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Effect of Cost Consideration on Organizations Adoption of Cloud Technology by International Non-Govermental Organizations in Kenya

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Abstract: ***The purpose of this research was to investigate the effect of cost consideration on organizations adoption of cloud technology. Four objectives informed this study; Hardware cost, Software cost, IT staff cost and Operating cost and their effect on organizations adoption of cloud technology. One theory formed the foundation of this study; Unified Theory of Acceptance and Use of Technology (UTAUT). The research design employed in this study was descriptive in nature. Descriptive studies describe characteristics associated with the subject population. This method was chosen since it assisted in securing both qualitative and quantitative information from the respondents. The target population of the study was organizations listed by the NGO coordination board of Kenya. Thirty international non-profit organizations were surveyed. Focus was all persons in charge of ICT departments such as Chief Technical Officers (CTO), Chief Information Officers or IT Managers. The study used questionnaires to collect data. The instrument was subjected to validity and reliability tests where cost consideration attained 0.773, cloud reliability had 0.793, cloud security had 0.712 and cloud flexibility had 0.754. The analysis of data was both descriptive and inferential in nature. The study obtained a response rate of 58% and therefore met the required threshold. The correlational test results showed that cloud computing flexibility had the best correlation with adoption of cloud technology (r=0.676). In the model summary, the value of R square was 0.702, the value of adjusted R square was 0.593 and the value of standard error of the estimate was 0.151. The positivity and significance of all values showed that the model summary was also significant and therefore gave a logical support to the study model. Cloud computing flexibility is the best construct of predicting the adoption of cloud technology. Factor extraction for cost consideration yielded higher loadings of between 0.671 and 0.819 with acceptable Cronbach's alpha values giving an indication that the variables used for the variable represent a complete structure measure of adoption of cloud technology. Factor extraction for security effectiveness consideration had a higher loading of between 0.706 and 0.837 with acceptable Cronbach's alpha values giving an indication that the variables used for security effectiveness consideration represent a complete structure measuring for the adoption of cloud technology. Factor extraction for cloud reliability yielded higher loadings of between 0.780 and 0.915 with acceptable Cronbach's alpha values giving an indication that the variables used for the dependent and independent variables represent a complete structure measuring these constructs. Factor extraction was conducted and the factors used had higher loadings between 0.631 and 0.913 with acceptable Cronbach's alpha values giving an indication that the variables used for the dependent and independent variables also represent a complete structure measuring these constructs. This study concluded that cost consideration, cloud computing reliability, cloud computing security and cloud-computing flexibility are important variables that inform the adoption of cloud technology. The study recommends that since cloud computing flexibility is the most important predictor of adoption of computing technology, organizations should benefit from the computing diversity of needs that arises from the reference to computing flexibility. This way organizations will gain from the availability, affordability and high efficiency computing for demanding applications in use.***

Keywords: Hardware cost, Software cost, IT staff cost, operating cost, Cost consideration, Adoption of Cloud Technology, International, Non-Governmental Organizations and Kenya

1. Introduction

Information and Communication Technology (ICT) services are undergoing an evolutionary phase. Traditional ICT services used to be built entirely of hardware and software components in an organization premises. These are now being offered as commodity services. Organizations have realized that the personalized service model where everyone used to build their own services may not be the most effective solution. The application of shared large scale utility services combined with Service Oriented Architecture (SOA) is more flexible both from the financial and service quality perspective. Multiple standardized utility services already exist e.g., Customer relationship management (CRM), Enterprise resource management (ERP), managed operating systems, e-mail, instant messaging and file sharing (Gartner, 2010).

Deployment can be quick, and service charge is based on actual consumption, time, transactions or other measurable units. Deployment of utility services has been typically automated, making it a very effective way to duplicate the service to multiple clients. From the business perspective, this approach is warmly welcomed—time of project deployment reduced dramatically, and substantial investments are not required. Traditionally ICT services have been insourced or outsourced, and the platform was fixed for the organization only. This means an organization using the ICT service has a dedicated environment for them. In utility services however, multiple customers use the service underneath a shared platform. As the service is shared, the customers in a multi-tenancy environment have no or very little possibility of special tailoring for their service (Gartner, 2010).

Kim *et al*. (2009) recommends that critical applications should not be taken into the cloud. Moreover, users who are using cloud computing solutions should make sure to have backup of their data in other places. This factor represents a risk and it is one of the effective factors in cloud computing adoption. As observed by Waititu (2013) cloud computing is not just a game-changer for big businesses in developed

nations. In Africa, it is rapidly turning the continent into a place of rich opportunity for bright-eyed entrepreneurs, who are finding they can turn good ideas into market opportunities almost overnight. The reason for this is simple: even with patchy broadband access and high data costs, the cloud is providing an easy entry point to markets and platforms for entrepreneurs and small businesses across all sectors by reducing the cost and complexity of using technology to start or grow a business.

