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## **Adoption of Cloud Computing By Small and Medium Enterprises in Nairobi County, Kenya**

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**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 and low cost of entry IT solutions. Adoption of cloud computing among SMEs in developing countries is, however, low due to a number of barriers such as the investment capital required for setting up and maintaining ICT. This study attempts to investigate the level of cloud computing adoption by SMEs within Nairobi County in Kenya. To realize this, a survey using a questionnaire titled 'Questionnaire on use of Cloud-Based Services by SMEs' was conducted with a convenience sample of 45 SMEs in Nairobi County. The instrument was found to be reliable with Cronbach alpha of 0.903. Data were analyzed using IBM SPSS version 23 with descriptive and correlation analysis being the preferred methods for analysis. The results show that email and website services are widespread, however, cloud-based business applications adoption is particularly low. Therefore, the Kenyan Government should develop frameworks deliberately crafted to promote the adoption of cloud computing by SMEs in Kenya.

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

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### **Introduction**

Information Technology (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).

One of the most widely cited definition of cloud computing is from the National Institute of Standards and Technology (NIST) which defines it 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 Rfo-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 nor 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. Furthermore, 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 (CA) and Kenya National Bureau of Statistics (KNBS) in their 2016 report 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%) and 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).

### **Statement of the Problem**

Small and Medium Enterprises (SMEs) are constrained in budgets and as such generally do not have sufficient capital to invest in IT services (Venkatraman & Fahd, 2016). Most SMEs then often carry out manual processes and make use of low-cost IT solutions that may only be sufficient for short term use and may not be able to scale as the organization grows (Widyastuti & Irwansyah, 2018).

Use of cloud services might become a key component of success for SMEs (Ahmad & Siddiqui, 2014; Widyastuti & Irwansyah, 2018). This is because many of the IT services that SMEs may make use of are generally provided through the cloud with lower capital expenses to setup as compared to traditional IT environments (Alshamaila, Papagiannidis, & Li, 2013). Researchers in developed and developing countries have in the past conducted studies identifying levels of adoption such as in universities, insurance and manufacturing which informed research into frameworks for adoption (Ahmed, 2011; Lamba & Singh, 2011; Akhusama & Moturi, 2016; Akin, Matthew, & Y, 2014). However, little research exists for the context of SMEs in developing economies which identifies current levels of cloud computing (Oguntala, Abd-Alhameed, & Odeyemi, 2017). Therefore, there is need to establish the current situation for SMEs in Nairobi County, Kenya. This may provide a baseline for further research in the adoption of cloud computing as a solution to ICT adoption by SMEs.

### **Objective of the Study**

The objective of the study was to examine the current adoption levels of cloud-based services by SMEs in Nairobi County.

### **Research Question**

Based on the objective of the study, the main research question was: What is the current adoption level of Cloud Based services by SMEs in Nairobi County? This inferred more questions which are:

1. What are the main uses of cloud computing services by SMEs in Nairobi County?
2. What is the main reason for adoption or non-adoption of cloud computing services by SMEs in Nairobi County?
3. What are the levels of satisfaction of cloud-based services by the SMEs?
4. What factors influence the levels of satisfaction in use of cloud-based services by the SMEs?

### **Methodology**

#### **Research Design**

This study was a survey using an exploratory approach with quantitative methods being considered appropriate for primary data collection.

#### **Sampling and Sample Size**

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 convenience sample consisted of private businesses that had less than 250 employees and operated within the Nairobi County area that the researcher had direct access to.

**Instrumentation**

The study used a Questionnaire on use of Cloud-Based Services by SMEs(QUCSS) for data collection. The instrument 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.

**Data Collection**

Data collection was done through an online questionnaire which was distributed to the sample through email. In total, 50 respondents completed the online questionnaire, out of which 45 were usable based on the type and size of organization.

**Data Analysis**

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, it was found 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 .

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

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

It was established that the main reason for not using cloud computing was insufficient knowledge which supported the report by CA & KNBS (2016) that identified inadequate knowledge as the main reason for non-adoption (CA & KNBS, 2016). This finding thereby establishes 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 adoption of 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 . 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 2 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.

