Will Big Data and Cloud Computing Adoption by SMEs in Developing African Countries Survive? - Case Study of Ghana

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ABSTRACT

Small and Medium-sized Enterprises (SMEs) in Africa do make a lot of contribution to the national development of their respective countries. They face a number of challenges, to which a number of literatures have been well documented on, ranging from the adoption of Information and Communications Technology (ICT) to e-commerce security. However, little has been documented on the reasons why they are not embracing Big Data and Cloud Computing or if they have embraced it, why are they not growing as they should? Big Data and Cloud Computing when combined, can yield a powerful force that SME businesses can tap into. Big corporations and multinational organizations in the industrialized world are all making use of Big Data and Cloud Computing, except African countries. This paper makes a contribution by highlighting the reasons why SMEs in Africa are not embracing Big Data and Cloud Computing or why they are not reaping the full benefit if they already have embarked on Big Data and Cloud Computing technologies.

KEYWORDS:

Big Data, Cloud Computing, Small and Medium-sized Enterprises

1. INTRODUCTION AND BACKGROUND STUDY

Businesses both small and big are all taking advantage of Cloud Computing and Big Data utilization in order to edge their rivals. In this era, having a little information about your rival is a big advantage in terms of trade and decision taking. Corporations and businesses in the advanced countries have been using these facilities for some time now. With the Internet all over, it is easy for one to get on board to take advantage of these technologies. The question is; are SMEs taking advantage of such technologies to the fullest? The reasons for not doing so are the subject of this article. Do we begin by asking the question what is Big Data? We will then move to also explain or find out what Cloud Computing is and then how these two could benefit SMEs, and we shall list some of the challenges facing SMEs in the adoption of these two technologies. Finally, we shall proffer solutions to some of these problems and challenges.

Big Data mean different things to different people. It depends on whom you ask. A number of definitions abound and we shall just list a few of them here. Chen et. al. [1] defines Big Data as “data sets and techniques in applications that are so large and complex that they require advanced and unique data storage, management, analysis and visualization technologies. Forrester also gives a more pragmatic definition of Big Data as the techniques and technologies that make handling data at extreme scale affordable [2]. Gartner also defined Big Data as data with so high volume, high velocity, and/or high variety information assets that require new forms of processing to enable enhanced decision making, insight discovery and process optimization [3].

In [4],[5] they define Big Data as large amounts of data, gathered from a variety of sources and used to identify meaningful trends and relationships.

Cloud computing is defined as a model that helps enable ubiquitous, convenient, on-demand network access to shared pool of configurable computing resources such as networks, storage, applications, and services that can be rapidly provisioned and released.
with minimal management effort or service provider interaction[6]. Cloud computing should have on-demand self-service, broad network access resource pooling, rapid elasticity and measured service as part of its characteristics[6]. Cloud computing will go a long way to helping SMEs as it holds a number of potential benefits such as agility – which means that now companies are not required to build their own IT infrastructure but can ‘share’ or ‘rent’ those belonging to others, local independence, scalability – which means that such SME organizations are now no longer required to make their own system for peak load levels or maintain systems that are running far below capacity such as for instance below 20% capacity and reliability. It means using resources that are not yours to benefit your organization. When it is combined with Big Data the benefits are immense. With Big Data one can analyze and extract information from huge data that s otherwise remain undiscovered. These data could come from a variety of different sources such as from social media fora, scientific sources, streaming, weather, financial community just to mention few.

![Cloud computing overview structure](image)

Figure 1: Cloud computing overview structure (Source: Global Trade, SCM and Logistics Key questions)

From Figure 1, it can be inferred that Cloud Computing can benefit both supplier and customer, in supply chain management and customer relation management, cloud could be used where different information can be gathered from different sources and the right information extracted for the benefit of the user (customer or supplier). For instance an, SME could make use of cloud and Big Data facilities to find out which of his suppliers has the best pricing by collecting varied information from different customers and suppliers. Cloud computing can be deployed in four different ways

(a) Public cloud :- this is where the resources are shared among cloud subscribers and the shared resources are accessible over the Internet[7]

(b) Private cloud: - this is where the resources belong to an enterprise and they manage it or hire a third party organization to manage it for them.
(c) **Hybrid cloud**: this any two or more combination of public, private or community cloud. The enterprises that make up this hybrid are bound by standardized or propriety technology that enables data and application portability[8]

(d) **Community cloud**: this is whereby resources are shared among community members. Community cloud is formed by member organizations and institutions that share common missions, goals and possibly security requirements, policies and compliances. [7]

In addition, Cloud Computing service models can be classified into the following:

(a) **Platform as a Service (PaaS)**: this is where cloud delivery model provides the infrastructure and platform in the cloud for application developers to build, deploy and run applications on the Internet and users are billed per use. Typical example are AWS Elastic Benastalk, Engine Yard, Microsoft Azure and Salesforce Heroku. [9]

(b) **Infrastructure as a Service (IaaS)**: this is the delivery of hardware infrastructure (for instance servers, storage, etc.) as a service, which can be accessed over the Internet and usually hosted by a cloud provider. Other sub-components of IaaS include the following: Service Level Agreement (SLA), Utility Computing, Cloud Software, Platform Virtualization, Network Connectivity and Computer Hardware. This is analogous to signing on to an Utility Service provider such as Electricity where one is billed at the end of the month based on consumption or usage[10],[11]

(c) **Software as a Service (SaaS)**: this represents the largest cloud market and is still growing rapidly. SaaS uses the web to deliver applications that are managed by a third-party vendor and whose interface is accessed on the clients’ side. Most SaaS applications can be run directly from a web browser without requiring any downloads or installations, although some require plugins.[10],[11]

### 2. WHAT IS SME?

Many textbooks and different authors define SME differently. Some define in terms of workforce size, others define SME in terms of the turnover in a year and yet others define it as gross asset minus fixed assets. We have chosen to define SME as an enterprise having no more than 99 people [8]. This is the definition that was used in our qualitative methodology.