In Kenya, there has been an increase in the number of IT firms offering cloud computing services over the past five years. For example, a Swiss software firm Sofgen unveiled its cloud computing service in the country in 2012, eyeing the financial sector. The product, Temenos T24, a cloud platform developed by US firm Microsoft Corporation, targets banks, microfinance institutions and savings and credit co-operative societies. Similarly, InfoConnect, a division of local firm Dimension Data, as well as Safaricom in partnership with Seven Seas Technologies, Cisco and EMC² made an entry into the cloud computing services market with a cumulative KSh3.5 billion war chest in 2011 (Khisa, 2013). The company today offers a range of Cloud Computing services including hosting, storage and backup services.

The World Bank defines a non-governmental organization (NGO) as "private organizations that pursue activities to relieve suffering, promote the environment, and provide basic social services or undertake community development". An international non-governmental organization (INGO) has the same mission as a non-governmental organization (NGO), but it is international in scope and has outposts around the world to deal with specific issues in many countries. An INGO may be founded by private philanthropy, such as the Carnegie, Rockefeller, Gates and Ford Foundations, or as an adjunct to existing international organizations, such as the Catholic or Lutheran churches. A surge in the founding of development INGOs occurred during World War II, some of which would later become the large development INGOs like SOS Children's Villages, Oxfam, Catholic Relief Services, CARE International, and Lutheran World Relief. The Non-Governmental Organizations Co-ordination Board is a State Corporation established by the Non-Governmental Organizations Co-ordination Act (Cap 19) of 1990. The Board has the responsibility of regulating and enabling the NGO sector in Kenya.

2. Statement of the problem

Due to the pressure of organizations such as non-governmental organizations working with slim budgets to support operations, it follows that unnecessary IT infrastructure costs should be hedged and one way of dealing with this is by adopting technologies that enable flexibility and scalability of IT infrastructure (Darlyl, 2009). This can be made possible by accessing IT as a service technology and one best fit option is arguably cloud computing. According to Gartner (2009), many organizations want to venture into tasks that have high returns or impact. Organizations want to pay only for what they need and not necessarily what they have. Thus as organizations grow, flexibility and scalability of IT infrastructure becomes essential. On the other hand, if the level of activity of an organization reduces, a scale down of resources that does not result into idle resources is also required (Mitchel and Smith, 2008). It is also a prism that organizations want to concentrate their resources on core business and not in supporting IT services hence the need to reduce unnecessary costs related to operations. According to (Cloudtweaks, 2010) many analysts firmly believe that the benefits of using the cloud for certain applications will far outweigh its risks. The need to store most of the relevant data and access it efficiently is the main driving force behind many companies moving to the cloud.

Cloud computing adoptability studies have been conducted where by one sought to assess the awareness level of cloud computing (Karanja, 2011) and the other focused on adoptability of cloud computing by the banking sector (Wangui, 2011). Both of the stated research works were not focused on non-governmental organizations therefore a gap here arises in that in most of these studies no model has been advanced to explain critical factors affecting adoption of cloud computing technology in international non-governmental organizations. It was the intention of this study to look into that void by evaluating leader's attitudes and perceptions to these factors.

General objective of the study

To determine the effect of cost consideration on organizations adoption of cloud technology

Specific objectives of the study

1) To determine the effect of Hardware cost on organizations adoption of cloud technology
2) To determine the effect of Software cost on organizations adoption of cloud technology
3) To determine the effect of IT staff cost on organizations adoption of cloud technology
4) To determine the effect of Operating cost on organizations adoption of cloud technology

3. Theoretical Review

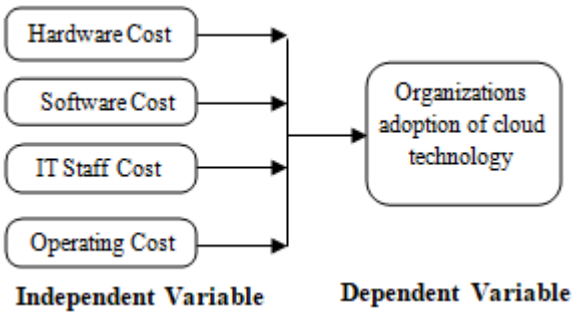
Unified Theory of Acceptance and Use of Technology (UTAUT)

