HARNESSING CLOUD COMPUTING BY SMALL AND MEDIUM ENTERPRISES IN KENYA

Conference Paper · March 2018

2 authors:

Amos Wachanga
Sibasi Ltd

3 PUBLICATIONS   **1** CITATION

SEE PROFILE

Joshua R A Ndiege
United States International University

18 PUBLICATIONS   **44** CITATIONS

SEE PROFILE

Some of the authors of this publication are also working on these related projects:

Project   Sustainability of using technology View project

Project   Information security awareness amongst students joining higher academic institutions View project

HARNESSING CLOUD COMPUTING BY SMALL AND MEDIUM ENTERPRISES IN KENYA

Amos Wachanga Wambugu[1], Joshua Rumo Ndiege[2]
School of Science and Technology, United States International University - Africa,
P. O. Box 14634, Nairobi, 00800, Kenya
[1]*Post-Graduate Student, Tel: +254 0724230600, Email: wachanga.amos@gmail.com*
[2]*Tel: +254 0720727594, Email: jrumo@usiu.ac.ke*

Abstract: Small and medium enterprises (SMEs) face numerous challenges in identification, setting up and making use of information technology (IT) as an enabler for business. Cloud computing could solve this problem by offering ready, low cost of entry IT solutions. Adoption of cloud computing among SMEs in developing countries is, however, low due to a number of barriers as identified by previous studies. This study attempts to investigate the level of cloud computing adoption by SMEs within Nairobi in Kenya. To realize this, a survey was conducted with a convenience sample of 45 SMEs. The findings reveal that emails and websites as cloud services are widespread, however, cloud-based business applications adoption is particularly low. Consequently, we submit that there is need to establish frameworks deliberately crafted to promote the adoption of cloud computing by SMEs in developing countries.

Keywords: Cloud Computing, Small and Medium Enterprises, ICT Adoption

Sub-theme: Science, Technology and Innovation

Introduction

IT has been deemed as an integral part of modern business, evidenced by how it supports businesses through communication, information storage, information retrieval and reporting amongst other key business tasks (Davenport, 2013). For the Small and Medium Enterprises (SMEs), IT has been determined to have a number of benefits including improving business performance mainly as an enabler of productivity, efficiency and an influencer of competitive advantage (Davenport, 2013; Ong, Habidin, Ithnin, & Fuzi, 2016). Research however shows that there is low adoption of IT by SMEs in general especially in developing economies such as in the Kenyan context (KNBS, 2016; Agboh, 2015). The major challenge for traditional IT environments has been the upfront setup costs and the increasingly complex management issue of software,

hardware and networking equipment which also require specialist staff for implementing and maintaining IT services (Alshamaila, Papagiannidis, & Li, 2013).

Cloud computing represents a new paradigm that enables the utility computing model in which computing resources are offered and consumed as a service on demand, thus reducing the barriers to entry and the challenges for use of IT by businesses (Junior, Biancolino, & Antonio, 2013). Small and Medium Enterprises (SMEs) more so would find cloud computing to be an attractive solution as they may not be having a lot of resources to allocate for IT as compared to larger enterprises (Carcary, Doherty, & Conway, 2014).

This paper presents results of an exploratory study into cloud computing adoption in the Kenyan SME context. The structure of this paper is as follows: the next section outlines the literature review followed by the sections that provide the methodology and the results and discussion sections respectively. The last section draws a conclusion to the paper, giving the implications and recommendations from the results and discussions of the study.

Literature Review

One of the most widely cited definition of cloud computing is from the National Institute of Standards and Technology (NIST) which defines cloud computing as

> "*a model for enabling very convenient, on-demand network access to a shared pool of configurable computing resources such as networks, servers, storage, applications, and services, which can be rapidly provisioned and released with minimal management effort or service provider interaction*" (NIST, 2011, p. 2).

