

# **A CLOUD ADOPTION FRAMEWORK FOR SOUTH AFRICAN SMEs**

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by

**Ronald Ratidzo Mudzamba**

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# **A CLOUD ADOPTION FRAMEWORK FOR SOUTH AFRICAN SMEs**

by

**Ronald Ratidzo Mudzamba**

**SUPERVISOR: MR KARL VAN DER SCHYFF**  
**DEPARTMENT: DEPARTMENT OF INFORMATION SYSTEMS**  
**FACULTY: FACULTY OF COMMERCE, RHODES UNIVERSITY**  
**DEGREE: MASTER OF COMMERCE**

## **Abstract**

Small to Medium Enterprises (SMEs) have been touted as key enablers to the economic development of most countries. Despite growing evidence that most SMEs fail within their initial years, ICTs have been found to add substantial value in facilitating their success. However, in most developing countries, ICT adoption by SMEs has been plagued with a plethora of challenges ranging from poor electricity supply, high ICT costs, lack of ICT expertise to lack of government support. While this might seem problematic for SMEs, the adoption and the use of cloud services mitigates some of these challenges.

The problem, however, is that a limited amount of literature has provided guidance with regard to how the cloud adoption process should be carried out by SMEs. The objective of this research, was therefore, to address this by developing a framework that can be used by SMEs to guide them through the cloud adoption process. To this end, thirteen (13) semi-structured interviews were conducted across nine (9) SMEs in the Eastern Cape. The resultant interview transcripts were analysed using an established thematic approach; the result of which allowed for the development of a rich interpretive narrative about SME cloud adoption. Combined with theory from extant literature, this culminated in the development of a framework for cloud services adoption for SMEs in the Eastern Cape.

**KEYWORDS:** cloud computing; Small to Medium Enterprises (SMEs); Cloud adoption; Thematic analysis; Interpretivism; TOE framework

## ***Declaration***

I declare that the Dissertation entitled, A Cloud Adoption Framework for South African SMEs, which I hereby submit for the degree of, Master of Commerce, at Rhodes University, is my own work. I also declare that this dissertation has not previously been submitted by me for a degree at this or any other tertiary institution and that all the sources I have used or quoted have been indicated and acknowledged by means of complete references.

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**Ronald Mudzamba** (*signed*)

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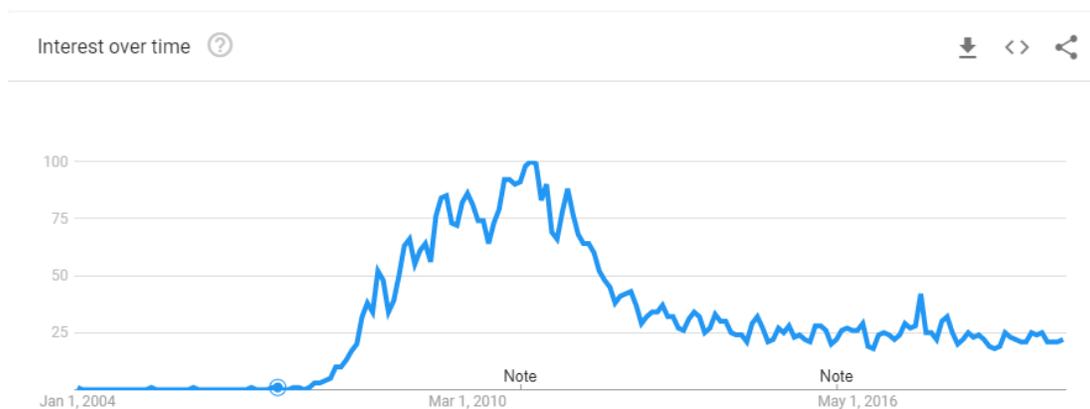
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# CHAPTER 1: Introduction and Project Overview

## 1.1 Introduction

As far back as over a decade ago, the idea of delivering Information and Communication Technology (ICT) services, based on the utility business model, had already begun to form (Rappa, 2004). The grounding concept behind a utility business model is that consumers pay a certain fee for their use of a particular metered service in a “pay as you go” fashion to the service provider (Rappa, 2004). “Utility computing”, as the concept came to be known, thus represented a radical transformation in the way in which ICT services were developed, deployed, scaled, maintained and paid for by businesses (Buyya, et al., 2009; Marston, et al., 2011). Several computing paradigms have since emerged; each promising to deliver ICT services as a utility. The most prevalent one which has been widely adopted today is cloud computing (Buyya, et al., 2009; Weinhardt, et al., 2009; Amankona, Panford and Hayfron-Acquah, 2017; Chemjor and Lagat, 2017; Arjunan and Kamath, 2018; Senarathna, et al., 2018).

Based on an analysis of Google web search trends from 2004 to 2019, the term *cloud computing* first became popular by search volume in 2007 (as shown in Figure 1 below). This popularity has been believed to be attributed to the announcement by IBM of its “blue cloud computing” effort in November 2007 (Vouk, 2008; Buyya, et al., 2009).



**Figure 1: Google web search trends for the term *cloud computing* from 2004 to 2019, cited from [www.google.com/trends](http://www.google.com/trends)**

Since then, a significant number of studies have emerged; each seeking to understand different aspects of the concept (Vouk, 2008; Khajeh-Hosseini, Sommerville and Sriram, 2010; Hamdaqa and Tahvildari, 2012; Yang and Tate, 2012; Oliveira, Thomas and Espadanal, 2014; Asiaei and Rahim, 2016; Assante, et al., 2016; Senarathna, 2018; Kreslins, Novik and Vasiljeva, 2018). Despite this surge in research, there remains a lack of consensus in extant literature on how cloud computing should be defined, which has resulted in a plethora of conceptualizations of it being proposed (Ferreira and Moreira, 2012; Oliveira, Thomas and Espadanal, 2014; Vidhyalakshmi and Kumar, 2016; Asiaei and Rahim, 2016; Hassan, 2017). However, a common definition that appears to have been widely accepted, is one that was coined by the National Institute of Standards and Technology (NIST) wherein cloud computing was defined as “*a model for enabling ubiquitous, convenient, on demand network access to a shared pool of configurable resources that can be rapidly provisioned and released with minimal management effort or service provider interaction*” (Mell and Grance, 2011, p.2; Assante, et al., 2016; Hassan, 2017; Senarathna, 2018; Wambugu and Ndiege, 2018). Mell and Grance (2011) further extended this NIST definition to include the following which also appear to have been widely accepted in extant literature:

- **Five Key Characteristics:** on-demand self-service, broad network access, resource pooling, rapid elasticity and measured service.
- **Four Deployment Models:** private clouds, community clouds, public clouds and hybrid clouds.
- **Three Service Models:** Software as a service (SaaS), Platform as a service (PaaS) and Infrastructure as a service (IaaS).

The definitions of small and medium enterprises (SMEs) have been observed to vary, depending on factors such as the country and/or the economic region in which the SMEs are located (Yeboah-Boateng and Essandoh, 2014; Prasad, et al., 2014; Mohlameane and Ruxwana, 2014; Wamuyu, 2017; OECD 2017). According to OECD (2017), this is because the dimensions “small” and “medium” are relative to the size of each domestic economy. In South Africa, The National Small Business Amendment Act (2003) defined a small business in terms of three parameters; number of paid employees, total turnover and gross asset value, excluding fixed property. However, extant literature, appeared to place emphasis only on the number of employees when defining SMEs (Mohlameane and Ruxwana, 2014; Adeniran and Johnston, 2014; OECD, 2017). For South Africa,

this is between five (5) and fifty (50) employees for small enterprises and between one hundred (100) and two hundred (200) employees for medium enterprises (National Small Business Amendment Act, 2003). This is the definition that was adopted for the purposes of this study.

Despite the variance on what constitutes an SME, there is consensus in the literature that SMEs are key drivers of economic activity in the majority of economies across the globe (Vidhyalakshmi and Kumar, 2016; Assante, et al., 2016; OECD, 2017; Khanda and Doss, 2018; Senarathna, 2018). However, according to Wamuyu (2017), contemporary SMEs now increasingly require the right ICT infrastructure to support their core business processes. This is because for a significant number of businesses, ICT infrastructure now supports, amongst other things, improvements in customer service, productivity and cost reduction by making it easier for SMEs to communicate, share information and streamline business processes (Wamuyu, 2017). Mohlameane and Ruxwana (2014) and Chemjor and Lagat (2017), further support this argument by highlighting that ICTs can improve the general competitiveness of SMEs. However, SMEs have been observed to face a number of challenges when it comes to adopting ICTs (Vidhyalakshmi and Kumar, 2016; Wamuyu, 2017; Wambugu and Ndiege, 2018). These include the lack of technology know-how to harness its full benefits, unclear return on investments (Vidhyalakshmi and Kumar, 2016), as well as limited financial resources (Wamuyu, 2017; Wambugu and Ndiege, 2018). According to Collins and Lam (2014) SME ICT departments are likely to be small or even non-existent and therefore, they do not enjoy economies of scale as happens in large enterprises. As such, investments in ICT infrastructure for SMEs is usually more costly in relation to turnover (Collins and Lam, 2014; Wamuyu, 2017; Wambugu and Ndiege, 2018).

The use of cloud computing technology has been viewed as a great mitigating factor for some of these challenges and, thus, their use has been encouraged amongst SMEs (Collins and Lam, 2014; Assante, et al., 2016; Chemjor and Lagat, 2017; Wamuyu, 2017; Wambugu and Ndiege, 2018). According to Wamuyu (2017), SMEs that utilize cloud technologies can make significant ICT related financial savings. This is because cloud computing offers lower setup costs than traditional ICT environments (Wambugu and Ndiege, 2018). Furthermore, SMEs that make use of cloud technologies can also gain access to ICT expertise that might otherwise not be available to them internally (Wamuyu, 2017). Prasad, et al. (2014), however, highlights that most of the initial value from adopting cloud computing services would be intangible, business processes-related and

business relationships-related and that SMEs should not initially focus too much on hard monetary savings.

## 1.2 Problem Statement

Despite all the benefits that the use of cloud services is touted to provide, the actual adoption of cloud services by SMEs remains low when compared to their large counterparts (Collins and Lam, 2014; Asiaei and Rahim, 2016; Chemjor and Lagat, 2017; Senarathna, 2018). According to Mohlameane and Ruxwana (2014) South African SMEs are no exception to this trend. Adane (2018), argues that SMEs need to have a clear cloud adoption strategy if there are to gain any measurable benefits from cloud services. However, Malik, et al. (2019), indicate that there is a shortage of industry-specific principles for SMEs to follow when adopting cloud services. This is supported by Asiaei and Rahim (2016) wherein they posit that a lack of clear standard guidelines and knowledge of how to adopt and utilize cloud technologies is one of the major obstacles for their adoption by SMEs. A limited amount of literature has either provided these guidelines or given directions on how the SMEs should establish these guidelines (Prasad, et al., 2014; Asiaei and Rahim, 2016; Malik, et al., 2019). In addition to this, there is a limited focus on the aforementioned problem by literature within the context of developing economies, such as South Africa. In an investigation of the awareness of cloud computing by South African SMEs, Mohlameane and Ruxwana (2014), reiterated this notion. They argued that there is a lack of awareness and exposure to cloud services and the guidelines for South African SMEs to follow, in order to establish and localize their benefits and fit for the South African SME context. **There is thus, a need for a framework which can be used as a guide by SMEs in South Africa as they adopt cloud services.**

## 1.3 Research Objective

To develop a framework which South African SMEs in the Eastern Cape can use as a guide as they adopt cloud services. This is the contribution of this study.

## 1.4 Research Questions

1. **What technological, organisational and environmental considerations should SMEs take into account when adopting cloud services?**

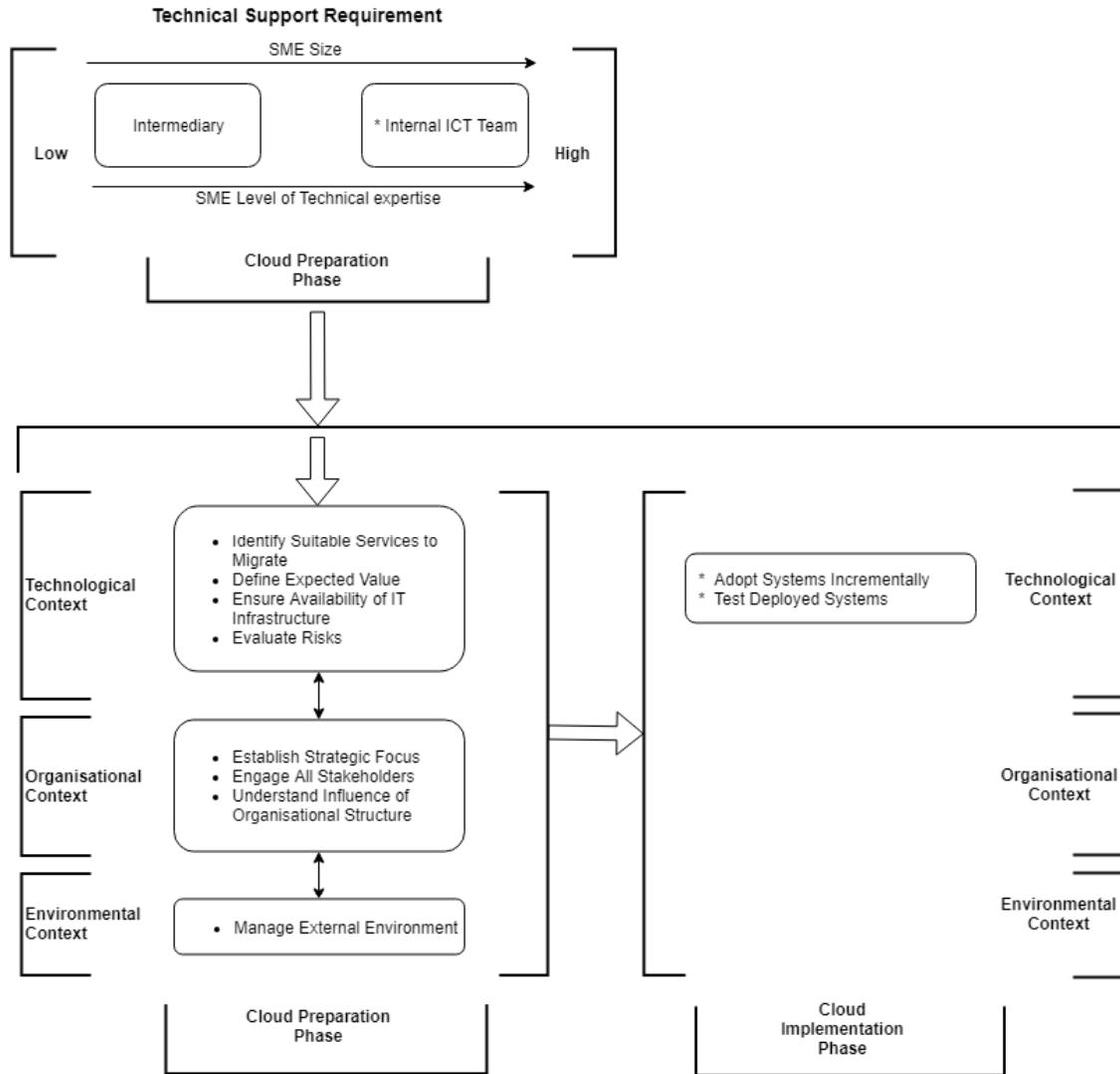
The purpose of this question was to establish, from extant literature, a theoretical foundation on which to base the investigation into the key considerations that SMEs should take into account when adopting cloud services.

**2. What technological, organisational and environmental considerations do South African SMEs in the Eastern Cape perceive as needing to be taken into account when adopting cloud services?**

The purpose of this question was to establish from South African SMEs in the Eastern Cape, the considerations that they believe should be taken into account when adopting cloud services; allowing parallels to be drawn with the literature.

**1.5 Contribution of the Study**

The main contribution of this research was a framework which can be used as a guide by South African SMEs in the Eastern Cape as they adopt cloud services (see Figure 2 below).



**Figure 2: Proposed framework for SME cloud adoption**

The framework highlights the key considerations that South African SMEs in the Eastern Cape need to take into account when adopting cloud services. It splits the cloud adoption process into two phases; a cloud preparation phase and a cloud implementation phase. Each phase consists of tasks that an SME needs to do during the cloud adoption process.

All the activities associated with the cloud preparation phase should be completed (in no particular order) prior to moving on to the activities associated with the implementation phase. The implementation phase activities should be carried out only when there is a high possibility of business operations disruption that could occur as a result of cloud adoption; thus, making them

optional. This is in turn depended on the complexity of the SME legacy ICT infrastructure, whether any was available and how easily it can be integrated with the required cloud implementation.

Other contributions of the study stemmed mostly from the methodology utilised in this study. A limited number of the studies in extant literature have studied the adoption of cloud services interpretively; with the majority utilising positivist methods to study the topic. As such, by utilising the principles of interpretive field research, it was possible to uncover unique aspects about this topic that would not have been possible through the use of positivist methods. This demonstrated the plausibility of interpretive principles in studying a topic of this nature.

In particular, it was possible to uncover the essential role of intermediaries as a catalyst for cloud adoption, as well as the mechanisms that South African SMEs in the Eastern Cape use to build trust between themselves and the intermediaries. In addition, the intrinsic nature of the SMEs in the Eastern Cape such as their propensity to adopt cloud services as a reaction to a business problem instead of a deliberate strategic effort, was also unravelled through interpretive field research principles.

## **1.6 Philosophical Stance**

The interpretivist philosophical paradigm assumes that knowledge of reality is socially constructed by human subjects and as such, is not value free (Walsham, 1995). Interpretivism attempts to understand phenomena through the meanings that people assign to them, hence focusing on the complexity of human sense making (Klein and Myers, 1999). This philosophical paradigm thus affords one the opportunity to gain a deeper understanding of a phenomenon than would be possible with the positivist paradigm. As part of this study, a thorough understanding of the contextual elements that influence the decisions to adopt cloud services by South African SMEs in the Eastern Cape was required. As such, this study was anchored on the aforementioned philosophical paradigm.

According to Mack et al. (2005), qualitative research is especially effective when one needs to obtain knowledge pertaining to the values, behaviours and norms within a particular cultural environment. As such, for the purposes of this research, it was believed that a qualitative approach would also be suitable. Through a qualitative approach, it was possible to engage with the research participants to gain a deeper understanding of the elements that affect the considerations that they

believed needed to be taken into account when adopting cloud services within their socio-cultural environment. This was consistent with the underlying philosophical paradigm, as outlined in the preceding paragraph.

### **1.7 Research Approach and Strategy**

For the purposes of this research, it was anticipated that the considerations that South African SMEs in the Eastern Cape needed to take into account when adopting cloud services would emerge from both theory and the collected data. As such, a combination of deductive and inductive approaches was used to get a holistic understanding of the phenomenon.

According to Yin (2003), a case study is an empirical inquiry which aims to investigate contemporary phenomena in their real-life setting, especially when one needs to uncover contextual elements which may be pertinent to the phenomenon under study. As it was believed that cloud services adoption decisions would vary, based on the context of each particular SME, the study employed a case study research strategy to understand the influence of the various contextual elements in the research participants' socio-cultural environment. Multiple cases (SMEs) were used; making it possible to draw parallels across the different cases.

### **1.8 Theoretical framework**

The TOE framework, developed by Tornatzky and Fleischer in 1990, provides a useful analytical framework that can be used for studying the adoption and the assimilation of different types of information and communication technology (ICT) innovations (Oliveira and Martins, 2011). It identifies three aspects of an enterprise's context that influence the process by which the enterprise implements and adopts a technological innovation: technological context, organisational context and environmental context (Oliveira and Martins, 2011). Several studies have utilised elements of the TOE framework to investigate cloud computing adoption by SMEs in different contexts (Boateng and Essandoh, 2014; Prasad et al., 2014; Asiaei and Rahim, 2016; Deil and Brune, 2017, Salum and Rozan, 2017; Senarathna, 2018). As such, the framework was used for similar purposes in this study, albeit within the South African, Eastern Cape context. Several TOE constructs that were applicable for the purposes of this study were chosen from the literature and utilised as a theoretical lens to further investigate the considerations that SMEs need to take into account when adopting cloud services.

## 1.9 Sampling and Data Collection

Purposive sampling involves selecting units to be observed on the basis of one's own judgment about which ones are the most useful or representative of a particular population (Mohlameane and Ruxwana, 2014; Saunders, Lewis and Thornhill, 2016). As such, this sampling technique was utilised in this study to enable the identification of appropriate SMEs to target as well as suitable research participants with sufficient cloud services knowledge from within the SMEs. In particular, individuals, from either the SMEs' internal ICT departments, those that were key in determining the overall ICT direction of the SMEs or those that were involved in the day-to-day ICT functions of the SMEs were targeted. (See Section 6.5.3 for specific roles that were targeted).

In addition, South African SMEs in the Eastern Cape that had experience regarding adopting cloud services (either for their own benefit or assisting other small businesses to do so) were also targeted. This is because they were believed to be more likely to provide more useful insights into the considerations that need to be taken into account throughout the adoption process. According to Adeniran and Johnston (2014), SMEs that provide ICT related services were more likely to implement cloud services. As such, SMEs within the ICT services and information and media sectors were targeted, as they were believed to be more likely to be utilising cloud services in their day to day operations.

However, there were a limited number of such SMEs within the Eastern Cape region. As such snowball sampling, where a case is used to identify other cases (Saunders, Hill and Thornhill, 2016), was utilised alongside the purposive sampling technique, to identify other suitable SMEs.

Data was then collected using both, semi-structured face-to-face interviews as well as semi-structured telephonic interviews. The semi-structured interview technique was utilised as it allowed for further probing into research participants' responses, to get a deeper understanding of their cloud services adoption considerations. This is consistent with the interpretivist paradigm, as it allowed for a shared understanding to be formed between the researcher and the research participants.

Furthermore, the semi-structured interview technique enabled structure to be maintained throughout the interview process (Saunders, Hill and Thornhill, 2016), thereby ensuring that the research questions of the study were sufficiently explored and answered. Finally, telephonic

interviews were utilised due to the costs involved in accessing SMEs that were located outside of the researcher's geographical location. This made it possible to access SMEs within a wider geographical area (Wilson, Roe and Wright, 1998).

### **1.10 Data Analysis**

Thematic analysis was employed in this study to identify the considerations that South African SMEs in the Eastern Cape believed needed to be taken into account when adopting cloud services. Thematic Analysis is a method used for identifying, analysing and reporting patterns (themes) within data (Braun and Clarke, 2006). Using the principles outlined by Braun and Clark (2006), the collected data was subjected to a rigorous six (6) phased analytical process (see Section 6.6.2) in order to identify, relevant prevalent themes within the data. The result of this process was a comprehensive interpretive narrative of the collected data.

### **1.11 Ethical Considerations**

To ensure compliance with ethical standards, the details of the study together with supporting documentation (research application form, sample individual and organisational consent forms and the research instruments) were handed over to the Information Systems Departmental ethical clearance committee for evaluation and approval, prior to any data collection. During the data collection and the post data collection phases, various measures were also employed to ensure that the study upheld the ethical standards of Rhodes University as well as the Information Systems department.

These included:

- Ensuring that all participants who took part in the study did so willingly and had the freedom to withdraw from the study if they saw it fit to do so. Signing of consent forms by each participant prior to their participation in the study facilitated this process.
- Ensuring that the reasons pertaining to why the study was being undertaken, any risks involved as well as the expected outcomes of the study were communicated to participants prior to their participation. The reason for this was to furnish them with enough information about the study for them to make an informed decision about whether to participate in the study or not.

- Making sure that information collected for the purposes of this study was kept anonymous and was not disclosed to any third party for any reason, to ensure complete confidentiality of participants.
- Ensuring that, on completion of the study, a summary of the study outcomes would be provided to the participants should they require it.

### 1.12 List of Abbreviations

A description of some useful abbreviations is provided below.

**SMEs:** Small and Medium Enterprises.

**ICTs:** Information and Communication Technologies.

**ERP Systems:** Enterprise Resource Planning Systems.

**Virtual PABX:** Virtual Private Automatic Branch Exchange.

**CRM Software:** Customer Relationship Management Software.

**IaaS:** Infrastructure as a Service.

**PaaS:** Platform as a Service.

**SaaS:** Software as a Service.

**GDPR:** General Data Protection Regulation.

**OECD:** Organisation for Economic Cooperation and Development.

**SLA:** Service Level Agreement.

**HOD:** Head of Department.

**HR:** Human Resources.

### 1.13 Dissertation Structure

The dissertation proceeds as follows:

- **Chapter 2: Cloud Computing**

This chapter introduces the reader to the concept of cloud computing; exploring the various cloud architectures and business models that are available for users.

- **Chapter 3: Small to Medium Enterprises (SMEs)**

Small to Medium Enterprises (SMEs) are investigated in this chapter. The formal definition of an SMEs for this study is defined and the relationship between SMEs and cloud

computing is explored. The chapter then further describes the problem that this study seeks to address.

- **Chapter 4: Theoretical Framework**

Various theoretical frameworks pertaining to the adoption of ICTs are looked at in this chapter. The Technology-Organization-Environmental (TOE) framework and how it can be utilised for the purposes of this study is described.

- **Chapter 5: SME Considerations for Adopting Cloud Services**

Using the TOE framework from the previous chapter as a lense, extant literature is explored and the factors that SMEs should take into account when adopting cloud services are investigated in this chapter. The chapter ultimately, presents the reader with a conceptual framework of the considerations that SMEs should take into account when adopting cloud services; in turn answering the first research question of the study.

- **Chapter 6: Research Methodology**

This chapter presents the reader with a detailed overview of the various design elements on which the study is anchored. The data collection methods and the process of data analysis are also presented to the reader in this chapter.

- **Chapter 7: Data Analysis**

This chapter starts by presenting the context of the research participants to the reader. This is followed by a detailed account of how the researcher analysed the collected data. The chapter then ends with a comprehensive interpretive narrative of the analysis of the collected data.

- **Chapter 8: Findings and Conclusion**

This is the final chapter of the dissertation and it presents the findings of this study to the reader. In particular, the research questions of the study are revisited and a demonstration of how the questions have been answered is presented. The study's contribution, recommendations for South African SMEs, and opportunities for future research are also highlighted to the reader in this chapter.

# CHAPTER 2: Cloud Computing

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## 2.1 Introduction

The previous chapter introduced the reader to the study and also gave a brief overview of the various design principles on which the study is based. This chapter introduces the reader to the concept of cloud computing. The chapter also explores the relationship between cloud computing and Small to Medium and Enterprises (SMEs).

The last few decades have seen human ingenuity lead to a proliferation of ideas and technologies that have revolutionised the way we do things. Brynjolfsson, Hoffman and Jordan (2010), postulated that some of these ideas and technologies, such as electricity, have been a great driver and catalyst for innovation and productivity in modern economies. Referring to them as *general-purpose technologies*, Brynjolfsson, Hoffman and Jordan (2010), viewed these ideas and technologies not as discrete human tools, but as platforms on which other tools or innovations could be materialized.

In recent years, a significant amount of businesses across the globe have had to rely heavily on ICTs to fulfil their business needs (Wamuyu, 2017; Wambugu and Ndiege 2018). However, as far back as over a decade ago, the idea of delivering ICTs as a service to businesses in a similar fashion to common utilities such as water and electricity had already begun to take shape. Utility computing (Rappa, 2004) as the concept came to be known thus assumed a *general-purpose* role in the years subsequent to its conception as it spawned the proliferation of several computing paradigms; each promising to realize it (Vaquero, et al., 2008; Vouk, 2008; Buyya, et al., 2009; Weinhardt, et al., 2009; Avram, 2014). The most widely accepted of these paradigms today is that of cloud computing (Buyya, et al., 2009; Weinhardt, et al., 2009; Dwivedi and Mustafee, 2010; Armbrust, et al., 2010; Slawinski and Sunderam, 2014; Amankona, Panford and Hayfron-Acquah, 2017; Chemjor and Lagat, 2017; Arjunan and Kamath, 2018; Senarathna, et al., 2018).

## 2.2 Cloud Computing

There is a variance in definitions of cloud computing in the literature, which implies a lack of consensus on how it should be defined (Asiaei and Rahim, 2016; Hassan, 2017). Kim (2009)

accentuated how cloud computing is often used synonymously with terms such as utility computing, grid computing and software as a service (SaaS). Furthermore, Marston, et al. (2011), highlighted how it appears that the existing definitions do not identify all the key characteristics of cloud computing; a view that was shared by Vaquero, et al. (2008) when they noticed how most cloud computing definitions focused on just certain aspects of the technology. All this further exacerbates the confusion around the concept and further mystifies it. This chapter, thus, endeavours to demystify the concept to enable the reader to better understand what the concept entails. This will be done by integrating the most widely accepted definitions from the literature into a concise and holistic view of the concept.

### **2.3 Utility Computing and the Connection with Cloud Computing**

Brynjolfsson, Hofmann and Jordan (2010) observed how the concept of utility computing seemed to be implicitly or explicitly tied to most definitions of cloud computing. Several definitions of cloud computing that have been coined thus far seem to validate this claim (Kim, 2009; Armbrust, et al., 2010; Brynjolfsson, Hofmann and Jordan, 2010; Helland, 2013; Nwabuonu and Nwachukwu, 2013; Slawinski and Sunderam, 2014; Chemjor and Lagat, 2017; Arjunan and Kamath, 2018; Senarathna, et al., 2018).

In fact, several authors viewed cloud computing as a *mélange* of several computing paradigms that arose to realise the idea of computing as a utility; cloud computing itself being better placed than the others to achieve this (Vouk, 2008; Buyya, et al., 2009; Weinhardt, et al., 2009; Dwivedi and Mustafee, 2010). From this, it could be inferred that the concept of utility computing in understanding what cloud computing is could not be ignored.

According to Vaquero, et al. (2008), the central idea behind utility computing is that, an application runs on a server and by so doing, turns ICT service provisioning into a utility service by delivering resources where they are needed. Slawinski and Sunderam (2013), added to this by highlighting the ability of an ICT service provider to meet any user's requirements as key to utility computing. However, utility computing, is believed to be best understood as a business model (Vaquero, et al., 2008; Lim, et al., 2009) wherein, usage of a particular ICT service is metered and by so doing, allow consumers to pay a certain fee for the service in a pay-as-you-go fashion (Rappa, 2004). Delivering ICT services based on this utility business model thus represented a radical

transformation in the way in which ICT services are developed, deployed, scaled, maintained and paid for by businesses (Buyya, et al., 2009; Chen, et al., 2010; Marston, et al., 2011). Rappa (2004) identified several key characteristics that make any service a utility.

**Table 1: Key characteristics of a utility service, cited from Rappa, (2004, p.33)**

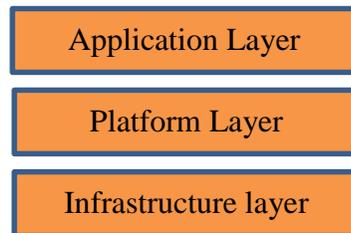
Characteristic	Definition
Necessity	Users see it as highly necessary in their lives
Reliability	Reliance on the service is heavy and critical
Usability	Ease of use is pivotal
Utilisation rates	Full capacity service utilisation is limited; hence utilisation rates need to be regulated over time and across regions
Scalability	Service is scalable hence providing economies of scale
Service exclusivity	The economies of scale can benefit from the exclusive provisioning of services by an organisation in a monopolistic fashion

With contemporary businesses increasingly relying on ICT services for their daily business needs, Rappa (2004) argued that ICTs should also be perceived as a utility. It appears therefore that, it is these characteristics of utility services that cloud computing aimed to fully or partially replicate in its delivery of ICT resources to consumers. Most of these characteristics can be observed to correlate with current cloud computing offerings.

## 2.4 Underlying Technological Architecture

The cloud computing technological architecture itself appears to be quite complex, as it is a mesh of several cooperating, pre-existing technologies rather than just one single technology (Vouk, 2008; Kim, 2009; Sharif, 2010; Avram, 2014). In general, however, whilst it might not be explicitly stated in some definitions of cloud computing, the assumption appears to be that there are two key components to the cloud computing architecture that are connected to each other via a network; the backend which is often referred to as the cloud (Gu and Grossman, 2009; Armbrust, 2010) and a front end which the end users or consumers interact with. Whilst at first glance, this might appear to be a simple architecture, the way these combine to enable ICT service provisioning as a utility to the consumer says otherwise.

The architecture is organised into three layers at varying levels of abstraction that also map to the different services offered by cloud computing (Weinhardt, et al., 2009; Marston, et al., 2011). The infrastructure layer lies at the bottom, followed by a platform layer and finally an application layer at the top, as shown in Figure 3 below (Buyya, et al., 2009; Weinhardt, et al., 2009; Askhoj, Sugimoto and Nagamori, 2011; Dhar, 2012; Chang, Walters and Wills, 2013).



**Figure 3: Layers in the cloud computing technological architecture**

According to Askhoj, Sugimoto, and Nagamori (2011), each layer builds on the services that are offered by the layer beneath it, whilst simultaneously offering its services to any layer above.

#### **2.4.1 The infrastructure layer**

The infrastructure layer is made up of what are commonly known as data centres (Gu and Grossman, 2009; Dwivedi and Mustafee, 2010; Armbrust 2010; Helland, 2013). These usually consist of servers (machines that host and provision services to consumers) (Gurav and Shaikh, 2010; Uchena, Wilson and Felista, 2013), storage (Boss, et al., 2007; Berman, et al., 2012) and network components (Boss, et al., 2007; Mell and Grance, 2011; Berman, et al., 2012). Together, these components appear to be the base hardware on which the cloud computing infrastructure operates. A number of technological principles are employed at this layer to make the entire architecture work; however, two principles that are either explicitly or implicitly implied in most cloud computing definitions are cluster computing (Buyya, et al., 2009; Weinhardt, et al., 2009; Cervone, 2010) and grid computing (Boss, et al., 2007; Buyya, et al., 2009; Weinhardt, et al., 2009; Kim, 2009).

Buyya, et al. (2009), describes cluster computing as a system that consists of a collection of interconnected stand-alone machines working together as one integrated computing resource. He further describes grid computing as a system that enables dynamic sharing, selecting and aggregation of computing resources that are geographically dispersed, depending on availability,

performance, cost, capability and service level requirements of a user. A typical data centre would hence consist of multiple servers grouped together as clusters and different clusters can sometimes be interconnected through grid technology if they are geographically dispersed. This combination of cluster computing and grid computing is often implied in a number of cloud computing definitions. For instance, Buyya, et al. (2009), describes cloud computing as a system that consists of a collection of interconnected computers that are dynamically provisioned and presented as one or more unified resources, based on service level agreements established with the user. Supporting this notion, Gu and Grossman (2009) postulate that, in cloud computing, high speed networks connect various geographically distributed clusters. Mullender (2012) also implies the same thing wherein he describes cloud computing as a concept that leverages large numbers of servers in data centres. Cloud computing, therefore, appears to be a combination of both cluster and grid computing.

Sitting on top of this infrastructure layer, but still part of it, is an abstraction layer that utilises virtualisation technology, to provide most of the capabilities that are delivered by cloud computing (Buyya, et al., 2009; Mell and Grance, 2011; Chang, Walters and Wills, 2013). The layer is in essence, a hypervisor, (Cervone, 2010; Zhou, et al., 2013) which is a special operating system software that runs other operating system software on virtual machines as its applications. The hypervisor runs on all the physical machines in the data centre and is able to run multiple virtual machines and their associated operating systems and applications on a single physical machine (Cervone, 2010; Mullender, 2012). The individual virtual machines are totally isolated from one another, providing the performance and reliability benefits of a dedicated server whilst, utilising the computational resources of the host physical machine (Newton, 2010). Applications and services will not be tied directly to the underlying hardware infrastructure, thus enabling them to move dynamically across virtual machines in an efficient manner (Gurav, and Shaikh, 2010). Mullender (2012), postulates that it is also feasible to move an entire virtual machine along with its applications to a different physical machine. This, according to Cervone (2010) is realised by multiple cooperating hypervisors that are deployed on all physical machines in a cluster, so that should one machine fail, another one will be able to take over the delivery of a particular service.

Physical server machines can hence be shared amongst a vast number of consumers, allowing for a lower cost of ownership due to economies of scale (Valentine and Enyinna, 2013). In addition,

the physical machines or virtual machines can also be automatically combined so that they work together to meet specific consumer requirements (Sharif, 2010), sometimes for a brief period before being made available to other consumers as well (Sharif, 2010; Mell and Grance, 2011). Cervone (2010) elaborates on this by accentuating how this enables an organisation to start off running an application on a single virtual server and then go on to increase the number of virtual servers running the application as demand increases; a view which was also shared by Armbrust (2010). The result is that there is better utilisation of physical and virtual server machines (Vaquero, et al., 2008; Patel, et al., 2011), dynamic scalability (Kambil, 2009; Mell and Grance, 2011; Berman, et al., 2012; Valentine and Enyinna, 2013; Hsu, Ray and Li-Hsieh, 2014) and the illusion of infinite resources to consumers (Armbrust 2010; Sharif, 2010; Mell and Grance, 2011; Avram, 2014). This is useful for businesses with limited resources.

#### **2.4.2 The platform layer**

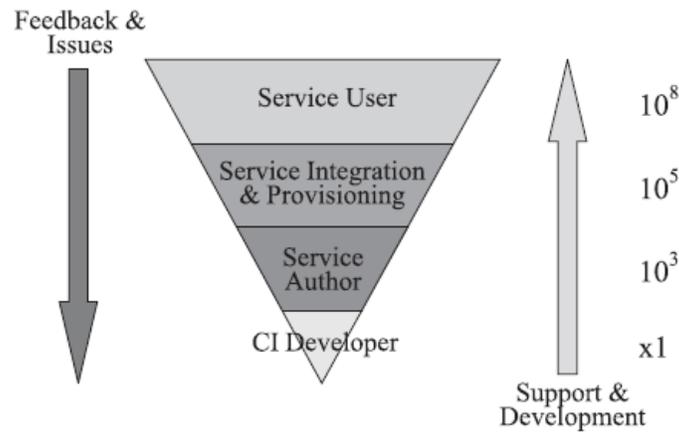
Sitting on top of the infrastructure layer, the platform layer, consists of a software solution stack that encapsulates all the required infrastructure and tools for the entire software development lifecycle (Chen, et al., 2010; Dhar, 2012; Chang, Walters and Wills, 2013). Nwabuonu and Nwachukwu (2014), list these infrastructure and tools as servers, operating systems, databases, program execution environments and programming languages. According to Babar and Chauhan (2011), only a specific set of programming languages can be supported in such environments; something which Chen, et al. (2010) believe locks developers into a particular development environment and tools. Mell and Grance (2011), however, posit that the use of other compatible languages from other sources may be feasible.

#### **2.4.3 The application layer**

The application layer is the highest level of abstraction and it is the one that most consumers commonly view and interact with (Weinhardt, et al., 2009). The consensus in the literature is that at this layer, full implementations of software applications are made available to the consumer without them being exposed to the infrastructure and platform layers beneath (Weinhardt, et al., 2009; Babar and Chauhan, 2011; Mell and Grance, 2011; Chang, Walters and Wills, 2013).

## 2.5 Cloud Computing Users

Discussions on the type of users who are involved in cloud computing are not common in the literature. The researcher believes, a better understanding of the cloud users can enable the reader to better understand what cloud computing entails. Vouk (2008) categorised the cloud computing users into four distinct categories; cloud infrastructure (CI) developers, service authors, service integration and provisioning experts and service users as shown in Figure 4 below.



**Figure 4: Cloud computing users, cited from Vouk, (2008, p.238)**

According to Vouk (2008), CI developers are experts who are responsible for the development and maintenance of the cloud computing infrastructure; service authors are developers of individual services who can be used individually or be combined by service provisioning experts into more complex aggregates. Service integration and provisioning experts focus on developing composite and orchestrated solutions as required by a service user; and finally, service users as the name implies, are the recipients and consumers of the provisioned services. A closer look at Vouk (2008)’s definitions of the user categories can lead to inferences with regard to which layer in the cloud computing architecture these types of users operate in and these are shown in Table 2 below.

**Table 2: Mapping of user categories into the cloud computing architecture**

User	Layer in cloud computing architecture
Service user	Application layer
Service integration and provisioning expert	Platform layer
Service author	Platform layer
CI developer	Infrastructure layer

Chen, et al. (2010), did an almost similar categorisation to Vouk (2008)'s categorisation. They distinguished between end users (consumers of cloud application services), cloud service providers (provider of cloud capabilities), cloud application vendors (vendors of cloud application services) and cloud tool providers (third-party providers of cloud support and manageability tools). Even though a different naming convention was used, it appears that these map very closely to the ones that were suggested by Vouk (2008), as shown in Table 3 below. Vouk (2008), however, was more detailed in his descriptions on the actual roles that each user category plays at the different cloud computing layers.

