Critical Success Factors for Cloud Computing Adoption in South Africa

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Abstract

The adoption of Information and Communication Technology (ICT) innovation offer the potential for organizations to enable effectiveness, increase efficiency, and achieve competitive advantage. One such ICT innovation is cloud computing and through its adoption, many benefits may be realized. However, although cloud computing awareness has increased in South Africa, cloud adoption in emerging economies is not prevalent. Therefore, the purpose of this paper is to provide insight into the real world experiences and perceptions of the Information Technology (IT) professionals involved in the cloud adoption successes and failures in South African organizations. By analyzing the experiences of IT professionals, combined with the literature of cloud adoption, we present a set of critical success factors for cloud computing adoption in South Africa. The purpose of such critical success factors is to better equip organizations to address cloud computing adoption holistically and comprehensively.

Keywords

Cloud adoption, cloud, critical success factors, ICT innovation.

Introduction

The role of Information Technology (IT) innovation encompasses a wide range of benefits such as social and capital equality, health, education and commerce (Ganju et al. 2016). In a progressively digital world, technology innovation attracts significant attention in the formulation of organizational strategy, which strives to sustain or establish a competitive advantage in a market. Organizations have invested significantly in IT innovation, in an attempt to keep ahead of competitors (Rocha et al. 2016).

One such IT innovation that is recognized as an important area for investment, is the use of internet-based technologies to conduct business through the use of virtual IT resources in a scalable on demand principle, or referred to as "cloud computing" (Gupta et al. 2013; Low et al. 2011). The adoption of cloud computing in an organization is comparable to a make-vs-buy or outsourcing decision in the business. Providers, on the other hand, realize savings by sharing virtual IT resources among clients thereby taking advantage of economies of scale (Gupta et al. 2013). This approach provides potential for significantly reduced cost of IT resources that can be scaled up or down, as organizations require varying levels of processing power (Tutunea 2014).

However, the ability to take advantage of cloud computing benefits remains relatively low in most African countries as opposed to the developed world where this innovation has been identified as a driver of economic prosperity and productivity (Anyanwu 2012). In this context, renewed focus is required to address organizations' readiness, as well as the perceptions of individuals within the organization, since they play a major role in the organizations' ability to effectively implement cloud solutions (Sharma et al. 2016).

Cloud adoption awareness in South Africa has increased to some extent, but adoption has been stifled by limitations, even though global cloud providers such as Microsoft, Amazon and Google are operational in this market (Gillwald and Moyo 2014). Furthermore, most cloud adoption studies have been conducted in developed countries and very few studies have been carried out on emerging economies like South Africa (Hinde and Van Belle 2012). Therefore, the purpose of this study is to consider the critical success factors for cloud computing adoption in South Africa. Building on the cloud computing research will contribute to

the growing body of research that Sharma, et al., (2016) believes is still a relatively new phenomenon and is still in a nascent stage.

The next section presents the background to the study, whereafter the approach to the study is explored. We then highlight the findings and discuss the research outcomes and conclude the paper.

Background

The National Institute of Standards and Technology defines cloud computing as "a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service provider interaction" (NIST 2017). Computing resources in this definition refer to networks, servers, storage, applications, and services (NIST 2017). Fundamentally, this definition expresses cloud computing as shared IT resources that can be rapidly provisioned and released on demand with minimum effort as corroborated by many researchers (Assantea et al. 2016; Hinde and Van Belle 2012; Johnston et al. 2016; Lechesa et al. 2012; Mohlameane and Ruxwana 2014; Puthal et al. 2015). One key aspect not pertinently highlighted by this definition, is the reliance on internet connectivity as a delivery method for cloud solutions, from the consumer to the shared resources (Garrisona et al. 2015; Oliveira et al. 2014; Willett and Von Solms 2014). It is therefore acknowledged that internet connectivity must be considered as is discussed in more detail in the paper.