Cloud computing can hence be explained as the provision and delivery of on-demand computing services (Lamba & Singh, 2011). There are a number of offerings from cloud computing. These include Platform as a Service (PaaS), Infrastructure as a Service (IaaS) and Software as a Service (SaaS) among other new types of services which service providers are continually adding (NIST, 2011; Kamra, Sonawane, & Alappanavar, 2012; Erl, Mahmood, & Puttini, 2013). Among the various offerings of cloud computing, SMEs could benefit mainly from cloud-based services that are offered as Software as a Service (SaaS) based applications over other categories of cloud-based services (Rosa Río-Belver, 2015). This is because SaaS includes the business applications that

offer direct IT solutions for day to day needs that an SME could be having, with little need for complex programming or setup.

Some of the main advantages offered by cloud computing include the minimal setup costs, on-demand payment model, and the easy setup where a user would not need to setup not maintain the server hardware, software and the necessary networking (Ricketts, 2015). A cloud computing user can get to test various cloud computing solutions for a time and terminate or migrate to another service at any point with lower costs than if the entire hardware and software had been purchased and setup for a particular solution. Further, IT resources can be expanded as needed, only paid for when they are used, with minimal technical expertise to manage the environment, hence lower maintenance costs. The service provider would inherently deal with all major risks including security, updating the software and ensuring uptime.

In Kenya, a recent report by Communications Authority of Kenya and KNBS (2016) indicated that an average of 85.8% of SMEs had access to internet at their premises, however fewer SMEs were using ICT for specialized applications such as orders management (20.9%) or human resource management (28.5%). The same study cited the main use of the internet cited by the businesses was email (88.9%) and getting information about goods or services (54.8%), while only an average of 24.2% of SMEs were using cloud computing. Of the SMEs that hadn't adopted cloud computing, an average of 66.8% indicated they don't have any plans to get cloud computing services citing the main reason for not using cloud computing is insufficient knowledge within the organization (CA & KNBS, 2016).

Methods

This study took an exploratory approach with quantitative methods being considered appropriate for primary data collection. The study employed a cross-sectional online questionnaire for data collection. The questionnaire had 4 sections, the first for demographic information, the second for the IT setup of the organization while the last two sections were to be answered by either those who didn't know what is cloud computing and those who had an understanding of cloud computing respectively.

Convenience sampling was the preferred sampling strategy since it is recommended for research studies where there is a limited budget or limited time, which was the case for this study (Lund

Research Ltd, 2012; Bornstein, Jager, & Putn, 2013). The research population consisted of a convenience sample of private businesses that had less than 250 employees and operated within the Nairobi County area. In total, 50 respondents completed the online questionnaire, out of which 45 were usable based on the type and size of organization. Data analysis was done through Statistical Package for Social Sciences (SPSS) version 23. Descriptive statistics (frequencies and percentages) and correlation analysis were employed to present the findings.

Results and Discussion

Demographics of the Respondents

There was representation from various categories of positions with Owner/Management being the highest at 40% (n=18) followed by Employees and IT Personnel at 29% (n=13) and 20% (n=9) respectively. The age group that had the highest representation was the *26-35 years* with 31 respondents (69%) being from this category while those who were *greater than 45 years* age group respondents was the least with only one response (2%) recorded from that age group. Almost all respondents had some form of ICT training at 84% (n=34) with only 13% (n=6) indicating they didn't have any ICT training.

Most of the respondents categorized their main industry as Information Technology (46%, n=21). The other major categories were Service (20%, n=9), Finance (11%, n=5) and Retail (7%, n=3). Transport, Agribusiness, Digital Marketing, Fashion, Hospitality and Health were also represented. Organizations that were most represented had *1-5 employees* (31%, n=14) and *51-250 employees* (35%, n=16).

