

Influence Of
Environmental Factors
On Decisions To Adopt
Cloud Computing By
Small And Medium
Enterprises In Kampala,
Uganda

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ABSTRACT

This research paper aimed to evaluate the environmental factors that influence Small and Medium Enterprises (SMEs) in Uganda to adopt cloud computing. It employed a descriptive and explanatory research design utilized a quantitative approach—and obtained data from 416 SMEs in Kampala, Uganda. A very weak, negative monotonic correlation between environmental factors and cloud computing adoption decisions ($r_s = -.071$, $n = 307$, $p > .001$) was found, implying that environmental factors contribute to the adoption of cloud computing in SMEs in Kampala, Uganda from an indirect perspective but primarily for the intentions of having a competitive edge in the business market.

Keywords: Environmental Factors, Cloud Computing Adoption decision, SMEs, External Support, Competitive Pressure

1. INTRODUCTION

In this information age, cloud computing comes with several advantages for business and especially for SMEs in developing economies for businesses, allowing them to complete tasks at a lower cost and with less effort. It provides large-scale Internet-based shared IT infrastructure (Kumar & Vidhyalakshmi, 2012). Cloud computing particularly promises to improve the reliability and affordability of IT systems, enabling SMEs to channel their limited resources to other critical areas of their core business.

Despite the benefits, there is still reluctance by SMEs in Africa to adopt Cloud computing technology and services as they continue to make use of a shop-to-shop approach of seeking software and hardware which in most cases do not meet their operational requirements (Fishman 2012; Luftman & Ben-Zvi 2010).

Limited resources, such as financial inadequacy, process servers, and very low memory saves, storage, and bandwidth, are among the primary barriers to cloud computing adoption in Uganda, according to Mugenyi (2018).

The use by SMEs of cloud computing in Uganda, generally, is low and is not growing as fast as one would expect, despite the numerous advantages attached to the use of cloud computing (Namisango et al., 2014). This has been attributed to several factors including concerns about the security of data, although data in the cloud is normally more secure than in-house hosted data, especially for SMEs most of which may lack data security experts (Kalinaki et al., 2022).

In specific terms, the use by SMEs of cloud computing in Kampala is low (Kasse et al., 2015). The low uptake of cloud computing by the SMEs in Kampala was, in part, attributed to the failure by the Ugandan government to establish an enabling IT environment (Kasse et al., 2015). This is also in line with Namisango et al's (2014) claim that despite the Uganda government's efforts of supporting SMEs through ICT by enhancing internet

infrastructure, acceptance of cloud computing is still very low among SMEs, in the country in general and in Kampala in particular.

As a result, the goal of this study was to provide evidence as to the factors and innovation characteristics that might help SMEs to adopt cloud computing, thereby improving their earnings and assisting in making a substantial contribution to the economy.

This study was also incentivized by the fact that not only is there evidence of little uptake of cloud computing by SMEs in Kampala, but also that there is little research focusing on the factors and innovation characteristics influencing the adoption of cloud computing by small and medium scale enterprises in Kampala, Uganda; hence this study.

Given that cloud computing systems and applications are still in their infancy, a study is required, particularly in regards to adoption, particularly among SMEs (Leimeister et al., 2010). The majority of studies and research on the acquisition/adoption and diffusion of new ICTs focus on a few key questions (Zmud, 2000), which include factors that determine the pattern, rate, and extent of an innovation's diffusion across a population of potential adopters; factors that determine an organization's general propensity to adopt and assimilate innovations in its business operations over time; and factors that determine an organization's pragmatism in adopting and assimilation of innovations in its business operations. Also, in the context of SMEs, Levy et al (2001) raise concerns about the disparity between large and small businesses in their adoption of ICT advancements.

Research on innovation adoption has been an important aspect of this large field of research, according to Damanpour (Damanpour, 1991). An extensive assessment of the existing literature on the adoption and spread of ICTs, as well as current trends and challenges reveals that, while much attention and effort have been devoted to ICT adoption research (Wang et al., 2011), there are still a number of important gaps. According to Ramdani and Kawalek (2007), the majority of the inconclusive findings in this area of research can be attributed to factors like differences in the ICT innovations studied, different data collection methods, differences in the operationalization of constructs, and differences in the innovation context.

