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Research Article

Status of Cloud Service Adoption in Climate Risk Country

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Abstract
Ghana has attained cloud readiness indices facilitating services adoption by local enterprises through brokerage firms. According to Gartner group by 2015, at least 20% of all cloud services will be consumed via internal or external cloud service brokerages, rather than directly with service providers. It means enterprises must identify local cloud brokerage firms to intermediate for cloud clients and service providers. We aimed at surveying cloud service awareness among enterprises in Ghana. We performed field study using statistical tool to analyze data collected among 45-participants spread across 20 local enterprises, using purposive sampling in the selection of strategic enterprise managers located in the second largest city, Kumasi, Ghana. We employed Delphi technique involving three Information Technology experts to validate responses in reducing margin of error in the analysis. We found that 67% respondents are unaware of local cloud service brokerage firms. Alternatively, 33% respondents mentioned at least one local cloud brokerage firm; although experts believed some did a chess guessing to have it correct. Our Delphi experts attributed this alarming percentile to lack of policy stakeholders involvement in ensuring cloud adoption readiness. We concluded on effective sensitization of cloud computing service adoption in optimizing data center proliferation by enterprises in Ghana. Adopting cloud computing over data center helps in reducing global warming contributed by heat emissions from computing servers.

Keywords
Cloud Computing—Service Brokerage Firms—Software-as-a-Service—Small Medium Enterprise—Delphi technique

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1. INTRODUCTION

Gartner research group on cloud computing indicated that by 2015, at least 20% of all cloud services will be consumed via internal or external cloud service brokerages, rather than directly, up from less than 5% today [1]. What it means is; consumers all over the world have to contact local cloud brokerage firms, acting as intermediaries, for service providers to hook them unto the platform. The rapid growth of cloud shows no sign of abating. Estimates by Gartner suggest the worldwide market will exceed US109*billion* in 2012, while a separate forecast by IDC predicts global spending on public cloud services will approach US100*billion* in 2016 [2].

It is unknown, if SME's in Ghana are aware of the Cloud and its appreciable benefits in terms of Information Technology investment optimization. Few investigators have surveyed adoption status of cloud computing in Ghana-West Africa. Ghana, like any other developing country faces business and financial challenges in growing Small-Medium Enterprises (SME's). Cloud computing must become a panacea to drive the SME sector even with small investment capital, as India has succeeded in moving many local players unto the cloud to optimize investment [2, 3].

We aimed at surveying perceptions of SME's in Ghana to gain insight into readiness for adopting cloud computing. We performed a field study to find out current status of cloud computing awareness, service adoptions and brokerage firms available in advancing the technology in Ghana. In this paper, we narrowed our objectives to present SME's awareness and cloud-service preferences of potential SME's. Security responses were excluded in this paper to strictly address cloud awareness. Data gath-

ered were obtained from potential cloud clients (SME's) in the Ghanaian market to measure readiness for cloud. Based on gathered data, we are strictly addressing what is happening instead of potential benefits of cloud for developing countries. This study had a small sample size and the findings were true only for a specific geographical area. However, part of our results complement KPMG international results on 2012 Global survey on cloud services adoption; indicating software-as-a-Service on higher demand by consumers [4]. United Nations 2013 information report stated that there are still early days for the cloud economy in developing countries. In their analysis of cloud literature, they emphasized how papers are concerned with its perceived potential rather than with what actually has happened or is happening [5]. Having the related interest as all early researchers looking into various attempts to access the cloud readiness of different countries and economies, we have presented works published by the United Nations, Pyramid research group, Business software Alliance group, the Asia Cloud Computing Association, Cisco Global Cloud and KPMG indexes on factors defining and depicting a countries' readiness for cloud.

1.1 Background of Cloud Readiness Index

1. **United Nations Report on Cloud Readiness-Kenya** The implementation of cloud services in Kenya, a developing country, mirrors global trends in terms of service and deployment models, but its success is dependent on local conditions [5]. Kenya has attained cloud readiness in terms of human orientation and infrastructure indices. While Kenyan SME's are at incipient stage of cloud adoption, all large companies listed on the Nairobi Stock Exchange have started migration of some services to the cloud, including messaging, payroll, accounting, human resources and customer relationship management [5]. The UN report indicated that, "Cloud adoption by SME's is hampered by the lack of awareness and trust, high cost of broadband services and limited access to electricity and the government designed a strategy in combating adoption barriers in Kenya[5].

2. **Pyramid Research on Cloud Readiness Index** Enterprise Cloud Readiness Index defines enterprise cloud readiness "as the degree to which service providers in a given country can potentially leverage cloud services for the enterprise segment". About 49 countries were used in the index and is purely a quantitative measurement based on nine economic demographic and ICT infrastructure indicators. [6].