**Table 3: Mapping of Chen, et al. (2010)'s categorisations to Vouk (2008)'s categorisations**

Vouk (2008)'s categorisations	Chen, et al. (2010)'s categorisations
Service User	End User
Service integration and provisioning expert	Cloud application vendor
Service author	-
CI developer	Cloud service providers Cloud tool providers

## 2.6 The Business Model Framework

Kim (2009) viewed cloud computing as a convergence between ICT efficiency, whereby modern ICTs are utilised in a more efficient manner and business agility whereby ICTs are leveraged to stay competitive in business markets. Venters and Whitley (2012) also shared a similar view wherein they viewed cloud computing as the merging of two distinct strands; technological innovations and an emphasis on service-based perspectives, which considers value for customers derived from the use of technology services. What these two views have in common is that they both look at cloud computing from two angles; a technological angle and a business angle. A discussion on the technological concepts associated with cloud computing has already been done and to get a complete picture of the concept it is important to look at the business aspects of it as well.

## 2.6.1 Service models

Cloud computing has the capacity to be deployed into various service models (Aleem and Sprott, 2013; Stieninger and Nedbal, 2014). This is especially true if one looks at the various service models that were defined by Linthicum (2009) as feasible within the context of cloud computing. These include Storage-as-a-Service, Database-as-a-Service, Information-as-a-Service, Process-as-a-Service, Application-as-a-Service, Platform-as-a-Service, Integration-as-a-Service, Security-as-a-Service, Management/Governance-as-a-Service and Testing-as-a-Service. Discussions on most of these service models that were defined by Linthicum (2009) are, however, not common in the literature and thus were not explored further. Three commonly described service models that appear in extant literature, are Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS) (Armbrust, et al., 2010; Mell and Grance, 2011; Dhar, 2012; Chang, Walters and Wills, 2013; Vidhyalakshmi and Kumar, 2016; Assante, et al., 2016; Wamuyu, 2017; Palos-Sanchez, Arenas-Marquez, Aguayo-Camacho, 2017; Wambugu and Ndiege, 2018). These map closely to the infrastructure, platform and application layers of the cloud computing architecture respectively.

### 2.6.1.1 Infrastructure as a service (IaaS)

With this type of service, consumers are given ownership and control of virtualised infrastructure over a network and according to their requirements (Dhar, 2012; Helland, 2013). There appears to be a consensus in the literature that the provisioned virtual infrastructure is divided into computational resources (which are essentially virtual machines) where the consumer according to Mell and Grance (2011) is able to deploy and run arbitrary software (that can include operating systems and software applications) and storage facilities (Weinhardt, et al., 2009; Marston, et al., 2011; Barbara and Chauhan, 2011; Chang, Walters and Wills, 2013). According to Mell and Grance (2011), the consumer is not given control over the underlying cloud computing infrastructure, however, they are given control over the operating systems, storage and deployed applications. Amazon Web Services (AWS)<sup>1</sup> and Microsoft Azure<sup>2</sup> are two examples of this type of service model.

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<sup>1</sup> <https://aws.amazon.com/>

<sup>2</sup> <https://azure.microsoft.com/en-us/>

### 2.6.1.2 Platform as a service (PaaS)

With PaaS, the consensus in the literature is that consumers are given network access to a fully supported environment in which they can carry out all the stages of the software development lifecycle, according to their requirements (Weinhardt, et al., 2009; Marston, et al., 2011; Chang, Walters and Wills, 2013). Two key capabilities, however, seem to emerge in most of the descriptions of PaaS in the literature; the ability to run and host for consumers, uploaded applications that have been written using supported libraries and programming languages (Weinhardt, et al., 2009; Mell and Grance, 2011) and the ability for consumers to use supported application programming interfaces (APIs) to develop applications using supported software libraries and programming languages (Kim, 2009; Babar and Chauhan, 2011; Chang, Walters and Wills, 2013; Uchena, Wilson and Felista, 2013; Aleem and Sprott, 2013). According to Mell and Grance (2011), like IaaS, consumers also do not have control over the underlying infrastructure, but they can have control over deployed applications and configuration settings for the application hosting environment as well as the APIs. Appenda<sup>3</sup> is an example of this type of service model as described in Section 2.4.

### 2.6.1.3 Software as a service (SaaS)

With this type of service, consumers get to access and use over a network, fully implemented applications running on a cloud infrastructure using either a thin client such as a web browser or a program interface (Mell and Grance, 2011; Marston, et al., 2011; Dhar, 2012; Gupta, Seetharaman and Raj, 2013). The consumer has no exposure and hence control over the underlying infrastructure; however, they can have control over in-application configuration settings (Mell and Grance, 2011). Examples of this type of service model include applications such as Office 365<sup>4</sup> and Dropbox<sup>5</sup>.

Facilitating the provisioning of all three of these services of course, is the utility business model that was discussed earlier, which allows the consumers to pay for the services in a pay as you go manner.

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<sup>3</sup> <https://appenda.com/>

<sup>4</sup> <https://www.office.com/>

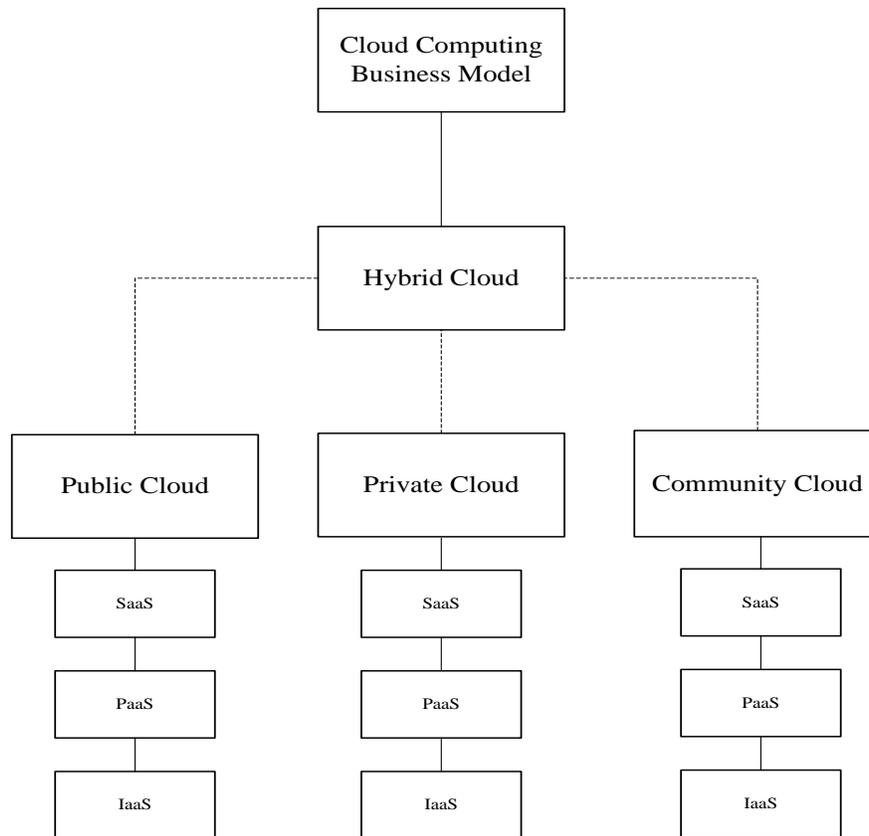
<sup>5</sup> <https://www.dropbox.com/>

## 2.6.2 Deployment models

Discussions on cloud deployment models often appear alongside discussions on service models in extant literature. This facilitates a greater understanding of the cloud business model framework. Four deployment models emerge quite often and these include the following: private, public, community and hybrid deployment models (Mell and Grance, 2011; Babar and Chauhan, 2011; Chang, Walters and Wills, 2013; Helland, 2013; Aleem and Sprott, 2013; Gupta, Seetharaman and Raj, 2013; Nwabuonu and Nwachukwu, 2014; Asiaei and Rahim, 2016; Amankona, Panford and Hayfron-Acquah, 2017; Vasiljeva, Shaikhulina and Kreslins, 2017).

Mell and Grance (2011) describe them as follows:

- **Private cloud:** services are provisioned for exclusive use by a single organisation.
- **Community cloud:** services are provisioned for exclusive use by a specific group of organisations with shared interests.
- **Public cloud:** services are provisioned for open use by the general public.
- **Hybrid cloud:** two or more distinct deployment models (private, community or public) are combined together, remaining unique entities, but bound together by standardised or proprietary technology.



**Figure 5: Cloud computing business model framework**

## 2.7 A Comprehensive View of the Cloud

From the preceding discussions the key attributes of cloud computing can be inferred to consist of the following:

- An underlying pay-as-you-go business model;
- Virtualised infrastructure in data centres which are dynamically scalable;
- Full utilisation of physical resources in data centres;
- The illusion of infinite resources to users;
- User self-service;
- User service requirements specification;
- Network access to resources from any device and location;
- Flexible business model framework that can be deployed in various forms;
- Multiple users of services which enables economies of scale;
- Ease of use by users; and
- A combination of grid computing, cluster computing, virtualisation and other supporting technologies.

From the aforementioned list of attributes, cloud computing can thus be described as a mechanism for full utilisation of grid computing, cluster computing, virtualisation and other supporting technologies, to dynamically enable on demand, simultaneous access to a large pool of scalable virtualized ICT resources, over a network by one or more users. These resources can be manifested in different forms of easily usable services, based on the requirements that are specified by the users and are paid for in a pay-as-you-go fashion. This feature is especially useful for businesses with limited resources as it enables them to only pay for what they need, as opposed to doing a costly upfront investment into resources that may never be used. SMEs thus stand to benefit the most from this feature as they inherently have less resources than their larger counterparts (Wamuyu, 2017).

## 2.8 Uses of Cloud Services by Businesses

Discussions on the usage of cloud services by businesses are limited in the literature. However, Kim, et al. (2009), observed that businesses usually do not use cloud services for mission critical applications and data. According to Eurostat (2014), the most commonly used cloud services amongst the surveyed businesses were respectively, e-mail, storage of files, hosting databases, office software, financial or accounting software applications, customer relationship management (CRM) software applications and computing power for internal business software, as shown in Table 4 below.

**Table 4: Uses of cloud computing services in EU28 enterprises, adapted from Eurostat (2014)**

	Use of cloud computing	E-mail	Storage of files	Hosting the database(s)	Office software	Financial or accounting software applications	CRM* software applications	Computing power for own software
	% of all enterprises	% of enterprises using the cloud						
EU28	19	66	53	39	34	31	21	17

In an exploration of the usage of cloud services by SMEs, Wamuyu (2017) had similar results to the above. Backup and recovery services were observed to have the highest level of usage amongst the observed SMEs (98%) followed by email and messaging services (94%) as well as office applications (74%). Virtual PABX systems (6%), ERP systems (8%) and software development

platforms (12%) were observed to have the lowest usage, whilst data storage services (44%) and business process management services (36%) had moderate levels of usage.

Drawing from the preceding discussions and for the purposes of this study, cloud computing usage is thus regarded as **the use by small businesses, of either fully functional software services (SaaS), platforms (PaaS) or infrastructure (IaaS) that are offered by a remote third party, through a public cloud deployment model over the Internet.** Five categories of software services which are especially important in this regard are shown in Table 5 below. If a business is using one or more of the services mentioned in Table 5 below, it will be regarded as using cloud computing services in this study.

**Table 5: Categories of software services used by businesses**

Category	Service offered
Information and Communication	E-mail services
Storage	File storage
Hosting	Hosting of databases and/or web sites
Business Applications	Office software, financial or accounting software, customer relationship management (CRM) software, Enterprise Resource planning (ERP) software.
Computing Resources	Computing power for internal software

## 2.9 The Risks of Cloud Services to Businesses

Whilst there are indeed benefits that businesses can gain through the use of cloud services, there are also some risks associated with their use that have been widely discussed in the literature (Amankona, Panford and Hayfron-Acquah, 2017; Khanda and Doss, 2018; Kreslins, Novik and Vasiljeva, 2018; Li, Yu and He, 2019). When businesses transfer their data and applications onto the cloud, they risk losing physical control of them (Kim, 2009; Marston, et al., 2011; Panford and Hayfron-Acquah, 2017; Kreslins, Novik and Vasiljeva, 2018). To date, knowledge about the physical locations and configurations of the systems that deliver services in the cloud environment remains obscure and thus the adoption of cloud services has been met with mixed feelings (Amankona, Panford and Hayfron-Acquah, 2017; Kreslins, Novik and Vasiljeva, 2018). According to Kim (2009) these concerns are especially important for compliance reasons as sometimes businesses can be subject to government regulations with regard to the secure storage, privacy and disclosure of data and it will not be clear if the use of cloud computing services will

violate such regulations due to jurisdiction limitations. The General Data Protection Regulation (GDPR) for instance, lays out the rules for processing, storing and managing data from people residing in the European Union (Li, Yu and He, 2019). According to Li, Yu and He (2019), organisations that process data related to EU residents will be held accountable for non-compliance with the stipulations of GDPR from the 25<sup>th</sup> of May 2018 onwards.

In addition to this, Kreslins, Novik and Vasiljeva (2018) stressed that there are still concerns with regard to the loss of control of data and/or systems during an emergency situation. Marston, et al. (2011), stress that if these data and applications are business critical there are often concerns with regard to whether the cloud providers will be able to commit to the high quality of service and availability guarantees that will be necessary for such data and applications. This, according to Lin and Chen (2012) is because the use of cloud computing gives rise to uncertainty of service reliability, as there is a possibility for unexpected systems downtime and disruptions. As such, Kim, et al. (2009) discouraged businesses from entrusting business critical applications to cloud providers.

With loss of control, the issue of security also becomes a major concern with the use of cloud computing services (Yeboah-Boateng and Essandoh, 2014; Mohlameane and Ruxwana, 2014; Amankona, Panford and Hayfron-Acquah, 2017; Kreslins, Novik and Vasiljeva, 2018; Ahmad, 2018). According to Amankona, Panford and Hayfron-Acquah (2017), applications and data hosted by cloud service providers can be susceptible to a number of internal or external security threats. According to Yeboah-Boateng and Essandoh (2014), misuse, theft or illegal uses of data from the cloud service provider's side is possible when they assume full responsibility over the data and applications. Ahmad (2018) suggests that the reason for this could be that sophisticated hackers can potentially break into just about any computer system and the cloud environment provides a conducive environment for attracting these hackers. The concern for businesses is that, whilst they are obliged to take reasonable and competent steps to safeguard their clients' electronic information, cloud service providers will not be under the same ethical guidelines (Ratten, 2012). As such, Amankona, Panford and Hayfron-Acquah, (2017), posit that businesses must ascertain the security policies that prospective cloud vendors have in place before engaging them.

A lack of standardisation of application programming interfaces and platform technologies means that interoperability amongst platforms is poor which makes it difficult if not impossible for

businesses to switch from one service provider to the next (Marston, et al., 2011; Lin and Chen, 2012; Kreslins, Novik and Vasiljeva, 2018; Ahmad, 2018; Khanda and Doss, 2018). Marston, et al. (2011), warns of the possibility of this vendor lock-in increasingly becoming more expensive over time. According to Ahmad (2018), businesses that might need to switch vendors might be compelled to pay a fee for switching to a different vendor. Coupled to this, Ferreira and Moreira (2012) also highlight how lack of standardisation of the processes over which the cloud service providers base their offerings makes it difficult for businesses to do an initial analysis as to which vendor provides the best service for the business at the highest quality level. Furthermore, Khajeh-Hosseini, et al. (2012) accentuate that understanding the operational costs associated with public cloud service offerings is complicated as the utility billing model has a certain degree of uncertainty that makes it non-trivial to estimate as compared to upfront hardware acquisition. The lack of standardisation over which the cloud service providers base their offerings exacerbates this problem.

The issue of performance is also called into question with the use of cloud services, as they often rely on the communication time between the client computer and the web server in the cloud, which often gets slower as the number of simultaneous users increases and the amount of data transferred to and from the cloud increases (Kim, et al., 2009). High bandwidth thus becomes very important, which unfortunately, according to Mohlameane and Ruxwana (2014) is still relatively expensive in most developing countries. A lack of reliable telecommunications infrastructure as well as shortages of electricity further exacerbates the problem (Yeboah-Boateng and Essandoh, 2014; Khanda and Doss, 2018).

## **2.10 Advantages of using Cloud Services to Businesses.**

The benefits that can potentially accrue to businesses through the use of cloud services have been widely discussed in the literature (Vidhyalakshmi and Kumar, 2016; Assante, et al., 2017; Branco Jr, Sa-Soares and Rivero, 2017; Ahmad 2018; Senarathna, 2018). Businesses do not need to make upfront investments in computing resources, the space needed to house the resources as well as the cost of training staff for administering the systems, networks and databases (Kim, 2009; Rawal, 2011; Johansson, et al., 2014; Yeboah-Boateng and Essandoh, 2014; Branco Jr, Sa-Soares and Rivero, 2017; Ahmad, 2018; Wambugu and Ndiege, 2018). Wambugu and Ndiege (2018) agree with this notion, as they attribute this to the fact that the computing resources will not be owned

by the business and will not reside on its premises, so the business does not have to be involved in the purchasing and upkeep of the computing resources. This can significantly lower the cost of entry for smaller businesses that are looking to benefit from highly computing power intensive applications such as those used for business analytics, which would otherwise only be available to large corporations that have the money to make such large ICT investments (Marston et al., 2011; Garrison, Kim and Wakefield, 2012; Ratten, 2012; Vidhyalakshmi and Kumar, 2016; Ahmad, 2018; Wambugu and Ndiege, 2018). In addition, smaller businesses will also be able to have access to state-of-the-art technology and skilled personnel and be able to compete with larger businesses (Wamuyu, 2017; Wambugu and Ndiege, 2018).

According to Vidhyalakshmi and Kumar, (2016) the use of cloud services also enables businesses to lower their operating costs. In particular the pay-per-use or subscription charges on which most cloud services are based are most likely to be much lower than the cost of purchasing and maintaining on-premise computing resources (Vidhyalakshmi and Kumar, 2016; Ahmad 2018; Wambugu and Ndiege, 2018). This is especially beneficial due to the fact that businesses will only pay for computing resources and services that they will be using at a particular time (Wambugu and Ndiege, 2018). This is useful when the use of the computing resources or services is irregular (Kumar, et al., 2013). Businesses will, thus, not be exposed to the risk of over procuring computing resources and services for peak time use which would then go unused during off peak periods (Kim et al., 2009).

The use of cloud services has also been observed to enable services to be accessible from any computing device, regardless of geographic or time constraints (Kumar, et al., 2013; Vidhyalakshmi and Kumar, 2016; Ahmad, 2018). The implications of this for business are that information can then be accessed and shared by others from anywhere at the same time; giving way to opportunities for more collaboration within and outside the business environment (Kumar, et al., 2013; Ratten, 2014; Vidhyalakshmi and Kumar, 2016). Cost savings can also be realised from this as there can be an elimination of travel expenses, since there will be no need to have to travel to meet other people for collaboration to take place.

Other business benefits that have been touted in the literature include that businesses can redirect their resources towards performing their core business activities better when they offload their ICT overhead to a third party (Yeboah-Boateng and Essandoh, 2014; Johansson, et al., 2014). In

addition to this, barriers for innovation can be lowered which would enable businesses to explore new markets that they would otherwise not have access to (Vidhyalakshmi and Kumar, 2016). Yeboah-Boateng and Essandoh (2014) also accentuated that providers of cloud computing services rely on highly distributed and robust infrastructure that can store data redundantly in multiple locations, which defends Mohlameane and Ruxwana (2014)'s assertion that cloud computing services have the ability to offer better security of data and applications. Businesses therefore do not have to worry about key data being lost, such as happens in the event of hardware crashes or theft of computing resources housed internally (Ahmad, 2018).

### **2.11 Summary**

This chapter attempted to demystify the concept of cloud computing by exploring it from both a technological and business perspective, to come up with a holistic definition that encapsulates most of the attributes that identify it in extant literature. The following chapter explores the relationship between SMEs and cloud computing and also highlights the research problem of this study.

# CHAPTER 3: Small to Medium Enterprises (SMEs)

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## 3.1 Introduction

The previous chapter explored the concept of cloud computing from both a technological and business perspective. The definition for cloud computing for the purposes of this study was also established in the previous chapter. This chapter explores small to medium and enterprises (SMEs) in greater detail. The definition of an SME for the purposes of this study is established. In addition, the relationship between cloud computing and SMEs is also explored. The problem that this study seeks to address is then highlighted.

For over a decade, small to medium enterprises (SMEs) have been touted as playing a significant role in the development of the economic and social environments of most countries (OECD, 2002; Parida, 2008; Olawale and Garwe, 2010; Yeboah-Boateng and Essandoh, 2014; Vidhyalakshmi and Kumar, 2016; OECD, 2017; Senarathna, 2018; Khanda and Doss, 2018). According to the Organisation for Economic Cooperation and Development (OECD)'s 2017 report on enhancing the contributions of SMEs in global economies, SMEs account for on average seventy percent (70%) of all the jobs in OECD member countries.<sup>6</sup> According to OECD (2017), in most developing economies, SMEs contribute up to forty-five percent (45%) of total employment and thirty-three percent (33%) of GDP. Johnston, et al. (2008), observed that South African SMEs were increasingly becoming key to the economic development of both rural and urban areas. Rungani and Potgieter (2018) supported this notion; highlighting that in South Africa, SMEs contribute approximately forty-two percent (42%) of the national gross domestic product (GDP) and sixty percent (60%) of total employment. SMEs, thus, have the potential to have a significant positive impact on the global economy as a whole (OECD, 2017).

Information and communication technologies (ICTs), have been touted as playing a crucial role in driving and accelerating SMEs to better achieve their operational objectives (Yeboah-Boateng and Essandoh, 2014; Vidhyalakshmi and Kumar, 2016; Wamuyu, 2017; Wambugu and Ndiege, 2018).

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<sup>6</sup> <https://www.oecd.org/about/document/list-oecd-member-countries.htm>

However, SMEs face several challenges such as a lack of technology know-how to harness its advantages fully, unclear return on investments, cluttered product portfolios and high investments made in legacy systems (Vidhyalakshmi and Kumar, 2016). As such, due to the benefits that they promise (see Section 2.10), cloud services are increasingly being viewed as ideal for SMEs (Kourik, 2011; Yeboah-Boateng and Essandoh, 2014; Vidhyalakshmi and Kumar, 2016; Assante, et al., 2017; Branco Jr, Sa-Soares and Rivero, 2017; Ahmad 2018; Senarathna, 2018). This chapter, thus, seeks to understand SMEs and the environment they operate in as well as to establish exactly how cloud services can be of benefit to them.

### 3.2 Definition

There is no universal definition of SMEs in the literature as they are defined differently depending on their geographical location and economic region (Kayanula and Quartey, 2000; OECD, 2002; Abubakar, Bass and Allison, 2014; OECD, 2017). According to OECD (2017) this is because the dimensions small and medium of a business are relative to the size of the domestic economy. The South African National Small Business Amendment Act of 2003 particularly makes use of three parameters to define SMEs, namely; the number of employees, total turnover and the total gross value of assets excluding fixed property assets (Government Gazette of the Republic of South Africa, 2003). The actual values vary across different sectors in certain instances; however, the ranges are summarised in the Table 6 below.

**Table 6: South African definition of SMEs, adapted from the Government Gazette of the Republic of South Africa (2003) and Olawale and Garwe (2010)**

Size	Number of Employees	Total Turnover	Gross Value of Assets
Small	1-49	R13 million maximum	R5 million maximum
Medium	51-200	R51 million maximum	R19 million maximum

Bolton (1971) came up with a similar way to classify and, thus, define SMEs. He recommended that SMEs be statistically defined, using varying numbers of employees in some sectors and using

the total turnover (which also varied across some sectors) in other sectors, as shown below in Table 7.

**Table 7: Bolton's SME definitions, adapted from (Bolton, 1971, p3)**

Industry	Statistical definition of a small businesses adopted by the Committee (1)	Small businesses as a % of all firms in the industry, 1963 (2)	Proportion of total employment in small businesses, 1963 (3)	Average employment per small business, 1963 (4)
Manufacturing	200 employees or less	94%	20%	25
Retailing	Turnover of £50 000 p.a or less	96%	49%	3
Wholesale trades	Turnover of £200 000 p.a or less	77%	25%	7
Construction	25 employees or less	89%	33%	6
Mining/Quarrying	25 employees or less	77%	20%	11
Motor trades	Turnover of £100 000 p.a or less	87%	32%*	3*
Miscellaneous services	Turnover of £50 000 p.a or less	90%	82%	4
Road Transport	5 vehicles or less	85%	36%*	4*
Catering	All excluding multiples and brewery-managed public houses	96%	75%*	3*

Yeboah-Boateng (2013) however, argued that this created multiple definitions of an SME which according to Kayanula and Quartey (2000), made the definition very complicated for any generalisation to be applied across countries. Furthermore, Kayanula and Quartey (2000) and Yeboah-Boateng (2013) also argued that due to the instability inherent in currencies, an SME definition that included monetary valuations such as annual revenues was subject to change as a result of fluctuations in the currencies; again making generalising research findings a challenging endeavour. As such, the number of employees parameter alone has been used to describe SMEs across several studies in the literature (Modimogale and Kroeze, 2009; Yeboah-Boateng, 2013; Mohlameane and Ruxwana, 2014; OECD, 2017). Reynoso, Osuna and Figueroa (2014), however, advocated that this view whilst simple, was obsolete as it did not take into account that developments in technology such as ICTs are now making it possible for business sizes to be

significantly reduced whilst still maintaining similar or even better productivity levels (in terms of business turnover) to business with a larger size.

However, all definitions that are based on size (that is, number of employees, total turnover, value of assets etc.) have been subjected to criticism, as they were deemed as not being universally applicable in all contexts (Kayanula and Quartey, 2000). The problem, according to Storey (1994) is that a certain measure of size when applied in one context can lead to a different result when applied in a different context. For instance, an SME that employs ninety-nine (99) people can be regarded as being small in one region or sector and medium in another region or sector. The key, according to Abor and Quartey (2010), is therefore to use a definition that is more appropriate for a particular target region.

Following the preceding discussions, this study will therefore align with the South African National Small Business Amendment Act of 2003 (Government Gazette of the Republic of South Africa, 2003)'s definition of an SME with regard to the number of employees and total turnover parameters. This allows for sufficient inclusion of most SMEs in South Africa, whilst simultaneously making sure the definition is not overly complex. An SME will, thus, be defined as any business that employs less than two hundred (200) employees or has a total turnover of not more than R51 million in this study.

### **3.3 SMEs Characteristics and Challenges**

SMEs are quite different from large enterprises. According to Reynoso, Osuna and Figueroa (2014), in most cases, SMEs cannot or prefer not to be large enterprises, due to several reasons which can range from the lifestyle preferences of their owners to the characteristics of the markets they operate in, which can be niche in nature. They are, however, generally affected by factors and challenges which are distinctly different from those that affect large enterprises and they respond to these differently and with varying impacts (Reynoso, Osuna and Figueroa, 2014).

#### **3.3.1 Characteristics**

Bolton (1971) first established that an SME generally, has a relatively small share of the market it operates in, is managed by its owners or part owners in a way that is personalised and is not part of a larger enterprise, therefore the owners or managers can freely make decisions without any

outside influence. This view of an SME has however been criticised for several reasons. Storey (1994) and Kayanula and Quartey (2000) argued that managing an SME in a personalised way by the owners was only possible when the number of employees was small, because when the number increases to over one hundred (100) employees, that responsibility is often offloaded onto a team of managers. Furthermore, Storey (1994), argued that contrary to the committee's assertion that SMEs have a relatively small market share, the SMEs usually operate in a niche market, providing a specialised service or product in a monopolistic fashion.

The literature also cites a number of other characteristics that distinguish SMEs from large enterprises. Whilst the SME sector is quite heterogeneous in nature (Reynoso, Osuna and Figueroa, 2014), Brezinova (2013) particularly mentions the concentration of multiple work functions on a few employees, an informal leadership style and a preference on communicating orally, as characteristics typical of any SME. They have also been noted to spend a significantly lesser amount of money on development and research than their larger counterparts (OECD, 2002; Reynoso, Osuna and Figueroa, 2014). Employee training, including business training for the owners and/or managers, is also minimal amongst most SMEs (OECD, 2002; Murphy, 2002; Reynoso, Osuna and Figueroa, 2014).

In addition, according to Kyobe, Namirembe and Shongwe (2015), SMEs are also more flexible, and they respond and change quicker to a rapidly changing environment than larger enterprises, possibly due to their size and the close proximity to top management that employees enjoy. Storey (1994) reflected a similar view wherein he believed SMEs were much more likely to easily change, evolve or innovate than larger enterprises. They have further, been believed to have a better ability to make more efficient use of scarce resources than larger enterprises, mainly due to their ability to invest so little capital whilst simultaneously being very labour intensive and hence very productive (Kayanula and Quartey, 2000). This is in addition to Storey (1994)'s assertion that SMEs operate in a more uncertain environment than larger enterprises and that they are more consistent in their internal motivations and actions.

### **3.3.2 Challenges**

There is also some acknowledgement in the literature that SMEs face a significant amount of challenges that affect their daily operations (OECD, 2000; Quaye, et al., 2014; Vidhyalakshmi,

2016; Wambugu and Ndiege, 2018). According to Reynoso, Osuna and Figueroa (2014), these are often different from the challenges that larger enterprises face. A lack of finance appears to be one of the primary challenges that SMEs face, which has been cited in the literature (OECD, 2000; Kayanula and Quartey, 2000; OECD, 2002; Quaye, et al., 2014; OECD, 2017; Wamuyu, 2017; Wambugu and Ndiege, 2018). This is often seen as a driver for the adoption of cloud services (Wamuyu, 2017, Wambugu and Ndiege, 2018). SMEs often have to seek assistance from alternate sources of finance such as personal and family relationships (OECD, 2017). As a result, Murphy (2002) believes that this lack of finance affects their ability to effect organisational change such as changes in work organization, even though market developments and demands can sometimes warrant such changes.

According to the OECD (2017), a significant number of SMEs are persistently challenged with the adoption of new technologies and as such, are lagging behind their larger counterparts in adopting new technologies. This lag has been observed to emanate from a lack of investment in complementary knowledge-based assets such as research and development, human resources, organisational changes and process innovation (OECD, 2017). Modimogale and Kroeze (2009), note how an increasing number of SMEs in South Africa sometimes have to refer to ICT service providers as well as friends or family members who might have ICT knowledge, to get advice on technological issues. This, Modimogale and Kroeze (2009) believe, reflects a general lack of ICT expertise amongst a significant number of SMEs; a notion also supported by Wamuyu (2017). According to OECD (2017), this has significant negative implications on their capacity to turn technological change into innovation and productivity growth. According to Kayanula and Quartey (2000), even though most SMEs use relatively unsophisticated technology, an insufficient supply of skilled labour when it is needed has the potential to limit opportunities for specialisation, may inflate costs and be a hindrance to flexible management of operations. As such, the need for the adoption of cloud services has been observed to emanate from these challenges (Wamuyu, 2017).

Other challenges that have been cited in the literature include a general lack of managerial and entrepreneurial expertise amongst the SME owners (Kayanula and Quartey, 2000; Reynoso, Osuna and Figueroa, 2014; OECD, 2017). According to Kayanula and Quartey (2000), this is the case in the majority of the SMEs, despite the availability of a plethora of institutions that provide training

and advisory services in that regard. As a result, Reynoso, Osuna and Figueroa (2014) believe that this affects the owners' ability to utilise information, technological innovations and financial support from public institutions.

Compliance with regulations has also been cited as another challenge that SMEs face (Kayanula and Quartey, 2000; OECD, 2017). Kayanula and Quartey (2000) accentuate how SMEs experience similar regulation compliance costs to large enterprises but in turn they have limited capacity to market their products both, in their domestic and international markets. According to OECD (2017), this is because SMEs lack in-house expertise and lack information about the regulatory environment. In addition, SMEs have also been observed to incur additional expenses such as paying for external advisors or training staff to comply with new regulatory obligations than their larger counterparts (OECD, 2017). These costs can be a huge burden to bear for most SMEs and may therefore negatively affect their operations (Kayanula and Quartey, 2000; OECD, 2017). Furthermore, according to Kayanula and Quartey (2000), associations that favour SME interests in policy formulation processes appear to have limited roles to play when compared with those for large enterprises. Coupled to this, due to the heterogeneous nature of the SME sector (Reynoso, Osuna and Figueroa, 2014), their interests are wide ranging which makes it even more challenging for them to collectively defend these interests (Kayanula and Quartey, 2000).

However, ICTs, play a crucial role in assisting SMEs to evolve, innovate and compete on a global scale (Lin, 2007; Gago and Rubalcaba, 2007; Vidhyalakshmi and Kumar, 2016; OECD, 2017; Wamuyu, 2017; Wambugu and Ndiege, 2018; Senarathna, 2018) and, thus, can potentially mitigate some of these challenges. Therefore, there is some competitive value for SMEs that choose to make use of ICTs (Bazhenova, Taratukhin and Becker, 2011; Ismail, Jeffery and Van Belle, 2011).

### **3.4 ICT usage amongst SMEs**

Extant literature appears to support the notion that there are indeed some positive benefits that can accrue to SMEs through the use of ICTs (Kotelnikov, 2007; Mutula and Van Brakel, 2007; Ismail, Jeffery and Van Belle, 2011; Mohlameane and Ruxwana, 2014; Vidhyalakshmi and Kumar, 2016; Wamuyu, 2017; Wambugu and Ndiege, 2018). Kotelnikov (2007), however, accentuates that it is seldom the case that SMEs use ICTs at the same level of complexity as larger enterprises. As such,

Ismail, Jeffery and Van Belle (2011) observed that there was some variation in the levels of acceptance and usage of ICTs in SMEs.

Kotelnikov (2007) described the complexity of ICT usage amongst SMEs as a continuum ranging from basic communication (use of a fixed telephone line or mobile phone), basic Information Technology (use of a personal computer with simple software, internet and possibly a printer), advanced communication (use of the internet for communicating e.g. email, video conferencing, Voice Over Internet Protocol (VoIP) etc.) and advanced information technology (use of a personal computer with advanced software e.g. Enterprise Resource Planning (ERP) systems). Ismail, Jeffery and Van belle (2011) similarly identified the different strata of complexity of ICT usage amongst SMEs. They distinguished between general ICT usage (internet/intranet use, email, website presence etc.), production-oriented ICT usage (accounting software, ERP systems etc.) and advanced ICT usage (cloud computing, mobile payment systems etc.). Vidhyalakshmi (2016), identified two types of SMEs; unorganized and sophisticated. Unorganized SMEs were described as not having any set business processes and existing merely for subsistence. Sophisticated SMEs on the other hand, were described as having predefined standards and processes. The usage of ICTs was believed to be depended on the type of SMEs; with sophisticated SMEs utilising much more complex technological solutions (Vidhyalakshmi, 2016). Furthermore, Hassan and Ogundipe (2017), posit that the level of the owners' ICT skills and knowledge have a bearing on the level of ICT adoption by SMEs.

Whilst SMEs use ICTs at different level of complexity, Karim, et al. (2018) observed that the majority of SMEs use ICTs moderately for their day to day business activities; with only a small percentage (30%) having high ICT usage. According to Lu et al. (2019) as SMEs' number of employees and amount of turnover increases, the reliance on ICTs for day to day business activities also increases. Adeniran and Johnston (2014) accentuated that in South Africa, technology related SMEs (usually found in the manufacturing, construction and ICT sectors) generally used more advanced technology than non-technology related SMEs. Lu et al. (2019) seemed to support this argument, as they observed that SMEs in the construction industry in China have a more comprehensive and integrated application of ICTs. These SMEs used ICTs for inter-organizational coordination, data analysis and utilization, as well as business and service innovation.

Adeniran and Johnston (2014), observed that in general, SMEs across the different ICT usage spectrums generally used the internet for procuring information, for banking, for marketing, for finding partnerships and for establishing new business opportunities. However, according to Karim et al. (2018), three major categories of ICTs can be adopted by SMEs namely: general-use ICTs (email and internet access), production integrating ICTs (local area networks, electronic data interchange and the intranet) and market-oriented ICTs (relevant enabling tools such as websites). This appeared to support Ismail, Jeffery and Van Belle (2011)'s observation in South Africa wherein SME ICT usage was found to be limited to only internet access, emails, website hosting, VoIP and bulk SMS communication. Ismail, Jeffery and Van Belle (2011) attributed this to a general lack of awareness by SME owners of other technologies, as well as the benefit of using them.

Despite, ICTs being perceived as beneficial for SMEs wanting to create value for their businesses (Ismail, Jeffery and Van Belle, 2011; OECD, 2017, Jaganathan et al., 2018; Karim, et al., 2018; Mwila and Ngoyi, 2019), there are some challenges to their use that exist in addition to the operational challenges that SMEs already face (MacGregor, et al., 2002; Cheshire and Nassiuma, 2017; Jaganathan et al., 2018; Oyebiyi et al., 2018; Mwila and Ngoyi, 2019). According to Jaganathan et al. (2018), some of these challenges include lack of funding, lack of government support, owners' lack of ICT skills, the high cost of ICT implementation as well as a lack of exposure to relevant ICTs. However, SMEs in developing countries, have been observed to experience a unique set of challenges when adopting ICTs as opposed to those in well developed countries (Bazhenova, Taratukhin and Becker, 2011; Oyebiyi et al., 2018; Mwila and Ngoyi, 2019).

### **3.4.1 Challenges to ICT usage by SMEs in developing countries**

Electricity constraints have been touted as a major challenge to SME ICT usage in developing countries (Apulu and Ige, 2011; Oyebiyi et al., 2018; Mwila and Ngoyi, 2019). Oyebiyi et al. (2018) believes these constraints are the primary reason affecting the implementation of ICTs by Nigerian SMEs. According to Oyebiyi et al. (2018), this in part emanates from a lack of vital infrastructure to support ICTs which comes from inadequacies in their provision by the respective governments. Bazhenova, Taratukhin and Becker (2011) and Kuyoro, et al. (2013) highlight a

general lack of sound policies and interventions from the respective governments in most developing countries to support ICT usage by SMEs. Poor telecommunication infrastructure (Modisha and Van Belle, 2012; Awodele and Omotunde, 2013; Cheshire and Nassiuma, 2017; Oyebiyi et al., 2018; Mwila and Ngoyi, 2019) which is often costly to access (Cheshire and Nassiuma, 2017; Mwila and Ngoyi, 2019), is also another cited challenge that SMEs in developing countries have to deal with when wanting to use ICTs. According to Iddris (2012), SMEs in developing countries, thus, generally incur a higher cost of ICT implementation than their counterparts in developed countries. According to Mwila and Ngoyi (2019) 38.5% of the queried SMEs in Zambia mentioned that acquiring, using and maintaining ICTs was too expensive and as such, not feasible for them. This makes it even more challenging for the SMEs, given their financial limitations. As such, Bazhenova, Taratukhin and Becker (2011) highlighted how technology solutions designed for developed countries might not be compatible with most developing countries, even though SME needs in both environments may be similar.

Other challenges that have been cited in the literature as plaguing SMEs in developing countries include, a lack of sufficient literacy in ICT (Modimogale and Kroeze, 2009; Cheshire and Nassiuma, 2017), an inability to synchronise existing business processes with available ICTs, a lack of sound strategies for ICT, insufficient research and development, legal and regulatory issues, poor ICT implementation practices and insufficient understanding of the functioning of knowledge economies (Kuyoro, et al., 2013). South African SMEs are not exempted from some of these challenges.

According to Kew and Herrington (2009), even though a significant amount of SMEs in South Africa appeared to use ICTs, high internet tariffs, high access costs of telecommunication infrastructure, high costs of prerequisite hardware and software and a lack of awareness of the benefits promised by ICTs (Mohlameane and Ruxwana, 2014) are major stumbling blocks to the use of ICTs by these SMEs. In addition to this, Ismail, Jeffery and Van Belle (2011) also cited poor communication infrastructure as another challenge South African SMEs have to content with; resonating with Mwila and Ngoyi (2019). Ismail, Jeffery and Van Belle (2011) indicated that South Africa has developed in a disparate manner with some areas (mostly rural areas) lacking basic infrastructure like electricity and fixed lines that are required to propel ICT use whilst other areas (mostly urban areas) have better access to the infrastructure. As a result of these challenges, SMEs

in developing countries have been observed to be adopting ICTs at a much slower rate than those in developed countries (Bazhenova, Taratukhin and Becker, 2011; Kuyoro, et al., 2013; Cheshire and Nassiuma, 2017; Oyebiyi et al., 2018).

### **3.4.2 Mitigation of ICT usage challenges through the use of cloud services**

Even though a number of challenges with the use of ICTs by SMEs have been cited in the literature, there is some consensus that SMEs stand to benefit substantially from the use of cloud services (Vidhyalakshmi and Kumar, 2016; Assante, et al., 2017; Branco Jr, Sa-Soares and Rivero, 2017; Ahmad 2018; Senarathna, 2018; Wambugu and Ndiege, 2018). Prasad, et al., (2014), observed that SMEs are increasingly perceiving the benefits offered by cloud computing as outweighing the challenges associated with its use and, as such, are increasingly adopting it. According to Wamuyu (2017), SMEs are now exploring ways to reduce their computing costs fostered by an ICT landscape that enables obtaining ICT infrastructure services from a range of sources and acquisition models. This trend appears to be also true for a number of developing countries. Abubakar, Bass and Allison (2014) observed that SMEs in Nigeria were increasingly more concerned about the benefits gained through the use of cloud services than they were concerned with issues such as security, privacy and trust. This is despite the additional challenges associated with ICT usage in Nigeria (Oyebiyi, et al., 2018). Furthermore, Khanda and Doss (2018) highlight how SMEs in countries such as Kenya, South Africa, Ghana and India are now increasingly embracing the use of cloud services. Based on the preceding discussions, Table 8 below highlights how some of the common ICT related challenges that are faced by a significant number of SMEs could be mitigated through the use of cloud services.

