Evaluating the Benefits of Cloud Computing in Small, Medium and Micro-sized Enterprises (SMMEs) within the North West Province in South Africa

PB Modisane

orcid.org 0000-0000-0000-0000

Mini-dissertation accepted in fulfilment of the requirements for the degree *Master of Commerce in Computer Science and Information Systems* at the North West University

Supervisor: Prof O Jokonya

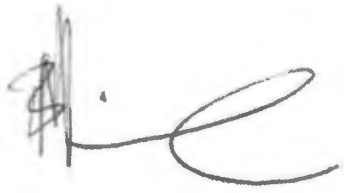
Graduation ceremony July 2018

Student number: 20912137

Declaration

I, **Phenyo Bagnold Modisane**, hereby declare herewith that the thesis entitled **Evaluating the Benefits of Cloud Computing in Small, Medium and Micro-sized Enterprises (SMMEs) within the North West Province in South Africa,** which I hereby submit to the North-West University, Mafikeng Campus, in compliance with the requirements set for the **Masters in Computer Science and Information Systems** degree, is my own work, has been language edited and has not already been submitted to any other university.

I understand and accept that the copies that are submitted for examination are the property of the University.

Signature of student:  University number: 20912137

Acknowledgments

First of all, I would like to acknowledge myself, for the hard work and dedication I have put in pursuing this degree, and furthermore take this opportunity to acknowledge those Small, Medium and Micro-sized Enterprises (SMMEs) that took part in this study.

Secondly, I would like to thank my family for the support given during the duration of this degree. Lastly, I would like to thank my supervisor Dr Osden Jokonya for the role he has played and the time spent reviewing my work.

Abstract

Cloud computing is becoming an essential tool in lowering Information Technology (IT) costs amongst Small, Medium and Micro-sized Enterprises (SMMEs). As such, amongst a myriad of challenges, SMMEs are faced with a general lack of resource capabilities, including the lack of Information and Communications Technology (ICT) infrastructure and skills. This further disadvantages the SMMEs' ability to compete with big business and industry peers. As such, cloud computing offers SMMEs the ability to access high level ICT services either through SaaS (Software-as-a-Service), PaaS (Platform-as-a-Service) or IaaS (Infrastructure-as-a-Service) service delivery models. Cloud computing adoption amongst SMMEs is relevant in the sense that SMMEs can realise the full benefits of reduced capital expenditure, improved access to ICT systems, heightened security of data and low costs for versatile development amongst a myriad of cloud computing benefits. The overall intention is to ensure that SMMEs always have access to updated ICT services through the cloud, without having the burden of maintaining ICT infrastructure in-house. Based on this interpretation, this study analyses factors affecting cloud computing adoption amongst SMMEs, by use of a Conceptual Research Model based on the Technology-Organization-Environment (TOE) framework. This is informed by a survey distributed to SMMEs within the Ngaka Modiri Molema and Bojanala Platinum Districts of the North West Province.

Chapter 1 of this study summarises the research and puts forward the problem statement, outlining in addition the research objectives and questions that underpin the study. Chapter 2 is the literature review section of the study, where we outline the full context of cloud computing in relation to SMMEs. This is followed by outlining the theoretical models and frameworks that inform the study where the Conceptual Research Model based on the Technology-Organization-Environmental (TOE) framework is presented, followed by a presentation of the research hypothesis. Chapter 3 outlines the research methodology, where the study takes a positivist epistemological approach through deductive means. Chapter 4 is the data analysis section computed statistically using SPSS 24 and lastly Chapter 5 constitutes the discussion and conclusion of the findings. As such, this study found that that the technological and environmental factors were significant, and affected cloud computing adoption positively. In addition, organizational factors were not significant and affected cloud computing adoption negatively.

Table of Contents

List of figures

List of tables

Abbreviations

AWS	Amazon Web Services
CSCC	Clouds Standards Customer Council
CRM	Customer Relationship Management
DOI	Diffusion of Innovations theory
EC2	Elastic Compute Cloud
ERP	Enterprise Resource Planner
GDP	Gross Domestic Product
HSREC	Human Sciences Research Ethics Committee
ICT	Information and Communications Technology
IS	Information System
IT	Information Technology
IaaS	Infrastructure as a Service
IoT	Internet of Things
NIST	National Institute of Standards and Technology
NWDC	North West Development Corporation
NWU-IRERC	North-West University Institutional Research Ethics Regulatory Committee
PaaS	Platform as a Service
POPI	Protection of Personal Information act
R&D	Research and Development
SLA	Service Level Agreement
SMME	Small, Medium and Micro-sized Enterprise
SaaS	Software as a Service
TOE	Technological-Organisational-Environmental framework
TAM	Technology Acceptance Model

Chapter 1

1.1 Statement of research problem

Businesses, particularly Small, Medium and Micro-sized Enterprises (SMMEs) are still utilising traditional forms of Information and Communications Technologies (ICT). These SMMEs acting particularly as key economic empowerment vehicles all have similar characteristics in that they are generally small, specialise in one field of work and lack resource availability (SEDA, 2016). However, a business, no matter how big or small, is forced to align itself with current conditions, where its clients/consumers are becoming technologically savvy. Small, Medium and Micro-sized Enterprises (SMMEs) in particular should explore and build their organisations around cloud computing services to realise greater efficacy and effectiveness within their business functions and processes (Kumalo & van der Poll, 2015). Cloud adoption as a result is the affordable choice, as it offers greater flexibility, accessibility, data security and disaster recovery benefits to SMMEs. In addition, it also gives SMMEs a competitive advantage whilst saving money, giving entrepreneurs more time to focus their energy on core business processes and objectives (Mohlameane & Ruxwana, 2014).

This study seeks to investigate factors affecting cloud computing adoption amongst SMMEs in the Ngaka Modiri Molema and Bojanala Platinum Districts of the North West Province. As such the underlying question for this transition amongst SMMEs remains as to why they should move in the direction of adopting cloud computing practices within their organizations.

Emphasis is thus directed towards Small, Medium and Micro-sized Enterprises (SMMEs) operating within the two (2) districts of the North West Province, a generally rural province in the Republic of South Africa, whose industrial overview spans five industries, namely mining, agriculture, tourism, manufacturing and service related industries (FEED, 2015).