As a result, it's still unclear what sets SMEs apart when it comes to their usage of ICT in general. More specifically, there is a scarcity of studies into how SMEs embrace cloud computing, as well as the technological, organizational, and environmental factors and changes that accompany this decision-making process. While the previous studies looked into cloud computing architecture (Rochwerger et al., 2009), prospective applications (Liu & Orban, 2008), and costs and benefits (Rochwerger et al., 2009), there is still more work to be done Assuncao et al. (2009) and Saya et al (2010) point out that the factors that influence decision-making regarding cloud computing adoption have not been empirically examined.

2. LITERATURE REVIEW ON THE ENVIRONMENTAL FACTORS AND ADOPTION OF CLOUD COMPUTING

Recent research (Buyya et al., 2009; Etro, 2009; Gens et al., 2010) has found that slow initial adoption of cloud computing innovation will be followed by aggressively accelerated uptake and cloud computing utilization. Etro (2009) used a Dynamic Stochastic General Equilibrium (DSGE) calibrated model enhanced with endogenous market structures to forecast the expected growth in European GDP due to the macroeconomic impact of cloud-computing technologies with a measured degree of uncertainty. However, the gap that these scholars leave unattended is the failure to show the specific factors such environmental factors that may directly or indirectly affect the cloud computing adoption that this study gave attention to.

The competitive and regulatory environments should also be considered and understood by SMEs (IDC Group, 2011; Lian et al., 2014; McGladrey, 2013; Seddon and Currie, 2013) Brender and Markov, 2013; IDC Group, 2011; Lian et al., 2014; McGladrey, 2013; Seddon & Currie, 2013). Changes in the competitive and regulatory environments can provide strong incentives or disincentives for the adoption of various cloud computing systems (IDC Group, 2011). If external constituents are resisting cloud adoption, the IDC group (2011) argues that those external attitudes, including changing costs and application capabilities, will need to be reassessed regularly. However, these scholars only considered the external environment as their main concern thereof leaving a gap whereby that arises from the internal environment as a major consideration also under cloud computing among other aspects such as employees' cloud knowledge and information intensity among others.

SMEs should think about CCS interoperability and contractual "lock-in" issues, as these difficulties can cost a lot of money and time to port the program and associated data (Takabi et al., 2010; Wei et al., 2014; Hsinking et al., 2012; Marston et al., 2011; Sultan, 2013; Sultan, 2014; Takabi et al., 2010). Contractual complications and inconsistencies (for example, costly exit clauses and data erasure) can result in SMEs being contractually "locked in." Another problem that demands careful thought is security (CISCO, 2013; Lian et al., 2014; McGladrey, 2013). According to McGladrey (2013), security capabilities vary by vendor and cloud structure, and if businesses aren't vigilant, they may be trading one form of risk for another. Despite the fact that a cloud solution is technically secure, it may not meet all legal and regulatory standards in certain industries. The most important characteristics for SMEs when choosing a cloud service provider, according to the CISCO group (2013), are those that correlate with prospective network asset differentiation. Reliability, quality, security, and technological expertise are among these criteria (CISCO, 2013). This study also notes that though the scholars addressed the issues that may arise as a result of contractual agreements pertaining to the faults and omissions, another gap remains, that is, pertaining to the knowledge of employees, even managers on cloud computing. This would be important since it may not necessarily be covered in contracts however much the cloud computing innovation may be sought in a given organization or business.

When an organization adopts the CCS, it must address risks that are external to the company (Kim et al., 2010). However, these risk considerations have an impact on the CCS's long-term viability for SMEs. The operational risks of cloud computing service providers, for example, will be integrated into the product that consumers purchase. Because of their fundamental reliance on service providers, businesses will have to constantly manage these risks (Lian et al., 2014; McGladrey, 2013).