**Table 8: SME ICT related challenges and corresponding cloud computing mitigations**

Challenge	Cloud Computing Mitigation
Lack of ICT expertise/ difficulty attracting skilled labour.	As cloud service providers assume all the responsibilities of maintaining the relevant ICT infrastructure, SMEs essentially would have access to ICT expertise that they would otherwise not have, internally.
High costs of prerequisite hardware and software and/or ICT implementation.	There is no need for upfront investments in hardware and software as cloud service providers assume that responsibility.
Difficulty in innovating and adopting new technologies/Insufficient research and development.	Cloud service providers are constantly researching about new technologies and developing their products; enabling SMEs to remain abreast with the latest technologies.
Incompatibility of some ICTs with the environment in most developing economies.	Cloud services can be readily customised to suit any user's needs regardless of geographical location.

### 3.5 SME Cloud Services Adoption

Despite all the benefits that the use of cloud services is touted to provide, the actual adoption of cloud services by SMEs remains low when compared to their large counterparts (Collins and Lam, 2014; Asiaei and Rahim, 2016; Chemjor and Lagat, 2017; Senarathna, 2018). According to Mohlameane and Ruxwana (2014) South African SMEs are no exception to this trend. Adane (2018), argues that SMEs need to have a clear cloud adoption strategy if there are to gain any measurable benefits from cloud services. However, Malik, et al. (2019), indicate that there is a shortage of industry-specific principles for SMEs to follow when adopting cloud services. This is supported by Asiaei and Rahim (2016) wherein they posit that a lack of clear standard guidelines and knowledge of how to adopt and utilize cloud technologies is one of the major obstacles for their adoption by SMEs. A limited amount of literature has either provided these guidelines or given directions on how the SMEs should establish these guidelines (Prasad, et al., 2014; Asiaei and Rahim, 2016; Malik, et al., 2019). In addition to this, there is a limited focus on the aforementioned problem by literature within the context of developing economies, such as South Africa. In an investigation of the awareness of cloud computing by South African SMEs, Mohlameane and Ruxwana (2014), reiterated this notion. They argued that there is a lack of awareness and exposure to cloud services and the guidelines for South African SMEs to follow, in order to establish and localize their benefits and fit for the South African SME context. There is

thus, a need for a framework which can be used as a guide by SMEs in South Africa as they adopt cloud services.

### **3.6 Summary**

This chapter looked at the various characteristics of SMEs and the environment they operate in. In addition, the chapter also established how cloud services can be of benefit to them. The problem that this study seeks to address was then ultimately presented to the reader. The next chapter establishes the theoretical framework on which to base the investigation into the considerations that SMEs need to take into account when adopting cloud services.

# CHAPTER 4: Theoretical Framework

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## 4.1 Introduction

From the preceding chapters, one can appreciate the importance of ICTs to SMEs; especially how the adoption of cloud services can be of substantial benefit to their operations. The value from ICTs can, however, only be unlocked if the ICTs are adopted by their intended users, which often does not occur (Agarwal and Prasad, 1998). As such, there has been an increased focus on trying to understand and manage how users react to new ICT innovations in the literature; with a plethora of theories being proposed in order to explain attitudes and behaviours towards new ICT innovations (Agarwal and Karahanna, 2000). Prior to investigating the considerations that SMEs need to take into account when adopting cloud services, therefore; it is essential that we have a look at some of these theories that have emerged, in order to understand and explain ICT adoption. These theories have been systematically applied in the literature to study ICT innovations of all kinds (Thong and Yap, 1995). Oliveira and Martins (2011), however, accentuated that the theories can be split between those that look at adoption at an individual level and those that look at adoption at an organisational level. As this study, focuses on adoption of cloud services by SMEs, the latter will be of greater interest and will hence merit greater focus.

## 4.2 ICT Innovations Adoption Theories

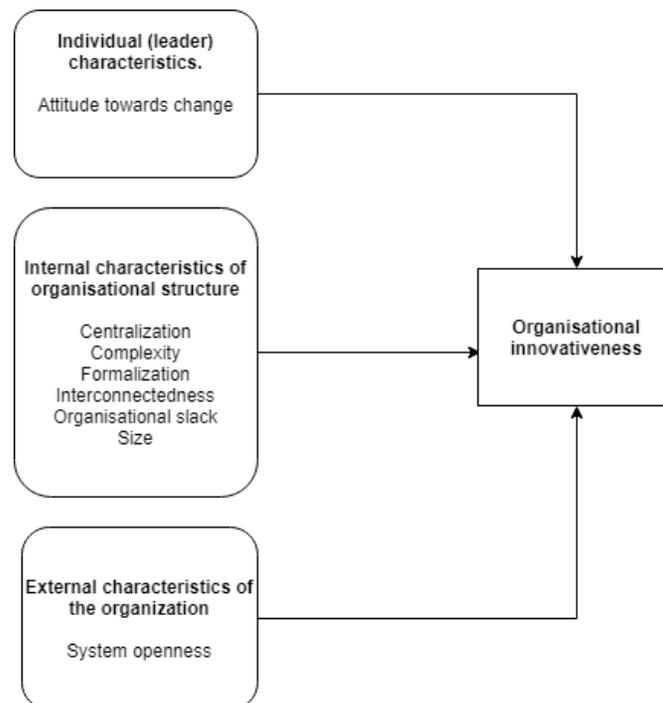
Bradley, (2009) highlighted a number of ICT innovation adoption theories that have been proposed over the last two decades. Whilst seemingly acknowledging the existence of a plethora of these theories however, Oliveira and Martins (2011) argue that the most used of these theories in the literature are the Technology Acceptance Model (TAM) (Davis, 1986; Davis, 1989; Davis, Bagozzi and Warshaw, 1989), the Theory of Planned Behaviour (TPB) (Ajzen, 1991), the Unified Theory of Acceptance and use of Technology (UTAUT) (Venkatesh, et al., 2003) the Diffusion of Innovations Theory (DOI) (Rogers, 1995) and the Technology-Organisation-Environment (TOE) framework (Tornatzky and Fleischer, 1990). A look at some of the literature on ICT innovation adoption theories over the last decade appears to support this observation (Thong and Yap, 1995; Manuelli, Latu and Koh, 2007; Bradley, 2009; Korpelainen, 2011; Awa, Ukoha, Emecheta, 2012; Lai, 2017; Taherdoost, 2018).

## 4.2.1 Organisational level ICT innovation adoption theories

Of the aforementioned theories, however, Oliveira and Martins (2011) point out that only the DOI theory and the TOE framework can be applied to understand ICT innovations adoption at an organisational level. It is therefore logical that we investigate these in greater detail as they are more relevant to this study.

### 4.2.1.1 The diffusion of innovation (DOI) theory

Rogers (1983), highlighted that, the DOI theory views new innovations as being communicated via certain mediums, across time and within particular social systems. As such, according to Oliveira and Martins (2011), the DOI theory can enable an exploration of how, why and at what rate, new ideas and ICTs can permeate through particular cultures, both at an individual and an organisational level. According to Rogers (1995), the DOI theory at organisational level views innovativeness (the adoption of cloud services in our case) as being affected by independent variables such as individual (leader) characteristics, internal characteristics of organisational structure and external characteristics of the organisation. Figure 6 below shows the theory pictorially.

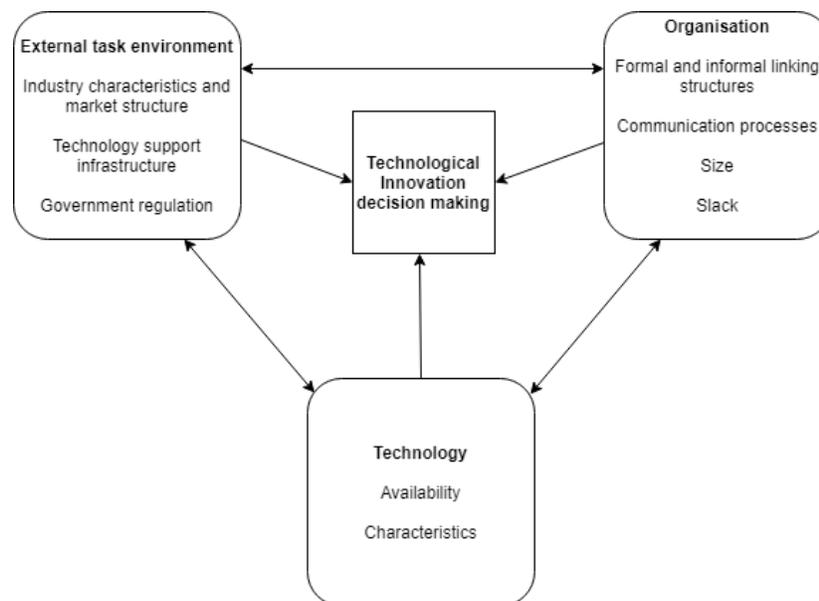


**Figure 6: DOI theory at organisational level adapted from (Rogers, 1995)**

Rogers (1995) defined *individual characteristics* as a leader's attitude towards change; *internal characteristics of organisational structure* as observed traits of the organisation such as centralisation, complexity, formalisation interconnectedness, organisational slack and size - whereby centralisation is the extent to which power and control in a system is within the hands of a relatively few individuals, whereas complexity is the extent to which an organisation's members have relatively high levels of knowledge and expertise, formalisation is the extent to which an organisation accentuates the following of rules and procedures by its members, interconnectedness is the extent to which interpersonal networks link units within a social system, organisational slack is the extent to which unused resources are available to an organisation and size is the number of employees in an organisation. *External characteristics of the organisation* refers to the extent to which a system is open (Rogers, 1995).

#### 4.2.1.2 The Technology-Organisation-Environment (TOE) framework

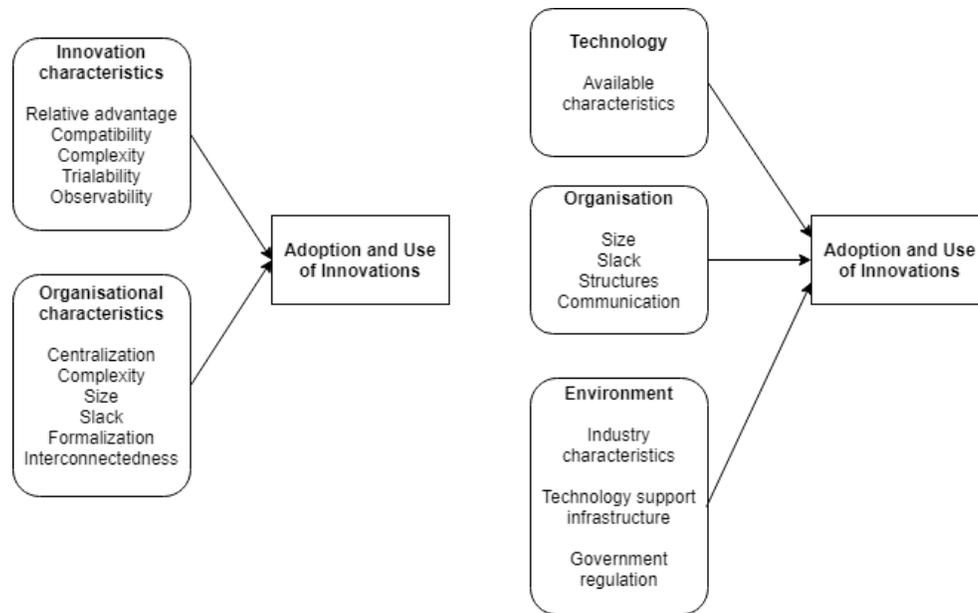
On the other hand, the TOE framework identifies three contextual aspects of an organisation that have an influence on the process whereby an organisation adopts an innovation; namely: the technological context, organisational context and the environmental context (Oliveira and Martins, 2011). Figure 7 below, shows a pictorial view of the framework as originally presented by Tornatzky and Fleischer (1990).



**Figure 7: Original TOE framework and its constructs, adapted from (Tornatzky and Fleischer, 1990)**

The technological context refers to existing technologies that an organisation uses (internal technologies), as well as those that it does not use but which are available on the market (external technologies) (Oliveira and Martins, 2011; Baker, 2012). The organisational context refers to descriptive traits about the organisation and its resources such as linking structures between employees, intra-firm communication processes, organisational size and slack resources (Oliveira and Martins, 2011; Baker, 2012). The environmental context is the domain within which an organisation conducts its business (Oliveira and Martins, 2011). It includes the industry structure, the presence or absence of service providers for technology as well as the regulatory environment (Baker, 2012).

While at a glance, they might seem like two totally different theories, however, the DOI theory and the TOE framework have been noted as being closely aligned (Zhu, Kraemer and Xu, 2003; Hsu, Kraemer and Dunkle, 2006; Oliveira and Martins, 2011; Baker, 2012). In particular, the *individual leader characteristics* and the *internal characteristics of organisational structure* from the DOI theory have been noted as being similar to the TOE framework's *organisational context* and the *external characteristics of the organisation* from the DOI theory similar to the TOE framework's *environmental context* (Baker, 2012). Furthermore, the characteristics of the innovation that were implicitly emphasized by Rogers in the DOI theory have also been equated to the TOE framework's *technological context*, as depicted below in Figure 8 (Zhu, Kraemer and Xu, 2003; Zhu, et al., 2006; Baker, 2012).



**Figure 8: Comparison of the DOI theory and the TOE framework respectively, adapted from (Hsu, Kraemer and Dunkle, 2006).**

According to Hsu, Kraemer and Dunkle (2006), however, the TOE framework's clear outline of the environmental context makes it better than the DOI theory in explaining intra-organisation innovation adoption. Resonating, with the aforementioned view, Oliveira and Martins (2011), further added that the TOE framework's environmental context better unravels opportunities and constraints for the adoption of technological innovations. The TOE framework also appears to have a solid theoretical grounding and extensive empirical support (Oliveira and Martins, 2011; Baker, 2012; Alshamaileh, 2013; Al-Jabri and Alabdulhadi 2016; Karim and Rampersad, 2017; Sallehudin, et al., 2018). For the purposes of this study therefore, the TOE framework will be the base framework that will be used to explore the considerations that SMEs should take into account when adopting cloud services.

### 4.3 Application of the TOE framework to study cloud adoption

The TOE framework is quite generic in that it can be applied to understand the adoption of innovations of many kinds (Ramdani and Kawaiek, 2007; Oliveira and Martins, 2011; Baker, 2012). As such, it allows researchers to examine a broad set of contextual factors; allowing them to vary them for each new innovation (Baker, 2012; Alshamaileh, 2013). No single TOE framework can, therefore, be used to study all types of innovations, as they are quite diverse and each one is affected by a different set of factors (Ramdani and Kawaiek, 2007).

The question then arises about which factors are key in studying cloud services adoption by SMEs, as it is imperative that we include the right kind of constructs within the TOE framework, for the purposes of this study. A look at prior literature that has utilised the TOE framework to study the factors influencing the adoption of cloud services by businesses will thus be essential in providing guidance for determining which constructs to include.

Table 9 below highlights these studies and the constructs they included within their TOE frameworks. From these constructs, and consistent with Alshamaileh (2013), the researcher selected a manageable and yet theoretically important set that closely relates to cloud services adoption for the purposes of this study. Even though some of the constructs that were included in these TOE frameworks appear to have stemmed from Rogers' DOI theory (relative advantage, complexity, compatibility, trialability), they were looked at within the context of the TOE framework and, thus, were viewed as part of it. Table 10 below lists the selected constructs, as well as their definitions.

**Table 9: Constructs used to study the technological, organisational and environmental factors that influence cloud services adoption across several studies**

Author	Technological factors	Organisational factors	Environmental factors
Alshamaileh, 2013	<ul style="list-style-type: none"> <li>- Relative advantage</li> <li>- Uncertainty</li> <li>- Compatibility</li> <li>- Complexity</li> <li>- Trialability</li> </ul>	<ul style="list-style-type: none"> <li>- Size</li> <li>- Top management support</li> <li>- Innovativeness</li> <li>- Prior technology experience</li> </ul>	<ul style="list-style-type: none"> <li>- Competitive pressure</li> <li>- Industry</li> <li>- Market scope</li> <li>- Supplier computing support</li> </ul>
Yeboah-Boateng and Essandoh, 2014	<ul style="list-style-type: none"> <li>- Trialability of cloud services</li> <li>- Existence of required IT infrastructure and resources</li> <li>- Compatibility with existing systems</li> <li>- Strength of in-built security systems</li> <li>- Learning capability of employees</li> <li>- Limited technical knowledge about similar technologies</li> <li>- Non-performance of cloud services to support operations</li> </ul>	<ul style="list-style-type: none"> <li>- Top management support and involvement</li> <li>- Resistance towards new technologies</li> <li>- Conformity with work culture and style</li> <li>- Impact of organisational structure and size</li> <li>- First adopters in industry</li> </ul>	<ul style="list-style-type: none"> <li>- Adequate user and technical support from provider</li> <li>- Choice of skilled and expert cloud vendors</li> <li>- Influence of market scope</li> <li>- The nature of the industry</li> <li>- Relationship with providers, government and competitors</li> </ul>
Al-Jabri and Alabdulhadi, 2016	<ul style="list-style-type: none"> <li>- Relative advantage</li> <li>- Complexity</li> <li>- Compatibility</li> </ul>	<ul style="list-style-type: none"> <li>- Top management support</li> <li>- Organisational readiness</li> </ul>	<ul style="list-style-type: none"> <li>- Competitive pressure</li> <li>- Business partner pressure</li> </ul>
Deil and Brune 2017	<ul style="list-style-type: none"> <li>- Technology Readiness</li> <li>- Relative Advantage <ul style="list-style-type: none"> <li>• Complexity</li> <li>• Compatibility</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>- Top management support</li> <li>- Support of Non-IT employees</li> <li>- Firm Size</li> </ul>	<ul style="list-style-type: none"> <li>- Competitive Pressure</li> <li>- Regulatory Support/Influence</li> <li>- Market Environment</li> </ul>
Karim and Rampersad, 2017	<ul style="list-style-type: none"> <li>- Relative advantage</li> <li>- Compatibility</li> <li>- Security concerns</li> <li>- Complexity</li> </ul>	<ul style="list-style-type: none"> <li>- Top management support</li> <li>- Readiness</li> <li><b>Culture</b></li> <li>- Uncertainty avoidance</li> <li>- Power distance</li> <li>- Masculinity</li> <li>- Individualism</li> </ul>	<ul style="list-style-type: none"> <li>- Competitive pressure</li> <li>- Regulatory support</li> <li>-</li> </ul>
Yoo and Kim, 2018	<ul style="list-style-type: none"> <li>- Related advantage</li> <li>- Compatibility</li> </ul>	<ul style="list-style-type: none"> <li>- Top management</li> <li>- Organization readiness</li> </ul>	<ul style="list-style-type: none"> <li>- Competitive pressure</li> <li>- Government regulation</li> <li>- Technology support</li> </ul>
Senarathna (2018)	<ul style="list-style-type: none"> <li>- Relative advantage</li> <li>- Security</li> <li>- Privacy</li> </ul>	<ul style="list-style-type: none"> <li>- Leadership awareness</li> <li>- Slack and interconnectedness</li> <li>- Flexibility</li> </ul>	<ul style="list-style-type: none"> <li>- Competitors</li> <li>- Market</li> <li>- Regulations and service</li> </ul>

**Table 10: Selected TOE constructs related to this study and their definitions**

Context	Construct	Definition
Technological	Relative advantage	The degree to which an innovation is seen as being better than the one superseded by its adopters (Rogers, 2003)
	Complexity	The degree to which adopters of an innovation perceive it as being relatively difficult to understand and use (Rogers, 2003)
	Compatibility	The degree to which adopters perceive an innovation as being consistent with their existing values, past experiences and needs (Rogers, 2003)
	Trialability	The degree to which adopters can experiment with an innovation on a limited basis (Rogers, 2003)
	Uncertainty	The degree to which the result of using an innovation is insecure (Ostlund, 1974; Fuchs, 2005)
	Infrastructural support	The existence of required IT infrastructure and resources (Yeboah-Boateng and Essandoh, 2014)
Organisational	Size	The size of the business (Alshamaileh, 2013)
	Top management support	Devoting time to the innovation adoption project, in proportion to its cost and potential, reviewing plans, following up on results and facilitating management problems associated with integrating computing systems with management processes of the business (Young and Jordan, 2008)
	Prior technology experience	The extent of a user's past experience with similar technologies (Heide and Weiss, 1995; Alshamaileh, 2013)
	Innovativeness	The extent to which a user is relatively earlier in adopting new ideas and/or innovations than other members of the same social context (Rogers, 1983)
Environmental	Competitive pressure	The degree of pressure experienced by a business from competitors within the industry (Oliveira and Martins, 2010)
	Industry	The sector in which a business operates in (Yap, 1990; Goode and Stevens, 2000)
	Supplier support	Activities by the supplier that have a significant effect on a business' probability of adopting an innovation (Frambach, et al., 1998)

### 4.3.1 The technological context

Premkumar (2003) observed that few studies have investigated the impact of technological characteristics in the adoption of new innovations especially within the context of small businesses. However, Al-Jabri and Alabdulhadi (2016) posit that technological characteristics have a significant bearing on adoption decisions. As such, in order to address this, constructs from Rogers' diffusion of innovation theory were adopted; with *relative advantage*, *complexity*, *compatibility* and *trialability* being selected on that basis. Other studies have also employed Rogers' diffusion of innovation theory to better understand the effect of technological characteristics on the adoption of cloud services (Alshamaileh, 2013; Asiaei and Rahim, 2016; Hassan and Nasir, 2017; Lynn, et al., 2018). Hassan and Nasir (2017) observed that the constructs *compatibility*, *complexity* and *relative advantage* were consistently associated with innovation adoption. As such, these constructs were found to be significant factors in innovation adoption and were thus chosen on that basis. *Trialability* was chosen as it was anticipated that adopters of cloud services would want to try out some cloud services first before fully adopting them.

According to Erumban and de Jong (2006), the adoption of new technology presents a lot of risk and uncertainty. As discussed in the preceding chapters, the adoption of cloud computing services also presents some form of risk. As such, the construct *uncertainty* was also deemed as theoretically important for the investigation of the adoption of cloud computing services and hence was included in this study's base TOE framework.

Several studies have highlighted the need for supporting infrastructure (internet access, adequate electricity etc.) as key in the adoption of cloud services (Yeboah-Boateng and Essandoh (2014); Wamuyu 2017; Amankona, Panford and Hayfron-Acquah, 2017; Khanda and Doss, 2018). The construct *infrastructure support* was, thus, included in our base TOE framework on that basis. Whilst there are other constructs within this context that have been used in some studies (Yeboah-Boateng and Essandoh, 2014; Karim and Rampersad, 2017; Sallehudin et al., 2018), they were not common across most of the studies that were reviewed and hence were excluded from this study's base TOE framework.

### 4.3.2 The organisational context

The organisational context has also been touted as an important context in innovation adoption studies (Alshamaileh, 2013; Al-Jabri and Alabdulhadi, 2016). A number of studies on SME innovation adoption have primarily focused on organisational context characteristics (Oguz, 2016; Allen, et al., 2017; Hassan, 2017). For the purposes of this study we included *size*, *top management support*, *prior technology experience* and *innovativeness* in the organisational context of our base TOE framework.

According to Al-Hujran, et al. (2018) organisational *size* is one of the common factors affecting ICT innovation adoption. The debate that has been ongoing for over a decade has been about whether small or large businesses are better at adopting new innovations (Damanpour, 1992). Alshamaileh (2013) posits that on one hand, larger businesses often have better resources, skills and experience to withstand failures than small businesses do. However, Damanpour (1992) argues that smaller businesses are more flexible towards responding to changes in the environment. It is for this reason that this construct was included in the base TOE framework of this study.

*Top management support* has also been touted as key in innovation adoption (Premkumar and Potter, 1995; Low, Chen and Wu, 2011; Al-Jabri and Alabdulhadi, 2016; Karim and Rampersad, 2017; Al-Hujran, et al., 2018; Grandhi, Wibowo and Balasooriya, 2019). In essence, besides making sure that the appropriate strategic vision and direction for the innovation adoption is given, top management support also ensures that the importance of a possible change is communicated to other members of the business and sufficient resources are allocated where they are needed (Premkumar and Potter, 1995; Thong, 1999; Low, Chen and Wu, 2011; Al-Jabri and Alabdulhadi, 2016; Karim and Rampersad; 2017; Al-Hujran, et al., 2018; Grandhi, Wibowo and Balasooriya, 2019). Hence this construct was included in this study's base TOE framework for the aforementioned reasons.

According to Alshamaileh (2013), *prior technology experience* facilitates a user's innovation adoption decision. A number of other studies have also found it to be quite important in innovation adoption (Igbaia, Guimaraes and Davis, 1995; Hunter, 1999; Dholakia and Kshetri, 2004; Alharbi, Atkins and Stanier, 2016; Kreslins, Novik and Vasiljeva, 2018). According to Bandura (1977), there is an association between a user's prior knowledge and their understanding of a new situation.

As such, according to Rogers (2003), a user's innovation adoption decision can be affected by any accumulated experience of using new innovations.

Marcati, Guido and Peluso (2008) accentuated that an organisation's receptiveness towards new ideas plays a crucial role in the adoption of new innovations in small to medium enterprises (SMEs); a view that was also echoed by Alshamaileh (2013). Organisations with a history of innovativeness have been deemed as being more likely to have positive adoption decisions of new innovations (Damanpour, 1991; Marcati, Guido and Peluso, 2008). *Innovativeness* is, thus, an important construct that has been investigated in a number of innovation adoption studies (Leung and Wei, 1998; Lin and Jeffres, 2008; Alshamaileh, 2013; Hoque, 2016; Hwang Huang and Wu 2016; Alan, et al., 2017; Martins, 2018) and has thus, been included in this study's base TOE framework on that basis.

#### **4.3.3 The environmental context**

For the purposes of this study, the constructs *competitive pressure*, *industry* and *supplier computing support* were found to be quite important in this context.

According to Majumdar and Venkataraman (1993), *competitive pressure* that is experienced by a business can strongly influence it to adopt new technology or innovative ideas, to cope with the pressure. Other studies have also accentuated the importance of competitive pressure in facilitating innovation adoption (Crook and Kumar, 1998; Premkumar and Roberts, 1999; Al-Jabri and Alabdulhadi, 2016; Karim and Rampersad, 2017; Yoo and Kim, 2018). According to Loasby and Leibenstein (1976) competition drives managers of a business to look for new innovative ways to bolster production levels, so as to remain competitive. Majumdar and Venkataraman (1993), go further, to accentuate that varying competitive pressures induce varying innovation adoption levels. From the aforementioned discussions, it therefore appears that competitive pressure plays a significant role in innovation adoption and it was, thus, imperative that it be included in this study's base TOE framework.

The *industry* a business operates in has also been observed to have an influence on its decisions to adopt new ICT innovations (Jeyaraj, Rottman and Lacity, 2006; Imre, 2016; Silva and Mattos, 2019). Due to their varying needs, businesses in various industries have been observed to vary in

their level of adoption of new ICT innovations (Yap, 1990; Levenburg, Magal and Kosalge, 2006). This could be due to the fact that different industries have varying information processing requirements which, in turn, have a bearing on businesses' adoption of new ICT innovations (Yap, 1990; Goode and Stevens, 2000). Within the context of cloud computing, *industry* has also been touted as significantly influencing adoption; with businesses in different industries adopting cloud computing services at varying levels (Alshamaileh, 2013).

Finally, *Supplier support* also plays a significant role in businesses' adoption of ICT innovations (Alshamaileh, 2013; Silva and Mattos, 2019). Specifically, the marketing activities that they engage in have been touted as having an influence on the businesses' innovation adoption decisions (Alshamaileh, 2013). According to Premkumar and Roberts (1999), this could be due to businesses being more compelled to use a new ICT innovation if they believe that they have ample support. The suppliers hence act as a source of both capabilities and knowledge (Weigelt and Sarkar, 2009) as well as reassurance (Frambach and Schillewaert, 2002).

#### **4.4 Summary**

In this chapter it was established that the decisions or considerations that SMEs need to take into account when adopting cloud services might be affected by some or all of the aforementioned factors in the base TOE framework (see Table 10). Based on this framework, the next chapter explores how these constructs can be operationalised to determine the actual considerations that SMEs need to take into account when adopting cloud services. This will then answer the first research question of this study.

# CHAPTER 5: SME Considerations for Adopting Cloud Services

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## 5.1 Introduction

The adoption of cloud computing services in enterprises has been observed to be a non-trivial process (Khajeh-Hosseini, et al., 2012; Al-Ismaili, et al., 2016; Alkhalil, Sahandi and John, 2016; Conway, et al., 2017; Al-Jabri, Eid and Sohail, 2018). This is because, a number of factors have to be taken into consideration; some of which might not be immediately obvious to the adopting organisation (Al-Ismaili, et al., 2016; Al-Jabri, Eid and Sohail, 2018). As such, a number of approaches have been suggested in the literature, to support a move to the cloud, through a number of research streams. Some studies have focused on providing guidance for the full cloud adoption life cycle (Conway and Curry, 2012; Rashmi, Mehruz and Sahoo 2012; Jamshidi, Ahmad and Pahl 2013; Karkošková and Feuerlicht, 2014; Bazi, Hassanzadeh and Moeini, 2017; Fahmideh, et al., 2018). However, Conway, Carcary and Doherty (2015), argued that most of these approaches have only provided a high-level structure or roadmap for successfully going through the cloud adoption process. As such, Conway, Carcary and Doherty (2015) sought to provide a more micro-level prescription that can be carried out at a practitioner level. Furthermore, Holloway, et al. (2017) evaluated some of these lifecycles against the perspectives of industry experts and found out that they do not always prevail in practice.

An increasing number of studies have also investigated ways to provide further support for some of the decisions that need to be made, prior to a cloud adoption engagement. This has led to some models and/or frameworks being proposed for assessing the maturity of an organisation's IT capabilities (Conway et al., 2017), assessing and selecting the right service models (Opara-Martins, Sahandi and Tian, 2017), selecting a service provider (Al-Jabri, Eid and Sohail, 2018). Branco Jr, Sa-Soares and Rivero, (2017) also proposed five (5) categories of considerations, that organisations should look at when thinking of moving to the cloud and then organised them, based on their relevance as a result of perspectives from industry experts.

While, these studies have been quite useful in assisting decision makers within organisations to adopt cloud services they have been mostly targeted at large organisations. As such, there is still

a paucity of such studies that are targeted towards SMEs (Carcary, Doherty and Conway, 2014; Hassan, 2017; Deil and Brune, 2017; Senarathna, et al., 2018). Carcary, Doherty and Conway (2014), observed that there was a substantial disconnect between what has been published in the literature with regard to the tasks that are necessary for successful cloud adoption and what is actually carried out by most SMEs. As such, this cloud adoption research, that is mostly targeted towards large organisations might not always be applicable across SMEs (Al-Ismaili, et al., 2016; Senarathna, 2018). This study seeks to address this problem by developing a framework that is applicable to SMEs.

In their exploratory study on the adoption of cloud services by Irish SMEs, Carcary, Doherty and Conway (2014) had some interesting findings which included;

- Only a minority of the SMEs developed criteria for assessing cloud readiness and used the criteria to actually assess their cloud service readiness.
- Although establishing a process to identify potentially suitable processes/services for cloud migration was carried out by the majority of the SMEs, this process was only carried out at a very high level.
- A small number of SMEs established a strategic plan for roll-out of the selected cloud services, documented a strategy for selecting cloud service providers and managed relationships with the service providers.
- Further preparatory steps, as suggested in the literature (Conway and Curry, 2012) were poorly followed by the SMEs.

These findings were mostly attributed to SMEs' significant resource limitations for implementing technology planning projects, their push for greater agility in decision making processes and their inclination towards less formality in and documentation of strategies and plans (Carcary, Doherty and Conway, 2014). As such, these findings are important for the SMEs to be cognizant of, when establishing a framework for cloud adoption that is targeted towards SMEs.

Some suggestions from the literature included;

- That the adoption model/framework should only contain a small number of easy to understand steps that can be implemented with ease, in order for it to be more relevant to SMEs.

- The model/framework should also have an appreciation of most SMEs' inclination towards lower levels of formality in procedures, as well as less documentation of plans and strategies.

With this in mind and with the assistance of the TOE framework from the previous chapter, the following sections establish from the literature, what considerations are important for SMEs to make when adopting cloud computing services.

## **5.2 SME Considerations when Adopting Cloud Services**

Whilst studies on the adoption of cloud services by SMEs remain limited, a number of studies have sought to provide guidance in that respect. As such, some studies have been more exploratory in nature; investigating the manner in which SMEs adopt cloud services (Carcary, Doherty and Conway, 2014) while others focused on developing cloud readiness models that could be used to assess an SME's fit to adopt cloud services (Colicchio, Giovanoli and Stella, 2015; Workineh, Garcia and Midekso, 2018). Other studies have also sought to investigate the challenges as well as the risks that are faced by SMEs, as they adopt cloud services and ultimately provide guiding frameworks that seek to overcome such risks and/or challenges (Khan and Al-Yasiri, 2015; Gupta, Saxena and Saini, 2016).

Extant literature on SME cloud adoption, suggests the existence of distinct phases of cloud adoption; each characterised by a number of activities that need to be carried out at each phase. Whilst, the naming convention of the phases differed across several studies, three distinct phases appeared to stand out; a cloud preparation phase, followed by a cloud implementation phase and finally, a cloud maintenance phase. Some studies have sought to provide guidance on the entire adoption process across the phases (Khan and Al-Yasiri, 2015), whilst others have only looked at certain parts of the adoption process (Workineh, Garcia and Midekso, 2018). This study is only concerned with the first two (2) phases of the cloud adoption process.

The next few sections seek to establish the consensus in extant literature on the key considerations (activities/tasks) that SMEs need to take into account when adopting cloud services and where they fit into the cloud adoption phases, as well as the overall TOE framework. Table 11 below places each activity/task within its respective phase as well as its TOE context, to enable the reader to better understand the considerations and where they fit in.

**Table 11: Cloud adoption considerations and their relationship with the TOE framework described in Chapter 4**

TOE Context	(1) Cloud Preparation Activity/Task	Matching/Similar Construct(s)	(2) Cloud Implementation Activity/Task	Matching/Similar Construct(s)
<b>Technological</b>	<ul style="list-style-type: none"> <li>Identify suitable services to migrate (Carcary, Doherty and Conway, 2014; Khan and Al-Yasiri, 2015; Colicchio, Giovanoli and Stella, 2015).</li> <li>Define expected value (Prasad, et al., 2014).</li> <li>Ensure availability of IT infrastructure (Hassan, 2017; Workineh, Garcia and Midekso, 2018)</li> <li>Evaluate risks (Khan and Al-Yasiri, 2015; Gupta, Saxena and Saini, 2016).</li> </ul>	<ul style="list-style-type: none"> <li>Compatibility</li> <li>Relative advantage</li> <li>Infrastructural support</li> <li>Uncertainty</li> </ul>	<ul style="list-style-type: none"> <li>Adopt systems incrementally (Prasad et al., 2014).</li> <li>Testing and deployed systems (Khan and Al-Yasiri, 2015).</li> </ul>	<ul style="list-style-type: none"> <li>Trialability</li> <li>Trialability</li> </ul>
<b>Organisational</b>	<ul style="list-style-type: none"> <li>Establish strategic focus (Carcary, Doherty and Conway, 2014; Prasad et al., 2014).</li> <li>Engage all stakeholders (Conway and Curry, 2012; Carcary, Doherty and Conway, 2014).</li> <li>Understand influence of organisational structure (Prasad. et al., 2014)</li> </ul>	<ul style="list-style-type: none"> <li>Top Management Support</li> <li>Top Management Support; Prior Technology Experience</li> <li>Size</li> </ul>	Not applicable	Not applicable
<b>Environmental</b>	<ul style="list-style-type: none"> <li>Manage external environment (Prasad, et al., 2014; Workineh, Garcia and Midekso, 2018).</li> </ul>	<ul style="list-style-type: none"> <li>Competitive Pressure; Supplier Computing Support</li> </ul>	Not applicable	Not applicable

There were no activities performed during the implementation phase that could be mapped to the organisational and environmental context of the TOE framework in the literature. As such, the organisational and environmental contexts were found not to be applicable in the implementation phase.

### **5.2.1 The Cloud preparation phase**

Several studies have highlighted the need for adequate preparation before implementing any cloud services (Carcary, Doherty and Conway, 2014; Colicchio, Giovanoli and Stella, 2015; Workineh, Garcia and Midekso 2018). Organisations that are better prepared to adopt cloud services have been observed to enjoy far greater cloud benefits and adoption success than their less prepared counterparts (Carcary, Doherty and Conway, 2014; Workineh, Garcia and Midekso, 2018). As such, as part of the preparation phase, several activities have been touted in the literature as essential to consider when an SME wants to adopt cloud services. The following sections highlight these considerations.

#### **5.2.1.1 Identify suitable services to migrate**

According to Colicchio, Giovanoli and Stella (2015), it is essential for an SME to be able to identify a suitable use case that can be supported by a cloud migration, as not every business process is appropriate for cloud adoption. Carcary, Doherty and Conway (2014) posit that poor cloud service selection can prove to be operationally costly, which can have a negative impact on the overall business operations of the SME. Loebbecke, Thomas and Ullrich (2012) suggested a cloud service selection process that consists of three phases; identification, screening and categorisation. Through such processes, it is thus, important to analyse the business processes of the SME and only select those that align with the characteristics that are necessary to positively affect the cloud adoption (Colicchio, Giovanoli and Stella, 2015). According to Khan and Al-Yasiri (2015), the appropriate cloud services that are required by an SME may depend on the number of employees, on business turnover as well as on the nature of the SME's business. SMEs with less than ten (10) employees and/or an annual turnover of less than two (2) million pounds have been observed to usually adopt Software-as-a-Service (SaaS) or Platform-as-a-Service (PaaS) over a public cloud model. On the other hand, those with less than or equal to two hundred and fifty (250) employees and/or an annual turnover of less than forty-three (43) million pounds have been observed to

usually adopt IaaS or PaaS over a private cloud model or go for a collection of services (SaaS, PaaS, IaaS, Hybrid) on hybrid cloud environments (Khan and Al-Yasiri, 2015).

### **5.2.1.2 Define expected value**

SMEs should have a realistic expectation of the value they wish to derive from a cloud implementation beforehand (Prasad, et al., 2014; Khan and Al-Yasiri, 2015). According to Conway and Curry (2012) this is because, despite all the benefits that cloud computing promises, it is not a silver bullet to solve all the problems faced by companies and their ICT departments. Avram (2014), also echoed the same sentiments; accentuating that adopting any technology should always start with an evaluation of the economical processes of the organisation, as the technology is supposed to support or improve the economical processes. As such, SMEs should look towards using cloud computing services to improve their existing processes and evaluate the investment against improvements in these processes (Prasad, et al., 2014). Generally, a business problem or business objective should determine whether a business really requires a cloud solution and not the other way around (Suo, 2013).

As such, before rushing to move to the cloud environment, SMEs should make sure they systematically evaluate their processes and business needs and weigh the risks and advantages, to ensure that the transition to cloud computing is strategically planned and understood (Conway and Curry, 2012; Avram, 2014). According to Khan and Al-Yasiri (2015), SMEs will thus need to be well equipped in cloud computing concepts and thus might need to invest in cloud service training for their employees.

### **5.2.1.3 Ensure availability of IT infrastructure**

Technological resources such as system modules, physical infrastructural assets (computers, network equipment and databases) as well as any collection of technological resources that would give a business functionality and a scalable foundation, have been touted as very critical when implementing cloud computing services (Garrison, Kim and Wakefield, 2012; Suo, 2013; Yeboah-Boateng and Essandoh, 2014; Workineh, Garcia and Midekso, 2018). According to Hassan (2017), this could be because the benefits of adopting cloud services are relative to the amount of allocated IT resources.

As such, Garrison, Kim and Wakefield (2012), posit that responding to the solutions that are offered by cloud vendors is more likely when a business's technological resources can sufficiently adapt and scale, as this enables it to realise cloud implementation success more quickly than a competitor. Furthermore, a greater technical capability is also able to limit the complexities associated with cloud computing services implementation and integration, hence ensuring that a business is able to deliver new technology more efficiently (Garrison, Kim and Wakefield, 2012). In addition, SMEs with more sophisticated IT resources (both hardware and software) have been observed to be more likely to readily adopt cloud services than their less sophisticated counterparts (Hassan, 2017). A robust and mature organisational technological landscape would thus, be key if an SME is to successfully adopt cloud services and should be considered when planning a move to the cloud (Garrison, Kim and Wakefield, 2012).

