

Adoption of cloud computing by small and medium-sized enterprises in developing economies: The South African context

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DECLARATION

I, Prince Nkosiymusa Hlatshwayo, declare that this research article is my own work except as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration in the Graduate School of Business Administration, University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

Prince Nkosiymusa Hlatshwayo

Signed atFourways, Johannesburg.....

On the ...25th... day of ...March... 2018...

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God has and continues to be great in my life. I thank Him for all and for getting me this far. To my wife and kids, your support and patience has not gone unnoticed. Good things are on their way for us. My supervisor, Moeketsi Makhalemele. Sir, I wish others had you as a supervisor. You've just been fantastic from day one. My editor, Joseph Maboko, I appreciate your contribution and assistance.

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ABSTRACT

SMEs and businesses in developing economies, through research, have shown a lack in the adoption of technologies that has benefit for them. Cloud computing is one of such technologies that has the potential of levelling the playing fields for these SMEs and businesses, enabling them to compete with big, global businesses. The adoption of cloud computing, by SMEs in developing economies, has not shown great traction. Why is this, especially, in the South African context? Cost, awareness, connectivity, security and other factors have been summarised as causes for the lack of cloud computing adoption in developing economies but there is a lack of research around why the lack of cloud adoption is, in the South African landscape. This paper focuses on the cloud-computing topic with specific focus to the developing economy of South Africa, the unique challenges that this economy and its SMEs face and the potential reason why adoption is lacking within this context. This study expands further on why there is a lack of adoption of cloud services in developing economies by showing that security is the main consideration, at present, that leads on why the adoption of cloud services lacks. SMEs are in the know around what cloud services are about (awareness), they make provision for ICT services from an expenditure perspective and are of the view that broadband connectivity has somewhat come down though more can still be done. Security came out as the major concern that is contributing to the lack of adoption of cloud.

This research gives a potential, cloud computing, South African SME a view of what other SMEs consider as the benefits of cloud computing to their business and what these prospective SMEs can do, and need to be mindful of, in infusing cloud computing as part of their business. The study continues to show cloud computing considerations that are still top of mind to most SMEs and how to plan for these in adopting cloud services.

Keywords: Cloud computing, security, small and medium enterprises (SME), awareness

INTRODUCTION

Purpose and context of this study

The purpose of this research is to evaluate the impact of cloud computing in the context of South Africa, as a developing economy and its Small, Medium and Micro-Enterprises (SMEs). This research further investigates how cloud computing could enable such a developing economy to compete effectively in a globalised environment, whilst assisting in ensuring the livelihood of these organisations within the South African economy.

Developing economies and SMEs are characterised by a lack of relevant skills, needed infrastructure, escalating costs of energy and high costs of Information and Communication Technology (ICT), hardware and software packages (Roztocki & Weistroffer, 2008). Organisations in these economies find themselves in a difficult situation where they find it financially challenging to compete in the global economy, which requires ICT as an enabler of organisational capabilities. Rio-Belver, Cilleruelo, Garechana, Gavilanes and Zabalza mentions that cloud computing is seen as the best alternative for addressing challenges faced by SMEs in adopting technological innovation (as cited in Ezer & Kofi, 2013).

Cloud computing is the concept of renting ICT services from a Service Providers (SP) on a pay as you use model. Core services offerings include Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS). Data centres are built to primarily house, power, and cool and secure computer equipment hosting racks used for hosting purposes (Greenberg, Mills, Tschudi, & Berkeley, 2006). SP's use data centres to host these services. (Chemjor, 2017) indicates that cloud computing guarantees benefits to SMEs such as lower costs of payment for assets enabling the SME to stretch their constrained, financial, resources.

According Kshetri (2010) and Adam (2014), cloud computing is a suitable catalyst in levelling the playing fields for small organisations in developing economies, allowing them to compete with established organisations in developed

economies. Cloud computing enables developing economies and their SMEs to share the same infrastructure, data centres and applications. Through this enablement, developing economies and their SMEs are able to catch up with developed economies, and do so at low ICT costs (Adam, 2014).

Abor and Quartey (2010) outlines that there is growing recognition of the important role that SMEs play in economic development. SMEs are often described as efficient and prolific job creators, the seeds of big businesses and fuel of national economies (Abor and Quartey, 2010). Carcary, Doherty, and Conway (2014) elaborated that due to the importance of SMEs to an economy, ensuring they have a firm understanding of issues associated with cloud computing is critical.

Ezer and Kofi (2013) outlines that SMEs prefer low cost alternatives that produce a competitive advantage. T. Bayrak discusses that traditional ICT comes with hiring staff and experts, data centre space, power and infrastructure (as cited by Ezer & Kofi 2013). Cloud computing does away with this need, and therefore helps cut costs. Harms and Yamartino (2010) also discusses the impact of cloud computing in how it offers its users economies of scale and efficiencies together with modularity and agilities beyond what traditional ICT can offer. Cloud computing's positively impacts on the cost of power, infrastructure labour costs, security, reliability and buying power, offering economies of scale in service consumption.

Roztock and Weistroffer (2008) states that developed economies are characterised by generally high standards of living, on-going and self-sustaining economic growth and a well-developed infrastructure. Contrary to the developed economies, developing economies are characterised by challenging factors such as low economic growth, poor infrastructure and lack of skilled workforce. SMEs in developing economies are can leverage the capabilities of cloud computing, due to its economical nature as cloud is fit for purposes for these economies. There is however a slow adoption of cloud computing solutions by the developing market as researched by Adam (2014). This study aims to investigate this slow adoption in the context of the South African economy.

Kshetri (2010) notes the infancy of cloud computing and its adoption in developing economies and that these economies have not taken up the full advantages that cloud computing has to offer. Makena (2013) supports the lack of adoption by stating that the benefits of cloud computing in developing countries have not been exploited. Cloud computing awareness has been noted by Adam (2014) as a factor in why developing economies have not taken up and experienced cloud computing.

Cloud computing can be understood through three constructs as outlined by Mell and Grance (2011):

- Essential Characteristics: On-demand, self-service, broad network access, resource pooling, rapid elasticity, and measured service
- Service Models: Software as a service (SaaS), platform as a service (PaaS), and infrastructure as a service (IaaS)
- Deployment Models: Private, community, public, and hybrid cloud

The above models, SaaS, PaaS and IaaS, may be leveraged in different combinations to respond to business requirement whilst assisting businesses to achieve their strategic intent.

The constructs considered most important and relevant to this study is the essential characteristics, which make it easy for SMEs to interact with cloud services. These are stated below as:

- On-demand – deploy services as and when they are needed
- Self-service – talk to ease of use for customers who have an appetite for the service
- Broad network access – cloud services can be consumed via any connection type i.e. internet, fixed connections
- Resource pooling – sharing of underlying infrastructure enabling economies of scale in service consumption
- Rapid elasticity – services can be scaled up and down, in and out as and when needed

- Measured service – services are consumed and paid for on usage based model

Using the above characteristics and looking at the needs of the SME and organisations in developing economies and their ICT service consumption, Conway & Curry (2013) emphasizes the importance of determining the organisations' ICT objectives, including the role of cloud computing with the ICT strategy and how the characteristics fit into this strategy.

Adoption of cloud computing

Carr looks at how ICT has, over the years, become an important part and function within businesses, considering modern-day businesses rely on ICT to deliver and interact with stakeholders and gain a competitive advantage (as cited in Ismail, Jeffery, & Belle, 2011).

Concepts such as digitalization of business processes have become entrenched in business operations and accelerate the rate of change of business operations, due to the impact of ICT (Modimogale & Africa, 2009). Collaboration services, systems and platforms have become a needed function of business operations necessary for businesses to stay connected, connecting its workforce, products and services to its customers.

Digitalisation, collaboration service and cloud computing technologies need skills, capital investments, infrastructure for accessibility and use, are complex in its nature and costly to assemble.

Mell and Grance (2011) allude to the role that cloud providers can play in helping these organisations, as cloud services require minimal skills, expertise for technology integration, management, support and upgrades.

Cloud computing awareness

One of the problems of cloud computing is the lack awareness of cloud services to the organisations that need it. As noted by Kshetri (2010) this lack of awareness is one of the big challenges faced by SMEs. Awareness in this context

refers to organisation's perception, comprehension and projection of the benefits and risks of cloud computing (Molla & Licker as cited in Madisha & Van Belle, 2012). Rogers notes that awareness is recognised as an important aspect of adoption of cloud services (as cited in Madisha & Van Belle, 2012).

Connectivity to the cloud

Connectivity is a primary enabler for cloud service, where availability and reliability of connectivity is a key deliverable in cloud computing consumption. Madisha and Van Belle (2012) and Ismail et al. (2011) describe the expensive nature of connectivity as one of the problems for cloud adoption. Having a cloud solution serves no purpose if you cannot connect to it due to unreliable connectivity mediums or due to a barrier of high costs of connectivity.

Security of cloud services

Cyber-security has become a dominant topic over the years and cloud computing services are also affected by this. Kazi and Susan (2013) mentions the complexity of cloud security and the different levels that are required.

With services hosted with a cloud service provider and considering the above security concerns, potential customer of cloud service may be reluctant to take their data and information to the cloud as the cloud may mean the customers services run from location unknown to them.

Significance of this study

Yeboah-Boateng and Essandoh (2014) notes the importance of SMEs to any economy and more especially so to developing economies as SME provide employment opportunity and advance the development of an economy.

Aljabre (2012) infers that cloud computing, as a technological platform, holds several opportunities for the SME as cloud computing has the ability to support increased capacity or extended firm capabilities, without the firm incurring extra costs.

Kasse (2015) writes that despite the fact that SMEs appreciate the role of cloud computing in improving business processes and operations there is still a slow uptake of cloud computing services.