The impetus of cloud computing is that it is highly scalable and makes virtualized resources available to users on a pay-per-use model (Masud and Huang 2012). Through this service-driven business model, computing hardware and software resources are delivered as a service over the Internet (Bora and Ahmed 2013). Cloud computing technology enables efficient computing using centralized data storage, processing and bandwidth and enables users to communicate through the Internet with remote servers, software, computation and accessing data (Botta et al. 2016). Furthermore, users are not required to have any special knowledge about cloud technology in order to use it (Bora and Ahmed 2013; Masud and Huang 2012).

Cloud computing services mainly consists of three models: (1) Infrastructure as a Service (IaaS), (2) Platform as a Service (PaaS) and (3) Software as a Service (SaaS) (Mohlameane and Ruxwana 2014). IaaS includes the storage and connectivity essential to hosting and accessing hardware resources (Mohlameane and Ruxwana 2014). Instead of purchasing dedicated servers and networking equipment, this layer enables organizations to rent hardware resources such as storage and computing power such as a Central Processing Unit and memory (Bora and Ahmed 2013). PaaS comprises of functioning servers with operating systems supporting the entire application development environment of an organization, including building, design, implementation, debugging, testing, operations and support of web applications and services on the Internet (Mohlameane and Ruxwana 2014; Poornima et al. 2017). SaaS encompasses an end-to-end service where all components are maintained by the cloud providers. In this instance organizations only have access to the use of the software (Puthal et al. 2015). These industry standards provide the service models available to organizations when considering the depth of cloud solutions the organization wishes to control (Willett and Von Solms 2014).

Based on the cloud computing service model chosen by the organization, various modes of deployment of computing are relevant. As such, cloud computing deployment models are classified into four categories: (1) private, (2) public, (3) hybrid, and (4) community (Puthal et al. 2015). Private cloud implies that the organization owns the data centre and it is exclusive to the particular organization although its location is not bound to the premises (Anyanwu 2012; Chaudhary and Saxena 2015). The private cloud deployment model maintains and owns its own services such as Iaas, Paas and Saas (Gunasekar Kumar 2011; Willett and Von Solms 2014). Public cloud points to the conventional way of cloud computing and is open for use by the general public. Applications, storage and other resources in this scenario are accessible for free or pay-per-use model depending on the parameters dictated by the service provider (Chaudhary and Saxena 2015). For hybrid cloud, the infrastructure consists of both in-house and third party providers and can be a combination of two or more distinct cloud infrastructures (Muniasamy et al. 2014). Community cloud is controlled and shared by multiple organizations within a community bound together with specific concerns and requirements, or resources of shared set of values and missions (Erl et al. 2013; Muniasamy

et al. 2014). The community cloud mode of deployment may realize some cost saving benefits (Bora and Ahmed 2013).

The cloud computing service models and modes of deployment inform distinct areas of concern that may impact cloud adoption (Alshamaila et al. 2012; Lechesa et al. 2012). In the next section we consider particular characteristics of cloud computing in order to further glean insight regarding the distinct areas of concern.

Cloud Computing Characteristics

The identification of essential characteristics is required in order to better understand a technical area as complex as cloud computing (Gong et al. 2010). Such essential characteristics include broad network access, resource pooling, on-demand self-service, measured service and rapid elasticity (Gong et al. 2010; Singh and Chatterjee 2017).

Broad network access refers to data and services that are accessible over a network via standard protocols and technology such as mobile phones, tablets, laptops, and workstations (Muniasamy et al. 2014; Singh and Chatterjee 2017). Resource pooling constitutes vast physical and/or virtual computing resources that serve multiple users (customers) of a service provider. These physical and virtual resources, such as storage, memory and network bandwidth, are distributed dynamically using a multi-tenant environment (Erl et al. 2013; Singh and Chatterjee 2017). On-demand self-service enables consumers to directly request, manage and access services from the service provider through the internet and without human intervention (Muniasamy et al. 2014). Cloud systems automatically control and optimize resource utilization providing transparency for both the provider and user of the consumed service. As resource usage can be monitored, controlled, and reported it is a measured service (Gong et al. 2010). Rapid elasticity refers to the characteristic where resources are scaled according to user requirements. From a user perspective, it seems that they have unlimited resources that can be purchased as needed (Puthal et al. 2015). Such cloud computing characteristics expose the essentials of cloud computing, contributing to the development and adoption of this evolving technology in order to realize benefits (Gong et al. 2010). Cloud computing is a form of IT innovation that aims to extend traditional IT benefits and range (Erl et al. 2013). In the context of this study, the ability to reach many of the African environments which are normally inaccessible to traditional IT resources, is emphasized as a benefit of cloud solutions (Gillwald and Moyo 2014; Willett and Von Solms 2014).