Pertinent to the issue of technological resources Suo (2013), believes that a good architecture design is also essential for successful cloud implementation. He refers to architecture design as the use of enterprise architecture standards, principles and artefacts, in order to provide a solution that delivers business-system alignment, as well as realise particular system functions across an enterprise. Suo (2013) warns that it could be quite risky for a business to rush into the cloud environment without thinking through the issue of architecture design. According to Sahandi, Alkhalil and Martins (2013), moving to the cloud environment requires that a business place more emphasis on the design of the business especially, the way cloud services will interface with existing systems. Successful cloud implementation will hence in part, depend on the efficient implementation of the architecture (Sahandi, Alkhalil and Martins, 2013). Suo (2013) further suggests that a service-oriented architecture (SOA) will be ideal if a business wants to further expand on the initial cloud services. Goel, Bali and Singh (2015) appear to support this view, as they list SOA as one of the critical success factors for businesses adopting cloud services.

#### **5.2.1.4 Evaluate risks**

Gupta, Saxena and Saini (2016) posit that SMEs need to make risk informed decisions when it comes to cloud adoption. As such, Branco Jr., de Sá-Soares and Rivero (2017), suggest that SMEs need to understand the risks associated with adopting cloud services and how those risks can be mitigated. This can be achieved by first listing the services that the SMEs need to move to the cloud, evaluating their risk, defining suitable steps for the migration process, based on this

evaluation and finally elaborating on a risk mitigation plan (Branco Jr., de Sá-Soares and Rivero, 2017). Khan and Al-Yasiri (2015), distinguish between three types of risks that SMEs should be mindful of when adopting cloud services; policy and organisational risks, technical risks and legal risks.

However, Gupta, Saxena, and Saini (2016) warn that the risks associated with cloud adoption may have a negative impact on SMEs' propensity to adopt cloud services. As such, SMEs may need to rely on trust on the cloud service provider. This trust could be based on the reputation of the service provider and/or the Service Level Agreements (SLAs) (Gupta, Saxena and Saini, 2016).

#### **5.2.1.5 Establish strategic focus**

According to Prasad, et al. (2014) cloud computing is a technology that is most probably going to be around for a very long time and as such, SMEs that adopt the services will end up having a long-term commitment to it. Cloud computing adoption should, thus, have to be treated as a strategic decision and not a tactical response (Prasad, et al., 2014; Carcary, Doherty, and Conway, 2014; Goel, Bali and Singh, 2015). Conway and Curry (2012) accentuated that businesses that had a clear vision and strategy of what they wanted to achieve by moving into the cloud environment had a distinct advantage over those that did not. As such, Carcary, Doherty and Conway (2014) argue that, aligning cloud adoption strategy with the SMEs' strategic business objectives has a positive impact on the SMEs' overall competitive advantage, as well as the flexibility to leverage new opportunities. Assante, et al. (2017), further posits that contemporary SMEs are having to compete with a larger number of companies, most of which are very large multinationals with a significant amount of technical and financial resources. Thus, it is essential that the SMEs be agile in attaining strategic skills so as to remain ahead of the competition, through the use of cloud services.

#### **5.2.1.6 Engage all stakeholders**

Conway and Curry (2012) accentuate that a failure to involve all relevant stakeholders, especially the users, usually results in resistance to cloud migration. As such, it is essential for all employees in an SME to be aware of the cloud adoption and also be involved in the process, in order to yield a greater implementation success (Carcary, Doherty and Conway; 2014; Workineh, Garcia and Midekso, 2018). According to Suo (2013), during the initial stages of a cloud initiative, an internal

team with the essential skillset needs to be assembled and this team should also include other personnel such as business analysts, subject matter experts and/or thought leaders, as opposed to just having tech-savvy people. Khan and Al-Yasiri (2015), recommended that SMEs should have a budget for cloud training courses for all their employees and also have a pre-requisite for prospective new employees to have a set benchmark of cloud knowledge. This is because, whilst most employees are probably not going to need much adjustment to the introduction of cloud computing services, it is essential to increase ICT support for the users during these initial stages, as new learning can slow rather than improve productivity (Prasad, et al., 2014).

Furthermore, Carcary, Doherty and Conway (2014) also add that, the involvement of managers in SMEs should also stretch from just deciding to adopt cloud services to planning, implementation as well as any post adoption activities, to ensure that there is an ongoing alignment of the requirements and objectives of the business.

However, Chemjor and Lagat (2017), also highlighted that the age and/or experience of the business owners/managers has an impact on cloud adoption; with much more youthful managers and/or business owners being more responsive and ready to adopt cloud services than their older counterparts. Furthermore, according to Garrison, Kim and Wakefield (2012), a capable ICT manager is more likely to implement cloud computing effectively, as well as to have direct influence over the business outcome, associated with this implementation. In addition, Garrison Kim and Wakefield (2012), also highlighted that organisations that have highly capable ICT managers or strong technical and business skills are more likely to be in a better position to sift through the services available from cloud vendors and thereafter implement solutions that complement the strategy of the business and ultimately provide a competitive advantage.

Finally, according to Workineh, Garcia and Midekso (2018), SMEs must evaluate whether there are able to support a move to the cloud from a financial perspective. In particular, SMEs must ensure that they have ample financial capacity to be able to pay for the cloud adoption and implementation costs, as well as the operational and maintenance costs (Workineh, Garcia and Midekso, 2018). Top management support thus becomes crucial in this respect, as they could be responsible for ensuring the provision of the necessary financial resources (Hassan, 2017).

### **5.2.1.7 Understand influence of organisational structure**

Prasad, et al. (2014) highlighted that SMEs needed to consider the structure of their future organisations with respect to growth and diversification, especially given the possibility that cloud adoption could be a long-term commitment. The complexity of the organisation is an important consideration because it could have an influence on the type of cloud deployment model an organisation can implement (Prasad, et al., 2014). Sultan (2014), further elaborated that SMEs operating in multiple sites would find running private clouds more appealing. Similarly, growth in the business over a period of time could result in new demands on the ICT infrastructure; hence SMEs would also need to engage in an approach to cloud adoption that recognises this surge in ICT requirements over time (Prasad, et al., 2014).

### **5.2.1.8 Manage external environment**

Literature also suggests that SMEs should consider a myriad of external factors when thinking about moving to the cloud (Prasad, et al., 2014). The regulatory as well as the competitive environment that a business operates in appears to be quite important in this regard (Seddon and Currie, 2013; Brender and Markov, 2013; Carcary, Doherty and Conway, 2014; Workineh, Garcia and Midekso, 2018). Seddon and Currie (2013), highlighted that there is a possibility that data can be transferred across geographical areas where it might not be exactly clear which authority has jurisdiction over the data. Businesses, however, still have to comply with the rules of the area(s). Hence it is important that they consider the different regulations that might affect them before moving their data to the cloud. It is therefore important that businesses take the time to consider the implications of their regulatory and competitive environment before embarking on the journey to the cloud.

The General Data Protection Regulation (GDPR) which came into effect on May 25, 2018, outlines rules for the processing, storing and managing of data from people residing within the European Union (Li, Yu and He, 2019). According to Li, Yu and He (2019) cloud service providers thus, have to adopt stricter security measures, standards and processes to protect, process and manage data personal data, to ensure their compliance with GDPR. As such, SMEs that process data related to European Union residence will be held accountable for non-compliance with GDPR.

In addition, the role of intermediaries in making sure that businesses successfully adopt the right cloud services for their business needs has also been emphasized in the literature (Prasad, et al., 2014; Gupta, Saxena and Saini, 2016).

According to Prasad, et al. (2014), intermediaries can sometimes mean the difference between successful cloud adoption and failure and hence they need to be considered more seriously when thinking about migrating to the cloud environment. Plummer (2012) added that the goal of these intermediaries is to make services more specific to a particular business, to integrate and/or aggregate services and do anything that will add another layer of value to the original services being offered by cloud vendors. Intermediaries are thus a key driving force for cloud adoption for a significant number of SMEs (Gupta, Saxena and Saini, 2016).

#### **5.2.1.8.1 Managing the Business/Vendor relationship**

Successfully managing the business/vendor relationship, appears quite prominently in the literature as a key external environmental factor, in ensuring successful cloud services adoption by businesses (Garrison, Kim and Wakefield, 2012; Suo, 2013; Prasad, et al., 2014; Colicchio, Giovanoli and Stella, 2015; Branco Jr., de Sá-Soares and Rivero, 2017, Salum and Rozan, 2017). Suo (2013) especially highlights three areas about managing the business/vendor relationship that appears to encapsulate most of the discussions in the literature about the topic. These are vendor assessments, contracts (both formal and informal), collaboration and trust.

#### **Vendor Assessments**

According to Suo (2013), prior to adopting cloud services, businesses need to thoroughly analyse suitable cloud service vendors that will provide the necessary technologies. As Collins and Lam (2014) argue, the goal should be to find a service provider that is capable of delivering a desired level of service at the lowest possible cost, while simultaneously ensuring the scalability of applications. Businesses should hence screen out all unqualified vendors (Suo, 2013). As part of this process, the cost and benefits of the different suppliers have to be evaluated. However, Collins and Lam (2014) warn that this evaluation of services that are offered by competing cloud service providers is not a trivial endeavour.

Conway and Curry (2012) and Senarathna (2018) recommend that a vendor be chosen, based on value, sustainability and quality. In addition, Branco Jr., de Sá-Soares and Rivero (2017), also encourage that SMEs verify the references provided by the service provider. Kumar and Suh (2013), however, believe that the most important criteria that SMEs should use when choosing a service provider are those that align to a potential differentiation with network assets such as, reliability, security, quality and technical competency.

In addition, Suo (2013) recommends that more than one qualified vendor be considered, as introducing competition can potentially drive down the costs of running the business. Furthermore, he stresses the importance of good, sustainable customer support and flexibility on the part of the vendor.

Garrison, Kim and Wakefield (2012), accentuate that a business should be confident that a cloud vendor is working to help it leverage its ICT resources. On that premise, a business that has plans to scale up its services in the future, hence, has to choose a vendor that is more likely to deliver the services at that scaled up level and is also less likely to go out of business in the foreseeable future (Suo, 2013).

### **Contracts**

Some ICT services that businesses outsource to cloud vendors can be crucial to their core operations. As such, it is important that businesses ensure that there are guarantees of service delivery by cloud vendors (Prasad, et al., 2014; Colicchio, Giovanoli and Stella, 2015; Senarathna, 2018). Hence, Businesses, have to craft very specific service-level-agreements (SLAs) with their chosen cloud vendors (Buyya et al., 2009; Suo, 2013; Yeboah-Boateng and Essandoh, 2014; Colicchio, Giovanoli and Stella, 2015; Gupta, Saxena and Saini, 2016; Branco Jr., de Sá-Soares and Rivero, 2017). Sahandi, Alkhalil and Martins (2013) elaborate further, stating that SMEs should first determine how well SLAs meet their desired level of business requirements as well as their required guarantees of security, prior to any commitment to a cloud vendor.

According to Suo (2013), appropriate security protocols agreed upon in SLAs, help to ensure that cloud vendors do not get unauthorised access to proprietary data. In addition, Gupta, Saxena and Saini (2016) believe that a well-crafted SLA boosts trusts between the cloud provider and SMEs. Prasad, et al., (2014), however, warned that businesses should be wary of contractual complexities

and inconsistencies such as expensive exit clauses and data deletion, as these can lead to contractual lock-in issues. Branco Jr., de Sá-Soares and Rivero (2017), provide a list of ten items that SMEs should look out for in an SLA.

Suo (2013), on the other hand, also raises an issue with regard to contracts that is often overlooked in the literature. He stresses that not all essential details can be covered by formal contracts, as unexpected events can often occur when least expected and for unknown reasons. As such, he recommends that businesses and cloud vendors should be willing to engage informally to institute the necessary trade-offs and work together outside the bounds of rigid contracts, to find solutions, should such incidences occur.

### **Collaboration and Trust**

Finally, collaboration and trust of the cloud vendor also comes out in the literature as another key factor that needs to be considered, when a business decides to move to the cloud (Garrison, Kim and Wakefield, 2012; Suo, 2013; Gupta, Saxena and Saini, 2016; Branco Jr., de Sá-Soares and Rivero, 2017). Gupta, Saxena and Saini (2016) define trust as “the willingness of a party to be vulnerable to the action of another party, based on the expectation that the other will perform a particular action that is important to the trustor, irrespective of the ability to monitor or control that other party”.

According to Garrison, Kim and Wakefield (2012), trust develops as a result of communication, procurement and transactional activities, that would all culminate into the business perceiving the vendor as trustworthy, reliable, even handed and working in its best interests. Gupta, Saxena and Saini (2016) also believe that trust can culminate from the reputation of the service provider as well as the guarantees provided by their SLAs.

Branco Jr., de Sá-Soares and Rivero (2017) provide a list of six (6) activities that SMEs can do to build trust with a service provider. This includes that SMEs should verify the references given by the service provider as a way to build trust.

As a result, the mutual trust between the business and the vendor enables the vendor to act beyond its own self-interests; augmenting the likelihood of a long-term future partnership (Suo, 2013). Garrison, Kim and Wakefield (2012), believe that, as trust between the business and the vendor

increases, the business is more likely to realise greater economies of scale and ultimately cloud adoption success. As such, Suo (2013), recommends that vendors and businesses should share, dashboards, reports and expertise, continuously communicate with one another and solve problems jointly, as these are positive signals that both parties are committed to the partnership. As a result, trust between the two parties is eventually earned.

## **5.2.2 Implementation phase**

Due to the non-trivial nature of implementing cloud services, there have been several recommendations in extant literature about the ideal approaches to carry out a cloud implementation. The following sections highlight the activities that SMEs need to carry out when carrying out a cloud implementation.

### **5.2.2.1 Adopt systems incrementally**

An incremental approach has been touted as ideal when adopting cloud computing services in the literature (Conway and Curry, 2012; Sahandi, Alkhalil and Martins, 2013; Prasad, et al., 2014; Khan and Al-Yasiri, 2015). This is because an incremental approach provides several benefits to SMEs that are adopting cloud services. Due to their limited resources (both technical and financial), SMEs might need to initially have targeted adoption of the services to make the cloud migration more manageable (IDC, 2010).

Lian, Yen and Wang (2014) also suggest that initial appreciation of cloud computing services by stakeholders would be slow. As such, starting small and adding more services as employees grow more comfortable with the technology would be quite important (Prasad, et al., 2014).

Sahandi, Alkhalil and Martins (2013), however, accentuate that it is possible for small start-ups to want to deploy all their applications on the cloud as they are usually not very sophisticated. The more established SMEs, on the other hand, could be more inclined to gradually move existing applications to the cloud environment (Sahandi, Alkhalil and Martins, 2013). This gradual move can be effected by initially targeting non-core business/mission-critical applications (Sahandi, Alkhalil and Martins, 2013). As such, an incremental approach, thus significantly reduces the risk associated with cloud computing adoption projects (Conway and Curry, 2012; Khan and Al-Yasiri, 2015).

However, an understanding of cloud technologies and what they can do for a business would be necessary before the business decides what applications to move to the cloud environment (Suo, 2013). Loebbecke, Thomas and Ullrich (2012), warn that selecting the wrong ICT services for moving to the cloud environment can be operationally costly and could potentially be detrimental to a business's strategy. As such, businesses should apply a sufficiently specific and yet applicable method to assess the suitability of the cloud environment for their ICT services (Loebbecke, Thomas and Ulrich, 2012; Al Ismaili, et al., 2016).

#### **5.2.2.2 Test deployed systems**

It is essential to test any cloud migrated system with real production data before going live (Al-Yasiri, 2015; Ahmad, 2018). This is because several unforeseen events may occur during the course of the implementation that may cause system errors, which could be very costly to the business.

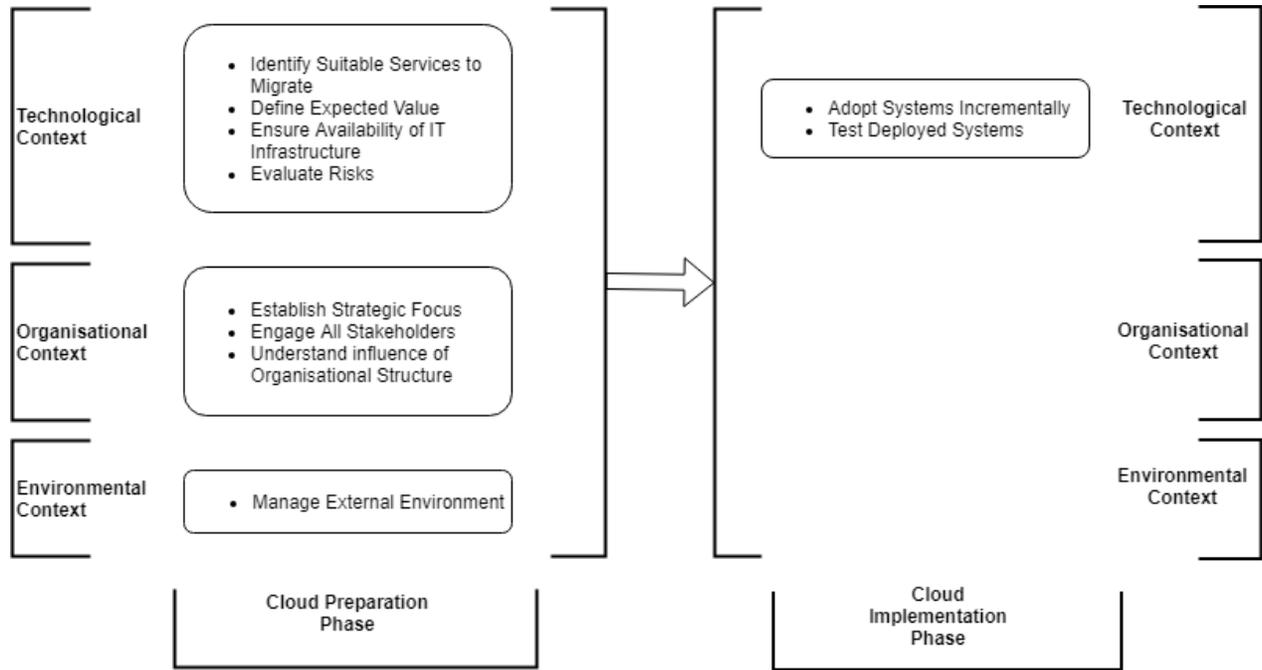
As such, Khan and Al-Yasiri (2015) suggest that SMEs should also utilise a hybrid model of deployment, where the system that is being migrated is run separately and in parallel with the legacy system until everything has been verified to be running smoothly on the migrated system. However, Lynn, Liang and Gourinovitch (2018) posits that cloud system deployment should be carried out with minimal time for on-site configuration and testing. Due to the flexibility offered by cloud, deployment and testing can be achieved easily (Ahmad, 2018).

### **5.3 Conceptual Framework for Cloud Adoption**

In the previous sections, the researcher established a number of considerations that SMEs need to take into account when adopting cloud services from extant literature. Based on this, Figure 9 below, illustrates a conceptual framework for the adoption of cloud services by SMEs. The framework highlights the tasks that SMEs need to perform, across different cloud adoption phases within the context of the TOE framework that was illustrated in Chapter 4.

Whilst the sequence of tasks within each phase is insignificant, all the tasks in the cloud preparation phase have to be completed before moving onto the tasks in the implementation phase. No activities were found to be associated with the organisational and environmental contexts of the

TOE framework, within the implementation phase. As such, these contexts were found to not be applicable in the implementation phase.



**Figure 9: Conceptual Framework for SME cloud adoption**

#### 5.4 Summary

In this chapter, the researcher explored the considerations that SMEs need to take into account when adopting cloud services by examining extant literature. This culminated in a framework illustrating the technological, organisational and environmental considerations that SMEs need to make when adopting cloud computing services across different phases of the adoption process (Section 5.3). This, in turn, answered the first research question of this study. In the next chapter the methodology to gather empirical data is discussed. This empirical data was subsequently used to evaluate the conceptual framework’s constructs within the operational context of SMEs, based in the Eastern Cape.

# CHAPTER 6: Research Methodology

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## 6.1 Introduction

Chapter 1 of this study introduced the reader to the objective of this study, as well as the key questions that needed to be answered in order to fulfil this objective. Up to this point, these questions have acted as a beacon to guide the work thus far. Chapter 2 explored the realm of cloud computing as a whole. This was followed by an exploration of the SME context and its relation to cloud services adoption in Chapter 3. A detailed discussion of the research gap to be filled by this study was also presented in Chapters 3. Chapters 4 and 5 then explored the technological, organisational and environmental considerations that SMEs needed to take into account when adopting cloud services; which in turn, answered the first research question.

The aim of this chapter is to reveal to the reader in more detail, the various research design elements that underpin this study. In essence, the chapter aims to give the reader an overall picture of how the study was intended to be carried out. Most of the research design elements in this chapter relate to Saunders, Lewis and Thornhill (2016)'s research onion.

## 6.2 Philosophical Paradigm

The literature states that a researcher's philosophical standing affects their research strategy, as well as the methods they will use as part of that strategy (Ihuah and Eaton, 2013; Saunders, Lewis and Thornhill, 2016). As such, it is believed that this should be outlined upfront as it has a direct bearing on subsequent methodological choices.

As Klein and Myers (1999) highlight, interpretive research can be utilised to understand human thought and action in social and organisational contexts; affording a researcher the opportunity to gain access to deep insights about a research phenomenon. Lee (1991), accentuates that in interpretive research, the same artefacts, or actions can have different meanings for different research participants; including the observer. As such, according to Nandhakumar and Jones (1997), interpretive research, requires close interaction between the researcher and the research participants.

The very essence of interpretivism hinges on the philosophical position that our knowledge of reality is socially constructed by human actors in a social system, through constructs such as language, consciousness, shared meanings, documents and other artefacts (Walsham, 1995; Klein and Myers, 1999).

According to Walsham (1995), it is impossible to obtain data that is value-free, since the investigator makes use of their own preconceptions to guide the process of enquiry. There are, therefore, multiple realities that exist and the researcher's goal is to arrive at a shared reality with the research participants being observed through mutual interaction. As such, reality and the individual who observes it, can therefore not be separated (Weber, 2004).

In contrast, the positivist philosophical paradigm posits that there are fixed relationships within a phenomenon (one reality) that exist in isolation from the researcher (Orlikowski and Baroudi, 1991; Weber, 2004). As such, the goal of the positivist investigator becomes that of discovering and testing these relationships, in order to prove or disprove existing theories, in the hope of improving the understanding of phenomena and ultimately the predictability of the phenomena (Orlikowski and Baroudi, 1991). As such, Lee (1991) believes that the positivist approach to organisational research, whilst useful in some cases (Weber, 2004), is inadequate for the study of social reality. Klein and Myers (1999), elaborated further by positing that organisations are dynamic and that the relationships between people, organisations and technology are not fixed, but are actually a moving target, which constantly changes with time.

For the purposes of this study, an interpretive approach was thus regarded as the most appropriate. This came from the realisation that, to come to a deep understanding of the technological, organisational, and environmental considerations that SMEs need to take into account when adopting cloud services, immersion and engagement with the context was necessary.

This afforded the researcher the opportunity to explore and unravel the underlying mechanisms that affect those considerations. Furthermore, although other studies have utilised positivist approaches to explore cloud adoption within the operational context of SMEs, (Alshamaila, Papagiannidis and Li, 2013; Yeboah-Boateng and Essandoh, 2014; Deil and Brune 2017; Salum and Rozan, 2017; Senarathna, 2018), it was believed that an interpretive approach would illuminate areas which a positivist approach could not fully explore.

To guide this process of enquiry, a number of interpretive principles, as suggested by Klein and Myers (1999) were utilised.

These included:

- Ensuring that understanding is reached through cycles of moving from individual concepts to more complex wholes that would form themes (decisions) in each SME – the **fundamental principle of the hermeneutic circle**.
- Bringing to light how the social, cultural and historical background of both the individual research participants, as well as the SME as a whole, affected the considerations made – the **principle of contextualization**.
- Gaining a better understanding of the considerations that SMEs make when adopting cloud computing services through close interaction with the participants. This meant understanding that the research participants also change their perception of cloud computing services adoption, through interaction with the researcher. The researcher thus aimed to get to a shared understanding with the research participants – the **principle of interaction between the researcher and the subjects**.
- Any theoretical generalisations made were only inferred from individual instances of the data as they were collected by the researcher, so as to articulate clearly to the reader how the researcher arrived at such conclusions – the **principle of abstraction and generalisation**.
- Being attuned to the possibility that there could be misalignments between the participants' theoretical preconceptions and the actual findings in the data. Such misalignments were, thus not treated as errors, but as important avenues, leading to the attainment of new insights into the phenomenon under study –the **principle of dialogical reasoning**.
- Acknowledging that cloud computing is a concept that could be interpreted differently; care was thus taken to ensure sensitivity to the existence of multiple interpretations regarding what constitutes cloud services and what the most ideal way of adopting the services is – the **principle of multiple interpretations**.
- Finally, being attuned to the possibility that biases might exist as a result of contextual characteristics of the research participants such as social and cultural background as well as their organisational positions– the **principle of suspicion**.

## 6.3 Research Approach

The following research approach was utilised for the purposes of this research.

### 6.3.1 Qualitative vs quantitative

According to Elliot, Fischer and Rennie (1999), qualitative research can enable one to have an understanding of the experiences and/or actions of people as they encounter, engage and live through situations. They further stress that, in qualitative research, such an understanding is usually reached through engaging as much as possible with the perspectives of those being studied, whilst continuously being cognizant of one's own perspectives. Mack et al. (2005) alludes to the point that qualitative research is especially effective when the researcher needs to obtain culturally specific knowledge about values, opinions, behaviours and social contexts of a certain population. This aligns well with the epistemological assumptions of interpretivism that underpin this study, as outlined in Section 6.2 of this chapter.

These include:

- That our knowledge of reality is socially constructed by human actors in a social system
- That the observer cannot be separated from what needs to be known; and
- That a shared reality has to be reached through mutual interaction between the research participants and the observer.

A qualitative approach would thus, better provide an opportunity to address this study's research questions adequately.

The unsuitability of a quantitative approach for this study stems from its close association with the positivist philosophical paradigm wherein, objectivity is key (Elliot, Fischer and Rennie, 1999). Lee (1991), recognizes this approach as one that manipulates theoretical propositions through logical rules, until the propositions eventually satisfy the four requirements of falsifiability, logical consistency, relative explanatory power and survival. Furthermore, Morgan and Smircich (1980) accentuated how quantitative methods often detach themselves from the context of the phenomenon under study, to achieve precision and objectivity, such as is found in large-scale surveys. According to Orlikowski and Baroudi (1991), quantitative methods also tend to ignore

the fact that people (including the researcher) continuously think and act, creating their physical and social reality throughout time, as they interact within a social system. This study aimed to understand the considerations that various stakeholders in SMEs take into account when adopting cloud services within their socio-cultural environment. As such, it was believed that this further clarified the unsuitability of a quantitative approach, as it would not be in line with the philosophical underpinnings of this study.

### **6.3.2 Deductive vs inductive**

According to Baxter and Jack (2008), a theoretical framework would assist one to merge constructs together that may be pertinent to a given study. Section 5.3 in the previous chapter drew ideas from the literature that led to the creation of an initial conceptual framework, as suggested above. Baxter and Jack (2008) however, warn that, such a framework can limit an inductive approach, as the researcher's thinking might begin to be driven by the framework (a deductive approach). As such, even though the researcher was aware of the study's theoretical grounding from the framework, the study was also inductive in nature. As stated in Section 6.3.1, the researcher sought to understand the considerations made by various stakeholders from SMEs in the Eastern Cape, when adopting cloud services beyond those suggested by the framework. As such, a purely deductive approach was not feasible, as an inductive approach also needed to be employed alongside it, to gain this further understanding.

## **6.4 Research Strategy**

In order to fully understand the considerations made by various stakeholders in SMEs within the Eastern Cape when adopting cloud services, it was acknowledged that they might need to be explored within their natural context. This is drawn from the idea that not all SMEs employ ICTs at the same level of complexity (Kotelnikov, 2007).

According to Baxter and Jack (2008), rigorous qualitative case studies afford a researcher the opportunity to explore a phenomenon in its natural setting, using a variety of data sources.

It is hence a useful strategy to employ when one:

- needs to answer how or why research questions;

- cannot manipulate the research participants of a study;
- needs to explore contextual conditions relevant to the phenomenon under study; or
- when the boundary between the phenomenon and context is unclear (Yin, 1981; Yin, 2003).

The qualitative case study approach was thus chosen for this study, particularly due to its usefulness in catering for the last two points mentioned above. This is because it is not quite clear how the SME environment would affect the considerations that are taken into account by relevant stakeholders within Eastern Cape SMEs, when adopting cloud services.

Furthermore, due to the aforementioned possibility that unique contextual elements would contribute to a different set of considerations by the various SMEs, multiple cases needed to be explored in this study. According to Saunders, Lewis and Thornhill (2016), multiple cases would assist in determining whether the findings unravelled in one case would also apply in different cases. Such an approach, thus, required an exploration of the differences and similarities within and across cases (Yin, 2003), to ultimately gain a holistic understanding of the phenomenon within the Eastern Cape context.

## **6.5 Data Collection**

Due to the philosophical underpinnings of this study as well as the study's qualitative nature, as outlined in Sections 6.2 and 6.3.1 above, data was mainly collected using both semi-structured face to face and semi-structured telephonic interviews.

### **6.5.1 Face-to-face interviews**

Qualitative, face-to-face, semi-structured interviews are one of the most common tools for gathering data in qualitative research (Polkinghorne, 2005; Mack, et al., 2005; Myers and Newman, 2007). Schultze and Avital (2011) affirm the face-to-face interview as an approach that affords a researcher the opportunity to engage a research participant so as to attain profound, highly contextualized and authentic accounts of the participants' experiences, as well as how they interpret them.

According to Polkinghorne (2005), human experience has a vertical depth and the data required to study experience has to be language data that is obtained through intensive engagement with a participant. This makes the interview a suitable tool to use for this study, as it enables the researcher to have first-hand access to the experiences of the various stakeholders within each SME.

As the study was both inductive and deductive, the unstructured nature of the interview was deliberately utilised to allow room for further probing of the research participants whilst still keeping the study focused on a particular set of concepts. To facilitate the interviewing process, an interview guide (discussed in Section 6.5.4) was used as a research instrument, in both the face-to-face interviews and the telephonic interviews.

### **6.5.2 Telephonic interviews**

Due to the high cost of reaching some research participants, the researcher also utilised semi-structured telephonic interviews. According to Musselwhite, et al., (2007) it can be much cheaper to use the telephone to interview participants, as opposed to travelling for an in-person meeting. In addition to that, Burnard (1994) and Wilson, Roe and Wright (1998) also assert that the use of the telephone can also enable one to reach more participants over a wider geographical area.

With telephonic interviews, a researcher is also able to write down notes without making the research participants uncomfortable. In turn, this can reduce biases in the participants' responses as they will not be affected by either the, researcher's facial expressions, body language or presence in general (Musselwhite, et al., 2007; Novick, 2008).

However, the potential pitfalls associated with telephonic interviews were also acknowledged. Cook, et al. (2003), highlighted the absence of visual cues in a telephonic interview, which makes it much more difficult to develop rapport with the research participants. According to Farooq (2015), developing rapport with the research participants creates an environment in which the participants are able to speak more freely and openly, which allows for more in-depth participant responses.

Musselwhite, et al. (2007), also cite lower levels of participant cooperation, participant difficulties in maintaining clear communication with the researcher and difficulties curbing participants who offer excessively extraneous information when dealing with telephonic interviews.

Despite these challenges, however, qualitative data from telephonic interviews has been touted as rich, vivid, detailed and of high quality, albeit with a much lesser associated costs of producing it (Novick, 2008). As such, despite the challenges associated with telephonic interviews, they were still utilised to effectively collect sufficient data for the purposes of this study.

### **6.5.3 Data sources**

According to Yin (1981), since the context forms part of the phenomenon under study in a case, there will always be variables that could affect the data collection and ultimately the results of the study. As such, when utilising the case study strategy, it was essential that data be collected from multiple sources, as this would ensure the validity of the results (Yin, 1981; Baxter and Jack, 2008; Saunders, Lewis and Thornhill, 2016).

According to Baxter and Jack (2008), by using multiple sources, the phenomenon under investigation would be explored using a variety of lenses, which in turn facilitates a holistic understanding of the phenomenon. As such, in this study, data was collected from multiple sources within and across different cases.

Purposive and snowball sampling were utilised to select SMEs within the Eastern Cape, based on the criteria given below. Furthermore, the SMEs had to conform to the formal SME definition discussed in Chapter 3, Section 3.2 as a prerequisite:

- The SME was supposed to have adopted or be in the process of adopting one or more cloud service offerings; or
- The SME attempted to adopt one or more cloud service offerings and failed.

Saunders, Hill and Thornhill (2016) describe purposive sampling as a sampling technique that utilises personal judgement in the selection of study samples to get informative data that is relevant to the study. The reason for the use of this type of sampling was due to the need to solicit specific

cloud adoption knowledge from the participants that would assist in answering the research questions of this study.

As such SMEs within the Eastern Cape from the ICT services and information and media sectors were initially targeted. This is because it was believed that SMEs in those sectors were most likely to use cloud services due to the nature of their operations. Snowball sampling, described by Saunders, Hill and Thornhill (2016) as a sampling technique where a case is used to identify other cases was then used to identify other suitable SMEs.

From these selected SMEs, all stakeholders from within the SMEs' ICT departments or otherwise who were key in determining the overall ICT direction of the SMEs, as well as those that were involved in the day-to-day ICT functions of the SMEs were targeted. More specifically, participants occupying any of the following roles were targeted as the primary sources of data for this study:

- Owners/Managers of the SMEs;
- IT Directors;
- Systems Managers;
- IT Managers;
- System administrators; and
- System Users.

A diverse range of participants within and/or across cases were deliberately selected as it was believed that this would facilitate a more holistic understanding of the phenomenon under investigation (Saunders, Hill and Thornhill, 2016). This is also consistent with the case study strategy's requirement of gathering data from multiple sources to ensure validity, as discussed in Section 6.5.2 above.

According to the University of Auckland's school of psychology website (2019), thematic data analysis (discussed in Section 6.6.2) requires at least ten interview transcripts for it to be effective, as the method relies on identifying patterns across the data. Thirteen (13) semi-structured interviews (both face-to-face and telephonic), across nine (9) SMEs with a diverse range of participants were thus conducted for the aforementioned reasons.

#### **6.5.4 Data to be collected**

An interview guide (see Table 12 below) was utilised to guide the process of data collection. This ensured that a set structure was maintained during the interview process and that the research questions of this study were adequately addressed. Due to the context of the SMEs being key in determining what considerations the SMEs take into account when adopting cloud services, data was also gathered about their context. It was anticipated that this contextual data would facilitate the interpretation of the collected data during the data analysis stage. This is reflected by question 1 and 2 in Table 12.

In Chapter 4, Section 4.2.2 the TOE factors (constructs) that were most likely to affect the considerations that SMEs should take into account when adopting cloud service were determined from extant literature. In Chapter 5, Section 5.2, the actual considerations that extant literature prescribed as essential when adopting cloud services were then explored. From this, the correlation between the chosen TOE constructs and the considerations from extant literature about what needs to be taken into account when adopting cloud services was established. This culminated in the creation of an initial conceptual framework illustrated in Section 5.3; thereby answering the first research question. Baxter and Jack (2008), believed that a theoretical framework can assist in anchoring a study as it can provide the initial concepts pertinent to the study. Using a deductive approach, the researcher, thus collected data around the concepts discussed in the aforementioned guiding framework, so as to establish whether they were applicable within the context of SMEs in the Eastern Cape. This is reflected by questions 3 in Table 12 below.

However, there is limited guidance in extant literature about how SMEs should go about adopting cloud services (Prasad, et al., 2014; Asiaei and Rahim, 2016). The situation is even more pronounced for SMEs based in the Eastern Cape, as the guiding literature for cloud adoption by SMEs in this region is almost non-existent. As such, gathering data from SMEs in the Eastern Cape using an inductive approach would allow for further insight into what they take into account when adopting cloud services within their context. It was anticipated that parallels could then be drawn between the literature and the collected data; the belief being that this would lead to the formulation of a comprehensive and contextually relevant framework for SMEs based in the Eastern Cape that need to adopt cloud services. This is reflected by question 4 in Table 12 below.

**Table 12: Interview questions pertaining to the study's research questions**

Question Number	Interview Question	Research Question Addressed	Inductive vs deductive	Purpose
1	Tell me more about your organisation. What does your organisation do?	Not related to any particular research question. Designed to only gather SME contextual data	Inductive	Whilst not directly related to any particular research question, the purpose of this question was to probe the organisation to reveal some details pertaining to its operational context. This also included, determining the size of the SME, to verify if it conforms to the National Small business amendment Act of 2003's definition of an SME.
2	The most popular cloud service model offerings are SaaS, PaaS and IaaS.  Are you familiar with any of these terms and in your opinion, do you think your organisation utilises any of them?	Not related to any particular research question. Designed to only gather SME contextual data	Inductive	The purpose of this question was to gauge how much the SMEs knew about cloud computing. This included, determining if the SMEs had adopted, are in the process of adopting, or have attempted but did not succeed in adopting cloud services. It was believed that such information would facilitate a greater understanding of the SMEs' cloud adoption maturity, which would be useful during the data analysis phase.
3	Literature suggests that in order to successfully adopt cloud services SMEs have to perform certain tasks/activities at various stages of the cloud adoption process.  These include identifying suitable services to migrate, ensuring availability of IT infrastructure, defining expected values, evaluating risks, establishing a strategic focus, engaging all stakeholders, understanding the influence of the organisational structure, managing the external environment, adopting systems incrementally and testing deployed systems.	Question 2	Deductive	The purpose of this question was to try and understand how SMEs in the Eastern Cape perceive the technological, organisational and environmental considerations prescribed by literature, as relevant within their particular context, when adopting cloud services.

	In your opinion, how essential do you think these considerations are when adopting cloud services and has your organisation practised any of them during the adoption process?			
4	If you were to implement a new cloud solution in your organisation today, what else do you believe needs to be considered, in addition to what we have already discussed?	Question 2	Inductive	<p>The purpose of this question was to inductively probe the SMEs further, to reveal other considerations they perceived as key in adopting cloud computing services. It was believed that each SME's context would influence their beliefs about what considerations need to be taken into account when adopting cloud services.</p> <p>Kotelnikov (2007) posits that SMEs adopt ICTs at varying levels of complexity. The inductive nature of this question thus sought to bring out context specific data, relating to cloud adoption by SMEs in the Eastern Cape.</p>

#### **6.5.4.1 Data collection instrument**

An interview guide (Table 12) was the primary data collection instrument in this study. Saunders, Hill and Thornhill (2016) stressed that one of the key concerns when negotiating access to research participants is the issue of time. In order to keep the interview focused, as well as to keep the interview length manageable, the interview guide included only those interview questions that were related to the research questions of this study. As suggested by Mack et al. (2005), all the interview questions were open-ended, so as to elicit as many unstructured responses as possible.

Additionally, care was taken in ensuring that the questions posed did not lead the research participants on, through any preconceived conceptions or encourage them to answer the questions in a particular way. According to DiCicco-Bloom and Crabtree (2006), questions that lead the research participants towards a particular response direction often produce misleading answers.

Due to the interpretive nature of this study, the questions were designed to allow for further probing of the research participants, with any relevant follow up questions relating to the concepts being addressed by the research questions of the study. However, care was taken to ensure that the interviews did not become too lengthy. Furthermore, DiCicco-Bloom and Crabtree (2006) emphasized that developing rapport early on in the interview process is essential, in making sure that participants cooperate and participate fully, as required by the interviewer.

They suggested that, in order to build rapport with the research participants, the first question of the interview should be broad, open ended and non-threatening. As such, a decision was made to reflect that notion in the order in which the questions appeared on the interview guide; placing non-threatening questions first, starting with general questions about the organisation and later, progressing to more difficult questions.

#### **6.6 Data collection Process**

The data collection process started by first submitting the interview guide as well as the relevant supporting documentation (individual consent form, organisational consent form, human subjects ethical clearance application form) to the Rhodes University, Information Systems (IS) departmental ethical clearance committee for ethical approval.

Two pilot interviews were initially undertaken to determine the suitability of the research instrument (interview guide outlined in Table 12). It was believed that the pilot interviews would expose any need for refinement of the interview guide where necessary, prior to collecting primary data. ICT support staff in the Information Systems (IS) department at Rhodes University were targeted for the pilot interviews. The reason why those were targeted was because it was believed that even though their context was different (Higher Education setting), they closely resembled the participants that the researcher was going to engage with for primary data collection, in terms of cloud computing expertise/knowledge. A second reason they were targeted was because they were also easier to access, due to their close proximity to the researcher.

