

THE USE AND CHALLENGES OF CLOUD COMPUTING SERVICES ADOPTION AMONG SMES IN NIGERIA

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Abstract

This paper considers the factors militating against the ready adoption of cloud services by Small and Medium Enterprises (SMEs) in Nigeria. The paper recognizes that the major challenges affecting the adoption of cloud services in Nigeria include infrastructural issues such as lack of adequate and affordable Internet network facilities and unstable power supply. Other factors include lack of proper awareness of the benefits of cloud services, high cost of bandwidth, and high cost of supporting cloud services among others. To mitigate these problems it is suggested that private organizations should make more investment in Information and Communications Technology (ICT) infrastructure in Nigeria and government on its part should create the enabling environment for this to be achieved. Private and public institutions alike should increase effort to encourage SMEs to understand the benefits of adopting cloud services to their bottom-line. Other ways the adoption of cloud services can be improved include the establishment of more focused research in the area of cloud computing; private organizations and possibly government can sponsor such researches. Furthermore, regulation including enforcement of data protection laws and all other intellectual property rights protection regime should be adequately enforced. If all these challenges are resolved cloud computing has the potential to be the next big thing in Nigeria and revolutionize the profitability of SMEs.

Keywords: Cloud computing, SMEs, infrastructure, ICT

INTRODUCTION

Cloud computing is fast changing the way information technology services are designed, developed, deployed, scaled, updated, upgraded, managed, maintained and even paid for (Martson, et al, 2011). This has brought about a decrease in the per unit cost of computing services (Hackett, 2008 and Lasica, 2009). Cloud computing promises to deliver the hitherto functionalities of information technology services with even more functionalities in a cost efficient and in more effective way (Staten, 2009). Cloud computing will enable organizations to avoid investing in Information and Communications Technology (ICT) infrastructure that they do not require. A survey by VWware (2008) of six corporate data centers revealed that most of the services in the data center were under utilized as only 10-30 percent of their available capacity was utilized. The survey also discovered that less than 5 percent of desktop computer capacity was utilized. Aside from the high costs involved in setting up ICT infrastructure, there is also the inherent cost of servicing and maintain these infrastructure. And this cost is known to be a huge chunk of an average organization's ICT budget (Gomolski, 2005).

According to Zissis & Lekkas (2012) cloud computing more or less originated from the convergence of grid computing, utility computing and software as a service. The components that make up a cloud computing system, the cloud ecosystem, are still at infancy stage in developing countries particularly in Nigeria (Dahunsi & Owoseni, 2012). Dahunsi & Owoseni (2012) suggests that the cloud ecosystem comprises of the consumers on the demand side (individuals, groups, businesses including SMEs etcetera), the cloud itself and the supply side. The supply side is made up of the cloud solution/service providers (telecommunication services providers in Nigeria such as MTN, etisalat, GLO, Airtel; and information technology solution providers; consulting companies; and regulatory bodies such as Nigeria Communication Commissions, National Information Technology Development Agency and the likes). Cloud computing can be described as the seamless coming together of two key aspects ICT namely ICT efficiency and business agility (Kim, 2009). Efficiency in this instance represents the efficient use of ICT hardware and software infrastructures capacity. Business agility on the other hand represents the effective and

strategic use of IT tools by businesses to gain competitive edge through for example rapid and scalable deployment, cost efficient procurement and basically avoiding huge upfront payment for ICT infrastructures.

In summary cloud computing entails the following (Martson, et al., 2011): the on-demand delivery of ICT services to end-users over a network not minding the devices or location of the user; such services can be readily and quickly accessed and provisioned by the service provider with minimal interaction with the user; the user decides when, how to use and what to use to access the service and the user also decides when to stop using the services and the volume of service to acquire at every point in time; users can pay for the services as operating expenditure, implying that the user does not have to incur huge capital infrastructural cost for setup and the user simply pays for only services consumed.