### 3. METHODOLOGY

The type of methodology that has been employed in this paper is both a theoretical and qualitative. Qualitative in the sense that some of the data were gathered during our previous research work and mostly theoretical by literature review and perusal of other similar works. Qualitative research is mainly concerned with trying to comprehend the phenomena under the study in its natural setting, which means the research does not attempt to make any changes to the phenomenon under the study [13].

### 4. EXPERIENCES & CHALLENGES FACED BY THE SMES.

Ghana is at the moment going through a tough time in the case of power generation and distribution. This has impacted negatively on the ordinary lives of its citizens as well as the business community. All industries need power to operate, and SMEs are no exception to this. With erratic and inconsistent power supply to households and businesses, it will be very difficult for SMEs to operate or break even through. In order for SMEs to embrace Cloud Computing and Big Data, constant power supply must be guaranteed. In [14] a number of challenges that are facing Nigerians
in the adoption of Cloud Computing are listed. Some of these challenges are Security, Privacy and Trust. This is obviously true in a land where 419 the schemes are very prevalent. The 419 scheme is the practice of unscrupulous people tricking innocent people to part away with large sums of money in exchange for bigger rewards through the use of the Internet. Definitely this also applies to Ghana, where it is popularly called “sakawa” [6], [15]. The authors in [6],[12] also mentioned a lack of technical people to handle Big Data and ICT respectively, a fact that is also well present in Ghana. The number two challenge listed by [14] is lack of good Internet Connectivity, which is not only true of Nigeria but also throughout the entire West African sub-region and to large extent the entire African continent. Without good broadband and high bandwidth connectivity, Cloud Computing and Big Data usage will remain a mirage in Ghana. In [12], we also carried out a research to find out similar challenges in the adoption of ICT usage by SMEs in Ghana, and found extensive number of challenges. Amongst these are as follows: high cost of acquiring computers for ICT facilities. Big Data and Cloud Computing ultimately and invariably make use of ICT therefore the same reason may apply in the case of Cloud Computing and Big Data. The high cost of ICT acquisition includes both the acquisition and the maintenance of such hardware. Frequent power supply disruption was also cited and it can be authoritatively confirmed that such erratic power supply has gotten worse since the year 2010. Poor telecommunication infrastructure leading to high cost of accessing broadband is a major challenge. Lack of transparency in business deals, widespread corruption, weak legal framework when it comes to e-commerce transactions in what [14] calls institutional environment is a major problem in Ghana too [12], [14]. In South Africa, [13] found the following challenges that are facing SMEs in that country. Among those they found are the following: lack of security in using Cloud Computing, what would happen to their data out there in the cloud? How safe will it be? They also found that SMEs were not sure whether the cloud will always be available? In Africa, power /electricity is a big issue, and if power is not there, or it is erratic then the time one wants to access his data in the cloud cannot be guaranteed. They also wonder about the performance of the cloud. Will it be much faster than doing everything in-house in the old traditional way or it will improve their lives? They also worried about about cloud costing more either in the near future or sometime in the distant future. Other challenges they faced were whether it will give them relative advantage over their competitors? Reliability, usability, and compatibility also were issues and finally they were worried that there aren’t many cloud providers/suppliers out there to assist them.

5. RESULTS, FINDINGS AND SOLUTIONS PROFFERED

The findings from both the qualitative and theoretical research suggest that it will take a very long time before Cloud Computing and Big Data could be integrated into the business of SMEs in Ghana. The challenges in Ghana are not much different from that of those in Nigeria and South Africa. A number of challenges have been highlighted in this paper. This ranges from erratic power supply, non-existence or inadequate expertise in the areas of Cloud Computing and Big Data in Ghana and Africa in general. Security, trust and privacy is a big issue gives the prevalent sakawa practices in Ghana which deter SMEs from doing business online let alone to establish permanent presence in the cloud. Poor telecommunication infrastructure or sub-standard mobile networks that are not able to allow high-bandwidth and which impedes the work of Cloud Computing and Big Data usage.

In order to address all these issues, the government and private stakeholders as well as Non-governmental Organizations (NGOs) must get involved. Also if the West is serious about bridging the digital divide then they must also be involved in building the telecommunication infrastructure in Africa so that Africa can seriously be considered as part
of the digital or smart world.

6. CONCLUSION

SMEs have in Ghana have been defined, Big Data and Cloud Computing concepts have been explained and highlighted. Challenges being faced by SMEs in the adoption of Cloud Computing and Big Data have also been highlighted. A number of solutions have also been proffered or suggested to mitigate against some of these challenges. It is of the view of the authors that it will take some time before Big Data and Cloud Computing could be integrated into the mainstream business of SME in Ghana and Africa as a whole. Once these measures are put in place we are sure that SMEs can participate fully in the Big Data and Cloud Computing technologies to enhance their profitability and ultimately leading to the development of the country.

REFERENCES