To interview the Information Systems ICT support staff members, the researcher first sought approval from both the HR Director of the university, as well as the HOD of the Information Systems department. This was carried out by getting organisational consent forms signed by both the HR director (for university wide consent) and the Information Systems HOD (for department wide consent). Prior to each pilot interview, an email containing the details of the study, an individual consent form, as well as an invitation to participate in the study were sent out to all potential participants. The participants were also furnished with brief descriptions of the concepts that appear in the interview questions (questions 2 and 4 in Table 12) that were believed to be essential for the participants to be aware of. From these two pilot interviews, it was realised that, the right context (SMEs) of the participants was essential and, thus, no adjustments were made to the interview guide. The interview guide was then used, in its original form, to carry out the data collection process. The following interview protocol was consistently applied across all the cases in the primary interviews.

### **6.6.1 Interview protocol**

Several activities were carried out at various stages of the interview process. These include, pre-interview, in-interview as well as post interview activities, which are outlined below.

#### **6.6.1.1 Pre-interview activities**

A number of activities were carried out prior to interviewing any research participants:

1. The Yellow Pages Business Directory was initially used to search for SMEs by industry, as well as by city. SMEs within the ICT services and information and media

sectors were targeted. Due to the nature of their operations, it was believed SMEs in these sectors would be most likely to utilise cloud services.

2. An initial list of SMEs was then created and stored on an excel spreadsheet. This list included details about the name of the SME, the industry it falls under, its location (city/town), as well as its contact details (phone numbers).
3. All SMEs on the list mentioned in point 2 were then called to explain what the study was about, as well as to invite them to participate in the study. SMEs that were either not willing or unreachable from this initial list were crossed out.
4. SMEs that indicated their interest in participating in the study were aggregated into a second list. Email addresses of these SMEs were also collected during this initial call. In addition, the researcher also indicated their intention to provide further details about the study to the SMEs, in a follow up email.
5. Emails were then sent to all the SMEs on the second list mentioned in point 4. These emails contained details about the study, as well as organisational consent forms that needed to be signed, prior to engaging with the individual participants from the SMEs. SMEs that were located in a different geographical location to the researcher's location were required to sign and return the organisational consent forms via email, prior to any participant engagement. For those SMEs that were located within the same geographical location as the researcher, it was possible for the participants to sign all the necessary consent forms just before the interview commenced. This was due to the researcher being able to physically go to the SMEs' premises and personally make sure that all forms were signed beforehand.
6. After organisational consent was granted by the SMEs, the researcher then contacted potential participants within the SMEs, to determine if they were willing to participate in the study. Details about the research study as well as individual consent forms were then sent to potential participants. Brief descriptions of the cloud concepts to be discussed in the interview, as well as the interview guide were provided to the participants on request. A suitable interview date and time that was convenient for the participant was also scheduled during this time. Participants outside the researcher's geographical location were required to sign and return the individual consent forms via email, prior to the interviews. Those located within the same geographical location as the researcher were given an option to sign the individual consent forms just before their interviews commenced.

### 6.6.1.2 In-interview activities

During the interview process, a number of activities were carried out:

1. Before the start of each interview the participant was thanked for agreeing to participate in the research interview.
2. Thereafter, a brief explanation of the purpose of the study, the expected outcome of the study, as well as any potential risk to the research participant was given.
3. If the individual consent form had not been signed by the participant beforehand, an explanation of the various sections of the individual consent form was then carried out before he/she signed it. Care was also taken to ensure that the following was explicitly stated to the participant prior to them signing the form:
  - That the participant had a right to stop the interview at any time should they wish to.
  - That the interview would be recorded using a voice recorder and they were free to not consent to any recording of the interview
  - That the data collected would remain anonymous so that it was not possible to trace the responses back to the participant.
  - That the estimated interview time would be roughly forty-five (45) minutes.
4. If the participant agreed with the aforementioned information in point 3, they were then asked to sign the individual consent form.
5. Finally, the participant was then informed of the switching on of the voice recorder, before proceeding with the interview, in accordance with the interview guide outlined in Table 12.

### 6.6.1.3 Post-interview activities

After, the interview process, several activities were carried out:

1. After each interview, care was taken to ensure that all physically signed consent forms were scanned and that a digital copy of them was stored on a computer. Signed consent forms sent via email were also stored on a computer in the same manner.
2. All interview voice recordings were transferred from the voice recorder to the computer for storage after each interview was finished.
3. Finally, preparation for the next interview would then commence.

## 6.7 Data Analysis

In this study, thematic analysis was utilised to analyse the primary data. Thematic analysis is a widely used qualitative analytical method; however, it is rarely acknowledged in most studies (Attride-Stirling, 2001; Braun and Clarke, 2006). A six-phased guideline provided by Braun and Clarke (2006) was thus used in executing the method, as outlined in Section 6.7.2. The method itself relies on the identification, analysis and reporting of patterns (themes) across the data and can be used both inductively and deductively. As its use is not restricted to any particular theoretical framework, thematic analysis can also be used across a range of different research designs (Braun and Clarke, 2006). In addition, its ability to enable a researcher to both reflect on research participants' reality and to explore beyond the surface of that reality (Braun and Clarke, 2006) made it ideal for answering the research questions of this study.

### 6.7.1 Definition of the terms

To assist the reader in understanding the different elements of the data analysis process discussed in the subsequent section, a brief description of the various terms that were used in the data analysis is given below.

**Data Corpus:** A collection of all the interview transcripts that form part of this study.

**Data Extract:** Part(s) of a data item that have been coded.

**Data Item:** A single interview transcript.

**Data Set:** A collection of data items and/or extracts that are similar in nature.

**Latent Theme:** A theme that goes beyond the semantics of the actual data. These are usually arrived at through careful analysis of the underlying ideas, assumptions and concepts in the data (Braun and Clarke, 2006).

**Semantic Theme:** A theme that presents itself in what is apparent from the raw transcribed data. The researcher usually does not need to interpret the data any further than assessing what was said during the interview (Braun and Clarke, 2006).

### 6.7.2 Data analysis process

As suggested by Braun and Clarke (2006), the analytical process spanned across six (6) phases. The process, however, did not follow a waterfall model of sequentially moving from one phase to the next. Rather, it was more iterative in nature, where analysis involved

moving back and forth between the phases, to make sense of the data (Braun and Clark, 2006).

### **6.7.2.1 Phase 1: Familiarisation with the data**

The process started with the researcher immersing themselves within the data to get acquainted with it. Braun and Clarke (2006) suggest that personally transcribing the data (audio recordings of individual participant interviews) would aid a researcher in gaining such familiarity. Careful attention was thus paid to making sure that the transcriptions retained the originality of the responses given by the participants, as suggested by Braun and Clarke (2006).

This involved making sure that punctuations, pauses and the tones were captured correctly, to keep the transcriptions as accurate as possible. In addition to personally transcribing the data, the researcher also read through all the transcribed interview data to better familiarise themselves with it. At this stage, some initial interpretation of the data started to occur and as such, the researcher ensured that initial ideas of codes pertaining to interesting aspects of the data were noted.

### **6.7.2.2 Phase 2: Generating initial codes**

This phase involved the systematically generating a list of codes and associating them to relevant data extracts in the data items using Atlas.ti, a qualitative analytical software program. The data extracts were coded inductively; paying careful attention that any theoretical biases the researcher had did not significantly influence the coding process.

In accordance with Braun and Clarke (2006)'s suggestion, care was taken to ensure that as many relevant data extracts as possible were coded so as not to lose any information that could be of interest at a later stage of analysis. Multiple data extracts could be associated with a single code and a single code could have multiple data extracts associated with it.

### **6.7.2.3 Phase 3: Theme searching**

During this phase the researcher started analysing the codes, together with their associated data extracts, in order to organise them into broader candidate themes. All codes that were conceptually similar were grouped together into separate groups. The data extracts associated with each of these codes were then reviewed and any themes associated with the codes were noted.

The themes were then analysed and grouped together by conceptual similarity. These became the candidate themes. At this stage, some coded data extracts did not seem to fit into any theme. However, nothing was discarded at this stage, as it was uncertain if the identified themes would need to be combined, separated or further refined to better fit the data extracts. This phase then ended with an initial thematic map of the identified themes.

#### **6.7.2.4 Phase 4: Reviewing themes**

At this stage the researcher read through all the identified candidate themes, as well as their associated data extracts. The themes were then refined in two (2) stages. Firstly, the data extracts associated with each candidate theme were reviewed, to determine if they cohered consistently within each theme. Data extracts that did not fit were either moved to a different theme or discarded completely. Secondly, the candidate themes themselves were reviewed, in relation to the data set as a whole.

This was done to ensure that the identified themes accurately reflected the views of the participants within the data set. As a result, some themes had to either be merged together, separated into different themes or discarded completely. The product of this phase was a refined thematic map of the one that was developed in the previous phase.

#### **6.7.2.5 Phase 5: Defining and naming themes**

At this stage, the researcher further refined the themes that were identified in Phase 4. The process involved analysing the previously identified themes and the data extracts associated with them, to determine the essence of each theme, as well as where it fitted in, within the overall interpretive narrative.

The themes were also reviewed to ensure that they were discrete and that there was no overlap between them. The naming convention of the themes themselves was also reviewed, to ensure that it concisely and accurately reflected what each theme entailed. A final thematic map which consisted of the final themes relevant to the research questions of this study was then the end product of this phase.

#### **6.7.2.6 Phase 6: Producing the report**

This was the final phase of the data analysis process. It involved using the final thematic map produced in the previous phase to write a comprehensive, interpretive analytical narrative of

the collected data. Care was taken to ensure that the narrative highlighted contextual influences in the data extracts and that the prevalence of the identified themes was clearly demonstrated.

## **6.8 Ethical Procedures**

This study involved the participation of human subjects in order to answer the research questions (question 2) relevant to the study's goal. As such, prior to the collection of data, the researcher submitted the details of the research procedure along with any supporting documentation (application form, sample individual and organisational consent forms and the research instrument) to the Rhodes University, Information Systems ethical clearance committee for review and approval.

Furthermore, throughout the data collection process, reasonable action was taken to ensure that:

- Participants took part willingly and that they had the freedom to withdraw from participating in the study whenever they saw it fit;
- Reasonable effort was applied in making sure that participants understood and signed the necessary consent forms, prior to participating in the research;
- The reasons pertaining to why the study was being undertaken, any risks involved, as well as the expected outcomes of the research were communicated to participants, prior to their participation
- All participant responses were anonymized to protect the identities of the participants. As such any responses that were sensitive could not be traced back to the responders.

## **6.9 Summary**

This chapter detailed the methods that were employed to answer the research questions of this study. Using the research onion created by Saunders, Hill and Thornhill (2016) as a guide, the philosophical paradigm of the study, the research approach, the research strategy, the data collection methods, the data analysis methods, as well as the ethical procedures that were carried out, were explained. The next chapter presents the process of analysis of the collected data in greater detail, as well as the results of the analysis thereafter.

# CHAPTER 7: Data Analysis

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## 7.1 Introduction

The previous chapter gave the reader an overview of the philosophical principles underpinning this study, as well as how the decisions pertaining to its research design were arrived at. Specifically, Section 6.5 of the chapter outlined what type of data was collected, as well as how the data was collected. Section 6.6 of the chapter then followed, to describe how the collected data was analysed.

This chapter describes, the process of data analysis as well as the results of the analysis. The chapter will proceed as follows: Section 7.2 gives a brief description of the context of the research participants. This is followed by a description of how the data analysis process was executed in Section 7.3. Finally, an interpretive narrative of the results of the data analysis is provided in Section 7.4.

## 7.2 Context of the Research Participants

As stated in Section 6.5, data was collected using both semi-structured face-to-face and telephonic interviews. The researcher interviewed thirteen (13) participants, across nine (9) small to medium enterprises (SMEs) located in three (3) cities in the Eastern Cape. Due to the diverse nature of SMEs, the researcher organised the SMEs into clusters, based on their size and industry to aid both the researcher as well as the reader, to better understand the context of the research participants. However, to further facilitate an understanding of the SME clusters described in Section 7.2.2 and ultimately, the overall research participant context, a brief description of the locations of the SMEs is provided.

### 7.2.1 Locations of the SMEs

#### City A

With a population of approximately 70 000 people, City A is the smallest of the three (3) cities. The internet infrastructure is not well developed, with most SMEs in the city only having access to ADSL connectivity from Telkom, with internet speeds of up to ten (10) mbps. The majority of SMEs within this city are small businesses with less than twenty (20) employees. Most SMEs in this city also have limited expertise when it comes to cloud technologies and ICT in

general. As such, the majority of their ICT requirements are often outsourced to local ICT service providers which are often small businesses themselves. Furthermore, the ICT requirements of most of the SMEs in this city are mostly basic; with the majority of the ICT usage being restricted to low bandwidth intensive applications, email services and data backup services. Furthermore, there is often some close interaction amongst members of the business community. As such, information about new technologies and ICT service providers is often shared amongst the businesses, through word of mouth.

### **City B**

City B is the second largest of the three (3) cities, with a population of approximately two hundred and sixty thousand (260 000) people. Whilst the city is bigger than City A, it is still a relatively small city and the characteristics of SMEs within this city are somewhat similar to those of City A. Like most of the SMEs in City A, most of the SMEs in this city often outsource their ICT requirements to local ICT service providers as well. Information about these ICT service providers is also often shared amongst the SMEs through word of mouth, albeit, at a slightly lower scale than do SMEs in City A. Furthermore, most SMEs in this city also use low bandwidth cloud applications; with most of them using the cloud to back up their data as well as to host their emails and share data amongst remote users and/or locations.

Unlike City A, however, City B contains a few medium sized SMEs with one hundred (100) employees or more. City B also provides access to more advanced internet infrastructure. Some areas have access to fibre Internet connectivity from Telkom (with speeds of up to 100mbps), which makes it more feasible to implement more bandwidth intensive cloud applications. Despite this, the cost of accessing such infrastructure is often perceived as too high and most SMEs often restrict their cloud usage to low bandwidth applications.

### **City C**

City C is the largest of the three (3) cities, with a population of approximately 1.3 million people. It is quite similar to City B but on a much larger scale; having more SMEs with over one hundred (100) employees than City B. It also has more pervasive advanced internet infrastructure; with more areas connected to Telkom's fibre infrastructure than City B. As such, SMEs that have more advanced uses of the cloud beyond just data storage and emails are often concentrated in this city. Like SMEs in City A and City B, SMEs in City C, also make use of local ICT service providers for their ICT requirements. However, the sharing of ICT service

provider information amongst the SMEs is not as pronounced as is found in City A and City B. Despite the city's better internet infrastructure, however, a significant number of the SMEs in this city, also only utilize the cloud for low bandwidth applications and data storage just like in City A and City B.

### 7.2.2 SME clusters

The SMEs were organised into clusters to facilitate a better understanding of the context of the research participants and to further aid interpretation of the collected data. The sizes and the types of industry of the SMEs were utilised to categorize them. Table 13 below shows the four (4) different SME clusters. The researcher considered an SME as small, if it had less than fifty (50) employees and medium sized if it had between fifty (50) and two hundred (200) employees (see Section 3.1 for the formal SME definition for this study).

**Table 13: SME clusters**

<p><b>Cluster A</b> Size: Small Industry: ICT services Sample size: 6 SMEs</p>	<p><b>Cluster B</b> Size: Medium Industry: ICT services Sample size: 1 SME</p>
<p><b>Cluster C</b> Size: Small Industry: Information and Media Sample size: 1 SME</p>	<p><b>Cluster D</b> Size: Medium Industry: Information and Media Sample size: 1 SME</p>

#### **Cluster A SMEs**

SMEs in this cluster consisted of small businesses that are quite proficient in ICTs. These types of SMEs usually provide ICTs services to other local small businesses. Often, these SMEs consist of very small groups of IT technicians that take care of most of the ICT needs of a small number of local clients. As most of the ICT requirements of the local small businesses are outsourced to these types of SMEs, they often have detailed knowledge of the ICT requirements and capabilities of their clients. As such, they have a very close relationship with their clients, and are often entrusted with most of the ICT decisions of their clients; hence playing a very significant role in those clients' cloud adoption decisions.

These types of SMEs can be found in all three (3) cities. Despite their ICT proficiency, however, these types of SMEs perceive the cloud as either too expensive or the local bandwidth

to be too low and as such, often restrict its usage to simple low bandwidth applications such as data storage and emails for their own operations.

### **Cluster B SMEs**

Just like Cluster A SMEs, these types of SMEs are also quite proficient in ICTs. As they have a larger number of employees than Cluster A SMEs, however, these types of SMEs are often only found in City B and City C. In addition, just like Cluster A SMEs, they are also entrusted with taking care of their clients' ICT needs and requirements. These clients are mostly local small businesses that are not proficient in ICTs. Unlike the SMEs in Cluster A, however, Cluster B SMEs usually have their own dedicated ICT departments that handle their internal ICT requirements, in addition to those of their clients'. Hence, they have a more structured way of implementing cloud applications and often run more complex software from the cloud such as Customer Relationship Management (CRM) software.

These types of SMEs usually can also afford to have more advanced fibre connectivity for cloud implementations for their own operations.

### **Cluster C SMEs**

Usually found in all 3 cities, these types of SMEs are quite small and are often not proficient in ICTs. They often outsource most of their ICT requirements to other local ICT service providers (usually Clusters A and B SMEs) and they fully trust these ICT service providers to handle all their ICT requirements. Most of their ICT needs are basic; usually only utilizing low bandwidth cloud applications such as email and data storage. As they are not proficient with ICTs, these SMEs often only consider using cloud after either hearing and getting a recommendation from either another local business or an ICT service provider. Often, ICT service providers have to facilitate SMEs in this cluster to adopt cloud technologies. Without such facilitation, Cluster C SMEs tend to be either ignorant or inexperienced enough to adopt the cloud.

### **Cluster D SMEs**

Cluster D SMEs are often only found in cities B and C. Despite their core business not being in ICT, these types of SMEs are often large enough to have their own internal ICT departments that take care of their internal ICT requirements. Cluster D SMEs also could afford to implement advanced internet infrastructure such as fibre connectivity. As such, when Cluster

D SMEs implement cloud, they tend to want to use the cloud for more complex cloud applications such as cloud-based content management systems. Cloud adoption in these types of SMEs is, therefore, often fairly structured and carried out deliberately.

### **7.3 Process of the Data Analysis**

Chapter 5 explored what extant literature said about what small businesses need to consider when adopting cloud computing applications. This culminated in a conceptual framework to guide SMEs in the cloud adoption process (See Section 5.2). This study, however, sought to illuminate and understand the cloud adoption decisions made by Eastern Cape SMEs within their socio-cultural context. The objective was to enable the researcher to draw parallels between the framework illustrated in Section 5.2 and what emerged from the collected data, to ultimately provide a conceptual framework for the adoption of cloud services by SMEs based in the Eastern Cape.

As such, the analysis of the collected data was more inductive in nature; focusing mainly on the concepts aligned to the research questions of the study. Due to the philosophical underpinnings of this study (see Section 6.2) the researcher was more inclined towards unravelling latent rather than semantic themes within the data.

The researcher closely followed the work of Braun and Clarke (2006) as a guide, during the entire analytical process. During the process of analysis, it was found that the use of thematic maps at each phase of the analytical process significantly improved the analysis and interpretation of the data. This was supported by Braun and Clarke (2006); alluding that the use of visual representations is a useful way to sort data into themes. As such, the researcher constantly referred to the work of Attride-Stirling (2001), in the construction of the thematic maps; all whilst making sure the process remained within Braun and Clarke (2006)'s six (6) phased approach.

According to Attride-Stirling (2001), one needs to look at thematic maps within the framework of Toulmin's argumentation theory (Toulmin, 1958). A distinction was made between basic themes (backings), organising themes (warrants) and global themes (claims). It was therefore apparent to the researcher that the main or over-arching themes had to be treated as claims that are fully supported by a set of candidate themes (warrants) and sub-themes (backings), in all thematic maps, at various stages of the analytical process. A detailed description of the entire analytical process is given below.

### 7.3.1 Phase 1

Audio recordings of all the interviews with the research participants were transcribed by the researcher. Care was taken to ensure that the transcriptions correctly captured the views of the participants. This was crucial as it allowed for familiarisation with the data. This immersion into the data also enabled initial interpretation to take place, which allowed ideas of initial concepts related to the research questions of the study to begin to form. These ideas would later feed into the next phase of analysis, as described in Section 7.3.2.

### 7.3.2 Phase 2

Coding of the entire data corpus was carried out during this phase. The researcher made use of Atlas.ti, a qualitative data analytical software tool, to analyse and code the data across the entire data corpus, which consisted of thirteen (13) data items. Bearing in mind, the initial concepts generated in the previous phase, data was coded inductively across the entire corpus. The researcher's aim in this phase was to let as many concepts relating to the research questions of the study as possible, emerge solely from the data, with minimal influence from theory.

Search Codes				
Name	Grounded	Density	Groups	
<input type="radio"/> ease of use of cloud based system upgraded fro...~	<input checked="" type="checkbox"/>	7	0	
<input type="radio"/> ease of use of software~	<input type="checkbox"/>	1	0	
<input type="radio"/> easier access to latest technology~	<input type="checkbox"/>	2	0	
<input type="radio"/> easier adoption with own internal IT department~	<input checked="" type="checkbox"/>	5	0	
<input type="radio"/> easier to go with a provider you already have a rel...~	<input checked="" type="checkbox"/>	10	0	
<input type="radio"/> easier to have one provider for all needed services~	<input type="checkbox"/>	1	0	
<input type="radio"/> emails mostly hosted on cloud~	<input checked="" type="checkbox"/>	3	0	
<input type="radio"/> extra fee charged for data backups~	<input type="checkbox"/>	1	0	
<input type="radio"/> fear of internet downtime~	<input checked="" type="checkbox"/>	3	0	
<input type="radio"/> fear of losing data control~	<input type="checkbox"/>	1	0	
<input type="radio"/> fear of negative consequences stemming from cl...~	<input checked="" type="checkbox"/>	7	0	
<input type="radio"/> goal of intermediaries is to make money~	<input type="checkbox"/>	1	0	
<input type="radio"/> handful of employees~	<input type="checkbox"/>	2	0	
<input type="radio"/> hybrid cloud solution common~	<input checked="" type="checkbox"/>	8	0	
<input type="radio"/> hybrid parallel implementation~	<input checked="" type="checkbox"/>	5	0	

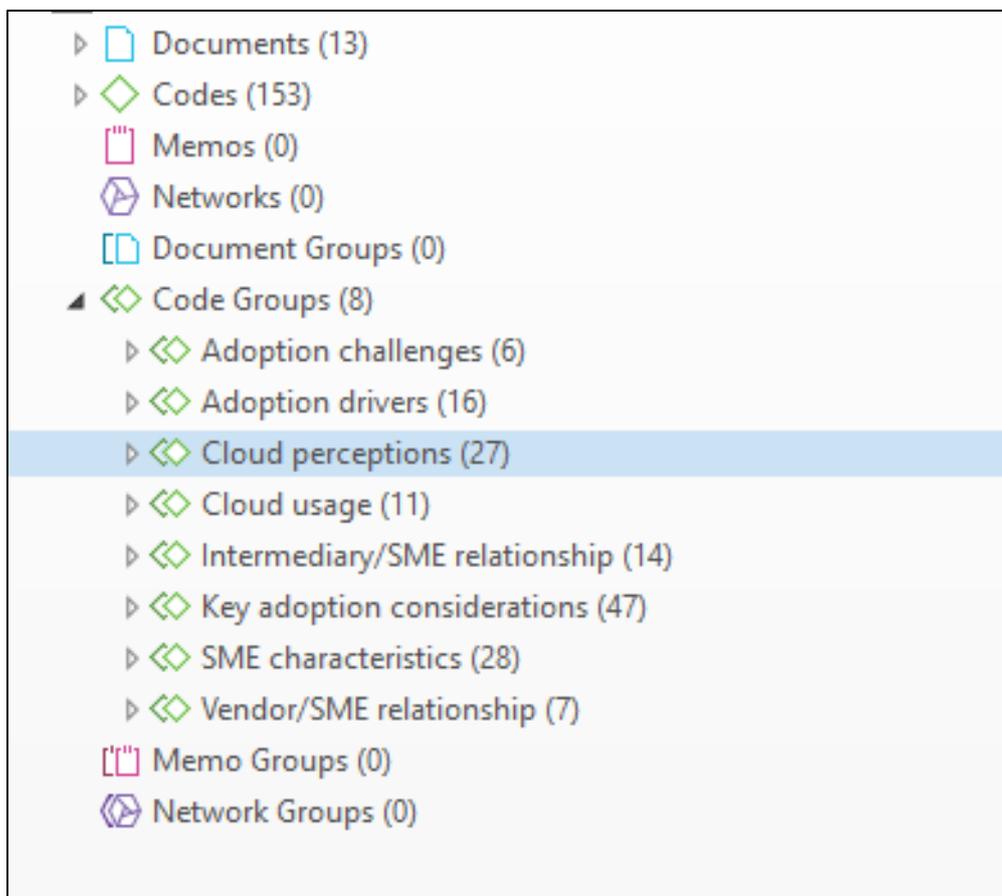
**Figure 10: Initial coding across entire data corpus as part of Phase 2 of data analysis**

A deliberate effort was therefore undertaken to code as close to the data as possible, so as to not miss any concepts that could be of interest in the later stages of analysis. Different codes were assigned to data extracts of interest across the entire data corpus. Consistent with Braun and Clarke (2006), some data extracts could be associated with multiple codes whereas some

codes could have multiple data extracts associated with them. At the end of this phase, one hundred and fifty-three (153) codes were generated; the majority of which had very low frequencies (data extracts associated with them), as shown in Figure 10. This indicated that the codes and their associated data extracts needed to be reviewed and the coding framework re-conceptualised.

### 7.3.3 Phase 3

Phase 3 of analysis commenced with a review of the one hundred and fifty-three (153) codes generated in the previous phase, together with their associated data extracts. The process involved reading through all the data extracts associated with each code across the entire data corpus, to find out what the essence of each code was. The codes were then organised, based on their common conceptual content (code groups) as shown in Figure 11.

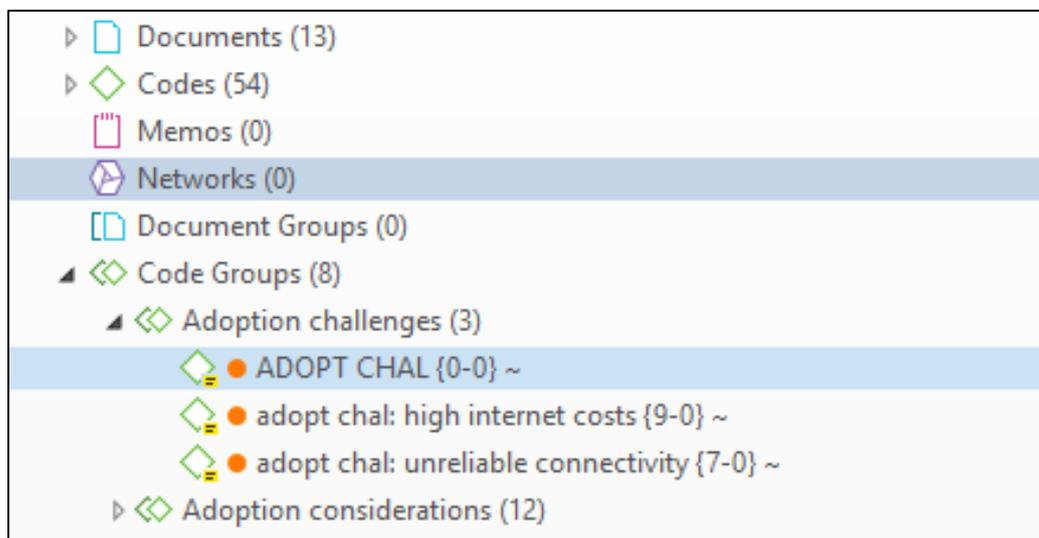


**Figure 11: Codes organised around common conceptual content as part of Phase 3 of data analysis**

It was important to note that at this stage, even though the codes had now been organised into conceptually similar groups, they still had very low frequencies. The codes themselves

therefore needed to be reconceptualised. According to Stirling (2001), codes need to be discrete so as to avoid redundancy, while being broad enough to be meaningful. As such, the code groups were reviewed and redundant codes within each code group were merged together and some of them renamed to better fit the data extracts within the code groups.

The data extracts were also reviewed to ensure that they fitted into the new codes with which they were associated. All the codes across the data corpus were then renamed to allow for the code group they belonged to, to be easily identified in subsequent analysis. At the end of this process, the one hundred and fifty-three (153) codes were reduced to fifty-four (54) codes as shown in Figure 12 below.



**Figure 12: Initial codes reviewed and re-conceptualised as part of Phase 3 of data analysis**

After the codes had been organised as above, the next step involved looking for candidate themes within the data. This involved reading through each of the data extracts associated with each code in each code group again and determining what the core theme was within each code. Themes were identified, based on their relevance to the research questions of the study. The researcher employed some of the techniques from Ryan and Bernard (2003) as they read through each of the data extracts for each code, within the code groups, in order to identify themes within the data. These included looking for repetition, transitions, similarities and differences, local typologies, metaphors, linguistic connections, missing data and theory related material. The result of this process was a list of all the codes and their associated themes as illustrated in Figure 13 below.

	A	B	
1	Category	Code	Themes
2	Adoption challenges		
3		High Internets costs	affordable, reliable internet is a cloud require
4		Unreliable connectivity	
5			
6	Adoption Considerations		
7		Cloud Viability	affordable, reliable internet is a cloud require
8		Contingency planning	there is a general fear of losing data and cloud
9		financial feasibility	affordable, reliable internet is a cloud require
10		implementation procedure	it is best to trial and test software to see how
11		internal organisational capabilities	support from top management essential to im
12		organisational IT maturity	prior working knowledge with a system that h
13		security (removed)	
14		service level agreements (SLAs)	need to agree on uptime and disaster recover
15		service provider choice	Ongoing process to find the right vendor/cloud
16		software usability	Very little change management if upgrading fr
17		supporting infrastructure	Important to upgrade internet connectivity of

**Figure 13: List of codes and their associated core themes, as part of Phase 3 of data analysis**

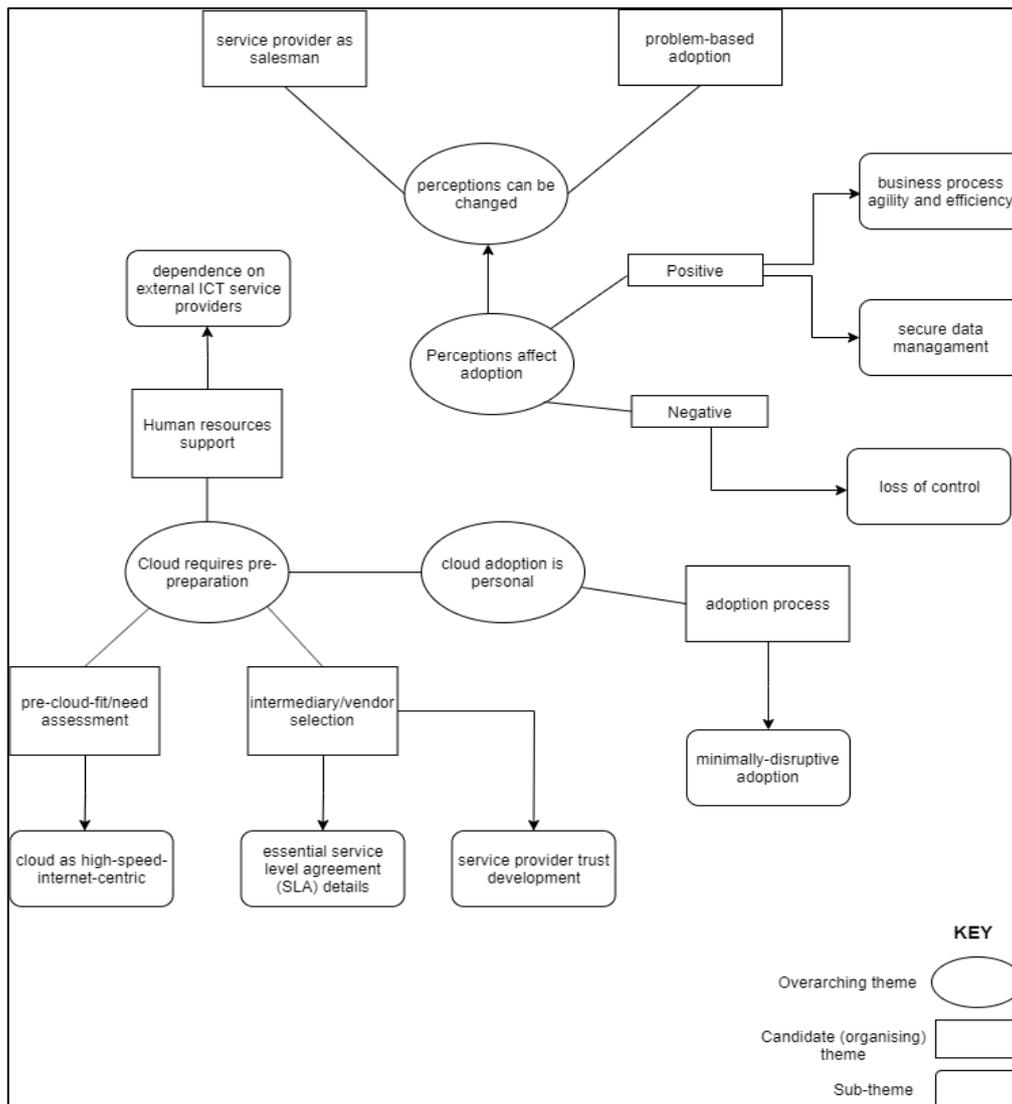
These themes were then grouped together into candidate themes (organising themes) and organised as such. The codes associated with these candidate themes were also recorded, to enable the researcher to re-read and collect all the data extracts that fitted into the candidate themes as shown in Figure 14 below. At the end of this process, fourteen (14) candidate themes emerged.

	A	B	
1	Theme	Organising Theme	code
2			
3	Adoption challenges		
4	affordable, reliable internet is a cloud	cloud as high-speed-internet-centric	High Internets co
5	lack of trust in local internet connect	cloud as high-speed-internet-centric	Unreliable conn
6			
7	Adoption considerations		
8			
9	there should be a cloud fit/need ass	pre-cloud-fit assessment	Cloud Viability
10	affordable, reliable internet is a cloud	cloud as high-speed-internet-centric	Cloud Viability
11	there is a general fear of losing data	secure data management	Contingency pla
12	affordable, reliable internet is a cloud	cloud as high-speed-internet-centric	financial feasibil
13	incremental implementation ensure	cloud-induced work disruption avoidanc	implementation
14	it is best to trial and test software to	cloud-induced work disruption avoidanc	implementation
15	Ability to manage change during clou	human resources support	internal organisa
16	support from top management esser	human resources support	internal organisa

**Figure 14: Themes organised by conceptual similarity as part of Phase 3 of data analysis**

The fourteen (14) candidate themes were further analysed and conceptual similarities between the themes were noted. Some candidate themes were found to work more as sub-themes of the other candidate themes, which led to the development of an initial thematic map. Consistent with, Attride-Stirling (2001)’s suggestions, the researcher took great care to ensure that during the development of the thematic map, all lower order codes and themes were consistent and

supported the claims made by high order themes. An initial thematic map (see Figure 15 below), was the final output of this phase of analysis (Phase 3) as suggested by Braun and Clark (2006).



**Figure 15: Initial thematic map, as final output of Phase 3 of data analysis**

#### 7.3.4 Phase 4

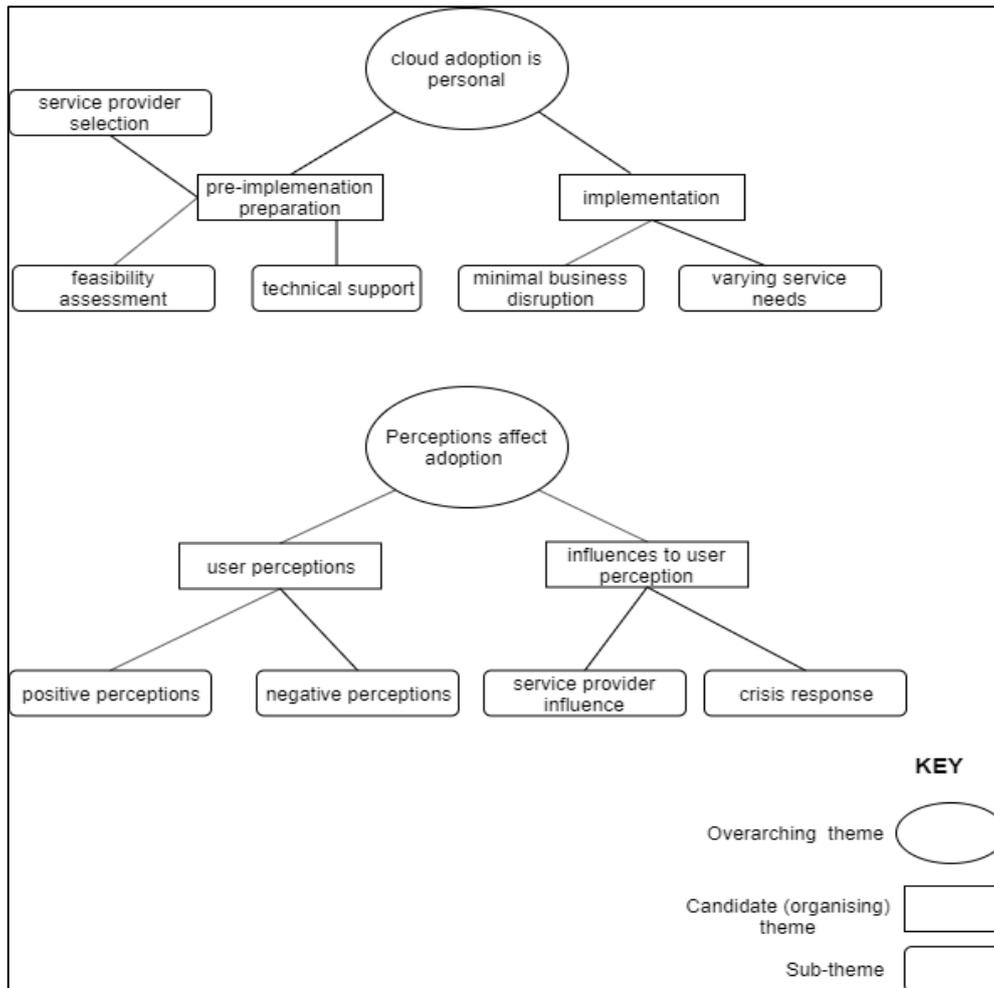
Refinement of the candidate themes that emerged in the previous phase took place in two (2) stages as follows:

- First the data extracts associated with each candidate theme had to be re-read to verify if they were consistent within each theme. Any data extracts that did not quite fit into the candidate themes with which they were associated had to be removed from the theme and/or moved to another candidate theme where they would fit better. This

process also involved a simultaneous evaluation of the candidate themes themselves. The goal was to determine whether the problem was with the candidate themes themselves or with the data extracts. In turn, this enabled the researcher to determine whether it was necessary to rework the themes, so that they adequately catered for the coded data extracts.

- The second stage involved evaluating the candidate themes in relation to the data set as a whole. This process involved re-reading the entire data set to ascertain if the defined candidate themes (represented as a thematic map) accurately and adequately reflected the views of the research participants in the data set. In addition, this process also afforded the researcher, the opportunity to re-code any data extracts into the candidate themes that could have been missed in the previous coding exercises.

The result of this two-stage refinement, was that some candidate themes had to be renamed, merged together or new ones created altogether. Figure 16 below illustrates a refined thematic as output for Phase 4 of the data analysis process.



**Figure 16: Refined thematic map – final output of Phase 4 of data analysis**

### 7.3.5 Phase 5

In this phase the researcher had arrived at a satisfactory thematic map to aid in further interpretation of the data. As part of the final refinement of the thematic map presented in Figure 16 above and consistent with Braun and Clark (2006), however, the entire data corpus was read again to ensure that the overarching themes were discrete and that they did not overlap. To facilitate this process, the researcher had to consider, how each overarching theme fitted within the overall interpretative narrative.

It was, therefore, important at this stage, that the researcher could concisely describe what aspect of the data each theme reflected. An evaluation of the naming scheme of the themes and their sub-themes also had to be carried out at this stage, to ensure that the reader could easily comprehend the essence of each theme.

This then culminated in a final thematic map (see Figure 17 below), which was then used as an aid by the researcher in the final phase of analysis, to interpret the data extracts in the whole data set.

### **7.3.6 Phase 6**

The data analysis process concluded with an interpretive narrative of the collected data. Using the thematic map produced in the previous phase as an interpretive aid, the researcher sought to illuminate the underlying meanings behind the collected data.