SMEs IN NIGERIA

There is no specific definition of SMEs as this can vary from country to country and even from one organization to another. Different criteria can be used to describe an SME including using turnover, number of employees, profit, capital employed, available finance, market share and relative size within the given industry (Etuk, Etuk, & Michael, 2014). According to (Etuk, Etuk, & Michael, 2014) the National Council of Industry in 2003 defined a small business as one that has between 11-35 employees with total cost including working capital but excluding Land of between 1 - 40 million Naira. It defined a medium enterprise as one that has between 36-100 employees and with total cost including working capital but excluding Land of between 40 – 200 million Naira. A more recent definition by the Central bank of Nigeria describes SMEs as “entities with asset base of N5 million and not more than N500 million (excluding land and buildings) with employees of between 11 and 200” (Central Bank of Nigeria, 2014).

According to a joint report by Small and Medium Enterprises Development Agency of Nigeria (SMEDAN) and Nigeria Bureau of Statistics (NBS) Nigeria has over 17 million Micro, Small and Medium Enterprises (Survey Report on MSME in Nigeria, 2010). Often both private and public authorities at various occasions suggest that Nigeria has about 17 million SMEs that currently employ over 32 million people (Oniyitan, 2014). This is not true at all as the data from SMEDAN and NBS suggest otherwise. The 2010 collaborative survey report from SMEDAN and NBS clearly states

that Nigeria has 17,284,671 MSMEs out of which 17,261,753 constituting about 99.87% are micro businesses. The survey observed that small businesses constitute 21,264 or 0.12% while medium businesses constitute only 0.015 or 1,654. So in a nutshell SMEs are merely 22,918 or 0.13% of the total number of MSMEs in Nigeria. And furthermore, out of the 32,414,884 jobs created by MSMEs the actual number created by SMEs at the time was only 39,918.

In as much as there are many SMEs in Nigeria with potentials to positively contribute to the country's GDP, Oyelaran-Oyeyinka (2007) believes that Nigeria is not very serious in growing its SMEs sector as compared to other emerging markets. According to International Finance Corporation (IFC) most established businesses in Nigeria are SMEs (about 96 percent) compared to only about 53% in US and 65% in Europe. And even despite the fact that most of the businesses in Nigeria are SMEs, they only contribute about 1% of GDP. This is very low compared to 40% in Asian countries and 50% in the US or Europe (Oyelaran-Oyeyinka, 2007).

While it may be true that most SMEs in Nigeria use ICT in their businesses not many of them have access to the Internet (Otuka, Preston, & Pimenidis, 2014). However, a large number of them see ICT as important to their business (Otuka, Preston, & Pimenidis, 2014). While a fair number of SME owners/managers seem to have knowledge of cloud computing service an overwhelming majority have never used any cloud computing service. In fact according to the survey by Otuka, Preston, & Pimenidis, (2014) only about 23 percent currently use cloud services in their organizations. Although this figure may seem low it is still significant considering the fact that cloud computing is still relatively a new technology. The survey also discovered that most of the respondents use Infrastructure-as-a-service (IaaS) followed by software-as-a-service (SaaS), while platform-as-a-service (PaaS) is the least patronized.

An improved cloud ecosystem in Nigeria will foster not just adoption of cloud services among SMEs but will improve collaboration among them as well, as there will be improvement in information gathering and sharing. It can effectively bridge the digital divide between SMEs spread across Nigeria as learning is made easier and access to vital information is made simpler.

Challenges facing cloud-computing services in Nigeria

Status of key infrastructure in Nigeria

One of the key challenges cloud computing faces in Nigeria is lack of adequate infrastructure on which the cloud services are to run. Major infrastructure that supports cloud services such as electricity; fast, reliable and affordable Internet connectivity; network backbone and so on are very limited in Nigeria. And even when available it is unreliable and present only within major cities leaving many rural areas and smaller cities in the dark. The poor state of electricity in Nigeria is undesirable for data center providers who will rather partner or establish their data centers abroad as this often is cheaper for them than incurring huge cost providing private electricity through generators. And many consumers and third-part vendors in Nigeria are more comfortable buying data center services from data center providers who are either located abroad in countries with more reliable infrastructure or who have their data center backup situated abroad. Ogunraku (2014) reported that even the very few data centers that are located in Nigeria are mainly situated in Lagos which has better network backbone connectivity and closer to the various under sea Internet cables including Main One and GLO 1 cables (Purefoy, & Kermeliotis, 2012). The in-country network backbone connectivity in Nigeria is still very poor implying that most other states in Nigeria lack direct connection to the under sea Internet network.