Findings from Respondents without Knowledge of Cloud Computing

There were 9 respondents (20%) who indicated they did not know what cloud computing is while 36 responses (80%) indicated they knew what cloud computing was. From this finding, it was discovered that there was a positive significant relationship ($r = 0.433$, $p<0.01$), albeit not a very strong relationship, between the respondents who had a qualification in ICT and having knowledge of what cloud-based services were.

The respondents that indicated they didn't have knowledge of cloud computing had a mean of 3.67 on complexity of ICT based on a likert scale (Strongly Disagree being 1 while Strongly Agree being 5). This indicated that the respondents didn't find ICT to be completely easy to use. There

was a positive significant relationship between the respondent having a qualification in ICT and their feel whether ICT is difficult to use (r = 0.726, p<0.05) as shown in Table I.

Table I Correlation between ICT Complexity and ICT Qualification

		ICT is complicated, it's difficult to understand what's going on	Do you have any qualification in ICT?
ICT is complicated, it's difficult to understand what's going on	Pearson Correlation	1	.726[*]
	Sig. (2-tailed)		.027
	N	9	9
Do you have any qualification in ICT?	Pearson Correlation	.726[*]	1
	Sig. (2-tailed)	.027	
	N	9	9

*. Correlation is significant at the 0.05 level (2-tailed).

From the literature review, it was identified that the main reason for not using cloud computing was insufficient knowledge which aligns with this finding concluding that having a qualification in ICT has an impact towards how individuals owning or working in the SMEs perceived ease of use of ICT and by extension cloud computing.

Adoption level of Cloud Computing by Kenyan SMEs

Majority of the SMEs represented in the group that had knowledge of cloud computing answered that they made use of emails and websites hosted on the cloud (86%, n=31). It was found that very few of the SMEs made use of cloud-based business applications as shown on Table II. This was a confirmation of the report highlighted in the literature review where SMEs indicated they use emails but do not make use of business applications (CA & KNBS, 2016).

Table II Automated Services in comparison to Cloud Deployed Services

Service	Automated Services		Cloud Deployed Services	
	Frequency (n)	Percentage	Frequency (n)	Percentage
Contact e.g. Email/Website	37	82%	31	86%
Accounting	27	60%	9	25%
Invoicing	22	49%	4	11%
CRM	21	47%	14	39%
HR	11	24%	3	8%
Payroll	20	44%	5	14%
Sales, Marketing	12	27%	6	17%

Manufacturing	0	0%	0	0%
Business Process Automation	15	33%	6	17%
Digital Marketing	1	2%	0	0%
Specialized Software	6	13%	4	11%
Inventory Management	10	22%	3	8%
Documents Management	18	40%	14	39%
Distribution (Supply Chain Management)	0	0%	0	0%
Don't use cloud-based services			3	8%