Based on five industry sectors: manufacturing, wholesale and retail trade, hotels and restaurants, transportation storage and communication, and real estate renting and business activities, Etro extrapolated these GDP predictions into the creation of over 430,000 SMEs and thousands of new jobs for the 25 European countries studied. A gap left by these scholars, therefore, is that though they put across the awareness of the possible risks that come with the cloud computing technology, they do not illustrate in detail how these can be addressed or combated which further would limit SMEs' decision for cloud computing adoption because of the uncertainty that would come with these insecurities.

The biggest technological impediments to cloud computing adoption were explored by Phaphoom et al. (2015). Employees and decision-makers were polled for information. Adopters and non-adopters were compared in the study. Security, data privacy, and portability are three major adoption inhibitors shown by the comparison. Shin (2013) used TAM to study the characteristics that drive cloud adoption in public sector organizations. The perceived usefulness and simplicity of use were found to have a significant impact on user intents and behaviors. Availability, security, reliability, and access all influence perceived usefulness.

The availability and accessibility of resources have an impact on perceived ease of usage. The purpose is influenced by the subjective norm. Shin (2015), for example, used TAM to explore the utilization of cloud services uptake. The findings revealed that accessibility and availability influenced ease of use and usefulness. Only perceived usefulness was influenced by security, while only perceived usefulness was influenced by reliability.

The perceived utility and simplicity of usage influenced intention. Intention and perceived norms both influenced use behavior. Although these researchers demonstrated that the perceived utility and simplicity of use of cloud computing had a significant impact on user intentions and behaviors, they failed to account for the economic implications of any given or desired technology or innovation in the organization. It is noted too that cost implications can be of high priority when organizations and SMEs are making adoption decisions and more so in developing countries such as Uganda.

3. METHODS AND MATERIALS

The study relied on a positivist approach paradigm and a descriptive as well as explanatory study design. It also applied the quantitative approach. The study targeted a population of 379, 257 SME employees in Kampala and a sample size of 416.

The stratified sampling technique was used to sample SMEs in Kampala. Data were collected through the survey questionnaire method and a self-administered questionnaire as the data collection instrument.

Inter-item consistency reliability (Sekaran & Bougie, 2013) and split-half reliability (Cronbach's alpha) was used to assess internal consistency. To find Cronbach's Alpha coefficient, the study used Statistical Package for Social Sciences (SPSS) version 25 computer program to calculate the variables' reliability. Cronbach's Alpha Coefficient on each instrument had to be more than 0.70 in order for the instruments to be considered dependable. The instrument was deemed satisfactory (Vogt et al., 2013) since the Cronbach's Alpha values were all over 0.7, which is always the suggested number.

Pretesting was also used to demonstrate the instrument's clarity. Before the instruments were administered to the real sample, unclear instructions, incorrect numberings, and similar questions were rectified and adjusted.

The content, criteria, and construct validity of the instruments were tested to see how well they were representative, how they captured relationships between variables, and measured ideas. For all of the items in the questionnaire, the Content Validity Index was found to be 0.95. As a result, the questionnaire was deemed valid, as a CVI of at least 0.8 is regarded highly in terms of assessing validity.

Descriptive statistics were used for which frequency tables were processed in addition to the graphs. The means and standard deviations were also processed to establish the level and the extent of variation in the responses respectively.

Inferential statistics were also used for which Spearman rank correlation analysis was conducted at a bivariate level to establish the existence of relationships between environmental factors and decisions to adopt cloud computing in SMEs in Kampala. Further analyses were conducted in ordinal regression analysis models that were fitted to ascertain the effect of human factors, environmental factors, organizational factors, and innovation characteristics as measured on an ordinal Likert on the decision to adopt cloud computing by SMEs in Kampala.