Venkatesh and Zhang (2010) explored technology adoption by examining culture as a boundary condition and identified the bounds of generalizability of the unified theory of acceptance and use of technology (UTAUT). UTAUT aims to explain user intentions to use an information system and subsequent usage behavior. The theory holds that four key constructs: 1) performance expectancy, 2) effort expectancy, 3) social influence, and 4) facilitating conditions; the first three being direct determinants of usage intention and behavior, and the fourth a direct determinant of use behavior. Gender, age, experience, and voluntariness of use are posited to moderate the impact of the four key constructs on usage intention and behavior. Before any organization can use cloud computing, it must be aware of the existence of such technology, what it is used for and where it can be applied. Wangui (2011) study was geared towards finding out whether commercial banking industry

in Kenya is aware of cloud computing, ready to adopt it and its attitude towards cloud computing. The findings from the study revealed that majority of the IT managers/CIOs were aware of cloud computing technology as shown by a 95% respondents defining cloud computing terminology correctly. On the attitude of IT managers on cloud technology the study revealed that, majority of commercial banks were not willing to adopt the technology. A survey on cloud computing awareness by Market Connections (2008) on U.S. defense/military and federal government unearthed that cloud utilization is poised for rapid gains as awareness of cloud computing grow. The research clearly showed that cloud computing knowledge was not widespread among agencies involved in cloud computing.

4. Conceptual Framework

The study adopted the following conceptual framework:



Source: Author 2017
Conceptual framework

5. Cost Consideration

Cost effectiveness is the relationship that exists between monetary input and a favorable outcome. One of the most attractive and important cost issue in cloud computing is the capability to pay for service based on ones needs therefore avoiding large expenses of buying private computer systems. Another attractive feature of cloud computing is the saving of space, utilities and maintenance of staff that come up by outsourcing computing applications and management to the cloud provider. According to Armbrust et al. (2009), the capabilities key for cloud computing is supplying large scale commodity computing resource at the lowest cost possible. Armbrust claims that this reduces the production cost by a factor of five to seven items in various areas such as: network expenses, electricity, network, software and hardware expenses, all this made possible because of economies of scale. In addition, the convenience of doing large computations quickly on demand can save users and organizations time and money because of the quick response time feasible with many processors on the cloud computers. As an outcome, previous calculations that were impractical to solve can now be solved in suitable time, cost and speed assuming transferring data to and from the cloud with finite latency.

Miller (2009) as stated in Armbrust at al. (2009), argues that that organizations do not have to handle with the peaks and the nonpeak times in computing power demands anymore by purchasing new equipment. Instead, the peak computing demands are handled by cloud servers. Cloud computing also leads to lower software costs. Organizations no longer have to buy separate software packages for each computer (Miller, 2009). Instead, a particular application is accessed only by the employees using that application. Moreover, this also means saved cost of installing and maintaining that software on each computer. Another software-related cost benefit is that organizations do not have to pay for a software upgrade in order to have the latest versions of the applications (Miller, 2009). As all applications are in the cloud, they are upgraded automatically by the provider. Organizations can also greatly reduce their maintenance costs (Miller, 2009). This refers to both hardware and software maintenance. Less computers and servers means lower maintenance costs. The IT staff in organizations does not have software to maintain as all applications are in the cloud and are maintained by the cloud provider. In relation to the above statements, we argue that the software costs depend on the cloud deployment and delivery models. This means that the software costs vary according to the levels of control and maintenance allowed by those models.

Cost savings, according to Reese (2009), means that the greatest benefit of Cloud Computing is a financial one, since the pay-for-use model is significantly cheaper for an organization than the prepay model. Durkee (2010) states that Cloud Computing saves energy, since the number of data centers used is the minimum required to maintain service levels. As regards entry costs, Marston *et al* (2011) state that they are dramatically lowered with Cloud Computing, thus allowing small organizations to have access to the benefits of technologies that previously used to be available only to large corporations. For Reese (2009), the cost savings in the cloud are significant and may even reach extraordinary levels, when there is big difference between the peak and average capacity of infrastructure use and between the average and low capacity of use.