In relation to the amount allocated and spent for the cloud-based services, majority of the respondents indicated they spend above Ksh 100,000 annually ($1000 p.a., n=14, 38.9%) followed by those who use free services (n=8, 22%). It was found that organizations that spent the above Ksh 100,000 on cloud computing were mainly IT based organizations with more than 5 offices while the organizations that didn't have any offices were the highest in making use of free services as shown in Figure 1. This meant that larger organizations preferred paid services while the smaller organizations were more accustomed to free services or those between Ksh 10,000-Ksh 50,000.
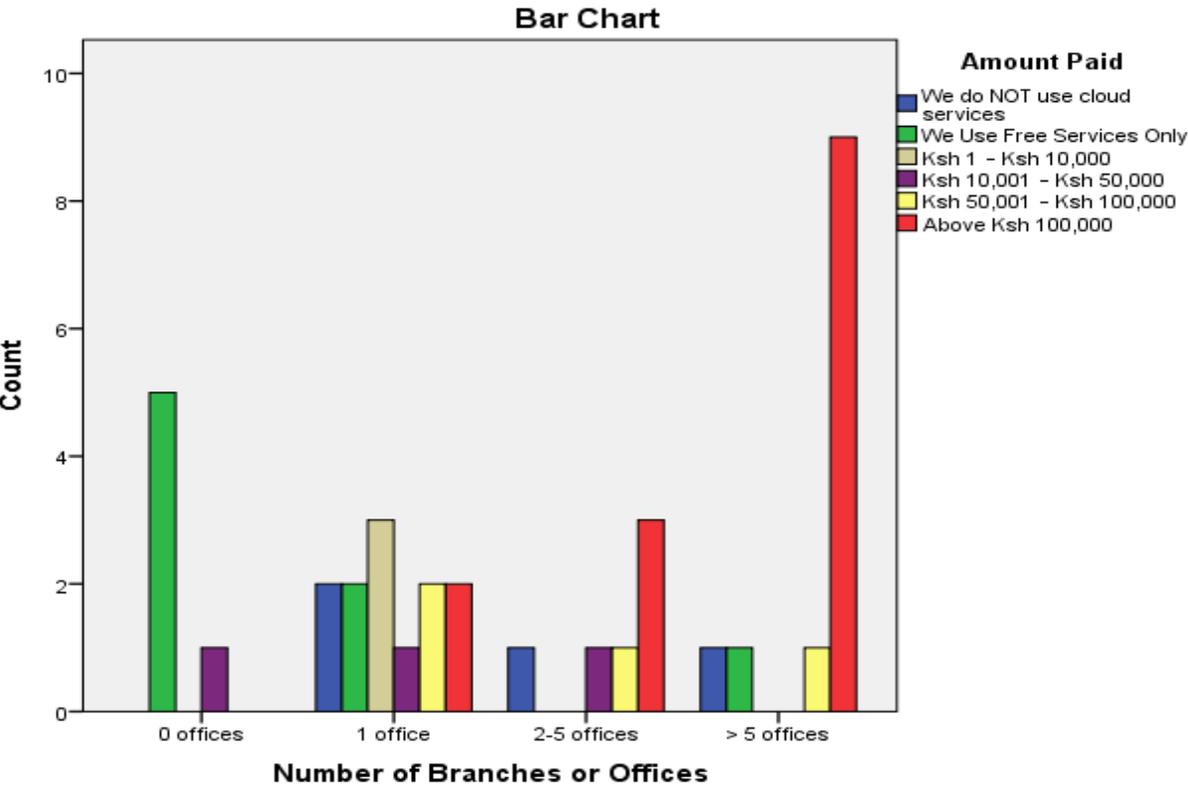