Backbone networks play major role in the delivery of ICT services including cloud services in all countries. And it contributes a huge portion of the total cost incurred by network providers to their overall cost. And in a country with very vast geographical spread like Nigeria the cost of providing broadband connectivity per subscriber is very high. This cost is much lower per subscriber in cities like Lagos and other densely populated cities compared to rural areas and cities with sparse population (Williams, 2010). As mentioned earlier most of the major broadband infrastructure (WACS, Main-one and Glo 1 fiber optic Cables) are sited in Lagos except for Nigcomsat -1R which is satellite. And these infrastructures are not adequately spread to other cities due to lack of domestic backbone networks. This lack of domestic network infrastructure is the major problem inhibiting the growth of broadband. Some states including the Federal Capital Territory have fiber networks within the state but there are very limited connections between fiber networks from one state to another. According to the Former

Nigeria Minister of Communications Technology, Omobola Johnson, Internet penetration is still very low with broadband penetration even lower (Chidiebere, 2013). And where there is connectivity between states it is only between state capitals. In a nutshell there is the absence of long distance national backbone to carry and distribute the capacities provided by the submarine cables mentioned above to the users in offices, schools, and homes in the hinterland across Nigeria (Olusola & Olojoyetan, 2013).

Other challenges facing cloud-computing services in Nigeria

Some of the problems identified as hampering the growth of broadband and by extension cloud computing services in Nigeria is the very high cost of obtaining right of way (inclusive of cost involved in settling government officials, the cost of settling various indigenous owners of the land where the infrastructure will pass through and long delays in procuring the right of way permits). This cost invariably causes the cost of leasing transmission infrastructure to be high. The high cost of investment in last mile broadband infrastructure leads service and infrastructure providers such as the telcos to concentrate only in major cities. Frequent vandalization of broadband infrastructure by hoodlums leaves undesirable financial burden on owners of telecommunication infrastructures. Other challenges include multiple taxation on the part of the federal, state and local governments; weak regulation in some case, incessant disruption due to road works and huge cost of providing alternative electricity to power telecommunication equipment (Olusola & Olojoyetan 2013).

Consequently Internet penetration in Nigeria is very poor due to inadequacy of this infrastructure. And where available the cost is quite high. According to the Nigeria Communications Commission there over 85 million Nigerians with access to the Internet as at March 2015. This figure is calculated by adding up all the Internet subscribers per telecommunication operator. This figure may not be very accurate as many Nigerians own more than one phone line, so there may be issues of double counting. The US Census Bureau (2014) suggests that Internet penetration in Nigeria is 33 percent. If this figure by the US Census bureau is correct it means that Internet penetration in Nigeria is low when compared to other African countries especially Morocco, Egypt, Tunisia and South Africa.

The cost of supporting cloud infrastructure and services in Nigeria is still quite high and limited. There are no manufacturing or assembly plants in

Nigeria for cloud equipment. This implies that every equipment that is used for cloud deployment is imported from outside the country. It further implies that when a device is faulty it has to be ordered abroad or procured from a vendor who of course buys abroad. Furthermore, there are not many qualified engineers who can install and support cloud infrastructures. For there to be massive deployment and support of cloud services Nigeria will need more trained and qualified engineers that understand how to install, manage and support cloud infrastructures. Presently most of the functional data centers in Nigeria are setup, managed and maintained by expatriates (Dahunsi & Owoseni, 2015).

There is limited investment by both private and public sector investors in ICT infrastructure. Odufuwa (2012) observed a decline in the investment made by some of the telecommunication providers in Nigeria. This is attributable to recent insecurity, which has led to the destruction of many telecommunications infrastructures. Another factor that could have been responsible for this poor level of investment could be recent instability in the political system and furthermore the decline in the price of oil and other economic parameters have not been very encouraging to investors.