6. Research Methodology

The research design employed in this study is descriptive survey. Descriptive studies describe characteristics associated with the subject population. According to Cooper and Schindler (2000) descriptive statistics discover and measure cause and effect relationships among variables. The target population of the study was organizations listed by the NGO coordination board of Kenya Thirty international non-profit organizations were surveyed. Focus was all persons in charge of ICT departments such as Chief Technical Officers (CTO), Chief Information Officers or IT Managers where two questionnaires was delivered to each of the organizations. These respondents were selected because they had the required knowledge and skills that enabled better conclusion and were involved with technology decision making. In order to meet the objective of the study, open and closed ended questionnaires were used to collect the primary data developed by the researcher. The questionnaires were used to obtain primary data from the sampled population, Qualitative analysis was done on the information collected from the results of the questionnaires; quantitative analysis was included, both descriptive and inferential statistical techniques were used. Descriptive statistics was used to analyze the quantitative data. The findings were presented using tables, graphs and pie charts.

7. Results and Discussions of the Findings

Factor extraction for cost consideration yielded higher loadings of between 0.672 and 0.819 with acceptable Cronbach's alpha values giving an indication that the variables used for the variable represent a complete structure measure of adoption of cloud technology.

Factor Analysis of Cost Considerations

Attributes	*Loading*
Cloud computing decreases the investment in new infrastructure setup	0.819
Deployment of cloud computing involves a negligible amount of time and effort	0.696
Cloud computing decreases our total operating cost with the pay as you go model	0.671
Cloud computing has low personnel training Costs	0.760
Deployment of cloud computing involves a negligible amount of time and effort	0.712

The respondents were requested to state the extent the cost effectiveness attributes inform the adoption of cloud computing in the organization.

Attributes	1	2	3	4	5
	%	%	%	%	%
Cloud computing decreases the investment in new infrastructure setup	24	62	10	5	5
Cloud computing eliminates the cost of licensing new software	67	30	3	0	0
Deployment of cloud computing involves a negligible amount of time and effort	10	45	40	5	0
Cloud computing decreases our total operating cost with the pay as you go model	30	68	2	0	0
Cloud computing has low personnel training costs	5	32	58	5	0
Cloud computing decreases the cost of system maintenance	22	70	8	0	0
Cloud computing decreases our capital expenditure	69	23	4	4	0
Cloud computing eliminates the cost of licensing new software	10	58	22	10	0
Deployment of cloud computing involves a negligible amount of time and effort	72	20	4	2	2

The results indicate that, majority of the respondents argued that; to a great extent, deployment of cloud computing involves a negligible amount of time and effort as stated by the majority (72%); to a high extent, cloud computing decreases the cost of system maintenance (70%); to a great extent, cloud computing decreases our capital expenditure (69%); to a high extent, cloud computing decreases our total operating cost with the pay as you go model (68%) and to a great extent, cloud computing eliminates the cost of licensing new software (67%). The findings agreed with (Reese, 2009; Durkee, 2010 & Marston et al., 2011), who found that cost savings, means that the greatest benefit of cloud computing is a financial one, since the pay-for-use model is significantly cheaper for an organization than the prepay model. Again, cloud computing saves energy, since the number of data centers used is the minimum required to maintain service levels. Finally, entry costs are dramatically lowered with cloud computing. This implies that cloud computing allows small organizations to have access to the benefits of technologies that previously used to be available only to large corporations.

8. Summary of the findings

Factor extraction for cost consideration yielded higher loadings of between 0.672 and 0.819 with acceptable Cronbach's alpha values giving an indication that the variables used for the variable represent a complete structure measure of adoption of cloud technology. The descriptive analysis of cost consideration in cloud computing showed that to a great extent, deployment of cloud computing involves a negligible amount of time and effort as stated by the majority (72%); to a high extent, cloud computing decreases the cost of system maintenance (70%); to a great extent, cloud computing decreases our capital expenditure (69%); to a high extent, cloud computing decreases our total operating cost with the pay as you go model (68%) and to a great extent, cloud computing eliminates the cost of licensing new software (67%). The implication was that cloud computing cost consideration allows small organizations to have access to the benefits of technologies that previously used to be available only to large corporations.

9. Conclusions

The study concludes that cost consideration, is important variables that inform the adoption of cloud technology. Cloud computing consideration allows small organizations to have access to the benefits of technologies that previously used to be available only to large corporations. Cloud computing reliability is paramount in organizations since privacy is one of the longest standing and most significant concerns with cloud computing. Cloud computing security is important since organizations in Kenya need to ensure reliability of cloud technology and the reality of not placing the potential subscriber at risk. A flexible cloud computing technology will enable organizations to have availability of large amount of the computing resource available against demand to meet needs of users.

10. Recommendations

The study further recommends that although cloud computing cost effectiveness is not the best constructs in adoption of cloud computing technology, organizations can still benefit from these factor by minimizing cost as possible in adoption of cloud technology because the study results have shown that it has some significance.

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