4. RESULTS

Objective of the study was to evaluate environmental factors that influenced the decision to adopt cloud computing by Small and Medium Enterprises in Kampala. Pursuant to this objective, the study sought to establish the respondents' decision in cloud computing adoption as a result of the environmental factors in the SMEs. In order to achieve this objective, the respondents were prompted to do a self-rating on Human factors using 9 items. Each item was based on a Likert Scale ranging from 1-Strongly Disagree, 2-Disagree, 3-Neutral, 4-Agree to 5-Strongly Agree. Agreement on each item was computed using the item Means and Standard Deviations. The descriptive statistics therefrom are shown in Table below

Table showing descriptive Statistics on Environmental Factors

	N	Min.	Max.	Mean	Std. Deviation
Our customers can easily switch to other companies for similar services/products	307	2	5	4.04	.777
Our cloud providers provide excellent technical support that we receive	307	1	4	2.70	1.205
Cloud computing can expose the firm to data security risks	307	3	5	4.10	.540
Cloud Computing can minimize information privacy	307	3	5	3.99	.629
We receive exceptional customer service for our company in cloud computing	307	1	5	2.98	1.255
There are customer hotlines by cloud providers that our company enjoys	307	1	5	2.99	1.328
We receive training in cloud computing from the cloud providers	307	1	4	2.56	1.012
There is a tight competition among businesses in the industry we operate regarding cloud computing services	307	2	4	2.98	.649
There are a number of products/services on the market that are similar to ours but provide the same purpose in terms of cloud computing.	307	2	4	3.43	.669
Valid N (listwise)	307				

Source: Primary data (2021)

Data analysis revealed that the majority of the respondents agreed that their customers could easily switch to other companies for similar services/products (Mean = 4.04, St. Dev = .777). This finding implies that there was stiff competition among these people that made it easy for their customers to switch to other companies.

The study also showed that the majority of respondents disagreed that their cloud providers provided excellent technical support (Mean = 2.70, St. Dev = 1.205). This finding can be looked at alongside a similar one where there were high disagreement levels on the item that “We receive exceptional customer service for our company in cloud computing” (Mean = 2.98, St. Dev = 1.255). This implies that cloud computing service providers may not have been so engaged in the operations of the business after they had installed the system for them.

The very high agreement levels by the majority of the respondents that cloud computing can expose the firm to data security risks (Mean = 4.10, St. Dev = .540) and a high agreement still that cloud Computing can minimize information privacy (Mean = 3.99, St. Dev = .629) implies that cloud computing can be risky sometimes despite its advantages.

Although respondents generally disagreed that there were customer hotlines “by cloud providers that our company enjoys” (Mean = 2.99, St. Dev = 1.328), the widely spread standard deviation implies that a few of the respondents had hotlines where they communicate while others basically did not have.

Consequently, the study also revealed the reality that, majority of the respondents disagreed with the item that they received training in cloud computing from the cloud providers (Mean = 2.56, St. Dev = 1.012), which

means that if a person bought a cloud computing system in their workplace/ business, they had only to follow the manual to learn how it worked or they will figure out themselves how it worked.

With disagreement levels that there was stiff competition among businesses in the industry that the respondents operated regarding cloud computing services (Mean = 2.98, St. Dev = .649), the implication is that there were few businesses in a specific industry that operated with cloud computing.

Lastly, the study revealed that the majority of the respondents agreed that there were several products/services in the market which were different from their products but performed the same function regarding cloud computing (Mean = 3.43, St. Dev = .669). This finding implies that businesses could easily opt for other products in the market especially if they found the processes to obtain cloud computing frustrating to acquire.

5. DISCUSSION OF FINDINGS

Discussion the study showed that there is a tight competition among these people that make it easy for their customers to switch to other companies. This study found out that there are basically few businesses in the specific industry that operate with cloud computing and that businesses can easily opt for other products in the market especially if they find the processes to obtain cloud computing frustrating to acquire can be looked at against scholars like McGladrey (2013) who reported that). Contractual complications and inconsistencies (for example, costly exit clauses and data erasure) can result in SMEs being contractually "locked in." Another problem that demands careful thought is the security (CISCO, 2013; Lian et al., 2014; McGladrey, 2013).

According to McGladrey (2013), security capabilities vary by vendor and cloud structure, and if businesses aren't vigilant, they may be trading one form of risk for another. Despite the fact that a cloud solution is technically secure, it may not meet all legal and regulatory standards in certain industries. The most important characteristics for SMEs when choosing a cloud service provider, according to the CISCO group (2013), are those that correlate with prospective network asset differentiation. therefore, when those instances arise, a change as initiated by the SMEs can be initiated.