The objectives of this study are to add to the body of knowledge by:

- Investigating why organisations and SMEs in South Africa, a developing economy, lack in the adoption of cloud computing.
- Identifying and assessing the challenges that SMEs in South Africa encounter in relation to the use or need of ICT
- Proposing suitable cloud deployment and accessibility methods that may best fit the SME market, addressing their ICT needs.

Understanding the impact of technology and cloud computing to these SMEs, how cloud technology can assist these SMEs improve operations and delivery to stakeholders, is an important consideration of this study.

RELATED WORK

The South African SMEs

The importance of SMEs to economies is relevant to this study and Berry et al., (2002) outlines SMEs as an important sector of the South African economy. Abor and Quartey (2010) notes that SMEs in South Africa are estimated at 91% of the formal sector contributing between 52% and 57% of the country's Gross Domestic Product and provide 61% towards employment. Therefore, developing systems and innovations that boost SMEs efficiencies cannot be overemphasised (Ezer & Kofi, 2013).

Table 1 below gives a brief description of what SMEs are defined as in the South African economy.

Table 1: Definition of SMEs given in the National Small Act (Falkena et al., as cited in Abor & Quartey, 2010)

Enterprise Size	Number of Employees	Annual Turnover (ZAR)	Gross Assets, Excluding Fixed Property
Medium	Fewer than 100 to 200, depending on industry	Less than R4 million to R50 million, depending upon industry	Less than R2 million to R18 million, depending upon industry
Small	Fewer than 50	Less than R2 million to R25 depending upon industry	Less than R2 million to R4.5 million, depending upon industry
Very Small	Fewer than 10 to 20, depending on industry	Less than R200 000 to R500 000, depending on industry	Less than R150 000 to R500 000, depending on Industry
Micro	Fewer than 50	Less than R150 000	Less than R100 000

Gockel and Akoena notes that despite the role of SMEs in developing economies have in accelerating growth and job creation, SMEs face a number of issues that impact negatively in their ability to realise their full potential (as cited in Abor & Quartey 2010). Gockel & Akoena acknowledge that SMEs' development is hampered by factors such as lack of finance, managerial skills, equipment and technology, regulatory issues and access to international markets (as cited in Abor & Quartey, 2010).

This study looks at how SMEs and developing economies can leverage cloud computing to further their interests, whilst contributing positively to the growth of an economy as cloud computing can offer an excellent value proposition to SMEs for whom cash flow, physical ICT assets and human resources are at a premium (Hinde & Belle, 2012).

Madisha and Van Belle (2012) and Saedi and Iahad (2013) document that cloud computing is still in its infancy in the South African economy and the SME's are still to acquaint themselves with the subject of cloud. This research article aims to contribute towards maturing the cloud computing topic and conversation within the South Africa SME context and mature the literature on the subject.

Yeboah-Boateng and Essandoh (2014) and Schofield (2013) point to the lack of research around cloud computing in developing economies and SMEs. This paper aims to contribute to this lack of research.

The concept of cloud computing

Berisha-Namani (2009) acknowledges that modern businesses are not possible without the help of ICT. This is as ICT has matured to have a significant impact on operations of for any organisation including SMEs. Further Berisha-Namani (2009) outlines that ICT is essential to the growth and survival of economies in general.

SMEs will not normally have a large ICT department or budget needed to have access to sophisticated ICT infrastructure and support tools they need to do business. Cloud computing appears to be the solution to SME's ICT requirements (Neves, Marta, Maria, Correia and De, 2009).

Suciu G, Ochian, Suciu V and Cropotova (2014) notes that the sharing of resources and services and managing and assigning resources effectively makes cloud computing to provide SMEs with entirely new business capabilities.

The National Institute of Standards and Technology (NIST) defines cloud computing as a model of enabling ubiquitous, convenient, on-demand network access to shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service provider interaction.

From this definition, Echanism (2012) describes cloud computing as a consumption of hosted ICT infrastructure, software or platforms of services that are built in a secure, shared and multi-tenanted manner. These services allow for the ease of use and consumption of technology using cost effective models that allow smaller organisations to consume and benefit from robust services that meet business needs.

Cloud computing definitions centre around the ease of use, accessibility, cost-reduction, on-demand, self-service, broad network access, rapid elasticity and measured services (Mell & Grance, 2011). Wolcott et al., says that this is the best fit for developing economies and SME (in general) and organisations who find themselves in environment lacking needed infrastructure and resources to thrive (as cited in Madisha & Van Belle, 2012).

Trope (2014) sees cloud computing offering great potential to the future of computing as having an impact in the operations of all organisations. Cloud computing's recent emergence as a paradigm for economic development opens opportunities for African countries seeking to engage world markets despite lacking the traditional infrastructure to facilitate trade (Lavery, 2011).

Lavery (2011) states that with ICT for development being an area of interest, it is inevitable that the function of cloud computing would be applied towards development.

To support small and growing entrepreneurs, a cost effective start-up model is necessary and enabling that from an ICT perspective is a key point to the success of these small start-ups. Gockel and Akoena mentions how costs (capital, skills, etc.) of technology have been a consideration and a barrier in an entrepreneur or start-up organisations entering their chosen market in developing economies (as cited in Abor & Quartey 2010). This is further supported by Mohlameane and Ruxwana (2013). Roztocki and Weistroffer (2008) discusses how the shortage of capital makes it more difficult for businesses and how infrastructure problems make conducting business almost impossible. C. Kloch, E.B Petersen & O.B Madsen discuss the convenience of cloud computing makes technology simple, scalable and accessible (as cited in Ezer & Kofi, 2013).

SMEs and organisations in developing economies like Kenya and China have started looking at alternatives of how they can deploy, consume and attain the required level of ICT services that are fit for purposes, within their budgets and deliver to business objectives. Joel and Karunakaran (2015) observes that the emergence of cloud computing and its adoption can improve business performance whilst at the same time reducing the cost associated with technology, accelerating business operations. Saedi and lahad (2013) points out that though there is adoption of cloud computing in developing countries, it is in not at the rate that has been anticipated as organisations are still reluctant, due to security concerns and access, of cloud computing's offerings as well as the opportunity that it brings (Ghaffari, Delgosha and Abdolvand, 2014).

ICT has become more than just the name. It is now, or should now, be looked at as a business enabler. Why? Technology, in one way or another, now supports and assists organisation in achieving business strategy, vision and mission. Technology provides this support to organisations by reducing costs, introducing needed efficiencies enabling organisational agility in attaining business set goals.

The impact of ICT, more so cloud computing to SMEs, can be seen by how some businesses are started, with entrepreneurs starting these without the need for traditional building blocks like office space, own ICT systems, large personnel etc. ICT, especially cloud computing, has enabled SMEs and the developing economy avenues to operate and run without limitations from a capital expenditure (CAPEX) perspective.

From a cost and skills perspective, cloud computing can go a long way in remedying some of these issues due to location and nature of services as well as their availability.

Cloud computing background discussion

Cloud computing is known to have benefits that SMEs, especially those in developing economy who have limited financial and human resources to invest in ICT, can leverage in levelling the playing fields by spreading the economies of scale in respect to ICT platforms (Hinde & Belle, 2012).

Investments in ICT infrastructure is reduced for SMEs due to the limited financial capital that SMEs have at their disposal (Mujinga & Chipangura, 2011). Zissis explains the flexibility, elasticity, scalability of infrastructure, reliability, broad network access, on-demand service provisioning, economies of scale, cost effectiveness, and increased speed of time to market are some of the benefits of cloud computing (as cited in Akande et al., 2013). Stephenson et al., as cited in Hinde & Belle (2012) lists low start-up cost, low cost for sporadic use, ease of management, device and location independence as key benefits. Access to new technologies becomes easier and cheaper for SMEs which should be an attractive proposition to the SME market.

Cloud computing also has some issues that have been spoken about such as ethical, security, data lock-in, lack of standardization, customization, technology bottleneck, strategy issues etc. (Akande et al., 2013).

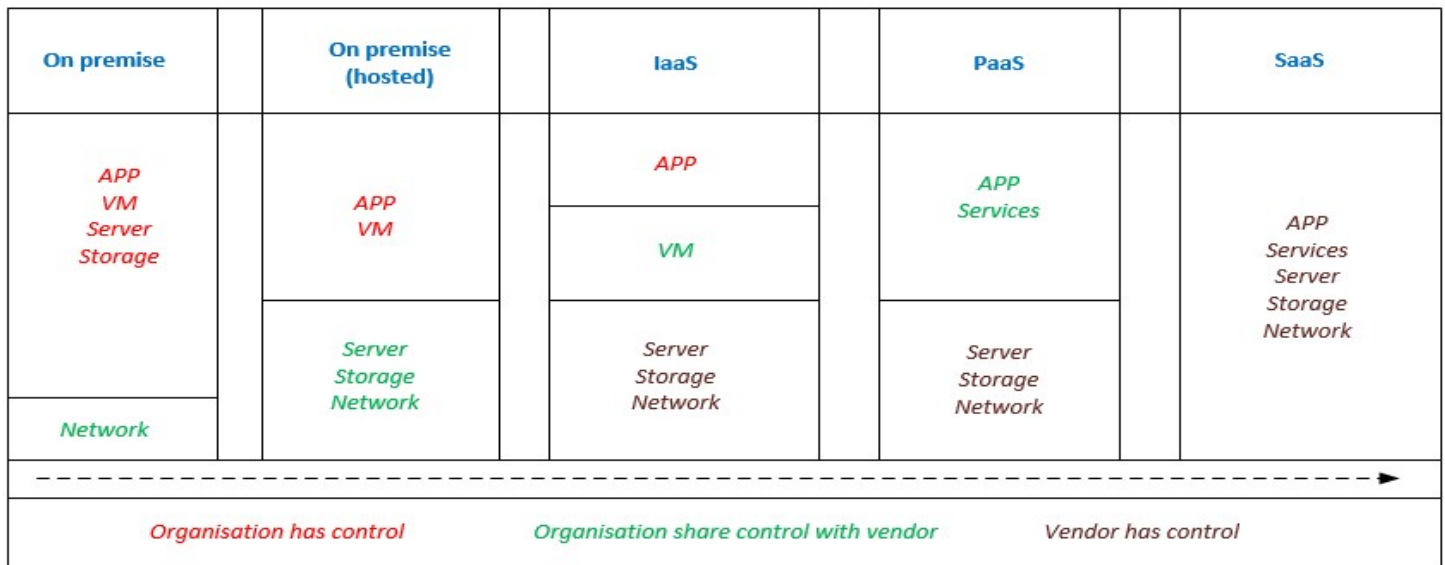
Concepts like cloud computing, amongst others, have reshaped ICT operations of organisations and allowed the organisations to inherit efficiencies, which may enable them to have a competitive advantage over their competitors. This study's endeavour is to deliberate on proper adoption of cloud computing and why South Africa's organisations and SMEs are not embracing what has the potential of transforming and uplifting their business to greater heights.