Cloud computing is one of the rapidly developing technologies which offers numerous benefits and entice users to enhance their existing technology with cloud power (Gunasekar Kumar 2011). The main benefit of this technology is that it provides, an effective way to reduce capital and operational expenditure, while optimally profiling and supporting an organization's usage profile (Johnston et al. 2016).

Cloud Computing Adoption in Developing Countries

The contribution of cloud solutions to economies in Europe includes access to advanced resources (Alshamaila et al. 2012; Gupta et al. 2013). This notion is confirmed in an African context where the potential benefits of mobile technology to the informal economy in Africa, is highlighted (Gillwald and Moyo 2014; Hinde and Van Belle 2012). However, a prominent factor that negatively affects cloud adoption, is the lack of network infrastructure in developing countries, as well as the critical dependence of cloud solutions on sufficient bandwidth capabilities. Two aspects of bandwidth are stressed, namely the cost and quality of connectivity (Gillwald and Moyo 2014; Johnston et al. 2016).

Even though South Africa's overall connectivity costs and quality have improved due to the implementation of new submarine cables, this has not resolved the so-called last-mile connectivity issues (Gillwald and Moyo 2014). The quality of connectivity refers to the latency (speed) and stability of the broadband services in South Africa and was measured at 74% of the connectivity speed for which South Africans have signed up. This is below the global average of 85%. The dependency on internet connectivity for users to access cloud resources makes consistent fast internet connectivity essential to effective cloud solutions (Oliveira et al. 2014).

Management support within organizations contributes to the successful implementation of cloud solutions including the relationship between organizational structures that must facilitate the adoption of

innovation, as well as the top management support for the organizational structures (Alshamaila et al. 2012; Oliveira et al. 2014). Shortcomings in the awareness or understanding of cloud solutions undermine the effectiveness of IT resources and a shortage of adequate internal skills and knowledge poses challenges to the adoption of cloud solutions (Johnston et al. 2016; Mohlameane and Ruxwana 2014).

SaaS solutions often consist of generic software designed for use in multiple organizations and industries to leverage economies of scale, and might not fit an organization's perceived unique strategic advantages. Organizations would need to rely on the service providers customizing the solutions to make it more specific to their needs, which could erode the saving and benefits (Lechesa et al. 2012).

Government regulations and infrastructure policies have a significant impact on cloud adoption (Gillwald and Moyo 2014). South Africa's absence of data protection led to the controversial Protection of Public Information (POPI) Act (4/2013) that is intended to bring South Africa's data protection framework in line with international standards. However, the proposed act is yet to provide clarity on the protection of information in the cloud. The act's restriction on transmitting, storing, or processing of personal information outside of South Africa impedes on cloud solutions that depend on redundant storing and transmitting of data outside of South Africa. Organizations are therefore reluctant to be liable for any breaches in customer privacy on behalf of the cloud solution provider (Gillwald and Moyo 2014).

Lack of support by service providers in migrating legacy solutions into the cloud raised concerns based on the number of service providers available in SA. This leaves organizations having to rely on internal IT resources, which has already been highlighted as a concern due to the shortage of skills (Hinde and Van Belle 2012; Mohlameane and Ruxwana 2014). Willett & Von Solms (2014) highlight that organizations indicated that they still require information regarding adequate guidelines for governance, risk and compliance in terms of cloud computing.

