime. Example of this service include Google doc, Gmail, salesforce.com, acrobat.com, Microsoft, zoho etc.

3. platform-as-a service (PaaS); on this service, clients are given the opportunity to build their own applications, which run on the provider's infrastructure. Consumers can purchase access to the platform but the operating system and network access are managed by the service provider. It is often seen as a variation of SaaS, Ume et al (2012) opined that PaaS providers use Alls websites portals or gateway software installed on the customer's computer. Examples of PaaS clouds include force.com, Microsoft Azure, Google APP Engine etc. Wikipedia (2015) recorded that some integration and data management providers now use specialized applications of PaaS as delivery models for data solution. These specialized services enable customer to develop, execute and govern integration flow. The service provided as noted by Tsagklis (2013) might include an operating system, a programming language execution database and web services. These include iPaaS and dPaaS. Under dPaaS, development and execution of data solution is managed by PaaS provider and not the customer.

4. Network- as- a- service (NaaS). This according to Tsasklis (2013) is the last common model. It involves the user being provided with network connectivity services such as VPN and bandwidth on demand, a VPN (Virtual private Network) as explained by Geier (2013) allows a computer using a public internet connection join a private network by securing a

tunnel between that machine and the network. This is today applicable when businesses allow the employees to connect to its work network from outside the business premises and was made famous when Marissa Mayer according to him used yahoo's VPN to check on the work habit of her employees. Bandwidth on the other hand is the amount of data that can be transmitted in a fixed amount of time, usually expressed in bits per second bps or bytes per second (Beal, 2015)

Types of Cloud (Deployment of cloud services)

Experts have identified four types of cloud: private, public, hybrid and other clouds

1. Private cloud: these are usually built for single organization or enterprise. This gives greater control to the user and affords greater security than the public cloud. The cloud is managed by the organization or a third party. Franklin (2010) listed the benefits of private cloud to include: i) Flexibility, ii) Lower recurring cost, iii) More reliable and efficient, iv) More secure

For cloud storage, he explained that private cloud has faster access, easier access and can be accessed via network places; other benefits include resource pool, remote desktop and easy administration. Private cloud services are capital intensive as the organization still has to acquire space, hardware and environmental controls and the assets have to be refreshed periodically thereby increasing the cost (Wikipedia 2015) this can be located on or off the organization premises.

2. Public cloud: this as Cloud Security Alliance (2009) stated is owned by an organization selling cloud services and the cloud infrastructure is made available to general public or a large industry group on a commercial basis which makes the service very cheap and the consumers pays for just their need In data and storage space, the services are available wherever the end user might be located which enables easy access to information and accommodates the needs of users in different time zones or geographic locations (Tsagklis, 2013). Documents and files can be viewed and modified from different locations making collaboration much easier. One major advantage of public cloud according to Harris (2015) is that this may be larger than an enterprise cloud thus providing the ability to scale seamlessly on demand. Examples include services for general public like; online photo storage service, e-mail service or social networking sites he stated. Public clouds according to Franklin (2012) have the benefits of : a) No upfront hardware costs, time, resources, b) Per-usage pricing, c) scalability.

When using shared computing, it has the benefits of: a) One has a computer without paying full price, b) easy scaling from smaller to larger system as necessary

The draw backs however includes: a) Not as flexible, b) can be expensive with heavy usage, c) less security.

3. Hybrid cloud: this is a combination of a number of cloud types. Through their interface, data and applications can be moved from one cloud to another. It can be a combination of private, public, and community clouds where some data can remain in the organization's private cloud while some others can be in public cloud.

Other clouds

1. **Community cloud:** here, cloud infrastructure is shared by a number of organizations with similar requirements. This reduces the cost as the organizations share the head cost. The infrastructure is owned by the organizations or by a third party.

2. **Distributed cloud:** as Wikipedia (2015) noted a cloud computing platform can be assembled from a distributed set of machines in different locations connected to a single network or hub service. There are two types, public-resource computing and volunteered cloud.
 - a. Public-resource computing it noted results from an expansive definition of cloud computing, it is seen as a sub-class of cloud computing and examples include BOINC (Berkeley Open Infrastructure for Networking Computing).
 - b. Volunteer computing: this is essentially the intersection of public resource computing and cloud computing. Here, the cloud computing infrastructure is built with volunteered resources, that is, computer owners donate their computing resources to one or more projects (Wikipedia, 2015).
3. **Intercloud:** the focus is on how public cloud service providers can work together than between providers and consumers as in hybrid.
4. **Multicloud:** in this approach, multi cloud computing services are used in a single heterogeneous architecture to reduce depending on a single vendor, increases flexibility through choice, mitigate against disaster etc. this is different from hybrid cloud where different modes are used.

Cloud Computing in Education

Cloud computing has provided a good alternative for educational institutions in developing countries where budgeting allocations are too low for ICT infrastructure. Universities in developed world are making use of the available cloud based application afforded by service providers which enables them to make use of data needed at very low cost, it enables educational institutions to actually make use of the global internet resources for data analysis and data storage (Gaytos, 2012).

Mircrea and Anderson in Gaytos (2012) listed the following advantages of cloud computing to educational institutions.