Cloud computing has enabled businesses of all sizes to accomplish business/information technology specific requirements that would have been unlikely with traditional deployments of information technology. Westphall et al. (2014) regard cloud computing as a tool that introduces efficiencies that businesses require to run effective and agile ICT solutions. This allows business to respond to the effects of the ever-changing external environment by being able to deploy services and solutions immediately, effectively as and when needed, running these services and solutions for the needed timeframe with associated costs (Trope, 2014).

ICT is regarded as a cost to businesses meaning that Chief Information Officers (CIOs) and ICT Managers' budgets are cut year on year with business expecting more and more services from their ICT departments. CIOs are being required to look at alternatives around how they can effectively use the limited budget resources they have whilst delivering more and more services to business. A need to move from a CAPEX spend model to operating expenditure (OPEX) becomes critical and cloud computing is the solution to this from a technology core perspective.

Figure 1 below demonstrates the flavours of cloud computing and its deployment patterns. These flavours are shown in detailed below.

Figure 1: Cloud computing governance structure of IT organisations (Mather et al., as cited Mujinga & Chipangura, 2011)



On premise – this is the deployment and ownership of all enabling components that make up the organisations ICT services. This include the application (APP), server, virtual machine (VM) and storage of the solution.

This deployment method is not advisable to SMEs as it is CAPEX based in terms of building the DC and purchasing of server, software and licensing of the total environment.

On premise (hosted) – this is with more service provider involvement as the customer now starts to rent, on a pay as you use model, the server and storage layers of deployment.

This deployment model has fixed-term contracts which could be high and long for an SME as this kit is built and managed in house by the SP, dedicated to the customer in a form of a private cloud. A private cloud is where resource and services are owned by the renting organisation utilised and managed in a cloud fashion (Géczy, Izumi, & Hasida, 2012).

Infrastructure as a Service (IaaS) – True cloud computing starts to be realised at this layer as the customer now owns only the application layer of the deployment meaning more and more of an OPEX spend to ICT services, realising more cost savings. Licensing of application remain the organisations responsibility.

IaaS services are rental in nature consumed on a usage based payment model. SMEs start enjoying cloud services with all characteristics mentioned earlier with IaaS service deployment.

Platform as a Service (PaaS) – Dedicated and service provider managed application and ICT infrastructure for the organisation with the consumption of the application without the need to worry about all enabling layers of deployment. Systems like hosted Customer Relations Management (CRM), Human Resources (HR) and Finance packages are examples of solutions under PaaS.

Software as a Service (SaaS) – Total control of all services lie with the services provider meaning the organisation only interact with the software package alone hence the ease of adoption of this technology as outlined by (Madisha & Van Belle, 2012).

SaaS is potentially the easiest and foremost user solution in the cloud stack (Ezer & Kofi, 2013).

Infrastructure as a Service (IaaS) – This is a service whereby components such as servers, storage and network infrastructure are delivered through the internet to the users or organisations without the need to buy the infrastructure allowing the provisioning of resources on demand (Adam, 2014). These services are located in a central place (data centre), accessible on demand (Echanism, 2012).

Software as a Service (SaaS) – is an application distribution model in which applications are hosted by service provider and made available to customer over the internet or network (Mujinga & Chipangura, 2011). Géczy, Izumi, & Hasida (2012) makes mention of the efficiencies of deploying SaaS as compared to deploying it in house in that in-house deployments may be underutilised and may prove to be costly for organisations. Benefits of SaaS are associated with centralised management and maintenance of the software (Géczy et al., 2012).

Platform as a Service (PaaS) – talks to a managed cloud solution from networking, infrastructure, software and platforms with the customer consuming the service without their interaction to all underlying and enabling services.

PaaS is the provisioning of a development environment that resides on top of the IaaS stack (Mujinga & Chipangura, 2011). PaaS is an environment upon which applications and services can be deployed (Chang, Walters, & Wills, 2013). This environment is meant for application development and the running of these applications over the internet with users and organisations being billed accordingly (Mohlameane & Ruxwana, 2013).

SAP HANA and Hosted ERP platforms are examples of PaaS. The costs associated with PaaS might not suit SMEs and organisations operating under immense financial pressure with the need to cut costs. Other cloud offerings that include IaaS might be an alternative given some level of skill within the organisation.

Given the above, it is of interest to this research to study the combination, if any, of the other cloud pillars and how, if they lack, they can improve business services.

Cloud computing adoption

Kshetri (2011) notes the infancy stages of cloud computing in developing economies like South Africa. There is however great potential for its adoption by these developing economies (Kacharava, 2015).

Table 2 below outlines the limited applications of cloud computing in South Africa.

Table 2: Cloud computing application areas in developing countries (Kshetri as cited in Trope, 2014)

Country	e-Education	e-Health	e-Commerce / e-Business / Supply Chain	e-Governance	e-Environment	Telecommuting
China	X	X	X		X	
East Africa	X					
India	X	X				
Korea			X			
Qatar	X					
South Africa			X			X
Turkey						
Vietnam	X			X		
West Africa					X	

Cloud computing awareness and its potential benefits are a key resolution that needs to be taken into account as to assist fast track development in these economies (Mohlameane & Ruxwana, 2013). Mohlameane and Ruxwana (2013) continue to outline that service providers of cloud computing can play an important role towards increasing knowledge of cloud by providing proof of concepts for SMEs as well as cloud computing roadshows and presentations to SMEs. SMEs have a role to play, as well, in educating themselves on the cloud topic through learning from other organisations and economies who have adopted cloud through their experiences, benefits and challenges post cloud adoption (Mohlameane & Ruxwana, 2013).

Ezer and Kofi (2013) conclude their research with that an increase in awareness of cloud computing amongst SMEs serves as a perfect recipe for increased adoption. Studying further this topic of awareness is a key consideration to this article.

Moving from traditional ICT to cloud computing

Change in management philosophy has a great impact on how organisations deploy, use and interact with ICT (Echanism, 2012). Echanism (2012)'s change in management philosophy talks to the change towards being biased on premise deployments and how organisations need to outsource non-organisational core competencies to SPs.

Pan and Jang look at the positive relationship between top management support and the adoption of innovation (as cited in Chemjor 2017). Daylami et al. argues management that support and mentality towards change has an impact on technology innovation (as cited in Chemjor, 2017). Management support, firm size and technical readiness are key in adopting cloud services within an organisation (Abdollahzadehgan, Gohary, Razak, Hussin, & Amini, 2013).

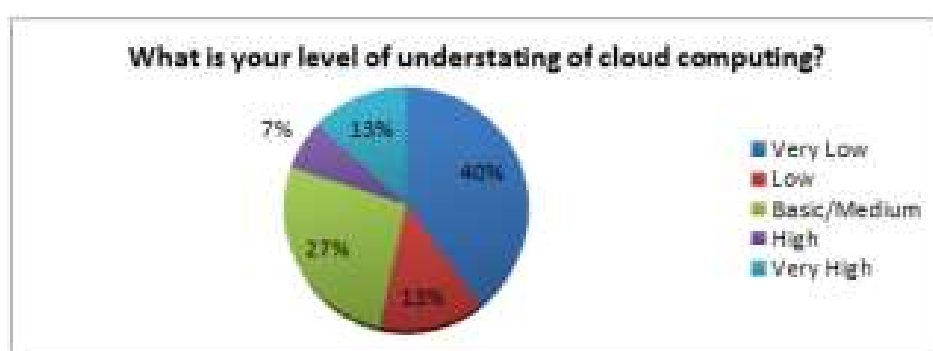
Top management support is important as it ensures sufficient and needed resources are allocated for the adoption of the new technology and top management support drives other members of the organisation easing the adoption process.

Cloud service providers cloud campaigns

To assist educate potential customers in the developing world, cloud service providers (CSPs) have made inroads in deploying cloud solutions in countries like China, India, Brazil, South Africa and Vietnam (Adam, 2014). This stands true for South African organisations and SMEs. Knowledge of the impact of cloud computing is important in making strategic future ITC decisions. Madisha and Van Belle (2012) supports this topic in that vendors should increase their efforts in promoting and educating SMEs about cloud solutions such as Software as a Service.

Mohlameane and Ruxwana (2013) rates the knowledge of cloud computing in South Africa, specifically, as low with 40% of their respondents having shown this. Figure 2 below outlines these finding.

Figure 2: Knowledge of cloud computing (Mohlameane & Ruxwana, 2013)



Security and trust of cloud services is impacted by the lack of awareness of cloud computing (Yeboah-Boateng & Essandoh, 2014). With services hosted by a service provider elsewhere, customers who lack knowledge around cloud see this as a vulnerability and security breach. Westphall et al., (2014) states that cloud computing transfers the responsibility of information security management from the customer to the cloud service provider. Cloud service providers need to, from an awareness perspective, educate and outline their responsibility as to create awareness around the safety of hosted customer information. This security factor has prevented migration to cloud computing by many businesses (Westphall et al., 2014).