Inconsistent power supply - like South Africa experienced during the sole electricity supplier Eskom's rolling blackout practices - left many businesses without electricity. The lack of power supply is another serious challenge to cloud adoptions since data centres and network connections need uninterrupted power supply in order to ensure data storage and access (Gillwald and Moyo 2014). Furthermore, the Cloud Africa 2018 study reported that organizations in Nigeria experienced the highest impact, and South Africa the lowest impact with regards to cloud computing (Goldstuck 2018).

Based on this status of cloud computing adoption in developing countries in general and SA specifically, we now present and discuss the study that was conducted regarding cloud computing in South Africa.

Investigation into Critical Success Factors for Cloud Computing Adoption

The purpose of our research was to investigate what critical success factors are relevant to cloud computing adoption in South Africa. In order to do so, we collected feedback via semi-structured interviews from a cross-functional sample population of organizations in Gauteng, South Africa. In terms of the profile of the organizations, the data was collected from 5 different organizations, namely two large listed companies, one medium sized company, and two small enterprises. In terms of the large listed companies, one is operating in the workforce management industry and are implementing cloud solutions to facilitate business operations. The other is a multinational ICT service provider offering large scale cloud solutions to corporate clients. The focus of the medium sized company is in the telecommunications monitoring industry and use ICT solutions to monitor communications activity. The one small enterprises is an end user of SaaS cloud solutions operating in the financial services industry and the other operates in the professional services industry providing small scale ICT solutions to small companies interested in cloud solutions.

Referring to the study objective aimed at interpreting the phenomena of cloud computing adoption in order to extract the critical success factors, research participants were selected purposively (Onwuegbuzie and Leech 2007). The sample population profile was prepared from professionals at the organizations where the study was conducted operating in SA. Professionals familiar with cloud computing principles and with recent experience with the technology, encompassed the ideal profile to assist with this research. The term professional is used in this study to refer to individuals that are paid a wage for their daily

activities on behalf of an organization. The ideal population of professionals are involved in different levels of the organization, ranging from end users to IT application implementation specialists.

In order to identify critical success factors of cloud computing adoption, a semi-structured interview guide was designed, with the following 4 sections:

- Biographical information: gather the biographical and demographic information about each respondent.
- Definitions and understanding: determine the research participants' perception of cloud computing.
- Cloud adoption experience: examine the experience (threats, opportunities, pitfalls etc.) regarding cloud computing adoption in the case study organization.
- A final question in the semi-structured interview was a request for other comments, which is important to ensure that unanticipated issues are explored (Kaplan and Maxwell 2005).

In order to assist in developing a general understanding of the complex narratives from research participants, themes were used to order data (Kaplan and Maxwell 2005; Leedy and Ormrod 2014). This was achieved through transcribing the interviews, the development of themes and the coding of data (Greener and Martelli 2015; Leedy and Ormrod 2014). Coding in this instance refers to the process of simplifying the complex transcribed data into understandable clusters of meanings and thematic analysis points to summarizing of themes of similar content by using descriptive codes (Leedy and Ormrod 2014). In order to guide the coding, we utilized the well-cited Technological, Organizational and Environmental (TOE) framework where the technological context refers to the ability and flexibility of the solutions, the organizational context considers the internal factors in the organization, and the external conditions are considered through the environmental context (Alshamaila et al. 2012; Gangwar et al. 2015; Kandil et al. 2018).

Nine specialists were invited to form part of the study, of which eight accepted the invitation, yielding a response rate of 89%. The profile of the research participants that were interviewed is shown in Table 1. It is acknowledged that a particular job may consist of different, multiple roles and research participants could therefore indicate the particular role they play with regards to cloud computing. It is also recognized that the job titles may not be consistently applied across organizations. Therefore, the roles identified by research participants were delineated in a matrix with the job profile as shown in Table 1.