Based on a holistic perspective, organizations still employ traditional Information Technology department outfits within their organizations. This traditional element is characterised by physical Information Technology components like networking infrastructure, servers, storage, and databases which encompass high maintenance and staffing costs (CSCC, 2014). As such in this section of the study, retrospection will be made into understanding the emergence and underlying structure of cloud computing. This includes analysing Small Medium and Micro Enterprises within the context of the North West Province and how they deal with the

Information Communication Technology (ICT) functions within their organizations. This is followed by determining factors that promote or hinder cloud computing adoption within SMMEs in the North West Province and lastly, through the Conceptual Research Model based on the Technological-Organizational-Environmental Framework (TOE), to recommend a framework to guide cloud computing adoption amongst SMMEs in the Ngaka Modiri Molema and Bojanala Platinum Districts of the North West Province within the Republic of South Africa.

This chapter commences with the problem statement, thereafter it is followed by outlining the main objectives for the research. In addition to this, the theoretical framework that underpins the research will be drawn, and finally the delineation parameters of the study will be outlined. Lastly, we will outline the significance and expected outcomes of the study.

1.2 Problem statement

The digital age has brought many advances to the society we live in today. This is characterized by a world of social media networks, e-commerce portals, blogs, online music and videos that can be accessed through personal computers, laptops, tablets, smart phones, watches and even glasses. The digital age as a result has become intrinsically linked to the broad growth and development of the human race where knowledge creation, distribution and absorption is vital towards the continued sustenance of the knowledge economy.

As such in this era, ICT is being driven by the need for improved technologies including hardware and software, broadband access, and energy efficiency and effectiveness. Cloud computing as result emerged from these improvements where traditionally Information Technology (IT) departments would host, process and store data on-site. As such cloud computing offered all those services on the cloud through cloud computing service providers (Bieber et al., 2015). These service providers define themselves within the SPI (Software, Platform, Infrastructure) model as outlined below in Figure 1.

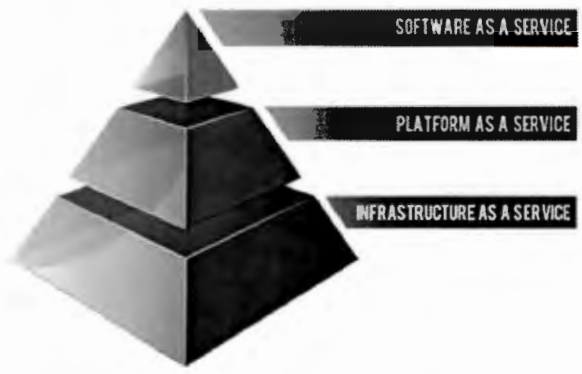


Figure 1 - SPI Model (SaaS, PaaS, IaaS) (Murhula, 2015)

The first model is Software-as-a-Service (SaaS), and is for consumption where end users can interact with emails, blogs, e-commerce, database administration, Enterprise Resource Planners (ERP) and Customer Relationship Management (CRM) software etc. As a result, SaaS only requires internet access to operate, is flexible and is low-cost. The second model is Platform-as-a-Service (PaaS) and is for building: this is where application developers use the platforms for application development. PaaS is beneficial in the sense that this service provides all the facilities a traditional application developer would need online at lower costs, such as Google App Engine. The third model is Infrastructure-as-a-Service (IaaS) which is for migration and is used by network architects. Here IaaS is beneficial to those who want to rent out equipment that would be available in a traditional Information Technology department. IaaS users would opt for providers like Amazon Elastic Computer Cloud (EC2) or HP BladeSystem Matrix (Bieber et al., 2015).

Small, Medium and Micro-sized Enterprises (SMMEs), as the focus of this study within the South African context, refers to businesses that employ less than 200 people, employ approximately 60% of the work force and contribute approximately 34% of the Gross Domestic Product (GDP). SMMEs as a result play an integral role in the South African economy as drivers of both growth and job creation (SEDA, 2016).

Adoption of cloud computing is at a disadvantage amongst SMMEs as opposed to bigger organisations, primarily because of ICT illiteracy amongst SMME owners. In addition to this, by not realising the full benefits of cloud computing, SMMEs invest unnecessarily in ICT infrastructure that does not assist the organisation to manage its processes in a fruitful manner. This inadvertently impacts on the organisation's ability to compete at a strategic level with industry peers. Other disadvantages include threats to data security, privacy, availability of service, standardization, cost uncertainties, loss of both technical and organizational control,

Service Level Agreement (SLA) negotiations, etc. However despite these drawbacks that could exist in the minds of SMME owners, the benefits for cloud computing adoption far outweigh the pitfalls. As such, attributable benefits are generally centred on Information Technology (IT) cost-saving mechanisms to the benefit of SMMEs. This results in greater efficiency and effectiveness in the SMMEs operational processes, which ultimately increases productivity (Senarathna, 2016).

Cloud computing adoption is defined by cost reductions in the Information System (IS). Through this mechanism, SMMEs pay for the services they use, and are able to justify the flow of capital and operational expenditure. Through scalability, SMMEs can tailor-make their IT needs at different points of the SMME's life-cycle, and respond to IT needs that are required for specific projects. Accessibility and flexibility allow SMMEs the ability to utilise their information needs anywhere through simple end-user programs. Innovation is another critical cost-saving mechanism to SMMEs, as it ensures that service providers are the ones taking up the costs for Research and Development (R&D) which results in an overall access to improved resources (Chovancová et al., 2015).

1.3 Research objectives

The primary objective of this study to evaluate the benefits of cloud computing in Small, Medium and Micro-sized Enterprises (SMMEs) within the Ngaka Modiri Molema and Bojanala Platinum Districts of the North West Province. To achieve this objective, the following sub-objectives have been identified, namely:

- To understand the effect of the technological context on cloud computing adoption amongst SMMEs.
- To understand the effect of the organizational context on cloud computing adoption amongst SMMEs.
- To understand the effect of the environmental context on cloud computing adoption amongst SMMEs.
- To develop a conceptual framework that will guide SMME owners on how to adopt cloud computing within their organizations

1.4 Research questions

This study seeks to answer the following main research question:

- What are the main factors influencing the adoption of cloud computing services amongst SMMEs in districts of the North West Province?

In order to answer the research question above, the following objectives have been set to aid the researcher as follows:

- What is the effect of the technological context on cloud computing adoption amongst SMMEs?
- What is the effect of the organizational context on cloud computing adoption amongst SMMEs?
- What is the effect of the environmental context on cloud computing adoption amongst SMMEs?

1.5 Theoretical Framework

In order to guide the process of analysing how SMMEs could adopt cloud computing services, various theories exist that have guided business adoption of cloud computing services which speak of technology adoption, sustenance and maintenance have been examined.