In the developing world, cloud computing is receiving attention in terms of cloud computing awareness in these markets. An example is IBM's establishment on cloud centres in countries like South Africa, China, India, Vietnam, Brazil and South Korea (Adam, 2014). Adam (2014) continues to point out that other cloud players like VMware, Salesforce, Microsoft, Parallels and Dell are in active search of opportunities within the developing world.

Given that cloud SPs are doing all they can to create awareness of their services, the adoption is still rather low in developing economies such as South Africa (Makena, 2013). This makes a difficult task ahead for cloud SPs as this awareness created needs to be such that it creates an environment for organisations to critically assess their internal structures and review them in adopting new technology (Makena, 2013).

Awareness of cloud computing

Organisations still believe in the traditional way deploying and consuming ICT services which has proved to require substantial capital and other needed supporting investments. It is important for decision makers to understand the benefits of innovation and how it creates competitiveness for their businesses (Alshamaila, Papagiannidis, & Li, 2013).

Grandon and Pearson (2004) outline the importance of all stakeholder, especially, management, in the support of change. Management in these economies should champion the change required to support their business survival. Supporting this, Yigitbasioglu (2015) found top management as the most important factor in influencing cloud computing adoption.

As much as there is research around the lack of adoption of cloud computing in developing economies, Sahandi et al., found that executives and people of influence have a part to play in ensuring sustainability of their organisations and adoption of new technologies (as cited in Yeboah-Boateng & Essandoh 2014).

The journey to the cloud

The journey to the cloud is influenced by three (3) important drivers (Harms & Yamartino, 2010):

- Large data centres that can deploy computational resources at significantly lower cost than smaller ones
- Resource pooling of computer resources which deliver the cost effectiveness of cloud solutions
- Multi-tenancy of applications and offerings ensuring low labour costs for large public clouds.

Journey to the cloud reflects on the steps that are needed to move from current deployments to new cloud solutions taking into consideration all possible obstacles that may be encountered and how these will be overcome in realising the end state of customer deployment in a cloud state.

For customers who have identified the need to transition to a cloud environment, issues arise around the how of the transitioning process. This is as customers fear the risk and impact to business operations which could have consequences.

Once organisations have noted the benefits of cloud computing, the transition process and the journey thereof becomes the most important.

Organisations that are conceived/born in the cloud organisation are those whom from inception have all their ICT systems deployed in the cloud with no legacy ICT services deployments. Unless an organisation was “born in the cloud”, the cloud journey for established organisations with existing ICT systems is not easy.

Connectivity to the cloud

With cloud, as all solutions are hosted in CSP data centres, there is reliance on internet connectivity to consume services (Mujinga & Chipangura, 2011). Cloud computing's lifeline is connectivity Goundar (2010), as with limited connectivity, the cloud conversation fails to exist. Reliable and affordable connectivity is critical for cloud adoption by SMEs.

Developing economies are known for challenges around connectivity and high costs of bandwidth, which adds to the slow uptake of cloud services. South Africa is an example of this (Ismail et al., 2011). This is holding potential cloud customers from migrating to cloud services as some data may reside outside the organisations firewalls and may also be outside the boundaries of the country with potential of higher costs requiring reliable connectivity (Azeemi, Lewis, & Tryfonas, 2013).

Chetty, Sundaresan, Muckaden, Feamster, & Calandro (2013) outline that unlike more developed countries, broadband access in South Africa is more costly.

Journey to the cloud and associated costs

Cost savings is in its true sense a major consideration for organisations in developing economies and for SMEs. The promise of cloud computing is that cost savings is a reality when cloud is adopted. Cost savings is one of the draw cards in the adoption of cloud technology.

The truth to this lies in how cloud will be deployed and what stage of existence the said organisation is in. Is the organisation adopting cloud services from initiation of its operations is the expectation to move existing services and infrastructure to the cloud. All these are considerations in adopting cloud hence the Journey to the cloud conversation.

Issues of cloud computing

There are considerations that SMEs need to take as to make a knowledgeable decision around cloud computing adoption. Kourik (2014) points to potential drawbacks to cloud computing being around technical and legal.

- Technical risks include multi-tenant cloud environment, internet connectivity, systems complexity and loss of control.
- Legal risks include governance, compliance, data sovereignty

Heales, Green, and Finau (2014) considers contractual 'lock-in' and interoperability as an issue to take into account as moving data across cloud providers may be an issue due to contracts with current incumbent.

Ghaffari et al., (2014)'s inhibitors to cloud computing are:

- Reliability of services as enterprise applications are now hosted. Costs may be pertaining to levels of reliability.
- Connectivity and open access as services are now dependant on high-speed, reliable connectivity.
- Security and privacy as there is a need to for cloud service provider to the integrity of data
- Interoperability with other platforms and systems becomes a consideration as it vital for SMEs to coexist with other players in their market

Assante et al., (2016) lists a number of issues with cloud computing with the main one being reliability and security of data and data accessibility. Lack of control over ICT environment is amongst these issues as ICT systems now reside away from organisation's premises and, in some cases, may be located in locations unknown to the organisation. Assante, et al., (2016) recognises that some of these issues can be overcome by educating the SME market on the concept of cloud computing and by developing business-based ICT skills in SMEs.

Digitisation

Of additional interest to this study is that cloud computing is but part of the digitalisation journey of organisations. Digitalisation as described by Parviainen et al., (2017) is the action or process of digitizing; the conversion of analogue data into digital form. It is also the ability to turn existing products and services into a digital variants thus offering advances products (Parviainen et al., 2017). Digitalisation is already impacting businesses and how they related with their internal and external environments. Neglecting digitalisation could create risk of losing in a highly competitive market (local and global) (Parviainen et al., 2017).

Figure 3: Model for tracking digital transformation (Parviainen et al., 2017)

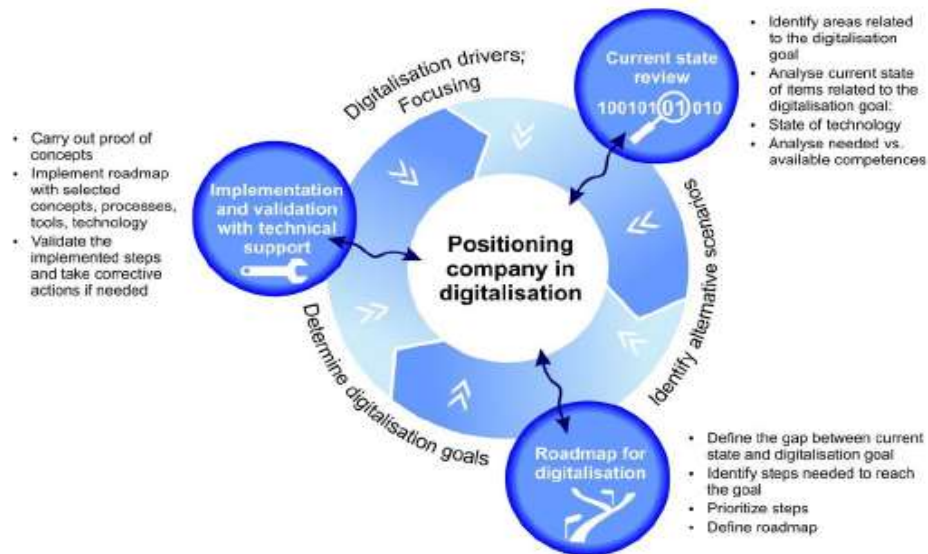


Figure 3 focuses on the journey that an organisation would need to embark on as to embrace digitalisation commencing with analysing the potential impact of digitalisation and the position and direction the organisation would need to take in order to modernise business and business processes.

Digitisation is about being efficient, agile and performing business operations in a manner that enhances business output whilst allowing centralisation of business processes and management. This journey, as outlined in figure 1, commences by the organisation identifying their current state and how business is managed, analysing business transformation goals towards digitalisation. This step includes the review of current technologies and those that will lead to success, including cloud services.

The roadmap to digitalisation outlines the gap between current and future, digitalisation, goals and the journey thereof, the transformation journey to the cloud. This transformation journey to a digitised environment is one of the key considerations of this study. Once the transition to a digitised environment has been attained, the implementation, support, maintenance and optimisation of the environment comes into play.

Conclusion of related work

From the literature review, there are still some gaps such as the availability of cloud services and service accessibility from a cost perspective need to be considered for the ease of adoption of cloud computing in the South Africa context taking the infancy of the concept to its organisations but most importantly its SMEs.

In any business, management that is forward thinking and that embraces change is important to the transformation of the organisation as well as driving an important strategic objective to those who follow. It will be of interest to learn from this research around how management of organisation embrace change in general but more so, change to cloud computing and if value is understood that cloud services can bring.

Further to this, cloud costs savings will be an interesting take away from this exercise. It will be important to note what savings, if any, those who have embraced cloud have realised and if cloud computing really affords the said benefits that it brings.

Marston, Li, Bandyopadhyay, Zhang, and Ghalsasi (2011) talk of efficiency and agility of cloud services and that of the organisation once cloud computing has been embraced. With this article and using the research methodology, interest will be on noting how SMEs who have adopted cloud service have experienced the agility and efficiencies that cloud computing is said to bring and how this experience can be communicated to other SMEs who have not adopted cloud services.