Profile element	Platform architect	IT program management	Application architect	Customer / End-user	Total
Programme owner / sponsor	3	3	3	1	5
Internal team / Service management	5	5	5	2	7
Internal technical specialist	5	3	5	3	6
Service provider / Service management	3	2	3	1	4
Service provider technical specialist	5	2	3	1	6

Table 1. Research Participant Role Matrix

In terms of roles in cloud computing, the internal service management roles were represented by 7 research participants, while the role of internal technical specialist and service provider technical specialist were highlighted by 6 research participants respectively. The job titles represented included IT platform architect, programme management, application architect and end-user.

In the next section we discuss the findings of the study and present a table of the critical success factors identified.

Findings and Discussion

Further to the conclusion of thematic analysis and coding (Greener and Martelli 2015; Leedy and Ormrod 2014) from the transcribed interviews, 13 critical success factors were identified as shown in Table 2. As these critical success factors are viewed as interrelated components that interact and support each other, critical success factors were grouped according to the TOE framework components (Alshamaila et al. 2012). Table 2 provides an overview of the critical success factors identified through the process of thematic analysis and coding using NVivo, and we also indicate the association to the environment, organization and technology themes in order to report the findings. This is achieved by placing an "X" in the particular cell between a research participant, denoted by a "Pn", and the critical success factor raised. We discuss each critical success factor in detail in the next sections.

	Critical Success Factors Associated with 3 Overarching Themes												
	Environment			Organization					Technology				
Research participant	Total Cost of Ownership	Economic	Regulation and Political	Awareness	Change and trust	Complexity	Skills	Support	Security	Latency	Accessibility	Flexibility	Reliability
Pn1	X			X	X	X	X	X			X	X	
Pn2	X	X	X	X	X	X	X	X	X	X		X	
Pn3	X	X	X	X	X		X	X		X	X		
Pn4	X			X		X		X		X		X	X
Pn5			X	X	X	X	X		X		X		X
Pn6	X	X	X	X	X		X	X	X	X	X	X	
Pn7	X			X	X	X	X				X		X
Pn8	X	X		X	X		X	X		X	X	X	X
Count	7	4	4	8	7	5	7	6	3	5	6	5	4
%	9.9%	5.6%	5.6%	11.3%	9.9%	7.0%	9.9%	8.5%	4.2%	7.0%	8.5%	7.0%	5.6%

Table 2. Critical Success Factors for Cloud Computing Adoption in South Africa per Research Participant

Environmental Critical Success Factors

The purpose of this section is to present critical success factors of cloud computing adoption that is relevant to environment i.e. critical success factors the organization has very little to no control over. For environment, three critical success factors were identified namely total cost of ownership, economic factors, regulation and political factors.

Total cost of ownership (TCO) evaluates the organization's perspectives regarding the cost of implementing and running cloud solutions and considers the expected cost benefits and the actual cost experienced in practice by organizations. Within the context, research participants expected the TCO of implementing cloud solutions to be lower and to reduce the cost of maintaining IT resources. This notion is supported by the well-documented cost benefit in the literature. However, from the prominent TCO related finding in Table 2, further investigation revealed high TCO as the concern. In conjunction with the high TCO, research participants also highlighted that there were unexpected costs related to the implementation of cloud solutions. These unexpected costs ended up reinforcing the high TCO opinion.

The feedback indicates that participants had a theoretical expected TCO in mind, which in practice proved to require unexpected resources and effort.

The economic critical success refers to the economy of the country, like exchange rates, possible market sizes effected by the weak coordination and insufficient investment in state-owned entities that have limited the market size in the South African economy. The participants' opinion highlighted the exchange rate from Rand in South Africa, to foreign currencies where most of the mature cloud providers operate, especially with the negatively affected Rand due to South Africa's recent weakened economy. South African organizations had to pay more to match the foreign currencies like US dollars. Combined with the smaller market size in South Africa, more established markets abroad are the only alternative, even though it is expensive.