3. **Business Software Alliance Cloud Readiness Index** BSA index, called the Global Cloud Computing Scorecard ranks 24 developed and developing countries in seven categories that measure "preparedness to support the growth of cloud computing". The scorecard uses both quantitative and qualitative data in projecting countries' readiness [7].

4. **Asia Cloud Computing Association Readiness Index** The index on readiness ranks 14 economies in the Asian region across 10 categories critical to successful deployment and use of cloud computing technology. Methods include both quantitative and qualitative factors in assessment [8].

5. **Cisco Global cloud Readiness Index** The index is based on three (3) indicators related to broadband: download, upload speeds and latency. These indicators are seen as reflecting countries' ability to support different levels of cloud services [9].

6. **KPMG report on breaking through the Cloud barriers** KPMG talks about the human factor index contributing to cloud readiness. A country is ready when Chief Information Officers and Chief Technical Officers are aligned to the generation of virtualization. We need to recognize CIOs' and CTO's as bridge to non-technical senior management in any enterprise preparation to go cloud. They can make or mar the cloud readiness level in countries and organizations. Service brokerage firms and service providers have to orient cloud sales message towards non-technical, board-level executives, with a focus on solutions that recognize the motivations of the various stakeholders and take account of the gradual homogenization of the cloud environment. We need to address concerns over potential downsizing of the IT department and the loss of control over the IT systems [4].

   In summary, the various groups used 10 related indicator s including; Download speed, Upload speed, Internet users, Computers, Smartphones, Mobile broadband subscription, Wired broadband subscriptions, Fiber optic subscriptions, Latency and International bandwidth. A Country having at least 3 out of the 10 indicators is classified under cloud services readiness. Ghana is ready for cloud.

2. MATERIAL AND METHODS

2.1 Study Setting

Nine (9) structured questions were crafted to survey SME's in Ghana; precisely in Kumasi-Ashanti acclaimed as commercial center of the country. Only four (4) questions relevant to the focus of this manuscript are presented to help our readers.

2.2 Selection Criterial of Respondents

We enlisted 100 SME's, out of which 65 qualified to be part of the survey based on ICT integration in their business operations as well as having branch office in Kumasi-Ashanti. In all 45 responses were included in this study, as some failed to return the questionnaire form on grounds of venture confidentiality policy. This late rejection typically came from some of the 15-rural or community banks enlisted to aid our study. Purposive sampling of venture strategic managers was employed and by availability or convenience, we issued questionnaire to those Managers for instant or postdated feedback. Selections criterial for participants included; General Manager, Branch Head, Senior Manager, Finance Manager, Operations Manager.

2.3 Measurement Tool

Responses were measured quantitatively using Statistical Software, SPSS 16.0 Windows. Study protocols were reviewed for approval by the Christ Apostolic University college-Ghana before granting introductory letter to visit enlisted SME's within the Kumasi City.

2.4 Results Validity using Delphi Technique

To reduce error of margin of 45 responses (i.e. a small representation of majority SME's beyond Kumasi), the researchers adopted Delphi technique[10], including three (3) faculty members interested in cloud research to do objective critique on data collected in deriving consensus on responds to compensate small data size.

Q1. Please have you ever heard about clouding computing, aside this engagement? Response: Yes [60%] No [40%] **Q2.** Mention one (1) cloud computing service provider in Ghana (if you selected yes in question 1). Please write the name of service provider here (or skip) —————— We used question 2 in validating question number 1.

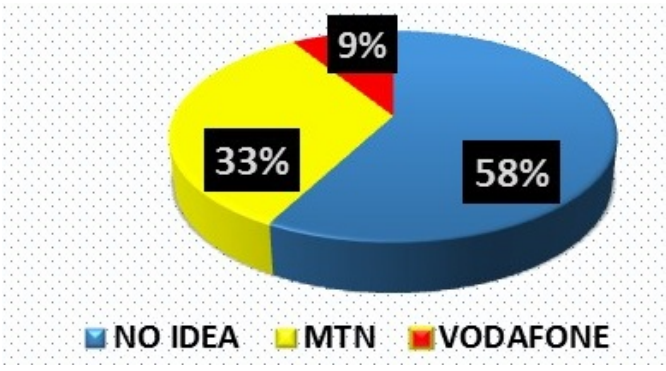

Figure 1. SME's awareness of services providers in Ghana

We offered basic education about cloud service types to most respondents based on their request, to inform their decisions on question 3.