These theories include firstly, the DeLone and McLean IS success model, where the dependent constructs entail an analysis of net benefits and user satisfaction, whilst the independent constructs entail an analysis of system, information and service quality. Secondly, the Technological-Organizational-Environmental (TOE) framework, where the dependent construct entails an analysis of the likelihood, intention and extent of technological adoption, whilst the independent constructs entail an analysis of the technological, organizational and environmental contexts (Larsen et al., 2015).

Thirdly, the Technology Acceptance Model (TAM), where the dependent constructs entail an analysis of behavioural attitudes regarding system usage and intention to use, whilst the independent constructs entail an analysis of perceived usefulness and ease of use. Lastly, the Diffusion of Innovations (DOI) theory, where the dependent construct entails an analysis of implementation success, whilst the independent constructs entail an analysis of technological compatibility and complexity as well as relative advantage (Larsen et al., 2015). These frameworks are dealt with in detail Section 2.7 (Theoretical models and frameworks) of the study.

The TOE framework developed by DePietro et al. (1990) suggests that ICT adoption within organisations is predisposed by technological, organizational and environmental contexts. The technological context refers to the analysis of technological innovations both internal and external to the organisation. The organizational context refers to the analysis of organisational

attributes whilst the environmental context refers to the analysis of the micro and macro environmental state of the industry as a whole. In summary the TOE framework guides organizations in the way the organization sees the need to adopt technologies such as cloud computing services (Gide & Sandu, 2015).

This study makes use of the Conceptual Research Model based on the Technology-Organization-Environment (TOE) framework, and its details are outlined below:

- Technological context

Technological considerations relate to relative advantage (DOI factor), where the benefits of adoption are analysed. Complexity (DOI factor) where the adoption of cloud services could be long and complicated. Compatibility (DOI factor) refers to how these cloud computing services should merge well with existing business processes. In addition to these, two attributes, being security concerns and cost savings, have been added to form part of the technological context. (Ray, 2016).

- Organizational context

Organisational considerations relate to top management support (TOE factor), where top management should have a buy-in to the new technology whilst providing resources for a successful migration. Firm size (TOE factor) also needs to be considered during the adoption process including technological readiness (TOE and TAM factor), which speaks to ICT literacy and how the human resources will be able to manoeuvre the new technologies employed by the organisation (Gide & Sandu, 2015). User satisfaction (DeLone and McLean factor), where we analyse how the users rate system, information and service quality, and lastly communication processes and channels (DeLone and McLean factor) an attribute that analyses information quality and how the organisation is able to communicate with its stakeholders is observed are considered.

- Environmental context

Environmental considerations relate to the macro-perspective of competitive pressure (TOE factor), being how we analyse the overall pressure the organisation feels/takes amongst its competitors in the industry. Trading partner pressure (TOE factor) where we analyse the pressure inflicted towards organisations by trading partners (clients and suppliers, etc.) to streamline their technological efforts, Government regulations (TOE factor) where we analyse the regulatory frameworks initiated by government that encourage or discourage

cloud computing adoption are considered. The micro-perspective relates to technology support infrastructure (TOE factor), we analyse the high wage levels of skilled personnel and the inherent effect on adoption, and the availability of cloud consultants, suppliers and other factors that affect the adoption of cloud computing services in SMMEs in the Ngaka Modiri Molema and Bojanala Platinum Districts of the North West Province (Ray, 2016).

1.6 Delineation of the research

This study will only analyse Small, Medium and Micro-sized Enterprises (SMMEs) in the North West Province with the following characteristics:

- Small, Medium and Micro-sized Enterprises operating within the boundaries of the Ngaka Modiri Molema and Bojanala Platinum Districts of the North West Province employing less than 200 people.
- Turnover less than R50 million.

1.7 Significance of the research

South African Small, Medium and Micro-sized Enterprises (SMMEs) generally face a challenge of difficulties during their life-cycles. These difficulties range from access to finance, skills shortages, deficiencies in innovation and creativity, and red tape, and within this context lack of relevant Information and Communication Technology (ICT) infrastructure (SEDA, 2016). As such, based on this understanding, cloud computing adoption amongst SMMEs has the propensity to bring forth a series of advantages where enterprises will generally see reduced costs within their operations. This is with special reference to their Information Technology (IT) departments allowing these enterprises to function effectively, efficiently and more productively.

The significance of this study is based on making a contribution to the field of cloud computing, with special reference to SMMEs. Studies in this aspect have been conducted but from other regions of the world (Senarathina, 2016; Pallivathukal, 2016). As such, this study is set on analysing the cloud context from the North West Province perspective.

By using the Technological-Organizational-Environmental Framework, as the guiding framework for cloud computing adoption, the view is that the process will allow organisations the ability to assess the various advantages and disadvantages associated with cloud computing adoption. This should also assist SMMEs to realise the critical factors that affect cloud computing adoption within their SMMEs. This study has the ability to assist enterprises within the North West Province, with strategic planning initiatives particularly those

concerned with introducing cloud computing initiatives as a tool to enhance competitive advantage. Lastly, this study aims to assist the South African Government with policy formulation with special reference to cloud computing adoption policies amongst Small, Medium and Micro-sized Enterprises (SMMEs).

1.8 Expected outcomes, results and contributions of the research

The expected outcomes of this study are aimed at assisting SMMEs within the North West Province to make informed decisions when engaged in the process of adopting cloud computing practices. Based on this expectation, the results of this study are aimed at laying the ground for further research as far as cloud computing adoption is concerned amongst SMMEs in developing countries like the Republic of South Africa. As such this study makes a contribution, where knowledge is added into understanding the factors that affect cloud computing adoption amongst SMMEs.

It is therefore expected that once SMME entrepreneurs have a full understanding of cloud computing services, more and more SMMEs will choose service providers that provide Software as a Service (SaaS), Platform as a Service (PaaS) or Infrastructure as a Service (IaaS) solutions to guide the process of taking informed decisions based on data that is sourced efficiently, effectively and productively.