Regulation and political critical success factors pointed to the governing political party and the legal position of these parties. Government plays a vital role in creating structures, policies and regulations that facilitate technology innovation and in SA the POPI act is a good example of such regulation. Political instability in the form of strikes and government policy is mentioned by research participants as obstacles to cloud adoption in South Africa. Most notably is the requirements of consistent electricity supply to the data centres where the cloud solutions as hosted. A single electricity supplier Eskom, which is a state owned entity, has experienced outages in the past. According to global ICT data centre standards, data centres should have uninterrupted power supply. Furthermore, the regulations like the POPI Act is understood to necessitate that personal information must remain in the border of South Africa. This contradicts the geo-redundancy policies of popular cloud solutions.

Organizational Critical Success Factors

The objective of this section is to examine critical success factors of cloud computing adoption that is relevant to organization i.e. the critical success factors relevant to the internal organization over which the organization has some control over. Critical success factors where the organization has some control over specifically deal with organizational resources and characteristics involved in implementing cloud solutions, as well as the organizational resources' ability to adapt new technologies. Such resources in an organization may also include the providers available in assisting with cloud computing implementations. For organization, five critical success factors were identified namely awareness, change and trust, complexity, skills, and support.

The organization's awareness of good principles and capabilities, forms an important context to review the research participants' understanding of cloud solutions. Only a third of participants were "fully familiar" with cloud computing terminology. Similarly only 20% of participants rated their awareness of cloud computing above basic.

Views and opinions of stakeholders' appetite for change and trust towards cloud solutions and providers are essential to the adoption of cloud services. This is evident in the emphasis placed on dependency of how much cloud providers build trust and confidence in their services. Research participants expressed uncertainty towards cloud solutions and the management of risks it claims to mitigate. With the solutions being virtual and outsourced, participants are unsure of how it is managed by third parties. Participants concurrently acknowledged the need for further change management in the industry.

Organizational and solution complexity or simplicity provides insight into the expected and everyday experiences. Strategic changes in the organization led some research participants to note the complex nature of synchronizing IT resources with business cycles. Once a cloud strategy is selected, it will be complicated to revert back from it, especially when the cloud environment is growing constantly. This constant growth and change creates additional complexity in an environment that is expected to provide simpler solutions.

The type and availability of skilled resources in the country are integral to the effective adoption of cloud solutions, so is the level of skills. Therefore, training becomes an essential factor contributing to the adequate number and level of skills. The lack of skilled human resources is a challenge for organizations in implementing ICT projects. While it is accepted that training is available and abundant, most research participants confirmed that they have not been on training and taught themselves the cloud skills they have. The fact that cloud skills are perceived as scarce, does pose the question as to why the necessary training is not adopted more in organizations.

Support within the organization and the support from suppliers are drivers of this critical success factor. Most significantly, top management support within the organization is found as a critical factor in cloud adoption. Government support is included for institutions like the South African Department of Education and its strategic plans to implement ICT in curriculums. Research participants believe that a local data centre will significantly improve the challenging conditions associated to cloud computing in South Africa. Together with the fact that they list a lack of skilled local resources, it suggests that there is a dependency on support from suppliers to implement cloud solutions. The principle of shared IT resources accessible to users through internet connected devices was common among the research participants.

Technology Critical Success Factors

The aim of this section is to present the critical success factors associated with technology and the nature of technology as it relates to the South African context. South Africa provides unique conditions in which the technology operates most notably due to its isolated geographical location at the southern tip of Africa. Organizations with established infrastructure and suitably skilled workforces are better suited to cloud integration (Oliveira et al. 2014). Five critical success factors were identified in the technology theme namely security, latency, accessibility, flexibility and reliability.

Security, privacy and ownership of data and systems are critical issues in the negotiations between organizations that require access of authorized users to be secure. Concerns regarding the restriction of access to data are raised by research participants. Hackings and ransomware in recent global news have sparked concern in cloud security amongst the cloud community. These concerns seem to have only created skepticism from users, which has not stopped the adoption of cloud solutions. The ability to grant access to users remotely is only noted as a secondary element by research participants.