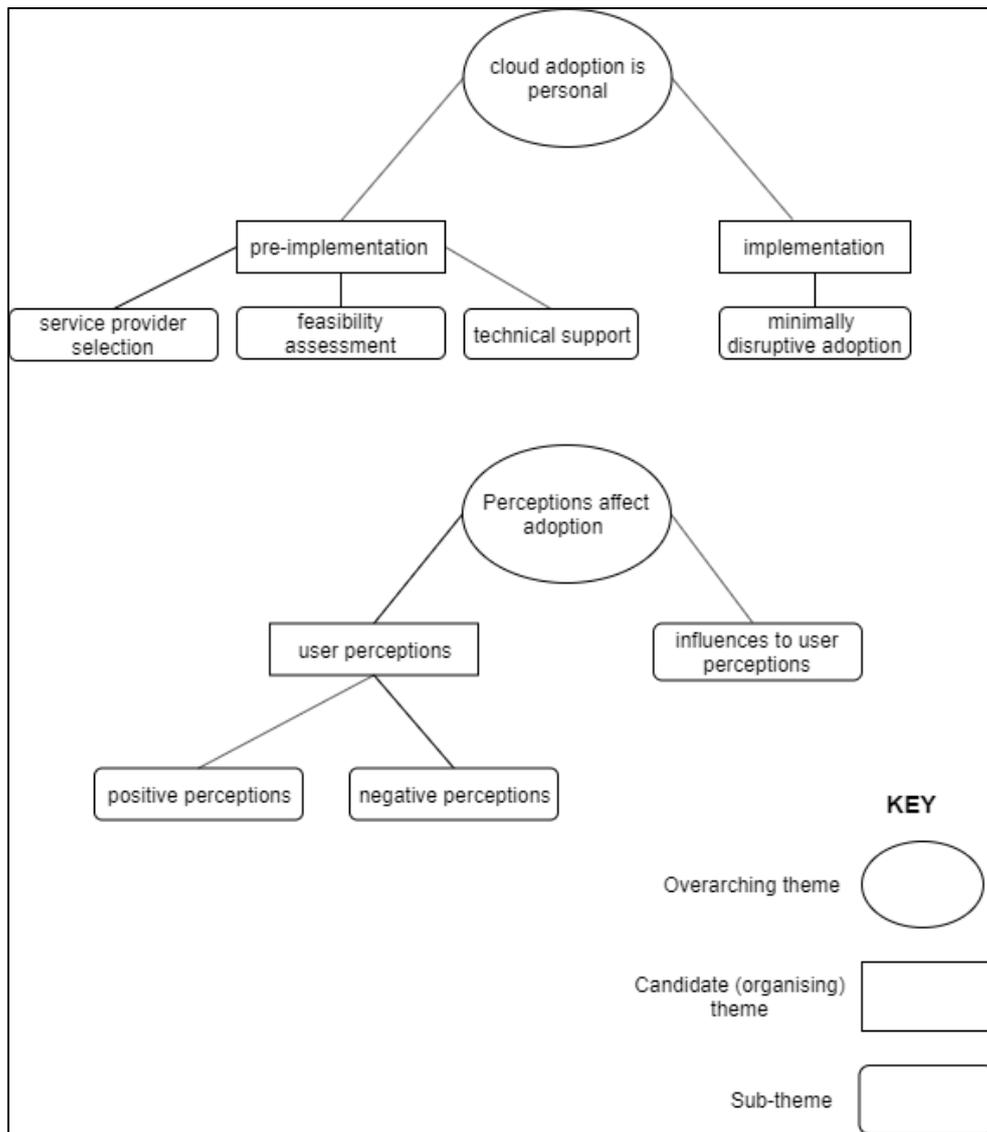
As a result, the data extracts associated with each theme were embedded in an interpretive analytical narrative in such a manner as to:

- Demonstrate the prevalence of the identified themes,
- Highlight contextual influences and their relationships with the data extracts and,
- Support the analytical claims of the researcher.

References to the literature were also made that were applicable throughout the narrative. This significantly enhanced the interpretive process, as it enabled better alignment of the emerging themes to the research questions of the study; in turn influencing the arguments within the narrative.

The culmination of this interpretation is presented in the form of a comprehensive analytical narrative in the following section.

## 7.4 Interpretive Narrative



**Figure 17: Final Thematic map – final output of Phase 5 of data analysis**

The researcher’s interpretations of the data were rooted in the final thematic map presented in Figure 17. In particular, the discussions on the adoption of cloud services with the research participants unravelled 2 prevalent, overarching themes; the non-universal and personal nature of the adoption process and the effect of user perceptions on the adoption process. These are illustrated in Figure 17 above, as separate thematic networks and each one is explored in depth, in the following sections.

### 7.4.1 Cloud adoption is personal

Even though it was not explicitly stated by the research participants, it was apparent to the researcher that the adoption of cloud services by SMEs in the Eastern Cape was highly

contextualised, which made every instance of it quite unique in its own way. The researcher could, however, distinguish between two major phases of cloud adoption; a pre-implementation phase and an implementation phase.

#### **7.4.1.1 Pre-implementation**

A close scrutiny of the data revealed that a significant amount of small businesses that decide to move their systems over to the cloud engage in a number of activities prior to cloud implementation. These include selecting a suitable service provider, assessing how feasible it is to move over to the cloud and ensuring that the technical expertise is available to support the move to the cloud. These activities, however, appeared to be more pronounced with SMEs in Clusters B and D. This could be attributed to their larger size and hence, much more complex ICT infrastructure and requirements. This, in turn, would, require a more careful approach to cloud services adoption.

##### **7.4.1.1.1 Service provider selection**

The discussions on service provider selection presented some underlying factors that were at play within each SME's contextual environment. A significant number of SMEs in developing countries have been observed to be technologically challenged (Modimogale and Kroeze, 2009; Wamuyu, 2017). This appeared to be the case for a number of SMEs within the Eastern Cape. It was observed that this was especially significant, as it appeared to have a bearing on the way in which these SMEs adopted cloud services.

In particular, intermediaries (Clusters A or B SMEs), which can be described as technologically savvy businesses that assist other less technologically savvy businesses with most of their ICT related issues, appeared to play a pivotal role in the cloud adoption process. This was because the SMEs could use the intermediary as a mechanism to overcome their lack of proficiency in ICTs; thus, enabling the SMEs to still implement and use new technologies despite their limited ICT proficiency. Participant J from a Cluster A SME alluded to that in the following excerpt.

*“...in my experience when dealing with clients (SMEs), basically the biggest issue is that they aren't tech savvy. They really don't know pretty much anything about hardware technologies or cloud-based technologies. And you start having a conversation with them giving them options maybe between local and cloud, or even just local depending on their needs. And a lot of times you have to get slightly technical, ... and yeah you start talking to them about how*

*the system works and a lot of them literally just stare at you, listen, listen and they go 'okay, well, I don't know really what you are telling me but it's cheap though so let's go with it', you know that sort of approach."*

The intermediary, therefore, appeared to be an essential part of cloud adoption for a significant number of SMEs, and could not be divorced from any discussion on the adoption processes. In some instances, the difference between an intermediary and a cloud service provider was blurry as some intermediaries also appeared to provide data backup cloud services to their clients (mostly SMEs that are not proficient in ICTs).

#### **7.4.1.1.1 User trust**

Throughout the discussions with the research participants, the concept of trust was quite prevalent when selecting a service provider. This applied to SMEs in all the clusters. The researcher observed that the SMEs conducted a number of activities in order to establish trust between either the intermediary or directly with a service provider.

SMEs that did not have sufficient technical capabilities (usually Cluster C SMEs) to implement new technologies used an intermediary to bridge cloud adoption; entrusting the intermediary with all the decisions that needed to be made as far as implementing new cloud services went. As such, for these SMEs, selecting an intermediary was almost synonymous with selecting a service provider, as they perceived the intermediary as all knowing, in terms of which cloud service provider was suitable for them. Participant D (Cluster A SME) seemed to support this notion:

*"... They fully trust me. In other words ... if I went to somebody I would say, listen man this is what I think you should be doing and this is why I think you should be doing it and I give valid reasons, and I give stats, and I can back myself up then they pretty much trust me in that."*

Participant J (Cluster A SME) also alluded to that idea; pointing out the following:

*"... I mean a lot of clients and I don't know if it's only in City A if I'm honest with you... in all of my years of doing IT I have been based in City A so for me I can't really vouch for other cities or towns or anything. But in my experience clients have a sort of, if I may say... they basically put all of their faith in the IT company that is looking after them. So basically, they have this opinion and*

*feeling when you start approaching them about technologies ... a lot of them would literally sit back and go ‘I’ll pay you and you sort me out, I don’t want to know about the technical, just sort me out.’*

As these SMEs (Cluster C) were essentially entrusting their entire ICT requirements into the hands of an intermediary, trust in the intermediary was a significant factor in the selection process. A referral system; where an SME would determine the reputation of an intermediary through information from another SME that had used them before, appeared to be the dominant method of establishing trust. Participant C (Cluster A SME) alluded to that in the following excerpt:

*“Basically, a lot of our customers at the moment are from previous customers that we have dealt with and we recommend systems and they say that we've got a system from this guy ... and that's how a lot of our customers are coming at the moment, via word of mouth.”*

Participant B (Cluster A SME) also had this to say about selecting an intermediary:

*“... another thing always to look at uhhh ... the current clients. You know in terms of who are they providing the service for as well, that's very important ... for me if I tell you for, example, one of the big banks is one of my clients and we provide the service to them, you know, it's going to change the way you think about us.”*

It was observed that this mechanism of establishing trust was more pronounced with Cluster C SMEs that were located in City A. The researcher, inferred that this could be due to the small size of the city, which enabled a much more rapid spread of information across the different SMEs as most of the business owners knew each other. Cluster C SMEs also did not seem to be concerned about the service level agreement (SLA) details with the cloud provider; being more concerned rather, with the constant provision of technical support from the intermediary, when they needed it. This could be attributed to Cluster C SMEs’ lack of proficiency in ICTs and therefore, apathy towards any ICT related issues.

Clusters B and D SMEs appeared to have a much more deliberate approach towards selecting a cloud provider. As these types of SMEs were much larger in size and had much more complex ICT requirements, they had their own internal ICT departments that took care of all their ICT

requirements. As such, they did not need an intermediary to move to the cloud as they could communicate directly with a cloud service provider to provision the services that they required.

The researcher observed that Clusters B and D SMEs, paid much more attention to the details of the service level agreement with the cloud service provider, and they used those details as criteria to establish trust with the service provider. The following was a response from a participant L (Cluster B SME) when they were asked how they decided on the right cloud provider for them.

*“One was the responsibility for the back-ups of the data and two was the emergency fail-overs and the guaranteed percentage of uptime of the system, so those were the three factors that we looked at but the contract was very good, it wasn't a one-sided contract. So, they did have all those pre-requisites in. We didn't have to negotiate them.”*

Participant F (Cluster D SME) also had this to say pertaining to the issue:

*“...we can't have our business running on someone else's building without some sort of service level agreement yaa ... Look if we are down for a specific amount of time we could potentially lose productivity and money so we would need some kind of service level agreement where we cannot be down for a certain number of hours without any financial repercussions, so we would have to come to some agreement with that so that if we go beyond, let's say just for example 2 hours. Anything after 2 hours and they cannot bring us back up then there would have to be some financial repercussions where they will have to reimburse us or something, something like that.”*

From the researcher's observations, cloud providers who did not have a comprehensive SLA in place were associated with lower levels of trustworthiness. The most common criteria that appeared to be given a significant amount of weight in SLAs were the following:

- Percentage of system uptime
- Data backup and redundancy
- Persistent access to data after termination of contract
- Disaster recovery timeframe and,
- Continuous support.

It is possible that the need to look more closely at SLA details could also have been driven by a fear of losing control of critical data and systems. As such, selecting a service provider on the basis of the provider's SLA provisions could also have been a cautionary measure to protect the SMEs in case of a disaster.

Clusters B and D SMEs also used the referral system to determine how trustworthy a service provider is. The researcher, however, observed that this was not as pronounced as with Cluster C SMEs, as these types of SMEs could only be found in either City B or City C with a much wider geographical spread. It was therefore, inferred by the researcher that the wider geographical spread of the SMEs provided some restrictions in terms of the transfer of information via word of mouth between the SMEs. However, an interesting observation was that, Clusters B and D SMEs then seemed to utilise other means such as the internet, in order to find out more information about previous customers of a service provider. Participant M (Cluster B SME) alluded to that in the following excerpt;

*“Yeah google it, go on the internet and find out, go read reviews, go to the forums and find out. You know ... you will go to a provider and they will tell you all sorts of wonderful things about their data centre, their failover and so on but go out and find out who has used them before and what their experience is.”*

#### **7.4.1.1.1.2 Service provider lock-in**

Through discussions with some participants, the researcher discovered that some SMEs were already using software products from some well-known cloud vendors. However, these companies then started offering cloud versions of their software and some SMEs saw this as a convenient route to move to the cloud. The SMEs therefore appeared to favour a particular service provider, based on this long-standing relationship that they already had with them. Participant G (Cluster C SME) had this to say;

*... “I asked her [support consultant] that they must please contact me so that I can find out precisely how it [the cloud version] works, and what the costs and so forth are because ultimately I'll take that decision...if it was gonna be a lot more expensive I think we would have thought twice about it at that stage. But when the lady phoned me and explained to me, because I said to her I am already working on their on-premise payroll system and she said no it's not a*

*problem. What they do is, they just transfer all your data from the on-premise system onto the cloud version ... I had confidence [in her] because the current on-premise system and the new system is run under the same umbrella, it's just the one is cloud based and the one is basically desktop-based."*

The ease that comes with porting data from an on-premise version of a software onto a cloud version through a provider one has been working with already also appeared to be a significant draw factor. This can be seen in the following response from a participant L (Cluster B SME).

*"... like I said before we are already ingrained with the service provider specifically because our development is done on their platforms, we didn't look at it [other service providers] because the change management from our business perspective would have been just too much."*

However, it was observed that there appeared to be an expectation that the cloud-based software should not be too different from the on-premises version that was already in use. This indicated, that even though the willingness to experiment with cloud was there, the SMEs were still conservative and were not prepared to take a significant leap forward in the technology in use. It could be inferred that, the SMEs were probably still not familiar with how the cloud works (and also, probably, did not trust it as well) and thus adopting the cloud in this way provided them with a way to start using cloud technologies without exposing themselves to a significant amount of risk. This can be seen in both the previous response from participant G above as well as the response below from participant L (Cluster B SME).

*"The main one that we were worried about is system A, and that obviously, we have running, at the moment through one vendor and we pay per user ... it's a once off fee that you pay and then you pay an annual maintenance fee on it and the vendor has now also offered a cloud based solution for that where you pay as you use the servers but the pay as you use service is slightly different from the licensed version and so we just looking at the differences and making sure that our systems are in place, that we can take full advantage of the pay as you use system."*

#### **7.4.1.1.2 Feasibility Assessment**

Feasibility assessment came up as a prominent sub-theme throughout the discussions with the research participants. The researcher observed that SMEs across all clusters tried to determine

how suitable it was for them to move to the cloud, prior to starting a cloud implementation. The researcher believes that there is a reason why that could have been the case.

Most of the research participants that were interviewed perceived the internet connectivity in the Eastern Cape and in South Africa as a whole to be either very slow, very costly or both. Participant B (Cluster A SME) had this to say:

*... “that software is pretty much, you know, the only service we use online, I don't really use any sort of uhmm, other services online at the moment ... I'm just trying to think ... you see unfortunately here in South Africa when it comes to like your major services that you need to use, our bandwidth is an issue.”*

Participant J (Cluster A SME) also had this to say:

*“A lot of the times we would approach them [clients] and most of the time it stops [interest in cloud] when they basically find out that A, it's quite pricey and B, you need that solid internet. When they realise that if there is no internet, they basically won't have access, you know they sort of step back and go, okay ... most of the time, it's more in a sense of lessening it down and it's only used as a cloud backup facility.”*

The above responses led the researcher to believe that due to this general negative perception about internet connectivity in South Africa, SMEs were trying to determine the impact that the connectivity issues would have on the services they would require and also perhaps determine the extent to which they might need to use the services. As this was done prior to any cloud implementation, it appeared to have a bearing on the overall decision to adopt cloud services. More specifically, the choice of what cloud services to use seemed to be influenced by the aforementioned perceptions. As a result, it was observed that cloud service usage was mostly restricted to low bandwidth applications and backup of data. This could be seen in responses such as the following from Participant I (Cluster A SME).

*“... luckily with these backups we are using, the cloud backups, we don't have that problem anymore, of clients losing critical data. But, ya, only critical data, we can't like upload everything to a cloud, because ya they [clients] are going to have to pay too much then.”*

For most of the SMEs, deciding what has to be put into the cloud was thus a very crucial process for the aforementioned reason. This could be inferred from participant responses such as the following from Participant D (Cluster A SME).

*“... architects, they run these huge massive, aerial photographs and drawings. That has to be hosted on a local network, not in a cloud network you know. So, you have to identify what you can put in there [cloud] that will run correctly versus just putting the whole lot there.”*

As each SME had its own requirements, this process appeared to be quite depended on the SME’s circumstances as well as the environmental context.

Even though, there seemed to be a general perception that the internet connectivity in South Africa was not sufficient enough to fully move to the cloud; thereby appearing to force SMEs to only use low bandwidth applications. Some instances of higher bandwidth application usage were observed with Clusters B and D SMEs. Most of these SMEs were located in either City B or City C, in areas that were provisioned for higher bandwidth internet connectivity. Whilst this could have been a contributing factor, the researcher observed that smaller SMEs (mostly Clusters A and C) were not utilising higher bandwidth intensive applications despite being located in the same geographical area. The cost of accessing higher bandwidth internet could have been a determining factor for that. Participant B (Cluster A SME) located in City B had this to say:

*“We find that just about any ADSL that is on offer, on the full range of ISPs out there, whether you get VDSL or just normal ADSL, the upload generally speaking doesn’t really hit higher than about 10mb/s and even that already, if you want that 10mb/s upload you are paying literally thousands a month for that. So, you know it’s a two-part system, the cloud is awesome but then you need the awesome internet with that. It’s just extra expenses, it blows up a bit. It’s a tough one but we definitely moving towards that, its time you know, the world is getting to that.”*

What appeared to be unique within Clusters B and D SMEs was that they did not seem to worry about the cost of accessing higher bandwidth internet. The researcher could infer that, perhaps due to their larger size, they had established a good reputation for themselves and could attract a much larger client base, which ultimately could have led to a better overall financial flow

than their smaller counterparts. Participant L (Cluster B SME) in City C when asked what they considered prior to moving any system to the cloud had this to say.

*“So, the one was we obviously, waited for all of our offices to have a fibre connection. some of our offices they still had a much slower connection, so that was the pre-requisite, we could have done the move perhaps earlier, but we waited for all the offices to be on fibre.”*

From the above response, it was apparent that the SME had installed fibre internet connectivity in a few of their offices and they were satisfied with the outcome. This was then rolled out to the rest of the offices later, which to the researcher indicated the SME’s financial capacity. Furthermore, due to Clusters B and D SMEs having their own internal ICT departments serving a larger number of employees, they also appeared to have made significant investments in their ICT infrastructure over the years, which could have become costly to operate and maintain. As such, even though most SMEs generally viewed cloud as costly, these SMEs could have been viewing the cloud cost in relation to their already existing ICT infrastructure costs and thus seeing it more as a cost saving than an unaffordable endeavour. Participant L (Cluster B SME) seemed to suggest that in the following response;

*“... now we have a much lower cost per month, per employee so if we for instance hire a whole lot of temporary workers we can just pay for their requirements per month, we don't have to buy an outright license. Uhhh so if we reduce staff then we reduce that cost immediately because we haven't had to have an upfront payment for the licenses. It's a pay as you go service.”*

For some of the SMEs, however, the option to use the cloud was perceived as impossible, due to the inadequacy of the internet in their area. One of the responses from a Cluster A SME was the following.

*“... a lot of our customers are in the Transkei and we've got a few in City B and City C but most of them are all in the Transkei ... so that is where our problem is because there is no internet access and we do go and use 3G but it's way too slow for a cloud-based system.”*

From the above discussions it became apparent that even though all the SMEs seemed to engage in some form of feasibility check before trying to adopt any cloud service, the issue of internet connectivity in South Africa was central, and most of the checks appeared to revolve

around that. Each individual SME's location, ICT requirements and financial capacity, however, also appeared to play a role in their decision to adopt cloud services. It was thus, apparent to the researcher, that this was a profoundly personal process that required each SME to look inwards and determine for themselves what they wished to derive from the cloud and whether it was worth it for them, given their current circumstances.

#### **7.4.1.1.3 Technical support**

Technical support was also another sub-theme that emerged in the interviews with the research participants. This could be described as SMEs ensuring that they have access to the technical expertise required to ensure that they could adopt cloud services smoothly. For Cluster C SMEs, this could be viewed as being synonymous with selecting the right intermediary and on first glance, it appeared as if this sub-theme could be tied together with the 'service provider selection' sub-theme. However, there were some factors that appeared to be at play during this process, that warranted that the researcher views this as its own separate sub-theme.

Participant L (Cluster A SME) had this to say:

*"... If I didn't have the 2 staff members with the skillset that they did I think it would have been a lot more challenging for us as a business to do it [move to the cloud]. And I think it's really important that you know that, these are guys that have started with our company, and they've been with us through the growth period as well"*

From participant responses such as the one above, it was apparent to the researcher that having access to technical expertise, either through an intermediary or through one's own ICT personnel was considered by most of the SMEs across all clusters as a very essential ingredient for adopting cloud services successfully. This was consistent with what was found in the literature wherein a strong technical capability was found to be associated with greater success when adopting cloud services. However, that seemed to depend on how receptive the owners of the businesses were to new technologies; especially for SMEs in Cluster C. Participant K (Cluster A SME) had this to say.

*"... they [SMEs] are busy doing their work they are not looking potentially for a better way to do their work, they are looking just to do their work. You become the genius in creating another way to do it better."*

As such, it could be inferred that a willingness to learn new technologies and improve on business processes was required on the SMEs' part before they started seeking any assistance, either technical or otherwise, to adopt cloud services. From the interviews with the research participants it was clear that there was a significant amount of small businesses whose owners were from the baby boomer generation (born 1946 – 1964). These business owners were generally perceived as being less receptive to new technologies; especially cloud technologies. Participant H (Cluster A SME) had this to say about how the baby boomer generation viewed cloud.

*“... an office in a virtual environment, is too great a psychological leap for them. They can't process it, they need an actual office space ... the concept of a virtual environment and functional and actual useful tools is quite a paradigm apart, it really is quite a paradigm apart.”*

Even though there seemed to be a perception that there is some correlation between the age of the research participants and cloud receptivity, the researcher observed that SMEs (mostly Cluster C) whose owners were familiar and comfortable with working with computers in general, were in a better position to adopt cloud services. This was because they appeared to be more willing to experiment with new ways of doing work whereas their less computer savvy counterparts appeared to want to maintain the current status quo for fear that things could go wrong. This could be inferred from the following response from Participant K (Cluster A SME) as they were describing their less technologically savvy customers.

*“... there is that old saying if you don't break it don't fix it so they [customers] invariably were stuck to how work was done 40 years ago”*

Whilst the aforementioned seemed to be more pronounced with the baby boomer generation, the researcher observed that it applied across all the age groups.

It was thus apparent to the researcher that, even though technical support was viewed as essential in the decision to adopt cloud computing, this needed to be supported by basic ICT aptitude, as this appeared to prompt SMEs (mostly in Cluster C) to be more confident in adapting to and utilising new technologies. The researcher believes this in turn, would propel them to readily seek technical support for further implementation of cloud services that they could not do on their own. Clusters B and D SMEs did not seem to be affected much by this as they had their own internal ICT departments that took care of their ICT needs.

### 7.4.1.2 Implementation

This involved a set of activities that SMEs would engage in during the cloud adoption process. According to the researcher's observations SMEs across the different clusters attempted to implement cloud with as little disruption as possible to their day to day business operations. However, each SME did this differently, depending on its particular set of circumstances.

#### 7.4.1.2.1 Minimally disruptive adoption

Extant literature suggested that small businesses needed to adopt cloud services incrementally (see Section 5.1.2) as that could minimise any risk associated with migrating any service to the cloud. This was observed to be the case with a significant number of SMEs in the Eastern Cape. In the interviews with the participants, it was apparent to the researcher that cloud computing services were still not well understood and SMEs still practised caution when they implemented any cloud service. As such, it was observed that some SMEs employed a number of mechanisms to try not to expose themselves to a significant amount of risk while adopting cloud services. Participant A (Cluster A SMES) had this to say:

*"... it's much easier to move to a cloud-based system, especially with trial periods. I mean, if you want to test out a piece of software, it will work for you to sign up for a thirty-day trial, or a ninety day or ten days or whatever ..."*

Participant G (Cluster C SME) had this to say when asked what they would recommend to another SME wanting to adopt cloud services:

*"Well, I would just recommend that they've got a backup of their critical systems and data, and that's sent off to them and from there, they [the service provider] do everything and then you are up and running, because they also give you, I think it's a 30 or 90 day free period that you can use on a trial basis to see whether you are happy. But I mean, in our case, we had 3 months free or whatever, a month or 3 months, I'm not sure, but we already knew that we were going to carry on with it."*

What was interesting from the above responses was that they seemed to only come from the smaller SMEs. These types of SMEs did not have any legacy infrastructure that needed to be integrated with any cloud service and their usage of cloud appeared to be restricted only to low bandwidth software as a service (SaaS) applications. A trial period where there would try out

the software for a limited amount of time thus appeared to be sufficient enough to satisfy these SMEs to either carry on using the software or to terminate its usage. What seemed to be more important for these types of SMEs was whether they were still able to do their work as before, without any significant learning being involved. As such, the ease of use of the software turned out to be of some importance during the trial period. Participant K (Cluster A SME) had this to say about their experience of trying out cloud-based accounting systems.

*“... I was trying their [vendor] accounting system as they also run an online accounting system. It's just very difficult for me as a non-accounting person to try get to grips with. It's a very comprehensive accounting system...the accounting system is way over the top for what I need to use ... I then found this accounting system, I just googled around, it could have been online as well, I can't remember. I have been using it for about 4 years now, 3 or 4 years. I just came across it, can't remember exactly how and it was brilliant because I am not an accountant and I can work it.”*

As alluded in Section 7.4.1.1.1.2, there were also some SMEs that had upgraded their software from an on-premise (local-based) version to a cloud-based version, from the same vendor. For these types of SMEs, the similarities between the on-premise (locally based) version and the cloud-based version appeared to be quite important during the trial period. Any differences between the two were met with resistance. This could be attributed to the SMEs' lack of ICT expertise and therefore, apathy towards having to learn any new technologies. Maintaining the current status quo while still enjoying the benefits of new technology (cloud) thus, appeared to be the preference.

However, larger SMEs (mostly Clusters B and D) were somewhat different as they had a much more sophisticated ICT infrastructure and thus much more complex ICT requirements. For these types of SMEs, an incremental approach appeared to be a method of choice when implementing cloud services. It became apparent to the researcher from speaking with the research participants, that this was mostly done so as to make troubleshooting easier, as a problem could be easily isolated if a service was rolled out in parts.

Another popular approach was a hybrid solution where both an on-premises version and a cloud-based version would be run at the same time. This would allow the SME to test the cloud version without affecting the on-premise version. When the SME was satisfied with the tests, they would then terminate the on-premises version over a period of time up until they are able

to run completely from the cloud. Participant M (Cluster B SME) had this to say about how they rolled out their cloud service.

*“We started off with one piece of cloud-based software. So we said we are going to start up a hybrid configuration where we move a segment into the cloud but that ties back into our on premise system and then we started moving the accounts one by one into the cloud for a couple of months or so and we were fortunate that we were happy that it worked and that we understood the system and how it functions and then we started systematically to roll out to the rest of the organisation and I think we are approaching 95% there now. So yaa it was again the hybrid solution, if it wasn't for that it would have been a very painful experience because then we would have to switch everyone over on the weekend and Monday morning everyone gets here and the email doesn't work, you know that type of setup.”*

From the preceding discussions, it was apparent that most SMEs in the Eastern Cape were still experimenting with cloud computing and had not yet fully grasped how it worked. Since it was unfamiliar territory, they seemed to employ various mechanisms as discussed above, to ensure that they do not disrupt their normal business operations in the process of adopting cloud services. As such, it could be inferred that there was an inherent need to always remain in control of data and systems. Cloud could have been seen as a potential risk in that regard and thus the need to roll it out carefully, so as to remain in control of data and systems.

#### **7.4.1.3 Summary of thematic network (Cloud adoption is personal)**

Using the thematic network, the researcher explored the personal nature of the cloud adoption process. A distinction could be made between pre-implementation activities and implementation activities. Discussions revolved around the various elements that were at play within the SMEs' socio-environmental context that influenced their adoption behaviour; thereby bringing to the fore their individuality within the adoption process. Cloud adoption was thus not just a one size fits all solution, but a complex, individual deliberation, that was tailor-made for each SME, depending on its requirements, location, size and ICT maturity.

Pre-implementation activities were viewed as mostly consisting of selecting a service provider, assessing the feasibility of adopting cloud services and ensuring that there was access to ample technical support. The concept of user trust was central to the discussions on service provider

selection. Its role as a tool in determining the right service provider was quite apparent throughout the discussions with the research participants. However, service provider selection also appeared to be carried out through the utilisation of long-standing relationships with software vendors that had begun to offer cloud versions of their on-premises software.

Discussions on cloud feasibility revolved around the availability of high-speed internet in South Africa. Internet connectivity in South Africa was generally perceived by most SMEs as being poor and thus insufficient to fully realise the benefits of cloud services. As such, that seemed to affect not only the decision to implement cloud services, but also what cloud services were to be implemented and how they were to be implemented.

Access to technical support was viewed as an essential element in the cloud adoption process by most SMEs in the Eastern Cape. This was not surprising as extant literature alluded that most SMEs, particularly in developing countries, generally were not proficient in ICTs. However, a basic aptitude and interest in ICTs, in addition to that, was seen to be a catalyst in SMEs' adoption and utilisation of new technologies such as cloud computing services.

During the implementation of cloud services, the need for control of data and systems was viewed as an inherent feature of most of the SMEs in the Eastern Cape. Implementation of cloud services by the SMEs was thus, observed to be carried out in a manner that seemed to preserve that inherent notion. In particular, through various mechanisms, the disruption of day to day business processes was minimised as much as possible throughout the cloud implementation process.

#### **7.4.1.3 Relation with literature**

According to the literature, SMEs, should take into account a number of considerations at various phases of the cloud adoption process, when adopting cloud services (see Section 5.3). SMEs in the Eastern Cape were observed to also perform various activities at varying stages of the cloud adoption process that were consistent with the cloud adoption phases (see Section 5.2) identified in the literature.

However, it was apparent that the activities performed by the SMEs at each phase (both the cloud preparation and cloud implementation phases) were not standard across the various SMEs. Rather, the adoption process for each SME, was highly personalised in nature; depending on a set of characteristics that were unique for each SME. In particular, the location

and size of the SME played a significant role in shaping the cloud adoption decisions of each SME.

During the cloud preparation phase, most of the SMEs in the Eastern Cape only made decisions regarding what services should be migrated to the cloud, whether the installed infrastructure was sufficient to support a cloud move, the choice of the right cloud service provider as well as negotiating the right service level agreements (SLAs), as prescribed by the literature. Cluster C SMEs, however, mostly relied on the services of either Clusters A or B type SMEs (intermediaries) to make decisions pertaining to the choice of cloud provider, the type of cloud services to utilise and/or the right supporting ICT infrastructure.

On the other hand, their larger counterparts (Cluster D SMEs) could rely on their own internal ICT departments to make such decisions. Furthermore, most of the Cluster C SMEs were located in City A, which had limited Internet bandwidth to support high bandwidth intensive cloud applications. This appeared to affect the choice of cloud services that these types of SMEs could utilise. As such, only low bandwidth cloud applications such as data storage and/or data backup services were utilised by these types of SMEs.

Further preparatory steps as prescribed by the literature, such as evaluating risks, establishing a strategic focus, evaluating the influence of the organisational structure, engaging all stakeholders as well as defining the expected value were not carried out by the majority of Cluster C SMEs. This could be attributed to their small size, and thus, consistent with literature, their propensity for more agility and less formalisation of processes. The larger SMEs (Clusters B and D) on the other hand, appeared to carry out these activities but less formally and as thoroughly as prescribed by the literature.

The activities that were recommended in the literature for the implementation phase were consistent with what was observed with Clusters B and D SMEs in the Eastern Cape. These types of SMEs had much more sophisticated ICT requirements and the systems that they needed to move to the cloud often required integration with their inhouse systems. Emphasis was placed on reducing business disruption as much as possible during the implementation phase. As such, the SMEs migrated their systems incrementally and they also conducted some testing to make sure that everything was working correctly before fully implementing the needed cloud solution. Cluster C SMEs on the other hand, had less sophisticated ICT requirements and their usage of cloud services are mostly limited to basic low bandwidth cloud applications. As such, the majority of these SMEs did not need to implement any cloud

solutions incrementally, as they could do so fairly quickly without disrupting their business operations.

## **7.4.2 Perceptions affect adoption**

Another overarching theme that emerged through interviews with the research participants was that user perceptions had a role to play in the adoption process. This thematic network afforded the researcher the opportunity to unpack this theme and explore the influences of user perceptions on cloud services adoption.

### **7.4.2.1 User perceptions**

The researcher observed that SMEs appeared to harbour particular views about cloud computing services, based on their individual experiences and context. The researcher could distinguish between positive views and negative views; each of these seemingly affecting the SMEs' cloud adoption decisions in different ways.

#### **7.4.2.1.1 Positive views**

Extant literature suggested that SMEs needed to have a strategic goal when implementing cloud services (see Section 5.1.1). The researcher, however, observed that a significant number of SMEs (mostly Cluster C SMEs) did not view cloud as a strategic implementation. Instead, the adoption of cloud services was mostly done as a reaction to a particular problem. For example, the following response that was given by participant G (Cluster C SME);

*“The reason why we went over onto the cloud is that at the end of last year, in November I was booked off sick, and December I had to go in for a back op (operation). At that stage we were running an on-premises system, and because we are on a network everyone had to be on the same server. So, seeing as I am the key person that needs to work with the finances and payments and so forth, I couldn't do it. After our annual shutdown, I found out that we could go over onto a cloud-based accounting system which is also under the umbrella of our current on-premises vendor, they all the same but one is on the cloud. So, I could work from a laptop from anywhere where I got internet access.”*

In another interview with a participant from an SME in City A, the researcher learnt that, there was a ransomware virus that was circulating amongst many of the small businesses in that city.

The consequence of this virus was that, it could lock up access to critical data and the affected SME would then be unable to perform their day to day operations. As such, since this was quite a small city and a lot of information was being handed down from one business to the next via word of mouth, there appeared to be a fear of being affected by the same tragedy. Participant I (Cluster A SME) had this to say:

*“I’ve got like a couple of clients that have critical accounting data and the safest way to keep their data safe is on the cloud, so we make use of a particular program and that backs up the data every night to the cloud ... the customers here in City A get a lot of ransomware virus, I don’t know if you’ve heard about it, the lock you virus.”*

It was thus apparent to the researcher, that cloud computing services were viewed more as a solution to particular business problems by most of the Cluster C SMEs; thus, driving adoption.

It is, however, important to note that most of the interviewed participants from Cluster C SMEs appeared to have had no knowledge of cloud computing or its benefits prior to being affected by the business problems. It had to be presented as a solution to them by their respective intermediaries through subsequent consultations with them and it could have made sense to them in the context of their circumstances. As such, the SMEs appeared to view cloud services in a positive light due to how it could afford them the opportunity to enjoy certain business benefits such as the following:

- Distributed access where they could access business systems from any location
- Lower ICT maintenance costs; and
- Secure management of critical data,

It was not quite clear if this was a reflection of how they felt about cloud services as a whole or if it was merely more of a relief that they had found a solution to their problems. It is possible that these SMEs could have been equally satisfied with a different solution. This could be inferred from how Cluster C SMEs tended to be apathetic towards any ICT related issues and were only worried about how they could continue doing their work uninterrupted. The larger SMEs, however, (Clusters B and D) appeared to view cloud services more as a strategic undertaking. Participant M (Cluster B SME) had this to say about the use of cloud services.

*“... you know, going out and having to pay for a license, for example your email exchange operating systems, hardware etc is a lot, so it makes sense to move*

*your email, that type of thing, to the cloud. Also, in terms of things like your databases and so on, you can buy licenses now for the server but next year they upgrade, and you have to buy all those licenses again whereas ... in the cloud it upgrades automatically, you know. So, keeping with new technology is much easier because you don't have that CAPEX every time you need to upgrade.”*

Participant F (Cluster D SME) also had this to say

*“... just from a disaster recovery point of view, recovering like a virtual machine, I'm not sure if you are familiar with the technology, but the recovery time from a disaster if your machines are virtualised or in the cloud is almost seconds, whereas if now if we have a disaster here, we going to have to bring up another server, install the OS, restore the data so ya ... I don't want to think about it, but it will be chaotic if that has to happen” ...*

Clusters B and D SMEs thus seemed to view cloud services as a way to streamline and enhance their current business processes. Contrary to Cluster C SMEs, their implementation of cloud services was more predictive than reactive in nature. The complexity of their ICT infrastructure could have been a reason for that. The researcher observed that these types of SMEs were very careful about making sure that nothing goes wrong with their ICT infrastructure.

The researcher, could infer that, due to their size and perhaps the number of clients that they had, they could have been relying on their ICT infrastructure more than their smaller counterparts to deliver their services efficiently. The impact of something going wrong with their ICT infrastructure could have thus, had more devastating consequences on their reputation and business operations than it did with Cluster C SMEs; thus, demanding a more careful approach to cloud services implementation. It was apparent that cloud services seemed to have a well-placed role amongst most of the SMEs as a one stop solution to a number of the business problems they were facing. This type of view not only enabled the SMEs to embrace cloud services more readily, but it also appeared to be a significant catalyst in driving their adoption.

#### **7.4.2.1.2 Negative Views**

The issue of security was a major concern, especially amongst some SMEs who were not that well informed about cloud computing and ICTs in general (mostly Cluster C SMEs). Participant J (Cluster A SME) provided this response:

... “a lot of clients when you start speaking to them about cloud, their first question is like, am I protected against hackers? You know, so it’s a threat I think because of movies and media out there. When people think cloud, they think hacking and, so you need to have that talk with the client and explain that okay yes, you know, there is that possibility, but it is actually just as great a threat on a local server. You are not really protected against hackers even if you are in the cloud or not.”

It could be inferred that there was an inherent need by some SMEs to always stay in control of their personal data and systems. For these SMEs, cloud services represented a loss of that control. Like participant J above, alluded, external influences such as the media could have played a role in enhancing that image. In mainstream media, “hackers” have a negative connotation that can be associated to actions such as theft. As such, an association of cloud services with words such as “hacker”, indicated to the researcher that some SMEs probably could have had an underlying fear of utilising the services. An interesting point was raised by another participant wherein they elaborated on another possible basis for this fear. The idea had its foundations in the nature and characteristics of a significant number of SMEs in the Eastern Cape. Participant D (Cluster A SME) had this to say;

... “it’s their personal data. It’s not like at corporate level, where the responsibilities are distributed, you know. At SME level the boss is the CEO, he is this, he is that, and that, so he is very concerned about his personal data.”

It was observed that, a significant number of Cluster C SMEs were quite small; some of them often being run by small families and thus did not have dedicated ICT departments with complex infrastructure. As such, the use of laptops was quite prevalent, as they were cheap and relatively easy to procure. However, the distinction between work content and personal content was blurry as the laptops were also used by the owners in their personal capacity. Furthermore, due to their small size, most of these Cluster C SMEs often had one person performing multiple roles within the business; thus, leading to an accumulation of various, sensitive company data all within one central repository. As such, it could be inferred that for these SMEs, using cloud services to store their company data was synonymous with storing their personal data on the cloud and thus it often met with a lot of resistance.

It was also observed that there were some concerns around the subscription model on which a significant number of cloud services are based. Participant A (Cluster A SME) had this to say:

*... “it almost seems like ... if I can say age related ... the older type of customers prefer on premise [non-cloud-based systems] and not monthly payments while the younger people go for a monthly subscription [cloud-based systems] type of thing ... they are not afraid of that ... maybe they [older customers] just prefer to have more control over everything ... and with a once off payment I mean, it makes it easier ... because ... you don't need to budget for a monthly payment or keep that in mind as well.”*

It was apparent from the above response that the issue of control was again quite important when it came to adopting cloud services, especially, by SMEs (Cluster C) with older owners (mostly the baby boomer generation). However, from the researcher's inferences, this type of required control appeared to be different from what was required when an SME had to entrust their personal data and systems to a third party. It seemed as though this type of control was more from a financial perspective.

The researcher suspects that cloud services could have been viewed more as some form of debt, due to their monthly subscription model. Thus, there is a possibility that due to the small nature of these SMEs, their client base was not always consistent and therefore their earnings could also have been intermittent, which made committing to a subscription model quite a scary endeavour, as it could be viewed as being akin to spending money one does not have. As participant A alluded, this seemed to be more pronounced amongst the older owners of SMEs in the Eastern Cape. Whilst, this was interesting, it was also not surprising, as the older (boomer) generation generally tend to be more conservative and more risk averse in nature than their younger counterparts.

These particular views around cloud thus, tended to have the effect of discouraging adoption of cloud services amongst the SMEs that shared these views. As such, a shift in perspective around cloud services could have been required first, before these SMEs could commit to a cloud implementation.