1.9 Thesis structure

This study comprises of five (5) chapters as outlined below:

- Chapter 1 – In this chapter an introduction to this study is outlined that delves into the background, covers the research objectives and subsequent questions. In addition to this, a summary of the literature review is presented, delineations and research significance outlined, and lastly expected outcomes are presented.
- Chapter 2 – In this chapter, a detailed account of the literature review is outlined. This process starts by outlining what cloud computing is, comprising cloud computing components (delivery models and deployment models) and cloud computing benefits and subsequent drawbacks. In addition we define South Africa's Small, Medium and Micro-sized Enterprises (SMMEs), evaluating the North West Province context and the challenges faced by SMMEs. This chapter also looks at cloud computing adoption models amongst SMMEs and looks into previous studies on cloud computing. This is followed by establishing a theoretical foundation of the study, where the deliverable is

a Conceptual Research Model based on the Technology-Organization-Environment (TOE) framework. Lastly, the various hypotheses that inform this study are presented.

- Chapter 3 – In this chapter, the research methodology is outlined in detail. This entails outlining the research philosophy that underpins the study, the research approach that guides the research and the research strategy and methods. The research population, sample, data collection and analysis, and ethical considerations are outlined.
- Chapter 4 – In this chapter the findings obtained from the distributed survey are presented statistically. This statistical analysis is captured through various frequency distribution analysis and bivariate correlation analysis. Lastly, regression analysis is performed to test the significance of the hypotheses on the likelihood of cloud computing adoption by SMMEs.
- Chapter 5 – In this chapter a discussion on the findings and conclusion is presented. In addition to these, theoretical considerations, limitations and future areas for research and recommendations are presented.

Chapter 2 - Literature Review

Cloud computing is generally an important innovation from a technological perspective. Its importance allows Small, Medium and Micro-sized Enterprises (SMMEs) the ability to compete on a larger scale with large enterprises that have sophisticated Information Technology (IT) resources at their disposal. With various attributable benefits, SMMEs backed with high-level IT infrastructure have the ability to focus their energies and operational budget on core business objectives. This ability allows SMMEs to competitively compete amongst industry peers (Senarathna, 2016).

In this chapter of the study, we will go into detail about cloud computing adoption, and its relation to Small, Medium and Micro-sized Enterprises (SMMEs) operating within the Ngaka Modiri Molema and Bojanala Districts of the North West Province. This process starts by analysing in detail what cloud computing is, which entails outlining the service/delivery models and deployment models and in addition, outlining the advantages and disadvantages associated with cloud computing adoption.

This chapter looks into, and defines Small, Medium and Micro-sized Enterprises (SMMEs) within the South African context. In addition it assesses the challenges faced by SMMEs, followed by analysing cloud computing adoption models amongst SMMEs, and looks into previous studies done on cloud computing adoption amongst SMMEs in South Africa.

Lastly, this chapter outlines four (4) Information Systems theories, and from that develops a theoretical model that underpins this research, which is the Conceptual Research Model based on the Technology-Organization-Environment (TOE) framework.

2.1 What is cloud computing

Cloud computing is by no means a new concept in the field of information systems. Instead, it is an evolutionary concept whose roots come from grid computing, which sought to solve intricate problems with parallel computing. This was followed by utility computing in the 1960s which offered computing solutions as a metered service, and finally Software-as-a-Service (SaaS) during the early 2000s, where end-users could subscribe to web services (Gustafson & Orrgren, 2012).

Cloud computing is best defined by the National Institute of Standards and Technology (NIST) as, "*A model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g. networks, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or cloud*

provider interaction. This cloud model is composed of five essential characteristics, three service models, and four deployment models" (Alshamaileh, 2013).

Through this definition six (6) key factors stand out that characterise the concept of cloud computing, where cloud computing is an on-demand self-service, portrays an aspect of multi-tenancy and resource pooling, promotes rapid elasticity and ubiquitous access, is a measurable/payable service and encourages resiliency. These six (6) key factors are extrapolated further below:

On-demand self-service: Here the premise is that because cloud computing is an Information Technology service offered over the internet, its users should be able to configure cloud services in order for them to meet their needs, leading towards an automated state of the cloud service. As such access of cloud services should be available without interruption when required without directly interacting with humans or cloud service providers (Bassett, 2015).

Ubiquitous access: the premise here is that cloud computing services should be accessible from anywhere in the world, through an internet-enabled device like a smart phone, tablet, laptop, etc. This ubiquity is made real through a series of network and security protocols coupled with an understandable interface (Bassett, 2015).

Multi-tenancy and Resource pooling: the premise here is that cloud computing services in particular do not service the needs of an individual cloud customer. Instead, a single cloud service can service a wide range of cloud customers each isolated from each other. This characteristic enables cloud computing services providers who host a large scale of Information Technology resources the ability to service a wide range of cloud customers (Bassett, 2015).

Rapid elasticity: Because cloud customers have different needs, each representing a unique organisation, with unique situations and circumstances, it would be unwise to provide a standard cloud service, which is the same for all cloud customers, without taking into consideration the uniqueness of the real space cloud customers find themselves in. As such, rapid elasticity allows cloud customers the freedom to modify a cloud service to meet their own objectives. This characteristic of cloud computing often justifies cloud computing adoption and gives cloud customers the illusion that the cloud services modification is limitless (Bassett, 2015).

Measured service: Cloud computing in its essence is set on providing a service, be it Software-as-a-Service (SaaS), Platform-as-a-Service (PaaS) or Infrastructure-as-a-Service

(IaaS) to cloud customers. As such, cloud customers in return for utilising these services are charged/billed on a pay-as-you-use system by cloud service providers. This characteristic of cloud computing is critical, as cloud consumers are able to keep track of, monitor and evaluate the Information Technology resources they utilise on the cloud (Bassett, 2015).

Resiliency: the premise here addresses the issue of a backup situation in case the cloud service fails. In such a situation a similar instance of the cloud service will automatically come into operation, allowing the cloud service to be reliably available without interruption to cloud customers when required (Bassett, 2015).

2.2 Cloud computing services and models

2.2.1 Main cloud computing services

As outlined in the National Institute of Standards and Technology (NIST) definition, cloud computing is composed of three service models which encompass the underlying structure of the cloud. These main service/delivery models comprise Software-as-a-Service (SaaS), Platform-as-a-Service (PaaS) and Infrastructure-as-a-Service (IaaS) and provide an alternative cost effective solution compared to the traditional Information Technology department outfits as outlined in Figure 2.