- i. Cloud computing allows institutions to have access to information on the cloud from anywhere in the world within seconds making it easy for teachers and students to be in touch and update information from time to time.
- ii. -it allows teachers and students to access applications and other useful tools for free.
- iii. Because the technology is new, it is efficient and environmentally friendly.
- iv. Cloud computing they said allows for interconnectivity, students are exposed to openness and be in touch with students in other institutions.
- v. the learner benefits more as through cloud computing schools can attain the goal of equal delivery of educational services to each and every learner
- vi. Bouncelli (2014) also added advantages like;
- vii. low total cost of ownership
- viii. No to software
- ix. -innovations at your desk, update and patches got to the end users as soon as it is released
- x. mobility solutions
- xi. Scalability as it is possible to scale vertically and horizontally which gives institutions the advantage to proactively provide on demand service to users he noted.

Roland (2013) listed how cloud computing can particularly enhance students learning as:

- i. Students can easily carryout group project without making out special time to meet as they can meet on the net at a particular time.
- ii. They can even record their interactions for recall on what they agree to do. Tools like Evernote she noted can even allow note taking sharing TED talks can be used for access to cutting-edge ideas, LinkedIn to connect with experts which can create long term relationship that can come in handy when looking for jobs
- iii. There are also professional social media profiles that potential employees can view etc.

As Nigeria has been described as the largest growing market in Africa's information and communication technology (ICT) in terms of internet usage and mobile/fixed line subscription by Dahunsi and Owosen (2015). Universities in Nigeria should benefit in what cloud gives generally like:

- i. Bridging the digital divide
- ii. -e-service such as e-learning
- iii. Research and collaborative purposes
- iv. Reduction in environmental degradation by using e-communication
- v. Disaster recovery and emergency response
- vi. Storage capabilities

The awareness is being created and the universities are buying the ideas. In a study by Oyeleye, Fagbola and Daramda (2014) on the impact and Challenges of Cloud Computing Adaption on Public Universities in South Western Nigeria, they found that out of 10 universities studied, nine had already adopted cloud computing. They found seven universities to use SaaS and the applications used include google docs, Moodle, Google mail, yahoo mail and Net suit. This is expected in other parts of the country.

IMPLICATIONS FOR EDUCATIONAL EVALUATION

Universities are regularly involved in evaluation of programmes hence, lecturers and students can all benefit from cloud computing. Cloud computing can greatly impact positively on teaching- learning transactions as lecturers can interact with their students making comments on their works, correcting what needs to be corrected which the students can see immediately as they be guided on what they are doing.

Cloud computing as Obunadike, Tyokyaa and Ume (2014) stated can enhance collaboration among the universities by enabling easy transfer of academic records like transcripts from one university to the other without getting the students involved. Universities offering similar programmes can have a pool of questions they can use to assess their students, thereby setting a standard that all the students have to meet for certification. Examination has to do with record keeping and, with fire incidents very common in Nigeria; universities are not left out as possible victims. Reports of fire gutting exams records Departments are not strange. Typical examples are those of Anambra State University VC's, DVC's and Registrar's offices in 2013 and also Economics Department of the same university destroying sensitive, irreplaceable documents which made it difficult for examination records to be retrieved. If all universities in Nigeria should adopt cloud computing, records stored on the cloud can always be retrieved. Universities are centers for research which can benefit immensely from cloud computing.

Studies can easily see how basic problems are solved and universities can learn from what is happening in other universities and in other countries since the cloud can be accessed from

anywhere. Certificates issue by various universities can easily be verified if there is interconnectivity thus putting an end to fake certificates being carried up and down. Assessment of lecturers for promotion becomes easy with cloud computing as cases of plagiarism can easily be detected Lecturers sacked for misconduct can be identified by unsuspecting universities who would have hired them unknowingly. University ranking becomes very easy within and outside the country

CONCLUSION

Cloud computing has revolutionized the ICT world and more organizations and institutions are adopting it because of its numerous benefits. Generally the education sector in Nigeria according to Abagbodi (2015) is grossly under financed. Universities are all struggling with poor finances to meet up with ICT requirements needed for universities to run effectively. Cloud computing has provided a cut-cost approach to enable these institutions to get both the data and storage space they need without spending so much. Things are changing every day and the institutions of higher learning should be up to date with what is going on around the world to produce graduates that are relevant in today's society. Cloud computing if adopted and well managed creates the opportunity the universities have been longing for. Its relevance in educational evaluation cannot be overemphasized, lecturers and students can use the internet continually at any time and from any place so long as they have the devices for internet connection, the problem of large class size and its effect on learning can be eliminated. Assessment can be more effective and records properly stored and retrieved in a very short time.

However, this should be done carefully and with great caution as most good policies in Nigeria have failed due to poor implementation .Issues of cloud ecosystem have to be taken seriously for services to run effectively. Onamade and Adedayo (2014) on this reported that most companies presently prefer to site their servers in countries like Canada, Sweden, Finland and Switzerland where the climate favours cooling and there is renewable electricity.

RECOMMENDATIONS

1. Nigeria universities should take time to study the various deployment models to come up with what will be cost effective.
2. Cloud computing should be taken seriously and both staff and students trained on how it can be used effectively to enhance teaching and learning.
3. Government should come to the help of universities by creating extra budgetary allocations for this to be properly implemented.
4. The various challenges like security of data on the cloud should be addressed before full implementation.
5. Lecturers should prepare to use it effectively to enhance teaching for sustainable development
6. Parents should also be sensitized to follow up their children's and wards' academic progress through the net to bridge the wide gap between home and school. For there have been cases where students have been rusticated from schools and the parents remain in the dark over years.

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