#### **7.4.2.2 Influences to user perceptions**

Whilst it became apparent that user perceptions could indeed potentially hamper SMEs' adoption of cloud services, it also appeared that these perceptions could be changed by various change agents. It was observed that this happened quite often with SMEs in the Eastern Cape, especially Cluster C SMEs.

Even though intermediaries seemed to play a key role in providing the technical support required by some of the SMEs to support a move to the cloud, their role appeared to extend beyond that. The following was a response from participant D (Cluster A SME):

*“The infrastructure doesn't matter ... the infrastructure follows. You need to sell the concept [of cloud] first and the belief that you need it, that the client needs it and then the infrastructure follows behind. [For example, I would say] This is what you need to put into place, you know. It's not a big cost but regardless of how much it's going to cost to do that within the realm of your budget, let's not fight over five rand, that type of thing. This is what you need to have in the cloud, and this is why. As a small business owner, myself this is what I would want in the cloud and this is what I got in the cloud and that's why I believe you should do it...”*

From the above response, it could be observed that, the intermediary also appeared to influence the way SMEs thought about cloud services. It was essential, to note that intermediaries in themselves were also small businesses whose goal was to make profit. As would be expected, this, depended a large part on how many services they sold to their customers. As such, even though intermediaries were being used by a number of Cluster C SMEs to overcome their shortcomings in ICT, they appeared to do a lot of marketing to the Cluster C SMEs as well; driven by their need to attract as many customers as possible and make a profit.

However, it became increasingly apparent to the researcher that a significant number of Cluster C SMEs would never have moved to the cloud if they had not received that sort of marketing from the intermediaries. This is because Cluster C SMEs remained apathetic to ICTs in general and they appeared to need some external influence to drive them to adopt any new ICT innovation. The intermediaries' marketing activities were thus quite an essential component in the cloud adoption process, the absence of which could have led to a significant number of SMEs in the Eastern Cape not adopting cloud services. Their relationship was thus of a complementary nature that required both parties to be present for cloud adoption to take place.

It was interesting to observe that user perceptions about cloud services also appeared to be changed by events within their contextual environment; usually of a tragic nature. The following was a response from participant G (Cluster C SME):

... *“I think you are well aware of the ransomware that's going around. We have been hit 3 times. Okay, it was last year October and apparently in December while I was off sick it hit again, sorry twice. And with the second time we lost 6 months' worth of critical accounting data that we had to catch up with so if we were on the cloud already, we wouldn't have had that problem because it wouldn't have affected our bookkeeping system.”*

The researcher observed that events such as the one described by the participant above appeared to trigger SMEs into exploring how they could have prevented such a tragedy, and this often led to them changing their perceptions about cloud services. The researcher learnt that, prior to such tragedies, cloud services were often viewed as unsafe, or even not known at all by a significant number of SMEs.

The researcher could also infer that perhaps the SMEs could have heard of cloud services in theory but never really thought they needed them, as cloud probably still remained an abstract concept in their minds. Thus, events such as the one described by participant G above appeared to have the effect of changing how the SMEs viewed cloud services in terms of what they are and what it can do for them; often driving them to adopt cloud services.

Even though one participant suggested that the media could also have had a part to play in influencing how SMEs thought about cloud, this was not reflected in most of the interviews with the participants and thus prompted the researcher to not to explore it further.

From the above discussions, it was apparent that the cloud adoption process was heavily depended on the context of the SMEs. This was because it appeared to be depended on user perceptions, which could be changed by different agents within their socio-cultural environment. Thus, the interaction between the users (SMEs) and the various change agents was an essential part of the cloud adoption process.

#### **7.4.2.3 Summary of the thematic network (Perceptions affect adoption)**

Through this thematic network, the researcher explored user perceptions and how they affected cloud services adoption. More specifically, the researcher explored the various positive and negative perceptions that users had and how these affected their adoption of cloud services. The researcher then explored how some of these perceptions could be influenced to manifest a particular result in the cloud adoption process.

cloud services were mostly viewed as the go to solution to a plethora of business problems affecting SMEs. For Cluster C SMEs, cloud adoption was more reactive than predictive, as they seemed to only require cloud services when a particular problem arose. Larger SMEs (Clusters B and D) SMEs, however, were more deliberate in their adoption of cloud; viewing cloud as a way to streamline their business services.

However, a significant number of Cluster C SMEs, seemed to view cloud services as being synonymous with losing control of their personal data and systems. There were also some concerns around the subscription model on which most cloud services are based. Subscription was mostly viewed as a debt and a number of the SMEs appeared to not be willing to commit to it. For these SMEs, subscription represented a loss of financial control, as they were not confident that they would always be able to meet the monthly costs. This however, appeared to be more prevalent amongst SMEs with older owners, as they seemed to be more risk averse than their younger counterparts.

Perceptions, however, could be changed by a variety of change agents, thereby influencing the adoption decision of the SMEs (mostly Cluster C). Intermediaries were particularly important as they appeared to market cloud services to Cluster C SMEs and convince them to adopt cloud services; something they were unlikely to do in the absence of the push from the intermediaries. Tragic events such as the loss of data also appeared to force SMEs to view cloud services differently. The SMEs appeared to have more appreciation for cloud services and what they could do for them, only after encountering a problem.

#### **7.4.2.4 Relation to the literature**

Literature did not seem to acknowledge the influence of user perceptions on the cloud adoption process. However, discussions with SMEs in the Eastern Cape revealed how essential user perceptions were, in driving the adoption process. Positive perceptions about the use of cloud services were generally observed to be associated with a greater propensity to adopt cloud services whereas negative perceptions were observed to be a significant deterrent to their adoption.

According to the literature, organisations that had more mature technological capabilities are more likely to readily adopt cloud services. It was observed that, Clusters A, B and D type of SMEs generally viewed cloud services in a positive light and thus, were more willing to adopt them. These types of SMEs were either in the ICT services sector and/or had their own internal

ICT departments that took care of all their ICT related needs. Their technological maturity level was, therefore, higher than that of Cluster C SMEs and their attitude and behaviour towards cloud services adoption appeared to be consistent with what was suggested by the literature.

A significant amount of negative perceptions appeared to emanate from Cluster C type of SMEs. These types of SMEs generally had low-level technological maturity and, thus, a significant number of them relied on the services of ICT service providers (intermediaries) for their ICT needs. These types of SMEs were observed to be less ready to adopt cloud services than SMEs in the other clusters; which was consistent with the literature's assertions about the behaviour of SMEs with low technical capabilities. This could also, be inferred to be significantly related to their negative perceptions about the use of cloud services.

However, it was observed that Cluster C SMEs' negative perceptions about the use of cloud services could be changed by a variety of change agents. Intermediaries could market cloud services to Cluster C SMEs, thereby changing their perceptions about them and influencing them to adopt the services. Tragic events such as loss of data also appeared to force Cluster C type SMEs to re-evaluate their negative perceptions about cloud and thus also influenced them to adopt the services. Positive perceptions about the use of cloud services, thus, appeared to be a pre-requisite for the cloud adoption process.

## **7.5 Summary**

This chapter presented the reader with a detailed description of how the researcher analysed the collected data. The reader was then presented with the results of that data analysis in the form of a comprehensive narrative. The next chapter presents the findings of the study; paying particular attention to how the research questions of the study were answered and ultimately, providing the contribution of the study.

# CHAPTER 8: Findings and Conclusion

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## 8.1 Introduction

The previous chapter presented the reader with a comprehensive narrative of the analysis that was carried out on the collected data. Using this narrative, this chapter aims to present the reader with the findings of this study in relation to the problem statement, objective and research questions. The chapter will proceed as follows: First, the problem the study sought to address is revisited to allow the reader to better comprehend the presented findings. The research questions are then revisited; followed by an explanation of how each research question was answered. The contribution of the study is then presented to the reader and the limitations of the study highlighted thereafter. The chapter concludes with some recommendations and directions for future research.

## 8.2 Research Problem

Despite all the benefits that the use of cloud services is touted to provide, the actual adoption of cloud services by SMEs remains low when compared to their large counterparts (Collins and Lam, 2014; Asiaei and Rahim, 2016; Chemjor and Lagat, 2017; Senarathna, 2018). According to Mohlameane and Ruxwana (2014) South African SMEs are no exception to this trend. Adane (2018), argues that SMEs need to have a clear cloud adoption strategy if there are to gain any measurable benefits from cloud services. However, Malik, et al. (2019), indicate that there is a shortage of industry-specific principles for SMEs to follow when adopting cloud services. This is supported by Asiaei and Rahim (2016) wherein they posit that a lack of clear standard guidelines and knowledge of how to adopt and utilize cloud technologies is one of the major obstacles for their adoption by SMEs. A limited amount of literature has either provided these guidelines or given directions on how the SMEs should establish these guidelines (Prasad, et al., 2014; Asiaei and Rahim, 2016; Malik, et al., 2019).

In addition to this, there was a limited focus on the aforementioned problem by literature within the context of developing economies, such as South Africa. In an investigation of the awareness of cloud computing by South African SMEs, Mohlameane and Ruxwana (2014), reiterated this notion. They argued that there was a lack of awareness and exposure to cloud services and the guidelines for South African SMEs to follow, in order to establish and localize their benefits and fit for the South African SME context.

**There was thus, a need for a framework which can be used as a guide by SMEs in South Africa as they adopt cloud services.**

### 8.3 Research Questions

**Table 14: research questions and study objective**

<b>Research Objective</b>	To develop a framework which South African SMEs in the Eastern Cape can use as a guide as they adopt cloud services	
<b>Research Questions</b>	Question 1	What technological, organisational and environmental considerations should SMEs take into account when adopting cloud services?
	Question 2	What technological, organisational and environmental considerations do South African SMEs in the Eastern Cape perceive as needing to be taken into account when adopting cloud services?

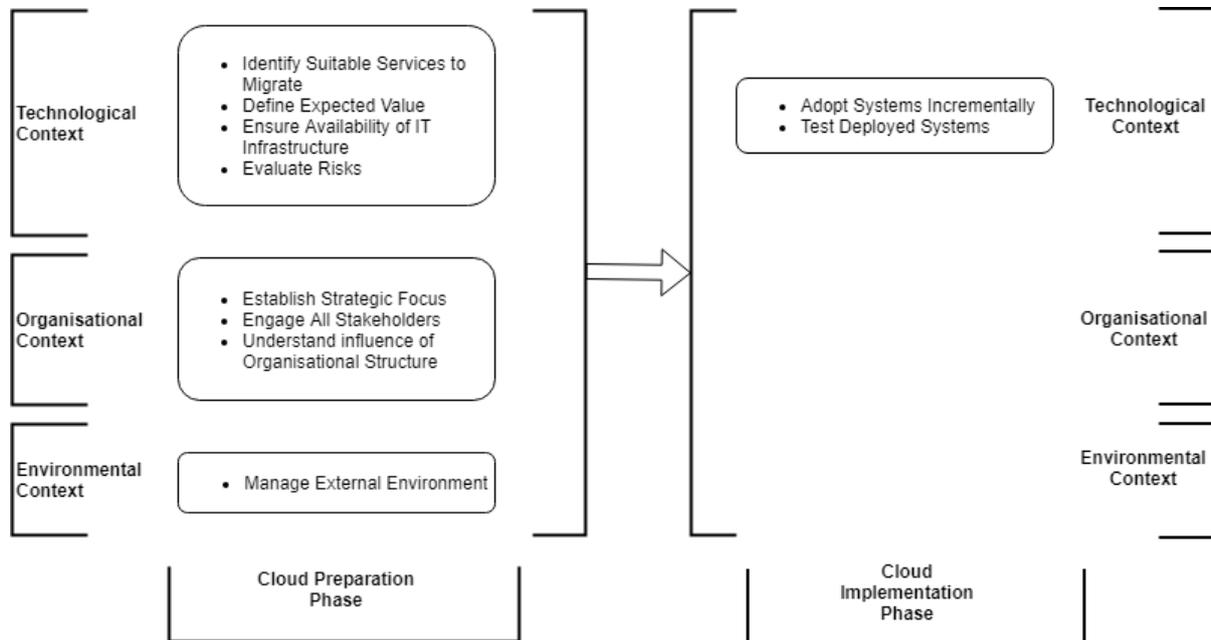
Table 14 above presents the objective of the study as well as the research questions associated with it. The purpose of the first research question was to try and establish from extant literature, a consensus regarding the key considerations that SMEs need to take into account when adopting cloud services. The second research question sought to establish what South African SMEs in the Eastern Cape believed needed to be taken into account when adopting cloud services. This would then allow parallels to be drawn between extant literature and the collected data, to ultimately fulfil the objectives of the study.

#### 8.3.1 Addressing the first research question

Extant literature revealed the existence of distinct phases in the cloud adoption process; each phase consisting of several tasks that needed to be completed before moving on to the next phase. Whilst the naming convention differed across studies, the phases generally included a cloud preparation phase, a cloud implementation phase and a cloud maintenance phase. This study was mostly concerned with the activities associated with the preparation and implementation phases of the cloud adoption process.

Using the TOE framework, eight activities were identified as key within the preparatory phase of cloud adoption and two activities were identified as key during the implementation phase. Figure 19 illustrates a conceptual framework for the adoption of cloud services by SMEs, based on these activities. The framework highlights the activities that need to be carried out at each

phase of the adoption process, as well as where they fit within the TOE framework. This answered the first research question of this study. Section 5.2 in Chapter 5 provides a detailed description of each of these activities.



**Figure 18: Conceptual framework for SME cloud adoption**

### 8.3.2 Addressing the second research question

Whilst a limited amount of literature seemed to acknowledge the role of intermediaries in the cloud adoption process, discussions with SMEs in the Eastern Cape revealed how central they were in the whole process. Consistent with the literature, a significant number of the SMEs (Cluster C type SMEs) were found to have limited technical expertise; an ability which was identified as essential if SMEs were to fully realise the benefits of cloud services.

Thus, in order to overcome this limitation, the SMEs were found to utilise the services of third-party ICT service providers (intermediaries). These were mostly Clusters A and B SMEs of the interviewed SMEs (see Section 7.2.1 for the different SME clusters).

Intermediaries particularly enjoyed significant influence over the cloud adoption behaviour of most of the Cluster C type SMEs. This could be attributed to the trust that existed between the SMEs and the intermediaries, as the intermediaries were responsible for overseeing all of the ICT requirements of the SMEs. Their role, thus extended from marketing of cloud services to the SMEs, guidance in any adoption decisions, to the actual implementation of any required cloud services. For the majority of the Cluster C type SMEs, intermediaries were thus, an

essential catalyst to the cloud services adoption process, the absence of which, would mean a breakdown of the entire process. This was also because they could change the perceptions of the SMEs about the use of cloud services and, thus, influence them to adopt them. Positive perceptions about the use of cloud services were found to be an essential prerequisite to the cloud adoption process.

However, there appeared to be a correlation between the size of the SMEs and their reliance on intermediaries. Larger SMEs (Clusters B and D type SMEs) were found to be more likely to have their own dedicated internal ICT department that is responsible for overseeing most of their ICT requirements; thus, negating the need of an intermediary to assist in any ICT related functions. This could be attributed to them having, significantly more resources (both financial and human) than their small counterparts, to dedicate to the adoption and maintenance of new technology. However, these types of SMEs were also not as pervasive throughout the Eastern Cape; only existing in cities B and C.

Throughout the discussions with the SMEs, it also became apparent that the SMEs performed various activities at varying stages of the cloud adoption process, that were consistent with the cloud adoption phases identified in the literature. However, it was apparent that the activities performed by the SMEs in each phase (both the cloud preparation and cloud implementation phases) were not standard across the various SMEs.

Rather, the adoption process for each SME, was highly personalised in nature; depending on a set of characteristics that were unique to each SME. In particular, the location, size as well as the technological maturity of the SME played a significant role in shaping the cloud adoption decisions of each SME.

During the cloud preparation phase, most of the SMEs in the Eastern Cape only made decisions regarding what services should be migrated to the cloud, whether the installed infrastructure was sufficient to support a cloud move, the choice of the right cloud service provider, as well as negotiating the right service level agreements (SLAs) as prescribed by the literature. Cluster C SMEs, however, mostly relied on the services of either Cluster A or Cluster B type SMEs (intermediaries) to make decisions pertaining to the choice of cloud provider, the type of cloud services to utilise and/or the right supporting ICT infrastructure.

On the other hand, their larger counterparts (Cluster D SMEs) could rely on their own internal ICT departments to make such decisions. Furthermore, most of the Cluster C SMEs were

located in City A, which had limited Internet bandwidth to support high bandwidth intensive cloud applications. This appeared to affect the choice of cloud services that these types of SMEs could utilise. As such, only low bandwidth cloud applications such as data storage and/or data backup services were utilised by these types of SMEs.

Further preparatory steps as prescribed by the literature such as evaluating risks, establishing a strategic focus, evaluating the influence of the organisational structure, engaging all stakeholders as well as defining the expected value were not carried out by the majority of Cluster C SMEs. This could be attributed to their small size, and thus was consistent with the literature, explained by their propensity for more agility and less formalisation of processes. The larger SMEs (Clusters B and D) on the other hand, appeared to carry out these activities but less formally and as thoroughly, as described in the literature.

The activities that were recommended in the literature for the implementation phase were consistent with what was observed with Clusters B and D SMEs in the Eastern Cape. These types of SMEs had much more sophisticated ICT requirements and the systems that they needed to move to the cloud often required integration with their in-house systems. Emphasis was placed on reducing business disruption as much as possible, during the implementation phase. As such, the SMEs migrated their systems incrementally and they also conducted some testing to make sure that everything was working correctly, before fully implementing the needed cloud solution.

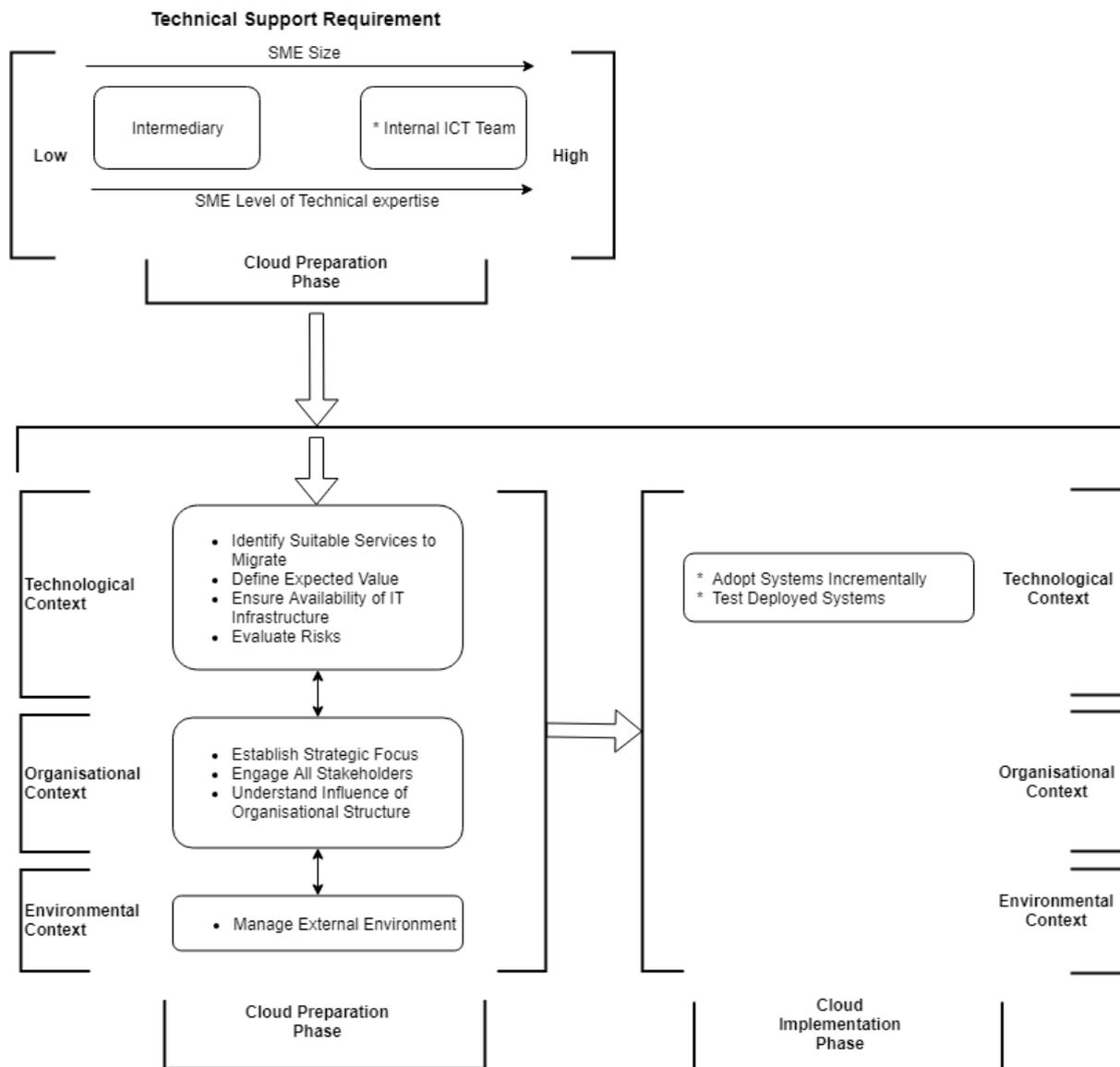
Cluster C SMEs on the other hand, had less sophisticated ICT requirements and their usage of cloud services are mostly limited to basic low bandwidth cloud applications. As such, the majority of these SMEs did not need to implement any cloud solutions incrementally as they could do so fairly quickly without disrupting their business operations.

Based on these findings the following section presents the proposed cloud adoption framework for SMEs in the Eastern Cape.

#### **8.4 Study Contribution**

Figure 20 illustrates the proposed framework for the adoption of cloud services by SMEs in the Eastern Cape. This is the main contribution of this study. Technical expertise was identified as the cornerstone of the entire cloud adoption process. As such, the proposed framework, encourages SMEs to first evaluate their level of technical expertise before commencing with the process. SMEs that are less technically inclined are encouraged to seek support from a

reliable intermediary whilst those with strong technical capabilities could also utilise their internal ICT team to see the cloud adoption process through.



**Figure 19: Proposed framework for SME cloud adoption in the Eastern Cape**

**Key: \* = Optional**

All the activities associated with the cloud preparation phase should be completed (in no particular order) prior to moving on to the activities associated with the implementation phase. The implementation phase activities should be carried out only when there is a high possibility of business operations disruption occurring as a result of cloud adoption; thus, making them optional. This in turn, depended on the complexity of the SME legacy ICT infrastructure if any is available and on how easily it could be integrated with the required cloud implementation.

Other contributions of the study stemmed mostly from the methodology utilised in this study. A limited number of the studies in extant literature have studied the adoption of cloud services interpretively; with the majority utilising positivist methods to study the topic. As such, by utilising the principles of interpretive field research, it was possible to uncover unique aspects about this topic that would not have been possible through the use of positivist methods. This demonstrated the plausibility of interpretive principles in studying a topic of this nature. In particular, it was possible to uncover the essential role of intermediaries as a catalyst for cloud adoption, as well as the mechanisms that South African SMEs in the Eastern Cape use to build trust between themselves and the intermediaries. In addition, the intrinsic nature of the SMEs in the Eastern Cape, such as their propensity to adopt cloud services as a reaction to a business problem, instead of a deliberate strategic effort was also unravelled through interpretive field research principles.

### **8.5 Limitations of the study**

One of the limitations of this study was the scarcity of SMEs that have adopted cloud services in the Eastern Cape. As such, most of the interviewed SMEs were from the ICT services sector. These SMEs provided ICT services to other less technically savvy SMEs, thereby acting as intermediaries. As a result, most of the views expressed in this study were from the perspective of the intermediaries that had assisted the less technically savvy SMEs in adopting cloud services and not of the actual SMEs that had been assisted. Thus, the results of the study might not be a true reflection of the views of the assisted SMEs.

In addition, most of the SMEs that were interviewed were from Cluster A type of SMEs. It was challenging to find SMEs that could be classified under clusters B, C and D (See Section 7.2.2) as there were a limited number of them in the Eastern Cape. As such, data from Clusters B, C and D type of SMEs was significantly limited and this could have had a bearing on the overall interpretation of the data. This is because the collected data might not have been a true reflection of SMEs in those clusters.

Another limitation arose from the way most of the data was collected. Due to financial limitations, it was not possible to physically access most of the SMEs for interviews. As such, a significant number of the interviews were carried out telephonically. As a result, visual aids such as behaviour and body language could not be observed during the interview process. This could have impacted the interpretation of the data, as some of the visual data from the responses was lost.

Furthermore, data was collected only from SMEs located in the Eastern Cape. As such, due to the contextually sensitive nature of this study, the results might not be generalizable to SMEs located in other provinces of South Africa. In addition, the interpretation of the data was also impacted by the operational context and background of the researcher, thus further limiting the generalizability of the results.

## 8.6 Recommendations

For SMEs that have started, are planning to start or have already completed the process of moving some systems to the cloud environment, the researcher proposes the following set of recommendations, in addition to the guidance already provided by the proposed framework.

- **Learning more about cloud services.** SMEs should dedicate a portion of their time to learning more about cloud services and their benefits. If possible, money should be set aside for employee training in the form of cloud training courses. This should increase awareness of cloud services and assist the business in reaping the full benefits of cloud services.
- **Sharing of information.** Even though some of the SMEs have had successes in the adoption of cloud services, the knowledge and experience gained from such processes remains within the SMEs. As such, platforms should be setup where SMEs that have had successes with adopting cloud services can share their experiences and expertise with other SMEs that are yet to or are in the process of adopting cloud services.
- **Cloud readiness assessments.** The majority of the SMEs were found to have a propensity for less planning when it comes to the adoption of cloud services. However, there is evidence in the literature that businesses that have a greater organisational readiness were likely to reap greater benefits from adopting cloud services than their counterparts that plan less. As such, the researcher recommends that SMEs that are planning to implement cloud services should also perform cloud readiness assessments, to identify areas of weakness and improve them prior to any cloud engagement. Organisations such as Amazon, provide free tools<sup>7</sup> for assessing businesses' cloud readiness.

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<sup>7</sup> <https://cloudreadiness.amazonaws.com>

## **8.7 Directions for Future Research**

Throughout the study, a number of additional research areas emerged that the researcher believes were worthwhile to study further. The researcher believes that some of these areas could further the contributions made by this study and/or uncover new areas that could contribute to the body of knowledge pertaining to SME cloud services adoption.

This study found that intermediaries appeared to have an influence on the cloud adoption behaviour of SMEs. Whilst this study briefly explored the topic, the researcher believes it will be worthwhile to have an in-depth study on the influence of intermediaries on the adoption decisions of SMEs. This could unravel the extent of this influence and/or how it can be leveraged to increase SME cloud adoption.

Whilst this study only focused on SMEs located in the Eastern Cape, the study could also be expanded to include SMEs from other provinces. Parallels can then be drawn with the results of this study and any differences or similarities noted. An investigation could then be carried out to explore the reasons behind the differences and/ or similarities as well as to examine what contextual elements contributed to those similarities or differences. Furthermore, as mentioned in the limitations of this study, most of the views expressed in this study were mostly from the perspective of intermediaries. A follow up study could thus also be conducted that includes more views from SMEs that have adopted cloud services.

SMEs appeared to place a lot of trust in the intermediaries and/or service providers they were engaged with. The researcher, thus, believes that the concept should be explored further, to try to establish its role in SME cloud adoption. In that regard, the research believes that it would be worthwhile to investigate how users establish trust, as well as what contextual factors influence user trust.

Finally, future research could also look at evaluating the proposed framework to determine its efficacy for SMEs based in the Eastern Cape.

## **8.8 Summary of the Dissertation**

This study explored the technological, organisational and environmental considerations that South African SMEs in the Eastern Cape believe need to be taken into account when adopting cloud services. Combined with theory from extant literature, the goal was to develop a framework which can be used as a guide by the SMEs as they adopt cloud services. The

contextual environment of the SMEs was believed to play a significant role in the adoption behaviour of the SMEs. As such, the study demonstrated the plausibility of interpretive field research principles in the study of topics of this nature, that are often investigated with positivist methods. The dissertation was structured as follows:

**Chapter 1** gave a brief outline of the study. The problem the study sought to address was highlighted. Thereafter, the research objective, as well as the research questions of the study were presented. This was followed by a brief description of the various design elements on which the study was anchored.

**Chapter 2** introduced the reader to the concept of cloud computing; exploring the various cloud architectures and business models that are available for users. The formal definition of cloud services for the purposes of this study was also established in this chapter.

Small to Medium Enterprises (SMEs) were then explored in **Chapter 3**. The formal definition of an SME for this study was also defined and the relationship between SMEs and cloud computing was explored. The problem that this study sought to address was also explored in greater detail in this chapter.

**Chapter 4** explored the various theoretical frameworks pertaining to the adoption of ICTs. The Technology-Organization-Environmental (TOE) framework and how it can be utilised to investigate the adoption of cloud services for this study was then explored. In particular, several TOE constructs, that were relevant for the purposes of this study were determined and presented.

Based on this framework, the considerations that SMEs should take into account when adopting cloud services were then explored in **Chapter 5**. The chapter concluded with the presentation of a conceptual framework for the adoption of cloud services by SMEs; thus, answering the first research question of this study.

**Chapter 6** presented the reader with a detailed description of the various design principles on which the study is based. This included a description of the data collection methods, as well as the processes utilised for data analysis in this study.

**Chapter 7** then followed up by providing a detailed account of how the researcher analysed the collected data. The chapter concluded with a comprehensive interpretive narrative of the collected data; thereby answering the second research question of this study.

**Chapter 8** is the final chapter of the dissertation. It presents the findings of this study to the reader. In particular, the research questions of the study are revisited and a demonstration of how the questions have been answered is presented. The study's contribution, limitations, recommendations to SMEs, as well as opportunities for future research are also highlighted to the reader in this chapter.

# References

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- Abor, J. and Quartey, P., 2010. Issues in SME Development in Ghana and South Africa. (39), pp. 11.
- Abubakar, A.D., Bass, J.M. and Allison, I., 2014. Cloud Computing: Adoption Issues for Sub-Saharan African SMEs. *The Electronic Journal of Information Systems in Developing Countries*, 62(1), pp. 1–17.
- Adane, M., 2018. Cloud computing adoption: Strategies for Sub-Saharan Africa SMEs for enhancing competitiveness. *African Journal of Science, Technology, Innovation and Development*, 10(2), pp.197–207.
- Adeniran, T.V. and Johnston, K.A., 2014. ICT Utilisation within Experienced South African Small and Medium Enterprises. *The Electronic Journal of Information Systems in Developing Countries*, 64(1), pp. 1–24.
- Agarwal, R and Prasad, J., 1998. A conceptual and operational definition of personal innovativeness in the domain of information technology. *Information Systems Research*, vol 9, no. 2.
- Agarwal, R. and Karahanna, E., 2000. Time Flies When You're Having Fun: Cognitive Absorption and Beliefs about Information Technology Usage. *MIS Quarterly*, 24(4), p. 665.
- Ahmad Dar, A., 2018. Cloud Computing-Positive Impacts and Challenges in Business Perspective. *Journal of Computer Science & Systems Biology*, [online] 12(01). Available at: <<https://www.omicsonline.org/open-access/cloud-computingpositive-impacts-and-challenges-in-business-perspective-jcsb-1000294-107626.html>> [Accessed 16 Oct. 2019].
- Ajzen, I., 1991. The theory of planned behaviour. *Organizational behavior and human decision processes*, 50, 179-211 (1991).
- Alan, A.K., Kabadayi, E.T., Bakis, S., Can, Y. and Sekerin, M.C., 2017. Generating and Assessing Consumer's Innovation Adoption through Consumer Innovativeness, Innovation Characteristics and Perceived Brand Innovativeness. *International Journal of Marketing Studies*, 9(6), pp. 68.
- Aleem, A. and Sprott, C., 2012. Let me in the cloud: analysis of the benefit and risk assessment of cloud platform. *Journal of Financial Crime*, 20(1), pp. 6–24.
- Alharbi, F., Atkins, A. and Stanier, C., 2016. Understanding the determinants of Cloud Computing adoption in Saudi healthcare organisations. *Complex & Intelligent Systems*, 2(3), pp. 155–171.
- Al-Hujran, O., Al-Lozi, E.M., Al-Debei, M.M. and Maqableh, M., 2018. Challenges of Cloud Computing Adoption from the TOE Framework Perspective: *International Journal of E-Business Research*, 14(3), pp. 77–94.
- Al-Ismaili, S., Li, M., Shen, J. and He, Q., 2016. Cloud computing adoption decision modelling for SMEs: a conjoint analysis. *International Journal of Web and Grid Services*, 12(3), 296-327.

- Al-Jabri, I.M. and Alabdulhadi, M.H., 2016. Factors affecting cloud computing adoption: perspectives of IT professionals. *International Journal of Business Information Systems*, Vol 23, No.4, pp. 389-405.
- Al-Jabri, I.M., Eid, M.I and Sohail, M.S., 2018. A group decision-making method for selecting cloud computing service model. *International journal of Advanced Computer Science and Applications*, vol 9, no. 1.
- Alkhalil, A., Sahandi, R. and John, D., 2016. A Review of the Current Level of Support to Aid Decisions for Migrating to Cloud Computing. In: *Proceedings of the International Conference on Internet of things and Cloud Computing - ICC '16*. [online] the International Conference. Cambridge, United Kingdom: ACM Press. pp. 1–8. Available at: <<http://dl.acm.org/citation.cfm?doid=2896387.2896443>> [Accessed 17 Oct. 2019].
- Allen, J.D., Towne, S.D., Maxwell, A.E., DiMartino, L., Leyva, B., Bowen, D.J., Linnan, L. and Weiner, B.J., 2017. Measures of organizational characteristics associated with adoption and/or implementation of innovations: A systematic review. *BMC Health Services Research*, [online] 17(1). Available at: <<http://bmchealthservres.biomedcentral.com/articles/10.1186/s12913-017-2459-x>> [Accessed 17 Oct. 2019].
- Alshamaila, Y., Papagiannidis, S. and Li, F., 2013. Cloud computing adoption by SMEs in the north east of England: A multi-perspective framework. *Journal of Enterprise Information Management*, 26(3), pp. 250–275.
- Alshamaileh, Y.Y., 2013. An empirical investigation of factors affecting cloud computing adoption among SMEs in the North East of England.
- Amankona, V., Panford, J.K. and Hayfron-Acquah, J.B., 2017. Cloud-Based Enterprise Adoption by SMEs in Ghana. 04(05), pp. 8.
- Apulu, I. and O. Ige, E., 2011. Are Nigeria SMEs Effectively Utilizing ICT? *International Journal of Business and Management*, [online] 6(6). Available at: <<http://www.ccsenet.org/journal/index.php/ijbm/article/view/10841>> [Accessed 17 Oct. 2019].
- Arjunan, R.V. and Kamath, K.V., 2018. Cloud computing system for small and medium corporations. *International Journal of Engineering*, pp. 4.
- Armbrust, M., Stoica, I., Zaharia, M., Fox, A., Griffith, R., Joseph, A.D., Katz, R., Konwinski, A., Lee, G., Patterson, D. and Rabkin, A., 2010. A view of cloud computing. *Communications of the ACM*, 53(4), pp. 50.
- Asiaei, A. and Rahim, N.Z.A., 2016. Conceptualizing a model for cloud computing adoption by SMEs. pp. 6.
- Askhoj, J., Sugimoto, S. and Nagamori, M., 2011. Preserving records in the cloud. *Records Management Journal*, 21(3), pp. 175–187.
- Assante, D., Castro, M., Hamburg, I. and Martin, S., 2016. The Use of Cloud Computing in SMEs. *Procedia Computer Science*, 83, pp. 1207–1212.
- Attride-Stirling, J., 2001. Thematic networks: an analytic tool for qualitative research. *Qualitative Research*, 1(3), pp. 385–405.

- Avram, M.G., 2014. Advantages and Challenges of Adopting Cloud Computing from an Enterprise Perspective. *Procedia Technology*, 12, pp. 529–534.
- Babar, M.A. and Chauhan, M.A., 2011. A tale of migration to cloud computing for sharing experiences and observations. In: *Proceeding of the 2nd international workshop on Software engineering for cloud computing - SECLOUD '11*. [online] Proceeding of the 2nd international workshop. Waikiki, Honolulu, HI, USA: ACM Press. pp. 50. Available at: <<http://portal.acm.org/citation.cfm?doid=1985500.1985509>> [Accessed 16 Oct. 2019].
- Baker, J., 2012. The Technology–Organization–Environment Framework. In: Y.K. Dwivedi, M.R. Wade and S.L. Schneberger, eds. *Information Systems Theory*. [online] New York, NY: Springer New York. pp. 231–245. Available at: <[http://link.springer.com/10.1007/978-1-4419-6108-2\\_12](http://link.springer.com/10.1007/978-1-4419-6108-2_12)> [Accessed 17 Oct. 2019].
- Bandura, A., 1977. *Social learning theory*. New York: Prentice Hall.
- Baxter, P. and Jack, S., 2008. Qualitative Case Study Methodology: Study Design and Implementation for Novice Researchers. pp. 16.
- Bazhenova, E., Taratukhin, V. and Becker, J., 2011. Impact of information and communication technologies on business process management on small and medium enterprises in the emerging countries. pp. 10.
- Bazi, H. reza, Hassanzadeh, A. and Moeini, A., 2017. A comprehensive framework for cloud computing migration using Meta-synthesis approach. *Journal of Systems and Software*, 128, pp. 87–105.
- Berman, S.J., Kesterson-Townes, L., Marshall, A. and Srivathsa, R., 2012. How cloud computing enables process and business model innovation. *Strategy & Leadership*, 40(4), pp. 27–35.
- Bolton, J.E., 1971. Report of the Committee of Inquiry into Small Firms. Cmnd 4811, HMSO, London.
- Boss, G., Malladi, P., Quan, D., Legregni, L. and Hall, H., 2007. Cloud Computing. *IBM Corporation 2007*, version 1.0, [online]. Available at: <[http://www.chinacloud.cn/download/PDF/Cloud\\_computing\\_wp\\_final\\_8Oct.pdf](http://www.chinacloud.cn/download/PDF/Cloud_computing_wp_final_8Oct.pdf)> [Accessed 16 Oct. 2019].
- Bradley, J., 2009. The Technology Acceptance Model and Other User Acceptance Theories. pp. 18.
- Branco, T., de Sá-Soares, F. and Rivero, A.L., 2017. Key Issues for the Successful Adoption of Cloud Computing. *Procedia Computer Science*, 121, pp. 115–122.
- Braun, V. and Clarke, V., 2006. Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), pp. 77–101.
- Brender, N. and Markov, I., 2013. Risk perception and risk management in cloud computing: Results from a case study of Swiss companies. *International Journal of Information Management*, 33(5), pp. 726–733.

- Březinová, M., 2013. Basic characteristics of small and medium-sized enterprises in terms of their strategic management. *Marketing and Economics*, pp. 4.
- Brynjolfsson, E., Hofmann, P. and Jordan, J., 2010. Cloud computing and electricity: beyond the utility model. *Communications of the ACM*, 53(5), pp.32.
- Burnard, P., 1994. The telephone interview as a data collection method. *Nurse Education Today*, 14(1):67-72.
- Buyya, R., Yeo, C.S., Venugopal, S., Broberg, J. and Brandic, I., 2009. Cloud computing and emerging IT platforms: Vision, hype, and reality for delivering computing as the 5th utility. *Future Generation Computer Systems*, 25(6), pp. 599–616.
- Carcary, D.M., Doherty, D.E. and Conway, G., 2014. The Adoption of Cloud Computing by Irish SMEs – an Exploratory Study. 17(1), pp. 12.
- Cervone, H.F., 2010. An overview of virtual and cloud computing. *OCLC Systems & Services: International digital library perspectives*, 26(3), pp. 162–165.
- Chang, V., Walters, R.J. and Wills, G., 2013. The development that leads to the Cloud Computing Business Framework. *International Journal of Information Management*, 33(3), pp. 524–538.
- Chemjor, E.M. and Lagat, C., 2017. Determinants of level of cloud computing adoption in small and medium enterprises in Nairobi county, Kenya. pp. 18.
- Chen, X., Wills, G.B., Gilbert, L. and Bacigalupo, D., 2010. Using cloud for research: a technical review. pp. 52.
- Cheshire, D.S. and Nassiuma, B.K., 2017. Influence of Information and Communication Technology (ICT) Adoption on Small and Medium Enterprise Performance in The Entertainment Sector in Nakuru Town, Kenya. 5(2), pp. 18.
- Colicchio, C., Giovanoli, C. and Stella, G.G., 2015. A Cloud Readiness Assessment Framework for Enterprise Content Management and Social Software (E-Collaboration) in Small and Medium Sized Enterprises. In: *2015 International Conference on Enterprise Systems (ES)*. [online] 2015 International Conference on Enterprise Systems (ES). Basel, Switzerland: IEEE. pp. 177–183. Available at: <<http://ieeexplore.ieee.org/document/7406861/>> [Accessed 17 Oct. 2019].
- Collins, D.J. and Lam, K.P., 2014. Selling the Cloud to Smaller Business Organisations. *Journal of Cloud Computing*, pp. 1–8.
- Conway, G. and Curry, E., 2012. Managing cloud computing: a life cycle approach. pp. 10.
- Conway, G., Carcary, M. and Doherty, E., 2015. A Conceptual Framework to Implement and Manage a Cloud Computing Environment. *Cloud Computing*, pp. 5.
- Conway, G., Doherty, E., Carcary, M. and Crowley, C., 2017. Enterprise cloud adoption – cloud maturity assessment model. *ECISM Conference Proceedings*, 2017.
- Cook, L.S., White, J.L., Stuart, G.C.E. and Magliocco, A.M., 2003. The reliability of telephone interviews compared with in-person interviews using memory aids. *Annals of Epidemiology*, 13(7), pp. 495–501.