Figure 2 asserts that in a traditional setting, organizations were burdened with the full cost of operating and maintaining applications, data, runtime, middleware, operating systems, servers, storage, networking and probable virtualization (CSCC, 2014). The new era of globalized information systems brought forth cloud service/delivery models, where certain aspects of the information systems delivery process was outsourced to cloud service providers like Google, Amazon, etc. These three service models are elaborated further below:

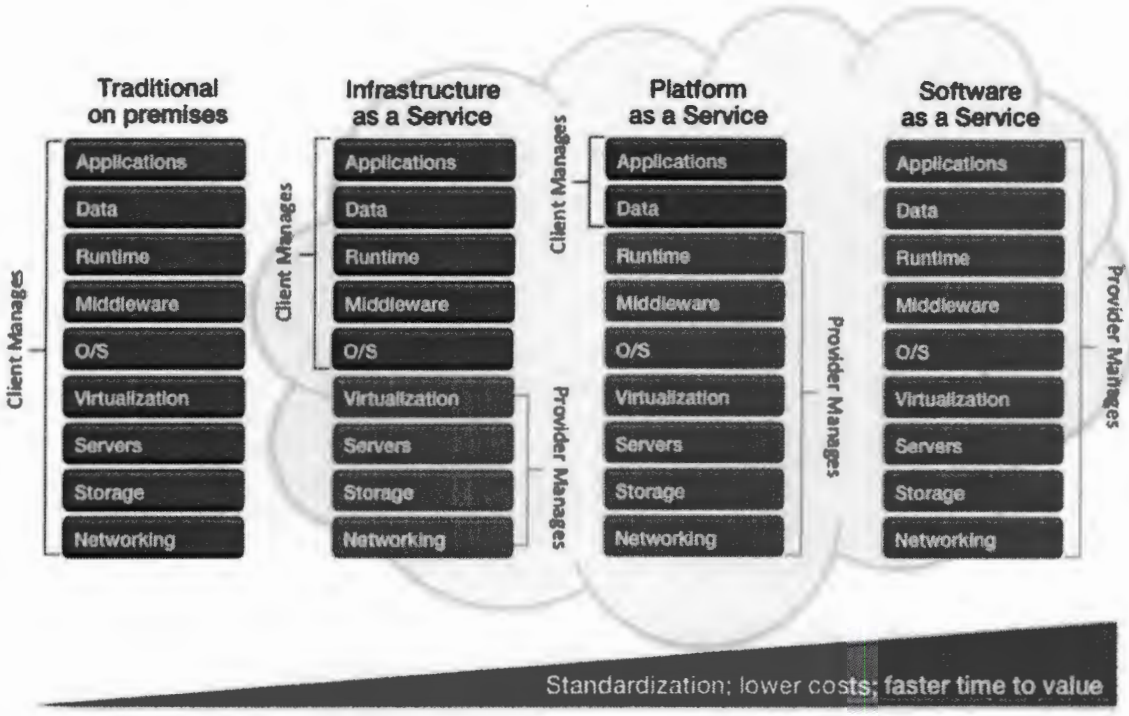


Figure 2 - Traditional IT outfit versus the cloud (CSCC, 2014)

- Software-as-a-Service (SaaS)

Software-as-a-Service (SaaS) is the most basic type of cloud computing service/delivery model available, and is utilised without realisation. SaaS was developed with the needs of end users in mind, and allows end users the ability to interact with web-based applications over the internet without having to install applications on their computers, as outlined in Figure 3.

Figure 2 outlines the types of responsibilities afforded to either the cloud customer or cloud service provider, and in a SaaS setting the responsibility of operating and maintaining applications, data, runtime, middleware, operating systems, servers, storage, networking and probable virtualization all fall onto the cloud service provider similar to a traditional setting. All the cloud customer does to access a particular service is to log into a web service via a web browser (Senarathna, 2016).

Figure 3 - Software-as-a-Service (SaaS) (Zahoor, 2013)

With SaaS, the most common example is an email service provided by cloud service providers. In this sense a cloud service provider, most notably like Google and its Gmail service, allows a wider range of cloud customers the ability to access and utilise the Gmail web service by logging in anywhere anytime, through a web browser using a web-enabled device. In addition to that, cloud service providers are responsible for maintaining the cloud service, whilst ensuring that the service is delivered without interruption to cloud customers. This enables cloud customers to enjoy cost saving and scalability benefits allowing the web service to be easily pliable to meet the needs of cloud customers (Ramothibe, 2012).

Due to this understanding of Software-as-a-Service (SaaS), it becomes clear that common features that define SaaS include aspects of a service distributed over the internet, which makes it easier to reach a wide audience of cloud customers. It is a pay-as-you-use system to support scalability, and overall cost savings where cloud customers do not need to operate and maintain systems, but enjoy the benefit of subscribing to a web service. SaaS service providers carry the burden of research and development costs to ensure competitiveness, whilst the spill-over effect means that cloud customers are getting the best service in the market at any given time (Vaskovich, 2015).

- Platform-as-a-Service (PaaS)

Platform-as-a-Service (PaaS) is a cloud service/delivery model developed with application developers in mind. With PaaS, application developers have the ability to develop, test, deploy, host and maintain web applications and software through platforms over the internet without installing base software on their computers. As a result, due to the high costs associated with buying developmental software, PaaS provides a cheaper alternative as the

disadvantages of directly owing such software is passed on to cloud service providers. In addition, cloud customers have the ability to enjoy benefits of elasticity, efficiency and workload management (McGilvary, 2014).

Figure 2 outlines this relationship in a PaaS setting where the cloud service provider manages runtime, middleware, operating systems, virtualization, servers, storage and network. The cloud customer, on the other hand, manages the applications development and data, ensuring that effective time and energy is spent on developing working systems timeously through tools and processes made available by the cloud service provider (Gorelik, 2013).

Figure 4 - Platform-as-a-Service (PaaS) examples (Cloudcomputingwire, 2012)

With PaaS, an example is the Google App Engine, which allows application developers the ability to create and host web applications using Google infrastructure, through a pay-as-you-use system. This ensures that application developers are able to work anywhere anytime, by just logging into the system through a web-enabled device.

- Infrastructure-as-a-Service (IaaS)

Infrastructure-as-a-Service (IaaS) is a cloud service/delivery model developed with the needs of network architects and organizations that seek to outsource their Information Technology infrastructure in mind. This move is particularly triggered by cloud customers who need to drastically reduce Information Technology expenses whilst remaining highly competitive in their respective industries. In addition to this, IaaS exposes a cloud customer to expensive technologies outside the reach of the cloud customer and a simplified, cost effective management of Information Technology infrastructure which allows cloud customers the ability to rent/utilise a service that best suits the needs of the cloud customer (Trope, 2014).