Lack of adequate awareness has also been identified by Awosan (2014) as a major issue affecting the adoption of cloud computing in Nigeria. The research carried out by Awosan (2014) revealed that 89.1 percent of the research respondents are of the view that lack of proper awareness of the workings and benefits of cloud computing was responsible for its poor adoption. The people interviewed also corroborated this view. The research also revealed that many small businesses in Nigeria have employees that lack the requisite skills to operate basic ICT tools including cloud applications. And many business owners do not want to invest in upgrading the skills of these personnel for several reasons including cost of training and fear that the employees may end up leaving the organization abruptly (Awosan, 2014). So lack of skills to manage these applications and business owners not seeing real value in automating their processes are huge challenges working against the adoption of cloud based solutions among many Nigeria SMEs. Some of these businesses especially the small ones do not have enough sales to justify the use of cloud computing applications as making such a purchase in their view may wipe away their bottom line. And possibly quite a good number of them do not understand how business automation can help make their business more efficient, improve sales, help manage customers and reduce

waste.

Lack of stability of power supply has been identified as factor that can cause both loss of data and inability to access cloud services. In essence consumers may not be able to access cloud services always and even when they do sudden loss of power supply can cause loss of data (Greengard, 2010). Another major problem limiting the ready adoption of cloud services is the high cost of bandwidth required to transfer data through the Internet especially when working with data intensive applications (Otuka, Preston, & Pimenidis, 2014). Furthermore, unreliability of Internet services due to several factors including low bandwidth capacity is also a militating factor (Leavitt, 2009). There is also the lack of confidence on the part of SMEs on the overall reliability and consistency in the quality of service provided by cloud service providers over a long term (Otuka, Preston, & Pimenidis, 2014). Some organizations especially large organizations may not be too comfortable entrusting their IT services to cloud service providers for fear of down time. They may not be sure if the cloud services provider will guarantee optimal performance for their missions critical business. This view is supported by Carr (2005), who rightly opined that one of the major impediments to the adoption of cloud computing will not be technology but attitude of end-users towards cloud computing. Marston et al., (2011) observed that some applications may not be currently sustainable to be implemented as cloud service but may therefore need to interact with other cloud based applications a process that may pose challenge both in terms of contractual and support issues. Due to the nature of cloud computing services some organizations may be skeptical in adopting the service, as they do not have “control” as such over the information and supporting infrastructure. And some may also be worried about vendor location due to lack of standards or the vendor even completely going out of service.

Awosan (2014), Qamar et al (2010) and Otuka, Preston, & Pimenidis, (2014) pointed out that issues of security, privacy and lack of standards are some of the major concern in cloud computing. From the research carried out by Awosan (2014) Chief Information Officers in selected organizations in Nigeria are of the view that cloud service adoption is considered risky due to insecurity and lack of privacy. Likewise the research by Otuka, Preston, & Pimenidis (2014) especially from the focus group part discovered that security and privacy issues were seen as major impediments to cloud computing adoption in Nigeria. Furthermore they found out that lack of

standards governing ICT use in general in Nigeria is a key problem to the adoption of cloud services by SMEs.

Suggested solutions to improving the state of cloud computing in Nigeria: making cloud computing the next big thing in Nigeria

The quest to make cloud computing the next big thing in Nigeria can properly be achieved through the active participation of all involved stakeholders. These include the cloud service providers, the SMEs, government at all levels, telecommunication infrastructure providers, financial institutions among others. Government on its part should put more effort in developing and propagating the adoption of ICT in Nigeria. It should ensure the development of basic infrastructure such as stable electricity supply. This can be achieved in collaboration with private sector investors in the area of electricity generation, transmission and distribution. With such infrastructure in place other investors in the ICT sector will be encouraged to make more tangible investment in cloud computing facilities and indeed other ICT infrastructures that will one way or the other support cloud computing. With stable and efficient power supply, organizations that are into the provision of cloud computing services will invest in the establishment of data centers in Nigeria. This will decrease the cost of accessing cloud services and also improve the speed of access, as the consumers will be able to access the services in-country instead of accessing it from a distance country. Furthermore, promoting the establishment of more inclusive and robust network infrastructure will bring about increase in the use of broadband services. The current state of network backbone infrastructure in Nigeria is still very limited not covering most sections of the country thereby making the reach of broadband very poor and where available not adequate. Government either working alone or in partnership with private sector investors by providing the necessary enabling environment should aggressively pursue the extension of current ICT network backbone across the country (Dahunsi & Owoseni, 2015).