South Africa's latency due to last-mile connectivity affects the adoption of cloud adversely as SA still has some of the highest broadband costs. The lack of adequate bandwidth in South Africa was a prominent response from the research participants. Similar to the literature, the feedback from participants mentions the lack of access to sufficient bandwidth and also the cost of sufficient bandwidth. This all culminates in the performance issues experienced by research participants. The latency results in increased frustration for users when there is not sufficient bandwidth available.

The accessibility critical success factor comprises of access to new and mainstream technology through cloud computing as an alternative ICT solution to overcome the high cost associated to traditional ICT implementations. The fact that large scale IT solutions are available via the cloud model to smaller organizations is a very appealing prospect to the research participants. This does provide smaller organizations with a lot more resources to compete with large enterprises. This is described in the form of the variety of solutions available to choose from, and the time and resources to implement these solutions. Ubiquitous data access to users connected to the internet is another major benefit highlighted by the research participants. The access to data that is kept in the cloud allows users to remotely and securely access data. The accompanying benefit of being able to transfer data, even between external users, is noted in the research participants' feedback in the example of sharing documents to and from clients.

In terms of the flexibility critical success factor, the ability to dynamically scale resources and skills as required when requirements change within the organization, provides organizations with the ability to manage TCO. Overlapping with the accessibility critical success factor, the ability to rapidly deploy resources is a noted benefit from the research participants. This helps to create flexible schedules as the turnaround times for implementation are reduced. The principle of only paying for the usage of the cloud resources is shared amongst the research participants, which links back to the cost saving possibilities. Research participants also mentioned that dynamically matching usage required by users, enabled the pay for usage model.

Cloud computing inherently has critical reliance on reliable internet connectivity and bandwidth. Additionally, cloud solutions need to match or out-perform traditional solutions when it comes to backups, uptime and speed (Hinde and Van Belle 2012; Mohlameane and Ruxwana 2014). Disaster recovery is an important element that has been put forward by the research participants. Peace of mind is expected when it comes to the backups that keep redundant copies of the data available in case of an emergency. Some concern on the recovery time in case of a total data centre failure was highlighted by research participants.

Conclusion

The benefits of ICT innovation is well documented globally and provides an abundance of motivation for organizations to pursue a transition to digital solutions. Cloud solutions are one such innovation that provides organizations with the ability to align the scalability of digital solutions more effectively with the needs of businesses. Identifying the benefits is however, the first step in the plan to implement cloud solutions. Failing to review the unique influences in an organization's environment could adversely influence the ability of organizations to take advantage of these benefits.

South Africa, like many other African countries, have unique conditions in its macro and micro environments that require organizations to apply special effort in order to realize the benefits of cloud computing. Legacy issues from geographical and political isolation have hampered the evolution of cloud solutions. This has had a knock-on effect on organizations, which additionally have their own internal challenges to overcome.

This research paper presented a list of critical success factors for cloud adoption in South Africa based on the literature and combined with the practical experiences of professionals involved in cloud computing organizations in South Africa. The complex context of research participant experiences were analyzed through interpretive analysis of voluntary interviews conducted. We focused on clarifying influences by evaluating the documented literature on cloud computing and the practical experiences of professionals involved in the implementation of cloud solutions.

Findings have highlighted the lack of ICT infrastructure development in South Africa as a significant factor that hampers the advancement of cloud adoption. Poor bandwidth and latency at very high cost in South Africa, have acted as a barrier to a positive acceptance of cloud solutions amongst user and businesses. The interrelated nature of influences is also evident in the findings as ICT managers have been reluctant to promote and enhance awareness of cloud solutions due to the poor performance experiences, which comes at the highest connectivity costs in Africa. Support of cloud solutions has therefore been lacking from mid to high-level managers.

By considering the critical success factors for cloud adoption in South Africa highlighted by this study, it will enable organizations to pro-actively manage their cloud computing adoption programmes as they could address the process more holistically.

Since the study was limited to organizations in Gauteng in South Africa, further research is required in order to refine the critical success factors for cloud adoption in South Africa in order to generalize findings.

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