The finding that there is a very weak, negative monotonic correlation between environmental factors and cloud computing adoption decision ($r_s = -.071$, $n = 307$, $p > .001$) implies that as the environmental factors increase in the negative direction, meaning that when SMEs' external support and competitive pressure are reduced or are in the negative direction in an organization, then the chances for the decision to adopt cloud computing in an organization is reduced. this could mean that there is need for some pressure so that people decision makers are motivated to adopt new technology to be more competitive. This can be understood alongside authors such as IDC Group (2011) who asserted that changes in the competitive and regulatory environments can provide strong incentives or disincentives for the adoption of various cloud computing systems. If external constituents are resisting cloud adoption, the IDC group(2011) argues that those external attitudes, including changing costs and

application capabilities, will need to be reassessed on a regular basis. other researchers also noted that when an organization adopts the CCS, it must address risks that are external to the company (Kimet al., 2010). However, these risk considerations have an impact on the CCS's long-term viability for SMEs. The operational risks of cloud computing service providers, for example, will be integrated into the product that consumers purchase.

In the present digital age, organizations are faced with highly global, interconnected, and dynamic environments (Fonseca & Domingues, 2017). The emergence of the phenomenon known as cloud computing represents a fundamental change in the way that are developed, delivered, updated, maintained and paid IT services in modern organizations. For the companies from an emerging economy, a profound consequence of this digital expanding consuming (Nistoreanu, Dinca, & Schiopu, 2017) is the necessity to invest permanently amounts of money in equipment used to process and stock data. Cloud computing services become true incubators for the new applications, meant to respond to the high demand of getting information fast and easy (Greavu-Șerban, 2015).

6. CONCLUSION

From the analysis and review the study concluded that environmental factors contribute and account to the adoption of cloud computing in SMEs in developing countries from an indirect perspective but primarily for the intentions of having a competitive edge in the business market. Taking into account the findings of this investigation, the know-how and experience on cloud computing represent the main components influencing the spreading of cloud computing among Ugandan small and medium businesses. Cloud providing companies can make use of the many social networking companies like Facebook, LinkedIn, Instagram and Twitter with the goal to make SMEs more aware about the benefits of cloud computing.

7. RECOMMENDATIONS

The study revealed that there was stiff competition among SMEs belonging to the same industry. Since stiff competition eats into the profit margins of SMEs and hinders growth and expansion, even closure of some companies, the study recommends that to weather such a difficult business environment, SMEs in Kampala should embrace efficiency and customer satisfaction. Hence, the study also recommends that SMEs adopt cloud computing services and technologies.

The study also revealed the SMEs that used cloud computing technologies and services in Kampala were not satisfied with the assistance offered by cloud computing providers, which could expose them to data security risks; the SMEs using cloud computing did not receive training in cloud computing from the cloud providers. Therefore, the study recommends that service providers of cloud computing should offer more after sales-services, and training in systems and data security for the SMEs for them to realize the full benefits of cloud

computing. The study further recommends that SMEs in Kampala should be sensitized to the effect that they only deal with cloud computing companies that offer after-sales technical assistance and data security training services in a timely manner.

8. SUGGESTIONS FOR RESEARCH

Future studies need to consider being industry-specific other than investigating all industries at once and where possible a census instead of a sample just within Kampala, Uganda. In addition, future studies need to consider exploring the experiences and challenges that the adopters in SMEs face in the course of utilizing the cloud computing platforms.

Future research can be focused on a specific industry based on the findings of this study. To quantify the effect of cloud computing in improving business/firm performance after adoption, a different research approach can be employed, such as a triangulation of both qualitative and quantitative data.

Further research into cloud computing adoption should concentrate on combining the generated extended TAM with other adoption models and frameworks to increase the predictive potential of the resulting models.

CONFLICTS OF INTEREST

There are no conflicts of interest.

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