METHODOLOGY

McQueen (2002) notes that interpretivist researchers are those that seek methods to enable them to understand in depth the relationship of human beings

to their environment. Thanh, Thi, & Thanh (2015) mentions that it is theoretically understood that interpretive paradigm allows researchers to view the world through the perceptions and experiences of the participants. Thanh et al. (2015) continues to outline that in seeking answers the researcher, using interpretivism, uses these experiences to construct and interpret his/her understanding from the gathered data. Willis, (2007) explains that the qualitative approach gives rich reports that are necessary for interprevists to fully understand the context. A qualitative approach, using interpretivism, is used in this study.

The research instrument

This research was conducted using a qualitative, semi-structured questionnaire and selected interviews to gather the required data.

The advantage of the structured section was the clear indication of how respondents relate to the matters placed before them and the resulting conclusion thereof. The disadvantage on this questioning was the limitation in thought around other matters that may pertain to cloud services that may not come up. The closed nature of the questions and answers may discourage an explanation that the respondent may need to present.

An advantage of the unstructured questioning approach was that it gives more information and experience than the structure section, allowing respondents to voice their opinions. A disadvantage of this approach may be the unnecessary and unrelated information being shared that clutters the research and may create leads that are not relevant to the context of the research.

Procedure for data collection

The questionnaire was delivered, via email, to targeted and other respondents. As part of the respondents, six ICT SMEs were targeted to respond to the interviews. Friends, family and work colleagues were requested to respond, where necessary or forward to those who were interested and affected.

Data analysis and interpretation

Descriptive analysis using Statistical Package for Social Sciences (SPSS) and a Cronbach alpha test was used to interpret data. Descriptive statistics were used as to means, standard deviations and frequencies of the collected data.

An important consideration in data analysis is uncovering common themes in the respondent's responses. Thematic analysis is used in identifying these themes. Aronson, (1995) identifies thematic analysis and a tools that focuses on identifiable themes and patterns of living and/or behaviour, breaking this analysis into steps of (1) collecting data, (2) identifying all data that relate to classified patterns and (3) combining related patterns into sub-themes. Thematic analysis is considered the most appropriate for any study that seeks to discover using interpretations (Alhojailan & Ibrahim, 2012).

Research design

Research and data collection was conducted using two distinct methods, namely interviews and a survey. Interviews and a survey were used as to get an unbiased view from all participants that are affected by cloud computing. This research follows a triangulated approach. Sharif & Armitage note that the triangulation approach is where a researcher uses two research methods to decrease the weaknesses of an individual method as to strengthen the outcomes of this study (as cited by Bekhet & Zauszniewski, 2012). The two methods are interviews and an electronic survey.

Interviews

The interviews were designed to target ICT SMEs whose core business is to render ICT services to customers. This was to have an understanding of how they approach cloud services, the conversations they are having with their customers and how they provide cloud services to their customer base. These interviews had pre-planned questions but were open-ended as to allow these SMEs to unpack as much as they can in maturing this study.

Table 3 below outlines the breakdown of the population and to greater degree, the sample audience. The six identified ICT SMEs are shown:

Table 3: Profile of ICT SME company respondents

1) IT Director and IT Operations Manager	2
2) Co-owner and Commercial Manager	1
3) Business Unit Head – SA	1
4) Portfolio Manager – Cloud Services	1
5) Financial and ICT Manager	1
6) ICT Infrastructure Director	1

Verbal consent was given by all interviewees not to share their information as part of the research process.

Survey

This research further uses an online survey to reach the bulk of the SME respondents. The respondents were allowed to forward the survey link to others that they deemed relevant. It is important to note that the survey may have reached ICT and non-ICT SMEs.

Population and sample

Population

SMEs are the target population for this research particularly those who consider ICT as an important function of their business. The population that was reached was predominantly in Gauteng but there was a sizeable response from KwaZulu-Natal, Limpopo as well as the Western Cape.

Sample and sampling method

Choosing a study sample is an important step in any research project as it is rarely practical to, efficient or ethical to study the whole populations (Marshall, 1996). The aim was to draw a representative sample from the population as to generalize back to the population.

As ICT services, to some degree, impact all industries and are important for business operations, the sample will be drawn from all respondents SMEs that are affected by ICT and are looking at better and cost-effective ways of implementing and adopting ICT services. These SMEs will be chosen based on the purposive sampling method.

Purposive sampling is used as a sampling tool for this research. Purposive sampling, also called judgement sampling as noted by Etikan, (2016), is the deliberate choice of a participant due to the qualities that the participant possesses. This research needed to be specific and selective in its approach to the sampling audience as to derive responses that add to this body of knowledge.

The sample size is broken down as below:

- 6 ICT SMEs, whose core business is to provide ICT service, were interviewed for the purposes of this study. These are SMEs that provide ICT services including cloud computing to their customers. From these SMEs, seven respondents took part
- 41, “general”/non-ICT, SMEs responded to the survey. These are SMEs who consider ICT services important to the operations of their businesses. As the survey was distributed to known owners of SMEs and employees of known SME and a subsequent request was made to share the survey, 41 unique respondents were noted who represent owners of SME organisations and employees of SMEs

Reason for this is to establish how SMEs whose core business is to deliver ICT services leverage cloud computing in delivering their services as compared to those whose core business is not ICT. This will give an interesting picture of how ICT knowledge and background impacts cloud adoption.

Thomson’s sample review identifies that theoretical saturation generally occurs between 10 to 30 interviews; and once the researcher believes saturation has occurred, he/she should conduct additional interviews to test whether existing themes and categories are sufficient (as cited Marshall, Bryan; Cardon, Peter; Poddar, Amit; Fontenot, 2013). The sample of this study fits this sampling requirement.

To note, as part of the distribution of the survey, an electronic note was made that no information about the respondents, if any, was to be shared as part of the research findings.

FINDINGS

Data Analysis: Survey

This section reports on the results of the survey and interviews done. This section presents the primary data, collected by the researcher, for the purposes of clarified the cloud adoption topic. Descriptive statistical analysis, for the survey questionnaire, was used to represent the primary data in graphical format, with relevant detail, for each question.

From the descriptive statistical analysis, a Cronbach alpha test was conducted to ensure the reliability of the survey study.

The presentation of these results helped depict the respondent's perception and understanding of the different aspects of cloud computing from different industries within the SME market. Results of this are shown in later sections of this report.

High-level explanation of these sections is outline in Research design, survey section of this document.

Electronic Survey

The objective of this study was to understand the reasons that influence the lack of adoption of Cloud Computing in developing economies with specific focus on SMEs in South Africa. The primary data collection was based on an online survey that serves to collect this data.

The survey was intended for prospective SMEs, and or their employees, who have knowledge of their organisation's ICT needs and organisation's prospect of and perhaps need for cloud computing. There was a total of 41 individual

respondents who took part on this survey. All respondents used the Qualtrics as an interface tool to the survey and the data analysed below was drawn from this central tool. There were questions that some respondents did not answer fully, with 90% of these respondents responding to all questions.

The survey data was exported from Qualtrics into Microsoft Excel then into Statistical Package for Social Sciences (SPSS) version 23 for further analysis.

Further to the descriptive statistics, a cronbach's alpha test was conducted for data analysis. Both the descriptive statistics and Cronbach alpha test are presented as findings to this study.

As to ensure the reliability of this survey, a Cronbach alpha test was conducted on the surveyed results with the following results. The results show a Cronbach alpha values of 0.845 and 0.886 respectively which are acceptable as reliability measures as they are above 0.5.

The following sections, [Respondent's demographics](#), [SME / Organisational demographics and understanding](#) and [SME / Organisational and respondent knowledge of Cloud Computing](#) outline the descriptive analysis for each questions of the survey in the form of percentages, cumulative statistics, mean, mode, medians, standard deviation, variance and kurtosis.

Demographic profile of respondents

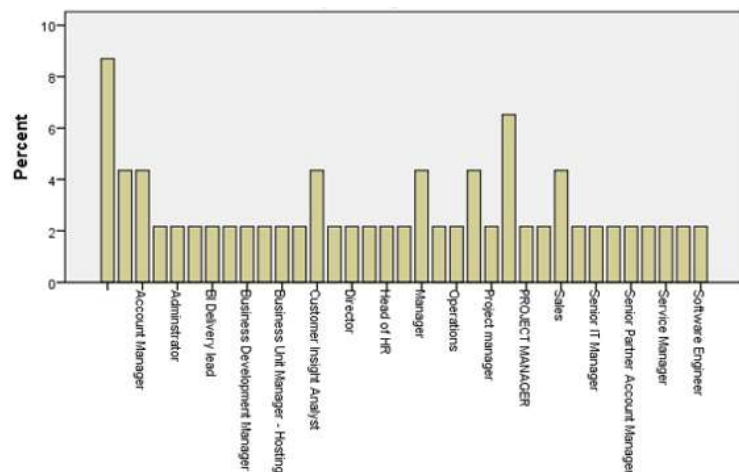
The survey commenced by trying to understand the profile of the respondent, which included the role they hold with their organisations and their level of education. The Statistical Package for Social Sciences output for each of these characteristics is as shown below.

Role in organisation: Role in organisation is important as to understand the level of influence that each of the respondents have within their organisation, the SME.

The researcher needed to know if these respondents have the authority to influence any future decision around cloud computing within their organisations.

The inputs for this section were strings and not numeric variables hence no predictive statistics could be generated but only a frequency table. Figure 4 shows the role of respondents in their organisations.

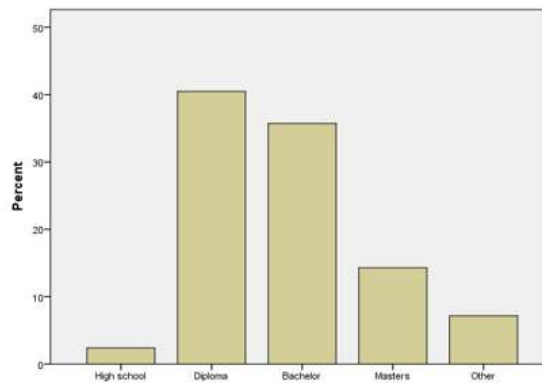
Figure 4: Role of respondents within their organisation



Level of Education: Education levels give insight into the type of SME who responded to the survey in terms of their mind set and possible career decision they might make for their business. Level of education were grouped into high school, diploma, Bachelors, Masters and other.