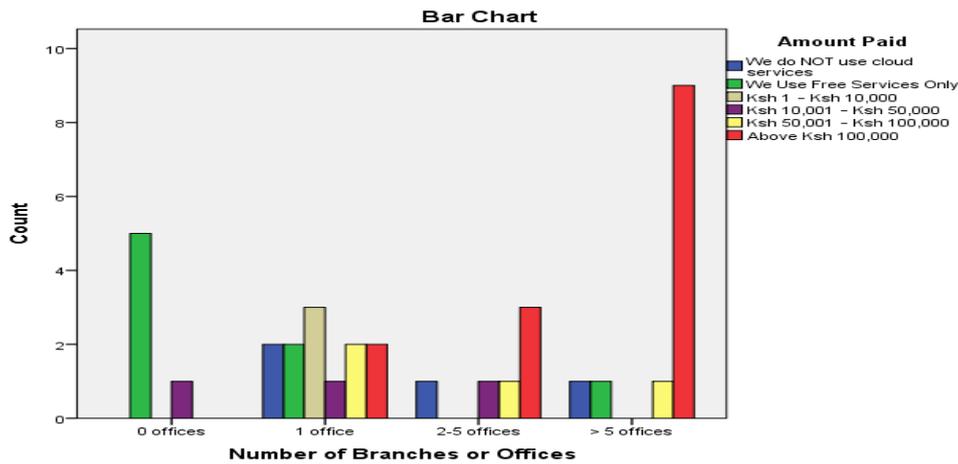


Figure 1 Chart of number of offices clustered by amount paid for cloud computing

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 may help all sizes of SMEs to adopt successfully cloud computing.

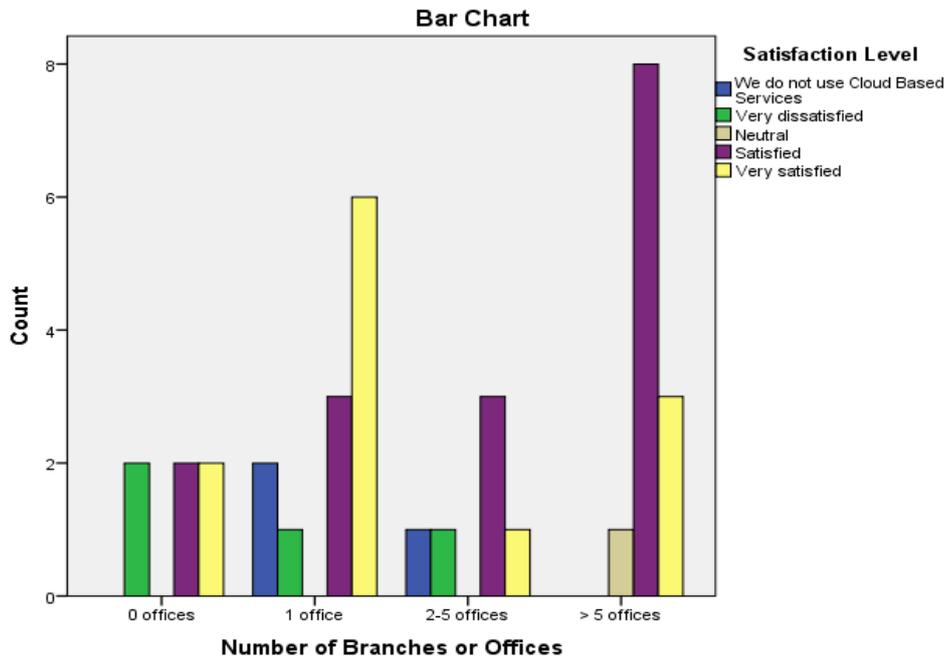


Figure 2 Chart showing satisfaction level clustered by amount spent on cloud computing

Internet/Social Media (75%, n=27) was the leading source of information on cloud-based services followed by schools (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, television, radio and newspapers. Service providers should therefore consider sharing information about cloud computing through 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

The researchers determined the following conclusions based on the findings of this study:

1. The main uses of cloud computing services by SMEs in Nairobi County are email and websites which fall in the category of communication services.
2. The key reason for non-adoption is lack of training in ICT.
3. IT based SMEs are generally satisfied with use of cloud-based services while non-IT based ones are not.
4. The industry of the SMEs, the organization size and the amount of money spent on cloud-based services are some of the key factors that influence the level of satisfaction. The higher the financial investment, the higher the level of satisfaction.

Although cloud computing has a number of benefits that SMEs can take advantage of, through this study, it was identified that adoption of cloud computing by SMEs in Nairobi County is low, especially the cloud adoption for the business applications. Most SMEs in Nairobi County make use of websites and email (communication services) as the main use of cloud computing. However, business applications such as finance and customer management applications had low adoption and use by the SMEs.

Through this study, it was identified that SMEs main reason for non-adoption was insufficient information. 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.

Larger SMEs that spent more investment on cloud-based services had higher levels of satisfaction than their smaller counterparts. It was therefore concluded that levels of satisfaction for SMEs adoption of cloud computing did varied by organization size. The authors therefore find that there is a need to have theoretical frameworks and models that can help and guide SMEs through to successful cloud computing adoption, standardizing the adoption and level of satisfaction of the cloud-based services.

The Kenyan Government should develop frameworks deliberately crafted to promote the adoption of cloud computing by SMEs in Kenya. Such frameworks should be supported by the Education Institutions, Research Organizations and Cloud Based Services in a combined effort towards SMEs adoption of cloud based services.

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