Figure 1 Chart of number of offices clustered by amount paid for cloud computing

Most of the respondents indicated that they were generally satisfied by the cloud-based services with most of the respondents (77%, n=28) being either satisfied or very satisfied. Organizations with more than 5 offices were generally very satisfied with cloud computing while those with 0 offices had an equal distribution of those who were satisfied, very satisfied and very dissatisfied with cloud computing as shown in Figure 2. Larger organizations were spending more on cloud-based services which indicates that they had more resources hence better adoption. This indicates that there is need for models to assist all SMEs in adoption process, highlighting the success factors and thereby defining guidelines for successful adoption. This will help all sizes of SMEs to adopt successfully cloud computing.
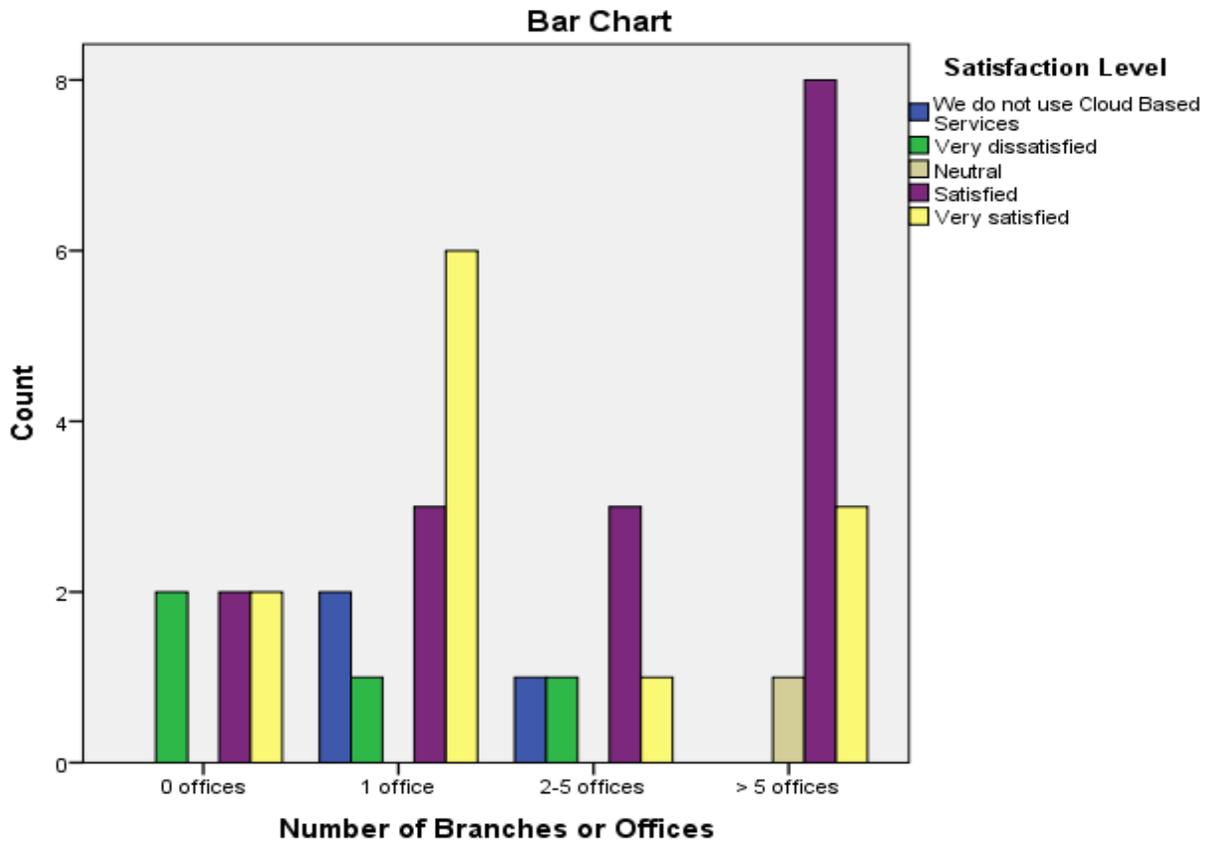

Figure 2 Chart showing satisfaction level clustered by amount spent on cloud computing

Internet/Social Media (75%, n=27) was the leading source of information on cloud-based services followed by school (58.33%, n=21), the cloud service providers (52.28%, n=19) and friends/family (16.67%, n=6). Other sources that were highlighted were self-education, tv, radio and newspapers. Service providers should therefore consider sharing information about cloud computing through

7

these channels. Education institutions should therefore consider adding the information on cloud computing to the curricula while Service providers and governments should carry out information dissemination campaigns especially through the internet/social media.

Conclusions

Based on the exploratory nature and the small sample size in this study, the authors are not suggesting the findings to be generalizable. Nonetheless, the insights gained from this study provide some interesting findings in terms of how SMEs in Nairobi County have engaged in cloud computing adoption.

Cloud computing has a number of benefits that SMEs can take advantage of, especially providing essential ICT services at low entry and maintenance cost. However, through this exploratory study, it was identified that adoption of cloud computing by SMEs in Nairobi County is low, especially, cloud adoption for the business applications. Insufficient information was cited as one of the main reasons for non-adoption. The authors therefore submit that there is need to have more information dissemination actions to SMEs on cloud computing, especially through the internet, social media, the schools' curricula and dissemination by the cloud providers

It was observed that levels of satisfaction for SMEs adoption of cloud computing varied by organization size. The authors therefore concluded that there is a need to have theoretical frameworks and models that can help and guide SMEs through to successful cloud computing adoption.