The establishment of manufacturing plants for ICT equipment especially the equipment that are used in cloud computing will help reduce the price of these items and invariably the adoption of cloud computing (Dahunsi & Owoseni, 2015). Investment in such manufacturing plants should be embarked upon by private sectors. On government's part it can provide the enabling environment including tax relieves to private sector

investors to encourage them to setup such manufacturing plants. The private sector investors should be bold enough to make necessary investments in setting up manufacturing plants. They should take special consideration to the over 100 million prospective consumers and the over 17 million micro businesses that can potentially become small and even medium size enterprises.

There should be increased advocacy on the use and benefits of cloud computing to SMEs. Many SMEs are not entirely aware of the real effect automation can bring to their bottom line. Letting them know how automation can help improve sales, manage customers, track inventory and so on will surely help encourage the adoption of cloud computing services. Government and cloud computing service providers can also go further to give incentives to enterprises that adopt the use of basic cloud computing services in their businesses. For instance SMEs can be given free tutorial on how to migrate to cloud services and service providers should also consider giving free trial for a given period of time to SMEs to try out cloud services. Increased availability of more cloud computing service providers will also aid adoption. This will help address the issue of inaccessibility and in the long-term reduce cost and bring about improvement in cloud services due to competition among cloud service providers. Development of innovative cloud solutions that are suitable for SMEs in Nigeria, such as CliniPak (West, 2015) a mobile healthcare solution currently in use in Nigeria will ultimately help improve cloud services adoption. Similar solutions should be developed for the various sectors in Nigeria in simple to use and affordable manner.

More focused research should be geared towards improving cloud computing infrastructure and services. Private sector organizations can sponsor research institutions either through grants, scholarships etcetera to carryout research work that will help improve cloud-computing services in Nigeria. Such research can include looking at ways of improving present services, manufacturing new hardware equipment and software applications. Dahunsi & Owoseni (2015) suggest that universities can be encouraged to establish cloud network laboratory in their institutions to teach regular students and organizations that may wish to send their employees to learn specific skills on the provision, management, support and deployment of cloud computing services.

Regulation including enforcement of data protection laws and all

other intellectual property rights protection regime should be adequately enforced. Nigeria is a member of WIPO and is signatory to all the major IPRs treaties but the problem has always been the enforcement of the relevant laws. Fully enforcing such laws will give users the confidence to adopt cloud computing services including allowing their vital data to be warehoused in a data center knowing that their data will be adequately protected. And where there is a breach they can easily get the relevant government authorities to take necessary action including getting redress from the legal system. Having a sound regulatory system that ensures that service providers keep to their side of the bargain and deliver proper services with minimal downtime will be a huge source of encouragement to SMEs to adopt cloud-computing services.

Conclusion

If the present challenges militating against the adoption of cloud computing in Nigeria are resolved it has the potential to deliver immense benefits to businesses including SMEs. SMEs can take advantage of cloud computing to quickly enter into a market a move that would have previously been more difficult due to cost of acquiring ICT infrastructure. This is particularly of advantage in emerging markets like Nigeria where there is gross inadequate infrastructure, which poses a strong disadvantage to SMEs trying to compete with other businesses in other countries. But with the advent of cloud computing these businesses can leverage readily available, efficient and affordable cloud services. So cloud computing will allow organizations in Nigeria to have access to information technology services on demand without having to incur the full cost of setting up full blown technology infrastructure of their own. This will allow the organization to utilize the money it should have invested in acquiring technology infrastructure into other areas. And the fact that the organization under cloud computing environment will have to pay only for what it needs and uses, it further saves the organization from making investment in infrastructure that it could cease to use in future. So in essence the problem of under utilization of technology infrastructure will be taken care of.

SMEs in Nigeria will have faster time to market their products/services as not only the cost of setting the necessary ICT infrastructure is reduced but also the time it would take to setup such facilities is also avoided. Marston, et al., (2011) further notes that cloud

computing significantly lowers the barrier to innovation, making it more feasible for businesses to scale their services (either upwards or downwards depending on demand and other considerations). And furthermore, cloud computing makes it possible for businesses to access new classes of applications and services that were hitherto impossible to access. Cloud computing will also help organizations achieve reasonable savings on energy cost. This is particularly true since the organization will have limited IT infrastructure that require energy in its premises.

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