Figure 5 shows that respondents with a diploma had the highest frequency (mode) whereas the median of the data are respondents with a Bachelor's degree.

Figure 5: Level of education of respondents



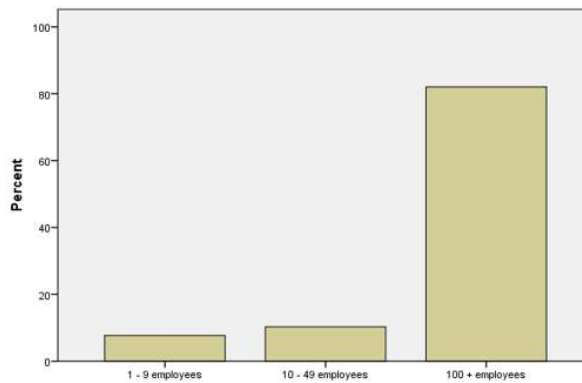
Demographic profile of the SME / Organisation represented

The survey continued to understand the organisations that the respondents represented, the organisation's access to financial resources to acquire needed ICT services, how the organisation currently consumed needed ICT services, the importance of ICT services, the organisation's reliance on ICT services and the decision makers within the organisation who influence ICT strategy. The SPSS output for each of these characteristics is as shown below:

Size of the organisation: The survey needed to outline the size of the organisation represented in the study. Size was categorised as 1 – 9, 10 – 49 and 100 +.

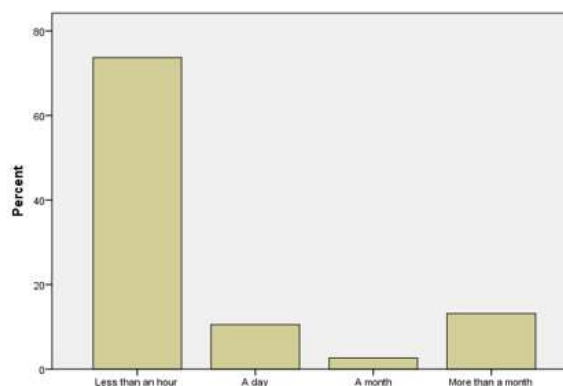
The survey findings in figure 6 show the organisation size allocations for the respondents.

Figure 6: Organisation size



Operational impact of failure of ICT services: As ICT service forms an important part of organisation functionality, understand the impact of failure of ICT services is valuable to this study. This section explores how long the respondent's organisation would function in the case of a failure in ICT services. Figure 7 presents the allocation for this survey.

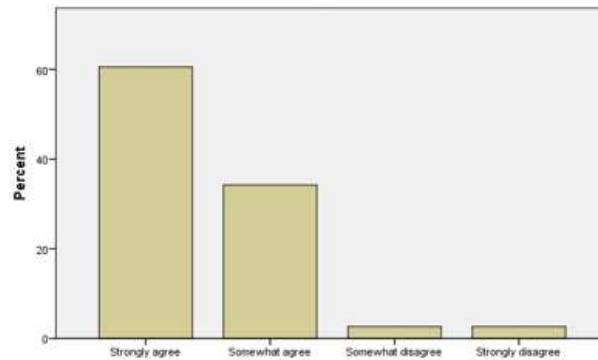
Figure 7: Operational impact of failure of ICT services



The majority of respondents, at 60.9%, show great reliance for ICT server availability and functionality for their organisational operations. The important to keep ICT system is important for the majority who took the survey.

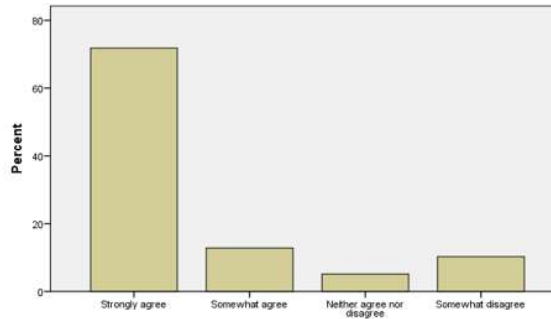
Organisational access ICT services: Access to ICT services relates to ICT services availability when required as well as their affordability to the SME. Looking at the respondents, on figure 8, there is a split in the number of those who agree and those who somewhat agree to strongly disagree at around 40% each. There is a case to be made for the 40% who feel they are not accommodated either partially or completely.

Figure 8: Organisational access to ICT services



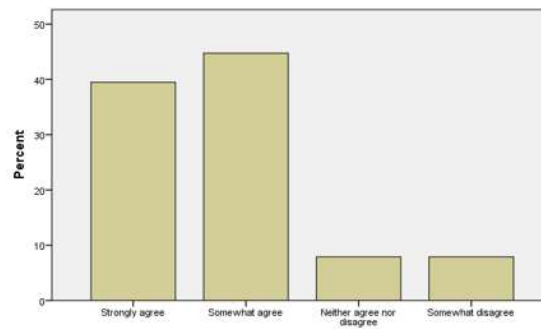
Organisational access to capital expenditure for ICT services: This question served to understand a) if SME regards ICT services as expensive and b) if the SME strategically budgets for ICT service expenditure as part of the SME's strategy. Respondents' choice and selection numbers are revealed in figure 9. A great number of respondents showed the readiness, ability and willingness of the SME in spending around ICT capabilities.

Figure 9: Organisational access to capital expenditure for ICT services



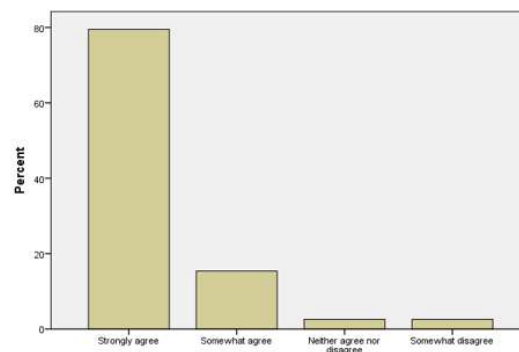
Affordability of connectivity costs (internet, broadband etc.): As cloud services are consumed, predominantly, via the internet, it was important to understand if connectivity may be the cause of the lack of adoption. The results to this question are outlined in figure 10.

Figure 10: Affordability of connectivity costs (internet, broadband etc.)



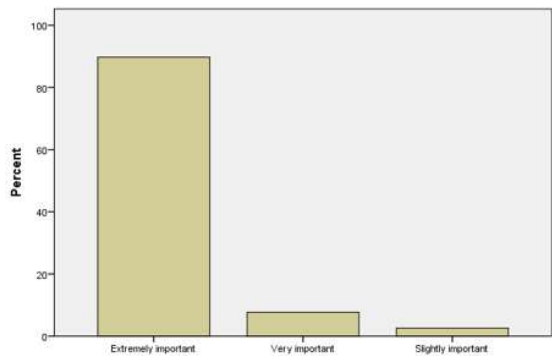
Importance of ICT service reliability, access and uptime: As for business' to strive, the availability and uptime of ICT services is an important consideration. Understanding if the SME regards availability and uptime the same, is an importance note to this study. Figure 11 illustrates the respondent's views on the reliability, access and uptime topic.

Figure 11: Importance of ICT service reliability, access and uptime



Importance of data integrity (accuracy and consistency) to organisation: When looking at how highly-priced data and information is and access to it thereof, it is important that the organisation's ICT system preserve this data/information at rest and in transit. This question aimed to understand how much the SME values the same. The survey responses are presented in figure 12.

Figure 12: Importance of data integrity (accuracy and consistency) to organisation

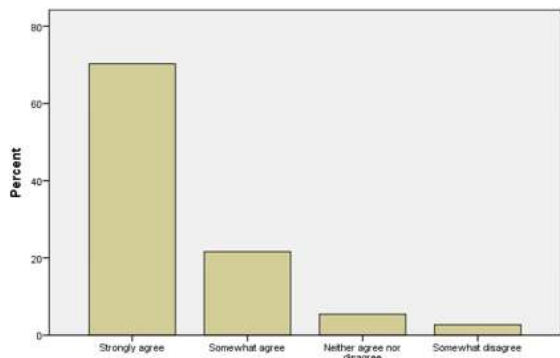


SME / Organisational and respondent knowledge of Cloud Computing

This last section of the survey looks at the SME organisations knowledge of cloud computing, if the SME has employed any level of cloud into their ICT operations or if the SME is looking at cloud computing as a long-term strategy. Within the section, potential hindrances to cloud computing that the SME organisation may experience are explored to try to answer the lack of adoption of cloud computing question that this research aims to understand.

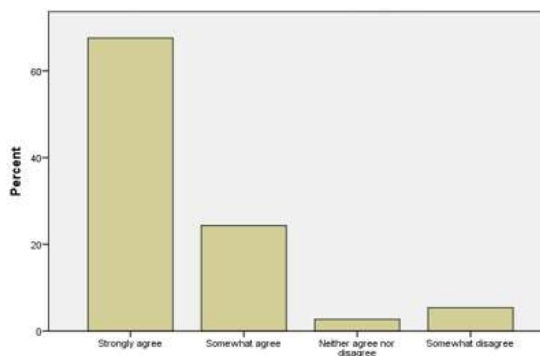
Awareness of cloud computing services by SME organisations: This section explores if the respondents and their SMEs are aware of what cloud computing is. Figure 13 depicts how the respondents think of their organisations awareness of cloud computing.