- Crook, C.W. and Kumar, R.L., 1998. Electronic data interchange: a multi-industry investigation using grounded theory. *Information & Management*, 34(2), pp. 75–89.
- Damanpour, F., 1991. Organizational innovation: a meta-analysis of effects of determinants and moderators. *Academy of Management Journal*, 34(3), pp. 555–590.
- Damanpour, F., 1992. Organizational size and innovation. *Organisation Studies*, 1992, 13/3:375-402.
- Davis, F.D., 1986. A technology acceptance model for empirically testing new end-user information systems: theory and results.
- Davis, F.D., 1989. Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly*, 13(3), pp. 319.
- Davis, F.D., Bagozzi, R.P. and Warshaw, P.R., 1989. User acceptance of computer technology: a comparison of two theoretical models. *Management Science*, Vol. 35, No. 8. August 1989.
- Deil, R. and Brune, P., 2017. Cloudy with a Chance of Usage? – Towards a Model of Cloud Computing Adoption in German SME. pp. 8.
- Dhar, S., 2012. From outsourcing to Cloud computing: evolution of IT services. *Management Research Review*, 35(8), pp. 664–675.
- Dholakia, R.R. and Kshetri, N., 2004. Factors Impacting the Adoption of the Internet among SMEs. *Small Business Economics*, 23(4), pp. 311–322.
- DiCicco-Bloom, B. and Crabtree, B.F., 2006. The qualitative research interview. *Medical Education*, 40(4), pp. 314–321.
- Dwivedi, Y.K. and Mustafee, N., 2010. It's unwritten in the Cloud: the technology enablers for realising the promise of Cloud Computing. *Journal of Enterprise Information Management*, 23(6), pp. 673–679.
- Elliott, R., Fischer, C.T. and Rennie, D.L., 1999. Evolving guidelines for publication of qualitative research studies in psychology and related fields. *British Journal of Clinical Psychology*, 38(3), pp. 215–229.
- Erumban, A.A. and de Jong, S.B., 2006. Cross-country differences in ICT adoption: A consequence of Culture? *Journal of World Business*, 41(4), pp. 302–314.
- Eurostat., 2014. ICT usage in enterprises in 2014. [online]. Available at: <<https://ec.europa.eu/eurostat/documents/2995521/6208098/4-09122014-AP-EN.pdf>> [Accessed 16 Oct. 2019].
- Fahmideh, M., Daneshgar, F., Rabhi, F. and Beydoun, G., 2019. A generic cloud migration process model. *European Journal of Information Systems*, 28(3), pp. 233–255.
- Farooq, M.B., 2015. Qualitative telephone interviews: Strategies for success. pp. 30.
- Ferreira, O. and Moreira, F., 2012. Cloud Computing Implementation Level in Portuguese Companies. *Procedia Technology*, 5, pp. 491–499.

- Frambach, R.T. and Schillewaert, N., 2002. Organizational innovation adoption: a multi-level framework of determinants and opportunities for future research. *Journal of Business Research*, 55(2), pp. 163-176.
- Frambach, R.T., Barkema, H.G., Nooteboom, B. and Wedel, M., 1998. Adoption of a service innovation in the business market: An empirical test of supply-side variables. *Journal of Business Research*, 41(2), pp. 161-174.
- Fuchs, S., 2005. Organizational Adoption Models for Early ASP Technology Stages. Adoption and Diffusion of Application Service Providing (ASP) in the Electric Utility Sector. WU Vienna University of Economics and Business.
- Gago, D. and Rubalcaba, L., 2007. Innovation and ICT in service firms: towards a multidimensional approach for impact assessment. *Journal of Evolutionary Economics*, 17(1), pp. 25–44.
- Garrison, G., Kim, S. and Wakefield, R.L., 2012. Success factors for deploying cloud computing. *Communications of the ACM*, 55(9), pp. 62.
- Goel, R., Bali, V. and Singh, N., 2015. A systematic literature review of critical success factors for cloud adoption. *International Journal of Advanced Research in Computer Science and Software Engineering*, 5 (5).
- Goode, S. and Stevens, K., 2000. An Analysis of the Business Characteristics of Adopters and Non-Adopters of World Wide Web Technology. *Information Technology and Management*, 11(2), pp. 129-154.
- Grandhi, S., Wibowo, S. and Balasooriya, P., 2019. Sec-HOTE-Fit Framework for Assessing Key Security Determinants in Cloud Computing Adoption. pp. 8.
- Gu, Y. and Grossman, R.L., 2009. Sector and Sphere: the design and implementation of a high-performance data cloud. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, 367(1897), pp. 2429–2445.
- Gupta, P., Seetharaman, A. and Raj, J.R., 2013. The usage and adoption of cloud computing by small and medium businesses. *International Journal of Information Management*, pp. 14.
- Gupta, S., Saxena, K.B.C. and Saini, A.K., 2016. Towards Risk Managed Cloud Adoption, A Conceptual Framework. pp. 7.
- Gurav, U. and Shaikh, R., 2010. Virtualization: a key feature of cloud computing. In: *Proceedings of the International Conference and Workshop on Emerging Trends in Technology - ICWET '10*. [online] the International Conference and Workshop. Mumbai, Maharashtra, India: ACM Press. pp. 227. Available at: <<http://portal.acm.org/citation.cfm?doid=1741906.1741957>> [Accessed 16 Oct. 2019].
- Hamdaqa, M. and Tahvildari, L., 2012. Cloud Computing Uncovered: A Research Landscape. In: *Advances in Computers*. [online] Elsevier. pp. 41–85. Available at: <<https://linkinghub.elsevier.com/retrieve/pii/B9780123965356000028>> [Accessed 16 Oct. 2019].
- Hassan, H. and Nasir, H.M., 2017. Determinants of cloud computing adoption at firm level: from the technological context. *Journal of Engineering and Applied Sciences*, 12 (16).

- Hassan, H. and Ogundipe, A., 2017. ICT Adoption by Micro and Small Scale Enterprises in Nigeria: A Case Study of the Federal Capital Territory, Abuja. SSRN Electronic Journal. [online] Available at: <<http://www.ssrn.com/abstract=2951901>> [Accessed 16 Oct. 2019].
- Hassan, H., 2017. Organisational factors affecting cloud computing adoption in small and medium enterprises (SMEs) in service sector. *Procedia Computer Science*, 121, pp. 976–981.
- Heide, J.B. and Weiss, A.M., 1995. Vendor Consideration and Switching Behavior for Buyers in High-Technology Markets. *Journal of Marketing*, 59(3), pp. 30.
- Helland, P., 2013. Condos and clouds. *Communications of the ACM*, 56(1), pp. 50.
- Holloway, M., Dickhaus, M., Hans, R., Emondts, B., Rizk, A. and Steinmetz, R., 2017. Cloud Adoption in the Spotlight - Empirical Insights from German IT Experts. pp. 10.
- Hoque, M.R., 2016. An empirical study of mHealth adoption in a developing country: the moderating effect of gender concern. *BMC Medical Informatics and Decision Making*, [online] 16(1). Available at: <<http://bmcmmedinformdecismak.biomedcentral.com/articles/10.1186/s12911-016-0289-0>> [Accessed 17 Oct. 2019].
- Hsu, P.F., Kraemer, K.L. and Dunkle, D., 2006. Determinants of E-Business Use in U.S. Firms. *International Journal of Electronic Commerce*, 10(4), pp. 9–45.
- Hsu, P.F., Ray, S. and Li-Hsieh, Y.Y., 2014. Examining cloud computing adoption intention, pricing mechanism, and deployment model. *International Journal of Information Management*, 34(4), pp. 474–488.
- Hunter, G.K., 1999. Sales technology, relationship-forging tasks, and sales performance in business markets. pp. 208.
- Hwang, B.N., Huang, C.Y. and Wu, C.H., 2016. A TOE Approach to Establish a Green Supply Chain Adoption Decision Model in the Semiconductor Industry. *Sustainability*, 8(2), pp. 168.
- IDC., 2010. Cloud computing in the mid-market: assessing the options. [online] the International Conference. Cambridge, United Kingdom: ACM Press. pp. 1–8. Available at: <[https://www.ibm.com/ibm/files/X245007U34853J04/14IDC\\_Executive\\_Brief\\_218KB.pdf](https://www.ibm.com/ibm/files/X245007U34853J04/14IDC_Executive_Brief_218KB.pdf)> [Accessed 17 Oct. 2019].
- Iddris, F., 2012. Adoption of E-Commerce Solutions in Small and Medium-Sized Enterprises in Ghana. *European Journal of Business and Management*, 4, pp. 10.
- Igbaria, M., Guimaraes, T. and Davis, G.B., 1995. Testing the Determinants of Microcomputer Usage via a Structural Equation Model. *Journal of Management Information Systems*, 11(4), pp. 87–114.
- Ihuah, P.W. and Eaton, D., 2013. The Pragmatic Research Approach: A Framework for Sustainable Management of Public Housing Estates in Nigeria. pp. 12.
- Imre, Ö., 2016. Adopting Information Systems in a Small Company: A Longitudinal Study. p. 15.
- Ismail, R., Jeffery, R. and Belle, J.P., 2011. Using ICT as a Value Adding Tool in South African SMEs. *Journal of African Research in Business & Technology*, pp. 1–12.

- Jaganathan, M., Ahmad, S., Ishak, K.A., Nafi, S.N.M. and Uthamaputhran, L., 2018. Determinants for ICT adoption and problems: evidence from rural based small and medium enterprises in Malaysia. *22(4)*, pp. 13.
- Jamshidi, P., Ahmad, A. and Pahl, C., 2013. Cloud Migration Research: A Systematic Review. *IEEE Transactions on Cloud Computing*, 1(2), pp. 142–157.
- Jeyaraj, A., Rottman, J.W. and Lacity, M.C., 2006. A review of the predictors, linkages, and biases in IT innovation adoption research. *Journal of Information Technology*, 21(1), pp. 1-23.
- Johansson, B., Alajbegovic, A. and Alexopoulos, V., 2014. Cloud ERP Adoption Opportunities and Concerns: A Comparison between SMES and Large Companies. pp. 13.
- Johnston, K.A., Kabanda, S.K., Adams, S. and Davids, E., 2008. How SMEs in Western Cape of South Africa use ICT. In: *PICMET '08 - 2008 Portland International Conference on Management of Engineering & Technology*. [online] Technology. Cape Town, South Africa: IEEE. pp. 1043–1051. Available at: <<http://ieeexplore.ieee.org/document/4599713/>> [Accessed 16 Oct. 2019].
- Kambil, A., 2009. A head in the clouds. *Journal of Business Strategy*, 30(4), pp. 58–59.
- Karim, F. and Rampersad, G., 2017. Factors Affecting the Adoption of Cloud Computing in Saudi Arabian Universities. *Computer and Information Science*, 10(2), pp. 109.
- Karim, N.A.-H.A., Jalil, N.A., Ramli, N.R., Zulkifli, N., Aziz, S.N.A. and Zakariya, Z., 2019. ICT Usage Performance of Small and Medium Enterprises and Their Exporting Activity in Malaysia. *International Journal of Academic Research in Business and Social Sciences*, [online] 8(12). Available at: <<http://hrmars.com/index.php/journals/papers/IJARBSS/v8-i12/5444>> [Accessed 16 Oct. 2019].
- Karkošková, S. and Feuerlicht, G., 2014. ITIL as a framework for management of cloud services. pp. 6.
- Kayanula, D. and Quartey, P., 2000. The policy environment for promoting small and medium-sized enterprises in Ghana and Malawi. pp. 30.
- Kew, J. and Herrington, M., 2009. ICT and entrepreneurship. A research report presented to the Small Enterprise Development Agency, UCT Graduate School of Business, University of Cape Town [online] Available at: <http://www.gsb.uct.ac.za/files/SEDAICTReport2009.Pdf>.
- Khajeh-Hosseini, A., Greenwood, D., Smith, J.W. and Sommerville, I., 2012. The Cloud Adoption Toolkit: supporting cloud adoption decisions in the enterprise. *Software: Practice and Experience*, 42(4), pp. 447–465.
- Khajeh-Hosseini, A., Sommerville, I. and Sriram, I., 2010. Research Challenges for Enterprise Cloud Computing. pp. 11.
- Khan, N. and Al-Yasiri, A., 2015. Framework for Cloud Computing Adoption: A Roadmap for SMEs to Cloud Migration. *International Journal on Cloud Computing: Services and Architecture*, 5(5/6), pp. 01–15.
- Khanda, M. and Doss, S., 2018. SME Cloud Adoption in Botswana: Its Challenges and Successes. *International Journal of Advanced Computer Science and Applications*, [online] 9(1). Available at:

- <<http://thesai.org/Publications/ViewPaper?Volume=9&Issue=1&Code=ijacsa&SerialNo=65>> [Accessed 16 Oct. 2019].
- Kim, W., 2009. Cloud Computing: Today and Tomorrow. *Cloud Computing*, 8(1), pp. 8.
- Kim, W., Kim, S.D., Lee, E. and Lee, S., 2009. Adoption issues for cloud computing. pp. 4.
- Klein, H.K. and Myers, M.D., 1999. A Set of Principles for Conducting and Evaluating Interpretive Field Studies in Information Systems. *MIS Quarterly*, 23(1), pp. 67.
- Korpelainen, E., 2011. Theories of ICT System Implementation and Adoption – A Critical Review. pp. 58.
- Kotelnikov, V., 2007. Small and medium enterprises and ICT. APCICT, Republic of Korea.
- Kourik, J.L., 2011. For Small and Medium Size Enterprises (SME) Deliberating Cloud Computing: A Proposed Approach. pp. 6.
- Kreslins, K., Novik, D. and Vasiljeva, T., 2018. Challenge of Cloud Computing for SMEs: A Case of Baltic Countries. *Journal of Innovation Management in Small and Medium Enterprises*, 2018, pp. 1–10.
- Kumar, D., Samalia, H.V., Verma, P. and Singh, H., 2013. Stumbling Blocks in Cloud Computing Adoption Pathway: A Charter. pp. 8.
- Kumar, N. and Suh, K., 2013. Insights from Cisco’s U.S. Research on SMB Services Delivery. pp. 7.
- Kuyoro, S.O., Awodele, O., Alao, O.D and Omotunde, A., 2013. ICT solution to small and medium scale enterprises (SMEs) in Nigeria. *International Journal of Computer and Information Technology*, Volume 02– Issue 04, July 2013.
- Kyobe, M., Namirembe, E. and Shongwe, M., 2015. The Alignment of Information Technology Applications with Non-Technological Competencies of SMEs in Africa. *The Electronic Journal of Information Systems in Developing Countries*, 67(1), pp. 1–22.
- Lai, P.C., 2017. The literature review of technology adoption models and theories for the novelty technology. *Journal of Information Systems and Technology Management*, [online] 14(1). Available at:  
<<http://www.jistem.tecsi.org/index.php/jistem/article/view/10.4301%25S1807-17752017000100002>> [Accessed 17 Oct. 2019].
- Lee, A.S., 1991. Integrating Positivist and Interpretive Approaches to Organizational Research. *Organization Science*, 2(4), pp. 342–365.
- Leung, L. and Wei, R., 1998. Factors influencing the adoption of interactive TV in Hong Kong: Implications for advertising. *Asian Journal of Communication*, 8(2), pp. 124–147.
- Levenburg, N., Magal, S.R. and Kosalge, P., 2006. An Exploratory Investigation of Organizational Factors and e-Business Motivations Among SMFOEs in the US. *Electronic Markets*, 16(1), pp. 70-84.
- Li, H., Yu, L. and He, W., 2019. The Impact of GDPR on Global Technology Development. *Journal of Global Information Technology Management*, 22(1), pp. 1–6.

- Lian, J.W., Yen, D.C. and Wang, Y.T., 2014. An exploratory study to understand the critical factors affecting the decision to adopt cloud computing in Taiwan hospital. *International Journal of Information Management*, 34(1), pp. 28–36.
- Lim, H.C., Babu, S., Chase, J.S. and Parekh, S.S., 2009. Automated control in cloud computing: challenges and opportunities. pp. 6.
- Lin, A. and Chen, N.C., 2012. Cloud computing as an innovation: Perception, attitude, and adoption. *International Journal of Information Management*, 32(6), pp. 533–540.
- Lin, C. A. and Jeffres, L. W., 1998. Factors Influencing the Adoption of Multimedia Cable Technology. *Journalism & Mass Communication Quarterly*, 75(2), pp. 341–352.
- Lin, H., 2007. Knowledge sharing and firm innovation capability: an empirical study. *International Journal of Manpower*, 28(3/4), pp. 315–332.
- Linthicum, D., 2009. Defining the Cloud Computing Framework. [online] Available at: <<http://cloudcomputing.sys-con.com/node/811519>> [Accessed 16 Oct. 2019].
- Loasby, B.J. and Leibenstein, H., 1976. Beyond Economic Man. A New Foundation for Microeconomics. *The Economic Journal*, 86(344), pp. 913.
- Loebbecke, C., Thomas, B. and Ullrich, T., 2012. Assessing Cloud Readiness at Continental AG1,2. pp. 14.
- Low, C., Chen, Y. and Wu, M., 2011. Understanding the determinants of cloud computing adoption. *Industrial Management & Data Systems*, 111(7), pp. 1006–1023.
- Lu, H., Pishdad-Bozorgi, P., Wang, G., Xue, Y. and Tan, D., 2019. ICT Implementation of Small- and Medium-Sized Construction Enterprises: Organizational Characteristics, Driving Forces, and Value Perceptions. *Sustainability*, 11(12), p. 3441.
- Lynn, T., Liang, X., Gourinovitch, A., Morrison, J., Fox, G. and Rosati, P., 2018. Understanding the Determinants of Cloud Computing Adoption for High Performance Computing. [online] Hawaii International Conference on System Sciences. . Available at: <<http://hdl.handle.net/10125/50377>> [Accessed 17 Oct. 2019].
- MacGregor, R., Vrazalic, L., Carlsson, S., Bunker, D. and Magnusson, M., 2002. The Impact of Business Size and Business Type on Small Business Investment in Electronic Commerce: a study of Swedish small businesses. *Australasian Journal of Information Systems*, [online] 9(2). Available at: <<http://journal.acs.org.au/index.php/ajis/article/view/189>> [Accessed 16 Oct. 2019].
- Mack, N., Woodsong, C., MacQueen, K.M., Guest, G., Namey, E., 2005. *Qualitative research methods: a data collector's field guide*. [online] Available at: <<http://www.fhi360.org/sites/default/files/media/documents/Qualitative%20Research%20Methods%20-%20A%20Data%20Collector's%20Field%20Guide.pdf>> [Accessed 16 Oct. 2019].
- Majumdar, S.K. and Venkataraman, S., 1993. New technology adoption in US telecommunications: The role of competitive pressures and firm-level inducements. *Research Policy*, 22(5–6), pp. 521–536.
- Malik, B.H., Asad, J., Kousar, S., Nawaz, F., -, Z., Hayder, F., Bibi, S. and Yousaf, A., 2019. Cloud Computing Adoption in Small and Medium- Sized Enterprises (SMEs) of Asia and

- Africa. *International Journal of Advanced Computer Science and Applications*, [online] 10(5). Available at: <<http://thesai.org/Publications/ViewPaper?Volume=10&Issue=5&Code=IJACSA&SerialNo=65>> [Accessed 26 Feb. 2020].
- Manueli, K., Latu, S. and Koh., D., 2007. ICT adoption models. *20th Annual Conference of the National Advisory Committee on Computing Qualifications (NACCQ 2007)*, Nelson, New Zealand.
- Marcati, A., Guido, G. and Peluso, A.M., 2008. The role of SME entrepreneurs' innovativeness and personality in the adoption of innovations. *Research Policy*, 37(9), pp. 1579–1590.
- Marston, S., Li, Z., Bandyopadhyay, S., Zhang, J. and Ghalsasi, A., 2011. Cloud computing — The business perspective. *Decision Support Systems*, 51(1), pp. 176–189.
- Martins., C.B.M.J., 2018. The individual innovativeness theory: a framework to investigate teachers' views on technology. *ICITE 2018 Proceedings*.
- Mell, P. and Grance, T., 2011. The NIST Definition of Cloud Computing. pp. 7.
- Modimogale, L. and Kroeze, J.H., 2009. Using ICTs to Become a Competitive SME in South Africa. pp. 10.
- Modisha, M. and Van Belle., 2012. Cloud computing for small South African organisations: factors influencing the adoption of software-as-a-service. *Proceedings of the 14th Annual Conference on World Wide Web Applications*, Durban, 7-9 November 2012.
- Mohlameane, M. and Ruxwana, N., 2014. The Awareness of Cloud Computing: A Case Study of South African SMEs. *International Journal of Trade, Economics and Finance*, pp. 6–11.
- Morgan, G. and Smircich, L., 1980. The Case for Qualitative Research. *The Academy of Management Review*, 5(4), pp. 491.
- Mullender, S.J., 2012. Predictable Cloud Computing. *Bell Labs Technical Journal*, 17(2), pp. 25–39.
- Murphy, M., 2002. Organisational Change and Firm Performance. *OECD Science, Technology and Industry Working Papers*. [online] Available at: <[https://www.oecd-ilibrary.org/science-and-technology/organisational-change-and-firm-performance\\_615168153531](https://www.oecd-ilibrary.org/science-and-technology/organisational-change-and-firm-performance_615168153531)> [Accessed 16 Oct. 2019].
- Musselwhite, K., Cuff, L., McGregor, L. and King, K.M., 2007. The telephone interview is an effective method of data collection in clinical nursing research: A discussion paper. *International Journal of Nursing Studies*, 44(6), pp. 1064–1070.
- Mutula, S.M. and Van Brakel, P., 2007. ICT skills readiness for the emerging global digital economy among small businesses in developing countries: Case study of Botswana. *Library Hi Tech*, 25(2), pp. 231–245.
- Mwila, M. and Ngoyi, L., 2019. The use of ICT by SMEs in Zambia to access business information services and investments: barriers and drivers. *Journal of Global Entrepreneurship Research*, [online] 9(1). Available at: <<https://journal-jger.springeropen.com/articles/10.1186/s40497-019-0145-7>> [Accessed 16 Oct. 2019].

- Myers, M.D. and Newman, M., 2007. The qualitative interview in IS research: Examining the craft. *Information and Organization*, 17(1), pp. 2–26.
- Nandhakumar, J. and Jones, M., 1997. Too close for comfort? Distance and engagement in interpretive information systems research. *Information Systems Journal*, 7(2), pp. 109–131.
- National Small Business Amendment Act, 2003. [online]. Available at: <<https://www.polity.org.za/article/national-small-business-amendment-act-no-26-of-2003-2003-01-01>> [Accessed 16 Oct. 2019].
- Novick, G., 2008. Is there a bias against telephone interviews in qualitative research? *Research in Nursing & Health*, 31(4), pp. 391–398.
- Nwabuonu, O.G. and Nwachukwu, N.J., 2013. Cloud Computing: Key to IT Development in West Africa. pp. 8.
- Oguz, F., 2016. Organizational Influences in Technology Adoption Decisions: A Case Study of Digital Libraries. *College & Research Libraries*, 77(3), pp. 314–334.
- Okorie Awa, H., Ukoha, O. and Emecheta, B., 2012. Integrating TAM and TOE Frameworks and Expanding their Characteristic Constructs for E-Commerce Adoption by SMEs. [online] InSITE 2012: Informing Science + IT Education Conference. pp. 571–588. Available at: <<https://www.informingscience.org/Publications/1676>> [Accessed 17 Oct. 2019].
- Olawale, F. and Garwe, D., 2010. Obstacles to the growth of new SMEs in South Africa: A principal component analysis approach. pp. 10.
- Oliveira, T. and Martins, M.F., 2011. Literature Review of Information Technology Adoption Models at Firm Level. 14(1), pp. 12.
- Oliveira, T., Thomas, M. and Espadanal, M., 2014. Assessing the determinants of cloud computing adoption: An analysis of the manufacturing and services sectors. *Information & Management*, 51(5), pp. 497–510.
- Opara-Martins, J., Sahandi, R. and Tian, F., 2017. A Holistic Decision Framework to Avoid Vendor Lock-in for Cloud SaaS Migration. *Computer and Information Science*, 10(3), pp. 29.
- Organization for Economic Co-Operation and Development Staff (OECD), 2017. Enhancing the contributions of SMEs in a global and digitalised economy [online]. Available at: <<https://www.polity.org.za/article/national-small-business-amendment-act-no-26-of-2003-2003-01-01>> [Accessed 16 Oct. 2019].
- Organization for Economic Co-Operation and Development Staff (OECD), 2000. Small and medium-sized enterprises: local strength, global research. [online]. Available at: <<http://www.oecd.org/cfe/leed/1918307.pdf>> [Accessed 16 Oct. 2019].
- Organization for Economic Co-Operation and Development Staff (OECD), 2002. *The OECD Small and Medium Enterprise Outlook, 2000 Edition*. [online] Washington: Organization for Economic Cooperation & Development. Available at: <[https://doi.org/10.1787/sme\\_outlook-2002-en](https://doi.org/10.1787/sme_outlook-2002-en)> [Accessed 17 Oct. 2019].
- Orlikowski, W.J. and Baroudi, J.J., 1991. Studying Information Technology in Organizations: Research Approaches and Assumptions. *Information Systems Research*, 2(1), pp. 1–28.

- Ostlund, L., 1974. Perceived Innovation Attributes as Predictors of Innovativeness, *The Journal of Consumer Research*, 1(2), pp. 23-29.
- Oyebiyi, O., Misra, S., Maskeliūnas, R. and Damaševičius, R., 2018. Application of ICT by Small and Medium Enterprises in Ogun State Nigeria. In: B. Panda, S. Sharma and N.R. Roy, eds. *Data Science and Analytics*. [online] Singapore: Springer Singapore. pp. 459–471. Available at: <[http://link.springer.com/10.1007/978-981-10-8527-7\\_39](http://link.springer.com/10.1007/978-981-10-8527-7_39)> [Accessed 17 Oct. 2019].
- Palos-Sanchez, P.R., Arenas-Marquez, F.J. and Aguayo-Camacho, M., 2017. Cloud Computing (SaaS) Adoption as a Strategic Technology: Results of an Empirical Study. *Mobile Information Systems*, 2017, pp. 1–20.
- Parida, V., 2008. Small Firm Capabilities for Competitiveness - An empirical study of ICT related small Swedish firms. pp. 188.
- Patel, A., Seyfi, A., Tew, Y. and Jaradat, A., 2011. Comparative study and review of grid, cloud, utility computing and software as a service for use by libraries. *Library Hi Tech News*, 28(3), pp. 25–32.
- Plummer, D., 2012. The Business Landscape of Cloud Computing. pp. 41.
- Polkinghorne, D.E., 2005. Language and meaning: Data collection in qualitative research. *Journal of Counselling Psychology*, 52(2), pp. 137–145.
- Prasad, A., Green, P., Heales, Jon., Finau, G., 2014. On cloud computing service considerations for the small and medium enterprises. *20th Americas Conference on Information Systems (AMCIS 2014)*, Savannah, GA, United States, 7-9 August 2014. Association for Information Systems.
- Premkumar, G. and Potter, M., 1995. Adoption of computer aided software engineering (case) technology: an innovation adoption perspective. *Data base advances*, Vol. 26, No. 2 & 3, May/August 1995.
- Premkumar, G. and Roberts, M., 1999. Adoption of new information technologies in rural small businesses. *Omega*, 27(4), pp. 467–484.
- Premkumar, G., 2003. A Meta-Analysis of Research on Information Technology Implementation in Small Business. *Journal of Organizational Computing and Electronic Commerce*, 13(2), pp. 91–121.
- Quaye, I., Abrokwhah, E., Sarbah, A. and Osei, J.Y., 2014. Bridging the SME Financing Gap in Ghana: The Role of Microfinance Institutions. *Open Journal of Business and Management*, 02(04), pp. 339–353.
- Ramdani, B. and Kawaiek, P., 2007. SME adoption of enterprise systems in the Northwest of England: An Environmental, Technological, and Organizational Perspective. pp. 21.
- Rappa, M.A., 2004. The utility business model and the future of computing services. *IBM Systems Journal*, 43(1), pp. 32–42.
- Rashmi, R., Mehruz, S. and Sahoo, G., 2012. A five-phased approach for the cloud migration. *International Journal of Emerging Technology and Advanced Engineering*, 2 (4).

- Ratten, V., 2012. Entrepreneurial and ethical adoption behaviour of cloud computing. *The Journal of High Technology Management Research*, 23(2), pp. 155–164.
- Reynoso, C.F., Osuna, M.A.A. and Figueroa, L.E.O., 2014. Micro, small and medium-sized businesses in Jalisco: their evolution, and strategic challenges. 5(2), pp. 18.
- Rogers, E.M., 1983. *Diffusion of innovations*. 3rd ed. New York : Free Press.
- Rogers, E.M., 1995. *Diffusion of innovations*. 4th ed. New York: Free Press.
- Rogers, E.M., 2003. *Diffusion of innovations*. 5th ed. New York: Free Press.
- Rungani, E.C. and Potgieter, M., 2018. The impact of financial support on the success of small, medium and micro enterprises in the Eastern Cape province. *Acta Commercii*, [online] 18(1). Available at: <<https://actacommercii.co.za/index.php/acta/article/view/591>> [Accessed 17 Oct. 2019].
- Ryan, G.W. and Bernard, H.R., 2003. Techniques to Identify Themes. *Field Methods*, 15(1), pp. 85–109.
- Sahandi, R., Alkhalil, A. and Opara-Martins, J., 2013. Cloud computing from SMEs perspective: a survey- based investigation. *Journal of Information Technology Management*.
- Sallehudin, H., Razak, C.R., Ismail, M., Fadzil, A.F.M. and Baker, R., 2018. Cloud computing implementation in the public sector: factors and impact. *Asia-Pacific Journal of Information Technology and Multimedia*, Vol. 7 No. 2-2, December 2018: 27 – 42.
- Salum, K.H. and Rozan, M.Z.A., 2017. Conceptual model for cloud ERP adoption for SMEs. *Journal of Theoretical and Applied Information Technology*, 95(4), pp. 14.
- Saunders, M., Lewis, P. and Thornhill, A., 2016. *Research methods for business students*. Harlow: Pearson.
- Schultze, U. and Avital, M., 2011. Designing interviews to generate rich data for information systems research. *Information and Organization*, 21(1), pp. 1–16.
- Seddon, J.J.M. and Currie, W.L., 2013. Cloud computing and trans-border health data: Unpacking U.S. and EU healthcare regulation and compliance. *Health Policy and Technology*, 2(4), pp. 229–241.
- Senarathna, I., Wilkin, C., Warren, M., Yeoh, W. and Salzman, S., 2018. Factors That Influence Adoption of Cloud Computing: An Empirical Study of Australian SMEs. *Australasian Journal of Information Systems*, [online] 22. Available at: <<http://journal.acs.org.au/index.php/ajis/article/view/1603>> [Accessed 16 Oct. 2019].
- Sharif, A.M., 2010. It's written in the cloud: the hype and promise of cloud computing. *Journal of Enterprise Information Management*, 23(2), pp. 131–134.
- Silva, R.B. da and Mattos, C.A. de, 2019. Critical Success Factors of a Drug Traceability System for Creating Value in a Pharmaceutical Supply Chain (PSC). *International Journal of Environmental Research and Public Health*, 16(11), pp. 1972.
- Slawinski, J and Sunderam, V., 2014. Approaching utility computing via adaptive multi-targeted deployment. TR-2014-004.

- Stieninger, M. and Nedbal, D., 2014. Characteristics of Cloud Computing in the Business Context: A Systematic Literature Review. *Global Journal of Flexible Systems Management*, 15(1), pp. 59–68.
- Storey, D.J., 1994. *Understanding the Small Business Sector*. Routledge, London.
- Sultan, N., 2014. Making use of cloud computing for healthcare provision: Opportunities and challenges. *International Journal of Information Management*, 34(2), pp. 177–184.
- Suo, S., 2013. *Cloud implementation in organisations: Critical success factors, challenges, and impacts on the IT function* (Doctoral dissertation, The Pennsylvania State University).
- Taherdoost, H., 2018. A review of technology acceptance and adoption models and theories. *Procedia Manufacturing*, 22, pp. 960–967.
- Thong, J.Y.L. and Yap, C.S., 1995. CEO characteristics, organizational characteristics and information technology adoption in small businesses. *Omega*, 23(4), pp. 429–442.
- Thong, J.Y.L., 1999. An Integrated Model of Information Systems Adoption in Small Businesses. *Journal of Management Information Systems*, 15(4), pp. 187–214.
- Tornatzky, L.G. and Fleischer, M., 1990. *The Processes of Technological Innovation*. Lexington Books, Lexington.
- Toulmin, S., 1958. *The Uses of Argument*. Cambridge University Press.
- Uchena, P., Wilson, N. and Felista, U., 2013. Enterprise Cloud Adoption: Leveraging on the Business and Security Benefits. *West African Journal of Industrial and Academic Research*, vol 7, no. 1.
- University of Auckland School of Psychology., 2019. Thematic analysis FAQ. [online]. Available at: <<https://cdn.auckland.ac.nz/assets/psych/about/our-research/documents/Answers%20to%20frequently%20asked%20questions%20about%20the%20thematic%20analysis%20April%202019.pdf>> [Accessed 16 Oct. 2019].
- Valentine, U.I. and Enyinna, O.U., 2013. Building Trust and Confidentiality in Cloud computing Distributed Data Storage. pp. 6.
- Vaquero, L.M., Rodero-Merino, L., Caceres, J. and Lindner, M., 2008. A break in the clouds: towards a cloud definition. *ACM SIGCOMM Computer Communication Review*, 39(1), pp. 50.
- Vasiljeva, T., Shaikhulina, S. and Kreslins, K., 2017. Cloud Computing: Business Perspectives, Benefits and Challenges for Small and Medium Enterprises (Case of Latvia). *Procedia Engineering*, 178, pp. 443–451.
- Venkatesh, Morris, Davis and Davis, 2003. User Acceptance of Information Technology: Toward a Unified View. *MIS Quarterly*, 27(3), pp. 425.
- Venters, W. and Whitley, E.A., 2012. A Critical Review of Cloud Computing: Researching Desires and Realities. *Journal of Information Technology*, 27(3), pp. 179–197.
- Vidhyalakshmi, R. and Kumar, V., 2016. Determinants of cloud computing adoption by SMEs. pp. 22.

- Vouk, M.A., 2008. Cloud Computing – Issues, Research and Implementations. *Cloud Computing*, pp. 12.
- Walsham, G., 1995. Interpretive case studies in IS research: nature and method. pp. 8.
- Wambugu, A.W. and Ndiege, J.R., 2018. *Adoption of Cloud Computing by Small and Medium Enterprises in Nairobi County, Kenya*. Available at: <<http://rgdoi.net/10.13140/RG.2.2.12989.97768>> [Accessed 16 Oct. 2019].
- Wamuyu, P., 2017. Use of cloud computing services in micro and small enterprises: a fit perspective. *IJISPM - International Journal of Information Systems and Project Management*, 5(2), pp. 59–81.
- Weber, 2004. Editor's Comments: The Rhetoric of Positivism versus Interpretivism: A Personal View. *MIS Quarterly*, 28(1), pp. iii.
- Weigelt, C. and Sarkar, M., 2009. Learning from Supply-Side Agents: The Impact of Technology Solution Providers' Experiential Diversity on Clients' Innovation Adoption. *Academy of Management Journal*, 52(1), pp. 37–60.
- Weinhardt, C., Anandasivam, A., Blau, B., Borissov, N., Meinl, T., Michalk, W. and Stöber, J., 2009. Cloud Computing – A Classification, Business Models, and Research Directions. *Business & Information Systems Engineering*, 1(5), pp. 391–399.
- Wilson, K., Roe, B. and Wright, L., 1998. Telephone or face-to-face interviews? A decision made on the basis of a pilot study. *International Journal of Nursing Studies*, 35, 314-321.
- Workineh, M., Garcia, N.M. and Midekso, D., 2018. Cloud Adoption Readiness Assessment Framework for Small and Medium Enterprises in Developing Economies. pp. 8.
- Yang, H. and Tate, M., 2012. A Descriptive Literature Review and Classification of Cloud Computing Research. *Communications of the Association for Information Systems*, [online] 31. Available at: <<https://aisel.aisnet.org/cais/vol31/iss1/2>> [Accessed 16 Oct. 2019].
- Yap, C.S., 1990. Distinguishing characteristics of organizations using computers. *Information & Management*, 18(2), pp. 97–107.
- Yeboah-Boateng, E.O. and Essandoh, K.A., 2014. Factors Influencing the Adoption of Cloud Computing by Small and Medium Enterprises in Developing Economies. 2(4), pp. 8.
- Yeboah-Boateng, E.O., 2013. Cyber-security challenges with SMEs in developing economies: issues of confidentiality, integrity & availability (CIA). *Institut for Elektroniske Systemer, Aalborg Universitet*.
- Yin, R.K., 1981. The Case Study Crisis: Some Answers. *Administrative Science Quarterly*, 26(1), pp. 58.
- Yin, R.K., 2003. *Case Study Research: Design and Methods*. Sage. Thousand Oaks, California.
- Yoo, S.K. and Kim, B.Y., 2018. A Decision-Making Model for Adopting a Cloud Computing System. *Sustainability*, 10(8), pp. 2952.
- Young, R. and Jordan, E., 2008. Top management support: Mantra or necessity? *International Journal of Project Management*, 26(7), pp. 713-725.

Zhou, F., Goel, M., Desnoyers, P. and Sundaram, R., 2013. Scheduler vulnerabilities and coordinated attacks in cloud computing. *Journal of Computer Security*, 21 (2013) 533–559 533, DOI 10.3233/JCS-130474, IOS Press.

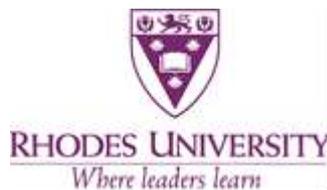
Zhu, K., Kraemer, K. and Xu, S., 2003. Electronic business adoption by European firms: a cross-country assessment of the facilitators and inhibitors. *European Journal of Information Systems*, 12(4), pp. 251–268.

Zhu, Kraemer, Gurbaxani and Xu, 2006. Migration to Open-Standard Interorganizational Systems: Network Effects, Switching Costs, and Path Dependency. *MIS Quarterly*, 30, pp. 515.

# Appendices

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## Appendix A: Ethical Clearance Approval letter



**Department of Information Systems**  
Hamilton building, Prince Alfred Street, Grahamstown, 6139, South Africa  
PO Box 94, Grahamstown, 6140, South Africa t: +27 (0) 46 603 8244 f: +27 (0) 46 603  
7608

e: [informationssystemswwww.ru.ac.za@ru.ac.za](mailto:informationssystemswwww.ru.ac.za@ru.ac.za)

29 November 2016

Dear Ronald

**Ethics Clearance:** Towards a framework for the adoption of cloud computing services by SMEs in the Eastern Cape: a technological, organisational and environmental perspective

**Principal Investigator:** Ronald Mudzamba

**Tracking Number:** CIS16-09

This letter confirms that the ethical application with tracking number title as above was **approved with minor stipulations for ethical clearance** by the Rhodes University Ethical Standards subcommittee in the Computer Science and Information Systems Departments.

Minor modifications required are stipulated in the attached documentation and reviews. Please contact the Ethics subcommittee for clarification of the stipulations, if deemed helpful. There is no need to resubmit the application for further review.

Please ensure that the ethical standards subcommittee is notified should any substantive change(s) be made, for whatever reason, during the research process. This includes changes to the investigators.

***Please also ensure that a brief report is submitted to the Ethics Subcommittee on completion of the research*** - a submission link is available on RUCConnected for that purpose (see <http://ruconnected.ru.ac.za/course/view.php?id=5470>). The purpose of this report is to indicate whether or not the research was conducted successfully, whether any aspects could not be completed, or if problems arose that the ethical standards subcommittee should be aware of. If a thesis or dissertation arising from this research is submitted to the Library's electronic theses and dissertations (ETD) repository, please notify the committee of the date of submission and/or any reference or cataloguing number allocated.

**Note:**

- This clearance is valid from the date of this letter until the time of completion of the data collections.
- The Ethics Subcommittee cannot grant retrospective ethics clearance.
- Progress reports should be submitted annually unless otherwise specified.

Yours sincerely,



Prof Kirstin Krauss

Chairperson: CS&IS Ethics Subcommittee of RUESC