Figure 2 outlines the relationship IaaS offerings have between cloud customers and cloud service providers. In this instance cloud service providers manage aspects of virtualization, servers, storage networks and operating systems to some extent, whilst cloud customers manage the applications, data, runtime and middleware.

Figure 5 - Infrastructure-as-a-Service (IaaS) examples (Xyfon, 2014)

An IaaS example as outlined in Figure 5 is Amazon Web Services (AWS), an IaaS cloud service provider which offers cloud customers a wide range of IaaS cloud services ranging from virtualization, servers, storage, database management, networking and content delivery, etc. With Amazon Web Service (AWS) products, an organization can become effective and efficient, by crafting its own Information Technology needs whilst remaining highly competitive (Bhattacharjee, 2009).

2.2.2 Cloud computing deployment models

As outlined in the National Institute of Standards and Technology (NIST) definition, cloud computing is also composed of four deployment models which encompass the underlying structure of the cloud. These deployment models as outlined in Figure 6 comprise public, private, community and hybrid clouds. In essence, cloud deployment models typically represent the types of cloud environments cloud customers and organizations can opt for and are distinguishable via ownership, size and access as outlined below:

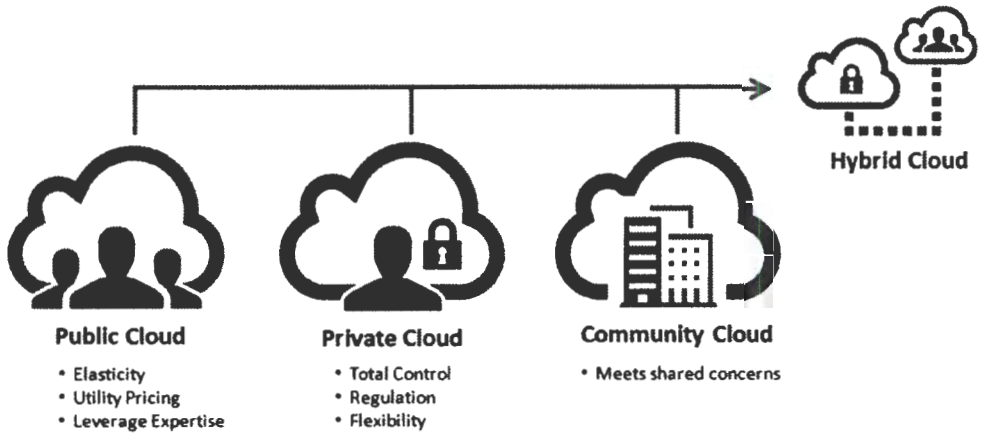


Figure 6 - Cloud deployment models (Ramsaran, 2014)

- Public cloud

A public cloud is a cloud environment that is publicly offered to many cloud customers without restriction by a cloud service provider. In such an environment, the cloud service on offer in a public cloud is often provisioned through a SaaS, PaaS or IaaS setting. Figure 6 clearly outlines this depiction of public clouds, where a public cloud service provider like Google would make its Software-as-a-Service (SaaS) offering like Gmail available to a wide range of cloud customers (Ambrose et al., 2010).

- Private cloud

A private cloud is a cloud environment that can take two scenarios. In the first scenario the private cloud can be deployed exclusively within a single organization; however the private cloud is maintained and controlled by the cloud service provider. In the second scenario the private cloud is deployed exclusively within a single organization, and the private cloud is maintained and controlled by the organization. In both scenarios the private cloud is utilised privately in a controlled environment by a single organization as depicted in Figure 6. From there the private cloud is provisioned through a SaaS, PaaS or IaaS setting (Ambrose et al., 2010).

- Community cloud

A community cloud is a cloud environment where access is limited to organizations and cloud customers that share the same objectives. This type of cloud can be jointly maintained and managed by members of the community, or by a separate cloud service. An example of a community cloud could be a banking community cloud, where access is granted only to banks

and financial institutions as they bounded by the same objectives as depicted in Figure 6 (Ambrose et al., 2010).

- Hybrid cloud

A hybrid cloud is a cloud environment that is a combination of one or more cloud deployment models. This could either be in the form of a combination of a public or private cloud. This cloud environment is often the solution cloud customers and organizations opt for, as they can store sensitive data on a private cloud for security purposes, whilst storing less sensitive data on a public cloud, as depicted in Figure 6 (Ambrose et al., 2010).

2.3 Cloud computing benefits and drawbacks

2.3.1 The need for cloud computing

The need for cloud computing, particularly amongst organizations, is triggered by the need to ensure organizational agility. This agility is reflected in the way an effectively managed information system contributes towards business success, whilst ensuring that it acts as an enabler of business functions. With the cloud, this effort is effectively streamlined and the positive effect it has on the organization is amplified as outlined below:

- Realise economy of scale

Here the view is that, by reducing the Information Technology (IT) infrastructure and relegating IT functions to the cloud, greater productivity can be achieved with fewer resources. This can be translated into improved business processes and user satisfaction coupled with scalability benefits. In addition to this, it remains the cloud service provider's responsibility to maintain up-to-date systems according to industry standards whilst incurring the costs associated with research and development (Tweel, 2012).

- Reduced capital expenditure

By having migrated to the cloud, organizations are subjected to the pay-as-you-use system, where they are billed according to the needs of the organization. This is beneficial in the long term as less capital is directed towards the maintenance of software, hardware and highly skilled IT staff. With this reduced capital expenditure, organizations are able to enjoy the benefits of task and resource automation and support management (Alsanea, 2015).

- Improved access and security of data

Here the view is that cloud customers can work from anywhere in the world, through a web-enabled device. With improved access the twin tasks of continuous availability and reliability are addressed, meaning that the cloud service needs to be made available without interruption to the satisfaction of the cloud customer. This is achieved with a cloud service provider that has intelligent backup systems in place to ensure that the cloud customer is protected from data loss scenarios, etc., whilst ensuring business continuity (Gustafson & Orrgren, 2012).

In a traditional Information Technology department setting, emphasis on security is a factor; however, time and energy is not spent in perfecting the security parameters that define the information system. In the cloud, however, it is the task of cloud service providers to always ensure that their security parameters are stringent and up to standard at all times. Failure of a cloud service provider's ability to invest in areas of security will result in a loss of clients. These efforts are achieved through a process of improving network and application security. In addition, protection against viruses, releasing updated versions of the service provider's systems are some mechanisms used by cloud services providers, which can often be disregarded in traditional information technology departments (Gustafson & Orrgren, 2012).