References

Agboh, D. K. (2015). Drivers and challenges of ICT adoption by SMES in Accra metropolis, Ghana. *Journal of Technology Research, 6*, 1-16.

Alshamaila, Y., Papagiannidis, S., & Li, F. (2013). Cloud computing adoption by SMEs in the north east of England: A multi-perspective framework. *Journal of Enterprise Information Management*, 250-275.

Bornstein, M. H., Jager, J., & Putn, D. L. (2013, 08 26). Sampling in Developmental Science: Situations, Shortcomings, Solutions, and Standards. *HHS Public Access*, 357–370. doi:http://doi.org/10.1016/j.dr.2013.08.003

CA & KNBS. (2016). *Enterprise ICT Survey.* Nairobi: Communications Authority of Kenya & Kenya National Bureau of Statistics.

Carcary, M., Doherty, E., & Conway, G. (2014). The Adoption of Cloud Computing by Irish SMEs – an Exploratory Study. *Electronic Journal Information Systems Evaluation, 17*(1), 3-14.

Davenport, T. H. (2013). *Process innovation: reengineering work through information technology.* Harvard Business Press.

Erl, T., Mahmood, Z., & Puttini, R. (2013). *Cloud Computing Concepts, Technology & Architecture.* Massachusetts: Prentice Hall.

Junior, A. M., Biancolino, C. A., & Antonio, E. M. (2013, February). Cloud Computing and Information Technology Strategy. *Journal of technology management & innovation*, 178-188. doi:http://dx.doi.org/10.4067/S0718-27242013000300070

Kamra, V., Sonawane, K., & Alappanavar, P. (2012, April). Cloud Computing and it's Pricing Schemes. *International Journal on Computer Science and Engineering, 4*(4), 577-581.

KNBS. (2016). *Micro, Small and Medium Establishments Basic Report 2016.* Nairobi: Kenya National Bureau of Statistics. Retrieved from https://www.knbs.or.ke/2016-micro-small-and-medium-enterprises-msme-survey-basic-report-2/

Kumar, D. (2017). *An Integrated Conceptual Framework of Cloud Computing Adoption in Small and Medium-sized Enterprises in India.* Punjab: Thapar Institute of Engineering and Technology University.

Lamba, H. S., & Singh, G. (2011). Cloud Computing-Future Framework for e-management of NGO's. *International Journal of Advancements in Technology* , 400-407. Retrieved from http://hdl.handle.net/11295/89875

Lund Research Ltd. (2012). *Convenience sampling.* Retrieved from Laerd Dissertation: http://dissertation.laerd.com/convenience-sampling.php

NIST. (2011, September 10). *The NIST Definition of Cloud Computing.* Retrieved 03 23, 2016, from https://www.researchgate.net/profile/Gillian_Oliver/publication/273692831_Storage_is_a_Strategic_Issue_Digital_Preservation_in_the_Cloud/links/55de804c08ae7983897d1572/Storage-is-a-Strategic-Issue-Digital-Preservation-in-the-Cloud.pdf

Ong, S. Y., Habidin, N. F., Ithnin, M., & Fuzi, N. M. (2016). The relationship between ICT adoption and business performance in Malaysia and Indonesia. *Malaysian Journal of Society and Space*, 40-49.

Ricketts, D. (2015). *60% cheaper to deploy ERP in the cloud than on-premise.* Retrieved 03 23, 2017, from https://www.linkedin.com/pulse/60-cheaper-deploy-erp-cloud-than-on-premise-david-ricketts

Rosa Río-Belver, E. C. (2015). Design and Implementation of a Cloud Computing Adoption Decision Tool: Generating a Cloud Road. *Public Library of Science*.