Figure 13: Awareness of cloud computing services by SME organisations



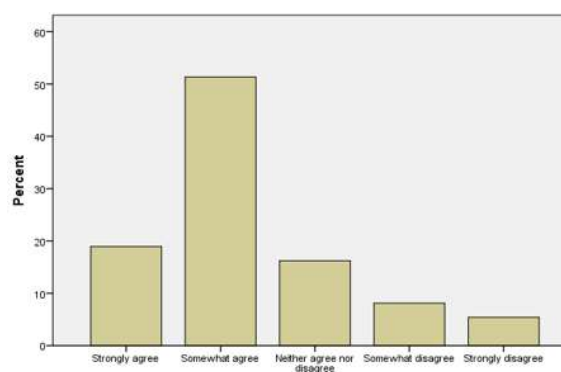
SME awareness of the potential benefits of cloud computing: Having looked at the current deployment method, awareness etc. of cloud computing, insight into the knowledge of the potential benefits of cloud computing, by the SME, is important. Benefits are key in the adoption process and if SMEs note them, as shown in figure 14, it becomes easier to move to the question of why SMEs lack in the adoption of cloud services.

Figure 14: SME awareness of the potential benefits of cloud computing



Cost of cloud computing services: With SME awareness of cloud computing as well as knowledge of benefits, getting a feel of what SMEs think of the pricing of cloud services adds to the conversation. Figure 15 shows that 65.2% of respondents are in agreement that cloud services are correctly priced.

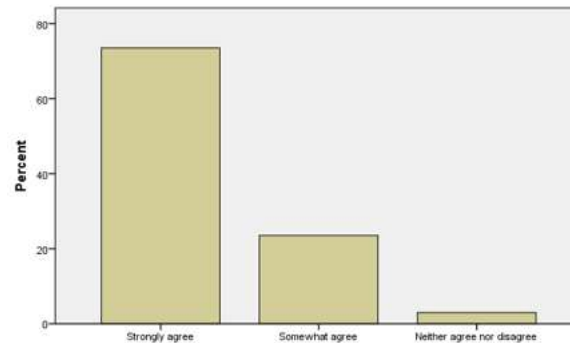
Figure 15: Cost of cloud computing services



SME thoughts on them adopting of cloud technology: This section gives the researcher insight into the appetite that SME have in adopting cloud services. This section also aims to understand if SMEs believe it is a wise idea for them to adoption such services. Figure 16 displays that none totally disagreed with the

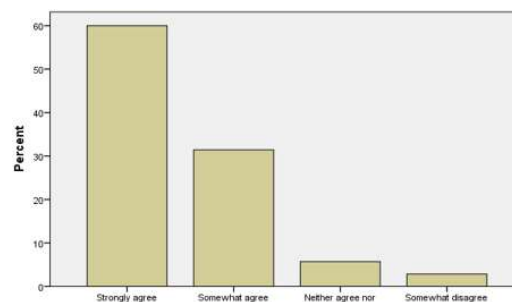
adoption whilst other were sceptical of whether they think cloud services are a good idea or not.

Figure 16: SME thoughts on them adopting of cloud technology



Cloud computing and competitive advantage in SMEs: Adopting any technology, for business, was done so as to introduce efficiencies, maintain or introduce some competitive advantage over competitors. It is key to understand if the SME note any of these benefits should they introduce cloud-computing services. Figure 17 depicts the SMEs views on the potential competitive advantage that cloud computing may bring to business operations.

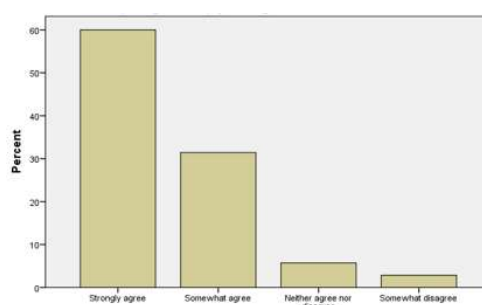
Figure 17: Cloud computing and competitive advantage in SMEs



Reduction of ICT costs through implementation of cloud computing:

Cloud's main selling point is that it reduces the total cost of ownership of ICT services. The researcher needed to test this theory and gauge if it may be a selling point to drive up adoption. Figure 18 shows 45.7% of respondents agreed that they believe cloud computing may help reduce ICT operational costs.

Figure 18: Reduction of ICT costs through implementation of cloud computing



SME concerns around cloud computing: Concerns on why cloud computing is lacking are the integral part of this research. As part of this, this final question looked at the primary concerns SME have in adopting cloud services and what may be a hindrance and contributes to the lack of adoption of cloud computing services. In this section, respondents were allowed to select multiple options as shown in table 4.

Table 4: SME concerns around cloud computing

		Frequency	Percent	Cumulative Percent
Valid	Outsourcing of non-core competencies	9	19.6	100.00
	Privacy	21	23.9	100.00
	Availability of services and/or data and information	9	19.6	100.00
	Integrity of services, data and information	8	17.4	100.00
	Confidentiality of corporate data and information	17	37	100.00
	Trans-national laws and regulations	1	19.6	100.00
	Uncontrollable variable costs	9	19.6	100.00
	Difficulty of migration to cloud	12	26.1	100.00
	Ability to launch new services	3	6.5	100.00
	Other	3	6.5	100.00
Total		92		
Missing	System	11	23.9	
Total		46	100.0	

Data Analysis: Interviews

Interviews

The purpose of conducting interviews was to understand the challenges that SMEs, whose core business is to provide ICT services, face and the conversations that these ICT SMEs have with their customers around cloud

computing. This was as to ensure that the results from the survey of “general” SMEs correlate with what their ICT service providers of cloud services, the ICT SMEs, see as possible issues in the adoption of cloud services.

Six (6) interviews were conducted with different ICT SME players who provide ICT services that include cloud computing. The interviews were structured such that there are similar questions that the interviewer asked as well as the interviewer allowed the interview discussion to flow to an unstructured discussion, allowing for a mature understanding of potential issues that these ICT SMEs face when conversing with their customers, the SME, around Cloud adoption.

Respondent's demographics

All the interviews were conducted with seasoned ICT SMEs who have provided ICT services, including cloud computing, to the South African market for a number of years. These are players who strong relationship with ICT players like Microsoft, VMware, NetIQ and prominent South Africa cloud service providers.

The interviews were held with senior personnel within these ICT SMEs as outlined in section Research design, Interviews section.

Interview Structured Questions

Each of the below sections contain sub-sections. Here, the high-level discussion of each question was discussed.

Cloud computing awareness: The questions in this section aimed to:

- 1) Gain an understanding of what the ICT SME understand of their market's knowledge of what cloud computing is and if the ICT SME finds themselves educating further, the “general” SME, around the concept of cloud,
- 2) Find out the ease and the types of conversations that the ICT SME is having with its SME customers in relation to cloud computing and its services.

Cloud computing adoption by SME: This section focused on the reasons why the ICT SME believes there is lack of adoption of cloud services, by the “general”

SME, in South Africa. Further, questions focused on the cloud service providers themselves and the role they need/are playing in driving awareness of cloud services to the SME community with emphasis on the benefits that cloud services introduce to the operations of the SME.

Costs associated with cloud computing: Costs associated with cloud computing were explored on this section and the sensitivities that SMEs have where costs are concerned. Connectivity, cloud infrastructure, security costs etc. were explored as to find which of these was of concern the most to the SME.

Cloud computing security: Regulations such as Protection of Private Information (POPI) force certain security standards upon organisation such as local residence of data. With other security issues such as cyber-security threats coupled with acts such as POPI, security breaches and data compromises have become a topic that all organisation have taken note of. Cloud computing introduces another security discussion that may hinder its adoption to those who do not understand the concept.

This section unpack further the security concerns of the SME, its impact to the adoption of cloud services and how the ICT SME and CSPs need to proactively work better in addressing security concerns.

DISCUSSION

Purpose of this chapter

In this chapter, research findings are discussed, unpacking further the results. Conclusions are then drawn based on the data presented. The discussion will relate the findings to the literature and the results will be presented together with the key findings linked to the literature reviewed in chapter two (2).

The analysis of the results will be performed systematically following as selected method as to clearly articulate the findings. The objective, in this section, is to investigate the various responses to understand what the reasons may be for the

lack of adoption of cloud computing services in the South African market and the potential benefits that the SME is forgoing by doing so.

Findings and discussions

From an organisational size perspective, the findings show that SMEs of all size show their reliance on ICT services and the importance that these services have to their organisational operations. This is as organisations that responded range from small sized to large SMEs. 69% of these organisations stated that business operations would halt within an hour if unreliable or unavailability of services was to be experienced. Similar to big business, SMEs related all their internally rendered services as well as those of them that on sell to Service Levels. It makes sense that an outage in the ICT systems will affect their Service Levels to their end customers hence hampering business operations. 80.4% of respondents agreed that ICT services, their reliability, access and availability is an important consideration in consuming ICT services. This goes hand in hand with the integrity of the ICT services consumed by SME.

Based on the above percentage of 69%, ease of access to ICT services and skills then becomes important for the SME. Based on interviews, a growing number of ICT-SME players in the market has boosted the supply of such services to the SME hence the SME felt that they are properly resourced where ICT services are concerned. To add to this, 71.4% of SME respondents added that, with the availability of ICT SME, they had knowledge of who the CSP are within the industry. Whilst on cost, talking again back to awareness, SME show that they have done some work around investigating cloud service with 56.6% mentioning that they believe that cloud services are correctly priced.