- Low costs for agile development

Here the view is that organizations that utilise agile systems development methodologies can better streamline their systems development processes at a fraction of the cost. This whilst using the latest tools and processes in the industry provided by the cloud service provider. In addition to this, the roll out of applications and software to the market is improved (Gorelik, 2013).

2.3.2 Cloud computing drawbacks

Despite the clear advantages associated with cloud computing, various drawbacks can be attributed towards its slow adoption amongst cloud customers, the basics among which are awareness issues, where the true value of cloud computing adoption is undervalued, or to an extent, undermined. These drawbacks are outlined below:

- Loss of data and its security

The view is that, by adopting cloud computing within an organisation, that particular organisation delegates the responsibility of storing and maintaining data security to a cloud service provider. As such, organisations might become wary of engaging in such a practice as

their data, a corporate asset, would not be stored in-house and evidently be at risk. This risk factor would either be from hackers, due to a lack of security protocols from a cloud service provider, or through a coordinated attack of corporate sabotage (Bellamy, 2014).

- Cost uncertainties

The view is that, due to the high traditional costs associated with Information Technology infrastructure and supporting resources, possible adopters become wary of cloud computing under the illusion that it too, is another expensive exercise to undertake as an organisation. This perspective could be triggered by the lack of knowledge from organisations, or by cloud services providers where standard pricing level barometers have not been established (Bellamy, 2014).

- Loss of control

Control is a very important factor amongst organisations. This perspective is most evident amongst traditional Information Technology department outfits, where the technical responsibilities of operating and maintaining applications, data, runtime, middleware, operating systems, servers, storage, networking and probable virtualization is an in-house affair. In addition to this, cloud computing adoption could be hampered by human factors such as job losses, fears of moving towards the future, etc. (Bellamy, 2014).

The advantage of being an on-demand self-service technology can become a drawback, in the sense that without an internet connection, organisations would not be able to utilise cloud computing services.

- Legislation

Legislation has the ability to directly become a barrier towards progress and the probable adoption of cloud computing. In the South African context, organizations have to be mindful of legislation governing the field of information systems like the recent Protection of Personal Information (POPI) act which governs the manner in which personal information of South African citizens is handled/managed by South African organisations (Sibanyoni, 2015).

In addition to this Act, various Acts have come into effect particularly when it comes to organisations storing data on the cloud. This includes the Electronic Communications Act of 2005 and the Electronic Communications and Transactions Act of 2002. These two (2) Acts generally protect the interests of organisations and consumers engaged in electronic transactions (Schofeld, 2013).

- Service Level Agreements (SLAs)

Service Level Agreements (SLAs) have the ability to dissuade organisations to adopt cloud computing practices. This could be in instances where organisations feel that they are not getting the best deal, where despite the organisation being pro-adoption, SLAs would fail to meet the needs of the organisation. This could further be translated in instances where SLAs address service availability and not much on performance of the chosen cloud service (Ambrose et al., 2010).

- Data portability

Most cloud service providers make it harder to change cloud services providers should the strategic need arise. This perspective is achieved by the lack of data compatibility and standards uniformity amongst cloud service providers, where in essence cloud customers become locked into a single cloud service provider (Bhattacharjee, 2009).

2.3.3 Cloud computing perspective

This technological era prides itself with innovation through emerging technologies like cloud computing. The discussion is roughly tilted towards the adoption of cloud computing practices precisely amongst Small, Medium and Micro-sized Enterprises (SMMEs).

This view is promoted by the measured service characteristic, where organisations pay for the services they use. In addition to this heightened access to industry relevant software and associated infrastructure, high levels of support are provided by cloud service providers, scalability benefits where organisations are able to modify a cloud service according to the needs of their respective organisations. The ability to work anywhere, through a web-enabled device through simple interfaces is another factor that is pro-adoption. Data management and security is also a factor that is pro-adoption, in the sense that organisations can opt for private clouds to deal with such concerns (Sibanyoni, 2015).

Lastly, the overall reduction of Information Technology costs is a motivating factor for cloud computing adoption. This gives organisations, particularly Small, Medium and Micro-sized Enterprises (SMMEs) the ability to manage costs, and focus their efforts towards core organisational objectives whilst remaining highly competitive in their respective fields.

2.4 Small, Medium and Micro-sized Enterprises (SMMEs)

This study seeks to investigate factors affecting cloud computing adoption among SMMEs in the North West Province within the Republic of South Africa. To gain more perspective on

this, an analysis into what constitutes as a Small Medium Enterprise should be undertaken within the South African context.

According to the Small Enterprise Development Agency (SEDA), SMMEs are the main economic drivers of job creation within the country. This view is made real, as small enterprises have low capital cost requirements and employ a lot of people as a result of labour-intensive production processes. In addition to this, their nature of being small gives them the benefits of organisational agility, as they are easily able to adapt to changing market conditions (Seda, 2012).

Small, Medium and Micro-sized Enterprises (SMMEs) serve critical functions within South Africa as they contribute approximately 57 percent towards the overall Gross Domestic Product (GDP), employing approximately 60 percent of the population (Seda, 2012).

Enterprise size	**Number of employees**	**Annual turnover**	**Gross assets**
Micro	Less than 5	Less than R150 000	Less than R100 000
Small	Less than 50	Between R2m – R25m	Between R2m – R4.5m
Medium	Less than 200	Between R4m – R50m	Between R2m – R18m

Table 1 - Small Medium Enterprise (SME) classifications (SEDA, 2016)

The Department of Trade and Industry within the Republic of South Africa classifies organisational types according to their annual turnover. As such, based on Table 1, it can be seen that organisations classified as Micro are organisations that employ less than 5 people, with an annual turnover of less than R150 000.00. Organizations classified as Small are those that employ less than 50 people with an annual turnover of between R2 million and R25 million. Lastly an organization classified as Medium is one that employs less than 200 people, with an annual turnover of between R4 million and R50 million (Seda, 2016).

2.4.1 Challenges faced by Small, Medium and Micro-sized Enterprises (SMMEs)

Despite Small, Medium and Micro-sized Enterprises (SMMEs) being key economic drivers within the South African economy, they remain inundated with a range of challenges that hamper their survival. These include:

- Access to finance and credit

Access to funding is a problem faced by most SMMEs, as most lenders are not in a position to lend credit to a start-up in its first year of operation, but rather in its latter stages of development. This means from a technological point of view, SMME owners are not likely to spend money on Information Technology systems, but rather to invest capital into core organisational processes (Muyengwa et al., 2013).