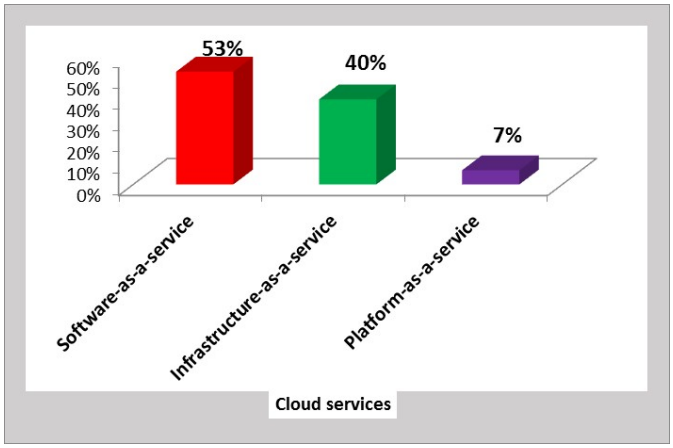

Figure 2. Choice of cloud Services by SME's in Ghana

Q4. Please select your choice on cloud software-as-a-service (SaaS) investment. Tick all preferences.

Table 1. SME'S in Ghana 'SaaS' Preference Ranking

Software –as-a-Service choice	N	Mean	Ranks
*Accounting and Finance	45	1.29	1
*Anti-virus Software	45	1.31	2
*Fleet Management Software	45	1.36	3
Human Resources Mgt.	45	1.38	4
Desktop Applications	45	1.4	5
Supply Chain and Logistic	45	1.4	6
Customer Relationship Mgt.	45	1.42	7
Project Management	45	1.47	8
Enterprise Resources planning	45	1.47	9
Enterprise collaborations	1.67	10	

Rank/Scale: Most preferred=1; Least preferred =10

3. RESULTS

Data analysis showed 67% (58% + 9%) of SME's in Ghana had no idea about cloud service providers or brokers operating in the country; a discovery attributed to lack of advertisement on cloud services through various media platforms by our Delphi technique team (Figure 1). Vodafone is currently outside cloud brokers in Ghana. We compared service options and all our male biased respondents voted for selected Software-as-a-Service (SaaS) as priority to seek outsourced or third-party support (figure 2). Top three (3) business software emerged for ready markets in Ghana are asterisk (*) as shown in Table 1.

4. DISCUSSION

4.1 Results Outcome

We found that 67% SME's had no idea about Cloud computing. The research was conducted in one of the top two trade and commerce regions in Ghana. We have no doubt that any future expansion to widen the respondents across regions may sustain our percentage of no idea. Aside some IT technicians and Managers of these SME's, who have heard about cloud computing

buzzword, we adopted first time briefing on what is about cloud computing as a mechanism to help most of our respondents in answering the questions. We also discovered that SME's preferred software-as-a-Service (SaaS) to Infrastructure-as-a-Service (IaaS) and Platform-as-a-Service (PaaS). In comparison, preference ranking of this new research complements the outcome of similar questions posed to respondents during the 2012 KPMG's survey on cloud-based services popularly subscribed by client on the global landscape. Figure 2 also indicated PaaS 7%, indicating that Ghana is lagging behind in IT system designs and developments.

4.2 Limitations

In general, research method limitations affects figures presentation. First, author's own perception or subjectivity on cloud adoption may influence respondents' feedback through the briefing; as most participants had no idea about cloud services. However, those "no-idea" participants remained active target of our research since they are part of the SME's strategic decisions. Without notice, all respondents were male managers in those ventures. We will leave this to the gender experts to craft bearing on our figures. What is strong about our figures is the use of Delphi technique to verify and validate the responses based on objective experts discourse. In future works, we have to expand the responds across all 10 regions in Ghana. The 45 inclusion as against initial 100 SME's enlisted is another challenge. We excluded thirty five (35) SME's without ICT in their business transactions. Twenty (20) qualified SME's, mostly rural banks denied researchers in accessing enterprise information on grounds of confidentiality. They took our questionnaire forms diplomatically and never gave feedback.

Notwithstanding the odds, we found over 67% SME's had no idea about Cloud computing. Our Delphi experts concluded that some respondents who mention correctly, MTN-Ghana, as a cloud brokerage firm performed chess guessing. We do not intent in this paper to do any marketing piece for all the known cloud brokerage firms in Ghana. We have put the figures outside; they should wake up to the harvest ground.

In conclusion, our findings demonstrate that over 67% SME's in Ghana had no idea about cloud computing and available services to take advantage in ICT cost optimization. Respondents expressing interest prefer Software-as-a-Service (SaaS). Those who have heard about the buzzword see it far from reality because no one is approaching and advertising to create awareness.

4.3 CONCLUSION

We gathered intelligence that brokerage firms have resorted to door-to-door canvassing. In the future we recommend a national based survey to quantify number of SME's exactly hooked to the cloud in Ghana. Some multinational companies such as Standard Chartered Bank are currently running a private cloud across their operational centers in the West Africa sub-regions. Recently, Greenpeace International reported that Apple data center in North Carolina uses more power than 250,000 European homes combined. (Greenpeace energy choices report, 2011). This is bad news in climate change era. In future works, we intend to total energy consumption of small and medium and large data centers across Ghana to inform policy makers on energy optimization amidst the current power crisis facing many developing countries.

5. ACKNOWLEDGEMENT

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