Most read literature, as stated in the literature review, relates to the lack of financial resource available to SME procure ICT services. This research shows that this is not necessarily true for all SMEs as 60.9% of SMEs who responded mentioned they feel that they have access to needed financial resources to run ICT operations. Whether this is just availability or must have availability, as ICT system are key for operation, this study does not show. This was interesting as

cost of ICT services are then considered not a hindrance factor in the cloud adoption by SME. This goes true as well with connectivity costs. South Africa has seen a number of Internet Service Providers (ISPs) entering the market which has resulted in competition as some reduction in prices. Literature has it that internet connectivity cost, as used to consume cloud services, in the main hindrance in cloud adoption. This is proving not true, in the context of this study with 69.9% of the respondents agreeing that connectivity costs are affordable. For the purposes of this study, affordability of services, ICT and internet connectivity, is discounted as a barrier to cloud service adoption in the South African SME context.

Respondent SME showed a disappointing 8.7% in their current adoption of cloud services with most of them, at 28.3%, still consuming services in a DIY, built-in-house, deployment model. CAPEX costs become a talking point in this deployment model as owned services, skills etc. need to be configured and deployed in running ICT services. This is not where the SME wants to find itself if the said cloud computing benefits are to be experienced. This research aims to understand why the SME still opts for this deployment model though they know and understand the potential benefits of cloud computing especially now that an understanding is that costs and availability of finances needed is not a main consideration in the cloud adoption journey.

The awareness conversation of SMEs around cloud has been pushed as a key driver in the adoption of cloud services. The South African SME, according to this study, shows that awareness of what cloud computing is not a reason for the lack of adoption with 73.9% of respondents having some knowledge of the cloud concept. 73.9%, showing their awareness of cloud, outline that they are aware of the benefits of cloud computing and its adoption into their operations. Sections of the literature review point to awareness as one of the key considerations in the lack of adoption. With the changing times, SMEs, in this research, show that changes have occurred and awareness of cloud services has grown showing improvements of knowledge of these services to the SME market.

Looking at the cloud computing awareness, benefits, costs and knowledge of cloud service providers and associated costs of cloud services, it was important

to understand if SMEs were, at all, interested in adopting cloud services, looking at current in-house-deployment that are currently high as per this research. 56.6% of SMEs agreed that the cloud conversation was top of mind, as they believe it will allow them the competitive advantage needed to be/stay competitive in their respective markets. The adoption of cloud computing was also believe to have an impact in the reduction of costs of running ICT with 69.6% of respondents agreeing that this may be realised via the adoption of cloud services.

With all the above that the SME painted being acceptable costs of cloud services, awareness of benefits, reduced costs of running ICT etc. the question remains as to why are SME not adopting cloud services. SME are considering cloud and cloud may be part of their strategy going forward but at present, there is no traction proving the lack of adoption that this research is trying to understand. Why is the South African SME not adopting cloud? Security, lack of control, privacy and integrity of services came out as a real issue around why cloud services are not being consumed. Quoting Westphall et al. (2014), the security factor has prevented migration to cloud computing by many businesses as the cloud transfers the responsibility of information security management from the customer to the cloud service provider. This seems to stand true for the South African SME as 23.9% were concerned around privacy, 37% around confidentiality of data and information.

Interpretation

In interpreting the results, it is to note that the South African SME has moved past the literature defined, known cloud adoption hurdles, like cost (cloud and connectivity), and awareness that have been defined as hurdles in the cloud adoption process. These, to a large degree, have been removed due to the reducing costs of ICT services of which cloud computing is part of, as well as the availability of information around such services as cloud.

With eminent threats around cyber-security and the recent breaches of large cloud players, this may have influenced the markets view of cloud services and

may have introduced a more cautious approach, from the SME, in adopting cloud services.

With some cloud services being hosted off-shore of South Africa, 19.6% of respondents' that transnational laws and regulations were a key factor around security of their data. This is, as laws of resident countries, where the cloud services may be located, may force that SME data be exposed to resident country authorities, breaching data and security issues. This contributes to the SMEs fears of cloud services.

Security has moved from being a grudge purchase by IT managers to a must have in this vulnerable ICT community we operate in and the costs of running system that secure physical and cyber security platforms are an expensive consideration. With this cost is, security of ICT systems is still a key consideration and, unfortunately, cloud services providers seem have not done enough to build the confidence needed, in the South African SME market, as for these SME to adopt cloud services.

Conclusion

This section presents the discussion of the research results. Findings of this research, relating to the research question, were found to be consistent with other research on same or similar topic.

SME are showing that they do have the capacity to build the needed ICT skills in house and they rely on ICT service provider to assist them in deploying and managing relevant ICT service. These are the same ICT service providers that the SME trusts to advise them around other services that may bring about efficiencies within operation, services like cloud computing.

The results show that SMEs (54.3%) have some level awareness in respect to cloud computing though this awareness is not to the details with full appreciation of the impact of cloud computing to the SME's businesses. 69.9% are interested in taking up cloud services in the near future. This is, somewhat, in line with the maturing of cloud as a concept as it has been around for over eleven (11) years.

The results also outline that, with this awareness, there is a desire for cloud computing service within the SME community (60.9%) with the SME noticing the said benefits that cloud service may introduce to their operations.

SMEs are showing that they do make provision for capital resource required for ICT service, as these services are important for business operations.

With 82.6% outlining data integrity as an important consideration for business and that with cloud computing, perceived security concerns are a reality. SMEs are showing to be more concerned about security related matter in the cloud adoption conversation, with privacy and confidentiality at 23.9% and 37% respectively as opposed to other known issues of cloud adoption.

In conclusion, whilst there is still a lack of adoption of cloud service, 71.7% of respondents believe that their businesses would benefit from the adoption of cloud services, driving down costs and enabling business to work and function well. The biggest drawback is trust and security of these services and that these services may reside anywhere in the world leaving the SME with limited to no control over their data and its residency.

The security of cloud services needs to be championed as a topic of clarity as to give the SME the peace of mind required to adopt cloud computing.

The following chapter, of this research, is the summary of this paper with emphasis on the research results and their findings. The research aims to outline the key findings and conclusions thereof. Suggestions follow outlining the suggestions and recommendations for further improvements of the topic of this paper.

CONCLUSION

The objective of this chapter is to outline the conclusion of the findings of this study. Recommendations to the SME, ICT SME and cloud service providers around what they should consider and or do in relation to the cloud computing conversation are discussed with greater focus on what needs to be addressed where cloud security is concerned.

This study was conducted based on the knowledge of the lack of adoption of cloud services, by SMEs, in South Africa and the insight that cloud services providers do not cater relevant services for the SME. The message out there is that affordability of services, security and knowledge of cloud computing has caused a lack of adoption. Cloud security issues and relevant security solutions are needed for current cloud deployments (Khalil, Khreishah, & Azeem, 2014).

This study's aim is to understand the challenges from a South African context and how these challenges may be dealt with as most SMEs who undertook this study have interest in cloud and cloud services that are fit for purpose as well as see the value of partaking in cloud services.

As stated earlier in this paper, SMEs are an important contributor to an economy, especially a developing one and enabling them to participate with ease is of importance in their sustained existence. Cloud computing is one of the needed solutions that are geared to make the SMEs operations efficient as for the SME to focus on core business deliverables. As SMEs are important, this study looked at analysing the key drivers of the lack of adoption of cloud service by the SME in South Africa.

Moving from traditional way of doing ICT to cloud solutions is not an easy journey to embark on but all SME have to start somewhere as to change the status-quo and endure the hardship and the change as to infuse and experience better way of doing things. The introduction of efficiencies, agility, the ease of use etc., from the study, are showing to be major draw card in the consideration of cloud service by the SME with the admission that cloud has the potential of introducing these.

Top management support, in driving the adoption of cloud service, is important in influencing factor in SME cloud adoption.

Security concerns are the main driver that is hindering the cloud adoption agenda by the South African SME. Fears, which have affected cloud adoption, are around security, data residency [local or overseas] and the loss of control of all ICT services by the SME. These fears are top of agenda in the adoption of cloud services.

Cloud computing, as noted by Yeboah-Boateng & Essandoh (2014), can be incorporated into a national ICT policy or framework for the development of SMEs as cloud computing does away with all ICT complexities, costs and expenditure associated with ICT service deployment allowing SMEs to focus on core business deliverables. Strategies are also needed for the drop of connectivity pricing as to enable ease of access and use by the SME.

Cloud service providers can do more in relation to the education and awareness of the SME market as to easy fears around cloud service(s) security. ICT SME, on being interviewed, outlined that local cloud service providers are not making it easy for the SME to interact with them, as their focus is more on larger enterprise. This interaction goes all the way to the support given to SMEs by the cloud service provider. Cloud service providers need to build SME focused cloud services that cater for SME requirements, fitting business processes that SME relate too. With this, education, awareness is stressed as to build comfort of the security of services.

Investing more on security and ensuring safety of data and information is critical. The hacking of services such as Amazon Web Services, Hetzner do not give comfort to SMEs as these are the very same cloud service providers that they have to rely on. Collaborating, and communicating this partnership, with reputable ICT security providers may help alleviate this security concern that is shared by the SME.

Organisations in developing economies believe that cloud computing, due to its nature, does not fit their business model and that it will not address their needs. Ismail, Jeffery, & Belle (2011) reflects on how SMEs are hesitant in embracing technological change and opt for more traditional approaches and means to conduct business and operations due to the lack of knowledge of cloud services. SMEs are also encouraged to integrate cloud services into their environment as to experience the said benefits of these cloud solutions i.e. agility of ICT deployment, use and associated costs as well the efficiencies that cloud services bring.

Service providers (SP) need to do more around the awareness topic of cloud computing. SPs outline the benefits of cloud computing to SMEs and organisations in developing economies without tangible evidence proving these benefits. SPs need to come closer and demonstrate how moving to cloud computing is one of the best business decisions that can be taken by an organisation, and deliver business models that will show the said savings, improvements and benefits to the business.

SMEs and cloud service providers need to place more emphasis on training either their personnel or the ICT SME around cloud service and how they can be integrated into the business operations of an organisation and how best to build them as to deliver value in the short term.

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