- Poor infrastructure

Poor infrastructure is another challenge faced by SMMEs. This can either be translated into the lack of Information, Communication and Technology (ICT) infrastructure, logistics, utilities or operating space (Nkwinika & Munzhedzi, 2016).

- Low levels of Research and Development (R&D)

Continued emphasis on Research and Development (R&D) within organisations, particularly within SMMEs, is a critical function that instils a great sense of competitive advantage. This means that SMMEs would continuously have access to innovative solutions that meet industry standards and requirements. However SMMEs are generally characterised as having low levels of R&D which makes them uncompetitive (Seda, 2016).

- Lack of Information Technology (IT) skills

Here the view is that the workforce within the SMME has the ability to stagnate its progress. This can be either through the SMME owner who is inadequately educated or who lacks the basic appreciation of organised systems that guarantee efficiency and effectiveness. In addition SMME owners as decision makers within their organisations have the sole discretion to adopt or reject various innovations that could improve their competitive advantage in the long run (Korongo et al., 2013).

The lack of know-how amongst employees can have detrimental effects on an SMME. This can be translated into employees who lack Information Technology skills, who will eventually be unable to realise that proper information system processes can act as enablers of business functions.

2.5 Cloud computing adoption models amongst SMMEs

As outlined in this chapter, cloud computing is faced with certain disadvantages that could discourage Small, Medium and Micro-sized Enterprise (SMME) owners from connecting

their organisations with the technology. However despite the presence of these disadvantages, the benefits of adopting cloud computing practices particularly within a Small, Medium and Micro-sized Enterprise (SMME) are far greater.

At the forefront of organisational benefits attributable is an influx of innovation within the SMME. The cloud offers Small, Medium and Micro-sized Enterprises (SMMEs) (who generally face the business world at a disadvantage) with industry standard tools and processes allowing SMMEs to compete effectively with competitors in their industry. In addition to this, SMMEs have the ability to compete with big business from an Information Technology infrastructure premise. This competitiveness is geared at a fraction of the cost, due to pay-as-you-use principles associated with cloud computing (Powelson, 2009).

Big proponents for adoption amongst SMMEs could be triggered by scalability (which makes the cloud computing strategy able to be aligned with the corporate strategy without lengthy bureaucracy), cost flexibility (which allows SMMEs the latitude to dedicate their precious capital reserves to core processes and objectives), market adaptability (which ensures that SMMEs are able to adapt to ever-changing market conditions through updatable customer tailored products), and small Information Technology (IT) departments coupled with no costs for continued Research & Development (R&D) in an organisation's Information Technology (IT) infrastructure (Bassett, 2015).

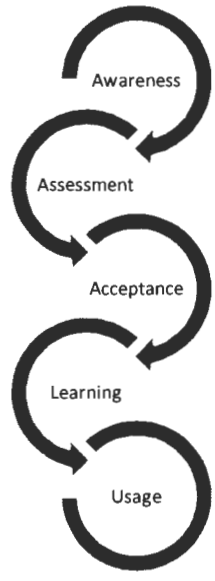


Figure 7 - Five step process towards adoption (Gustafson & Orrgren, 2012)

As such, should a Small, Medium and Micro-sized Enterprise (SMME) yearn for cloud computing practices within it, it should embark on a five-step process as outlined in Figure 7 of awareness, assessment, acceptance, learning and usage (Gustafson & Orrgren, 2012).

By awareness we imply that SMMEs should learn all that they can about cloud computing, cloud service and deployment models, coupled with the benefits attributable to the SMME (Gustafson & Orrgren, 2012). At this stage the SMME is probably spending more on Information Technology (IT) than it should on uncoordinated IT processes and functions, or probably has not aligned its corporate strategy to its Information Technology (IT) strategy. In this awareness stage, interest in cloud computing is developing amongst top management (Trivedi, 2013).

This is followed by an assessment. Here we imply that the SMME should enter a period of retrospection, in order to evaluate how useful and usable cloud computing practices will be for the SMME (Gustafson & Orrgren, 2012). At this stage, the SMME through its assessments is trying to bridge the theoretical gaps between hardware and software standardization, rethinking its IT governance and corporate strategy, searching for cloud service providers that complement the needs of the SMME, etc. (Trivedi, 2013).

This is followed by acceptance where the overall decision is made to adopt or reject the technology under assessment.

By learning, we imply that SMME should be in a position to best utilise cloud computing practices in an effective and efficient manner by acquiring the requisite skill sets to achieve that task (Gustafson & Orrgren, 2012). At this stage, the SMME has already evaluated Service Level Agreements (SLAs) to ensure that the needs of the organisation are met, engaged in change management processes in preparing workers and the organisation in adopting cloud computing, vendor retraining, process analysis as well as requisite improvement initiatives (Trivedi, 2013).

Lastly, usage implies that once the SMME has undergone the four preparatory steps towards adoption, a roll out of the new technology is adopted within the SMME. This ensures that it is utilised in manner that complements the corporate strategy, infuses with the organisational culture so that value can be realised within the Small, Medium or Micro-sized Enterprise (SMME) (Gustafson & Orrgren, 2012). At this stage, the SMME is championing cloud computing. In order to navigate this wave, the SMME should continuously engage in change

management practices, to ensure that cloud services are being utilised optimally within the organisation (Trivedi, 2013).

2.6 Related cloud computing studies

Scholars have made significant contributions towards the study of cloud computing within the broader South African society. These studies investigate how cloud computing could play a role amongst organisations in the public and private sectors. Overall, the studies show that organisations can benefit from cloud computing technologies, as they can directly be linked to cost savings as the cost for Information Technology (IT) infrastructure is significantly decreased. In addition to that, productivity enhancements have been recorded as organisations utilise cloud computing resources optimally with a strong emphasis on the mobility factor, coupled with a strong IT support function provided by cloud service providers. And lastly innovation within the organisation is improved. This innovation is intensified by cloud service providers who spend a lot of money engaged in Research and Development (R&D) to provide cloud customers with the latest tools, to make organisations highly competitive amongst industry peers (Schofeld, 2013).

In addition to the benefits of cloud computing, drawbacks affecting cloud computing adoption amongst organisations have been recorded too. This includes limited integration and lock-in problems, where cloud service providers make it difficult for organisations to migrate data across various platforms. Connectivity is also a mitigating factor for adoption, as connectivity lies at the heart of cloud computing. This means that when organisations suffer connection blackouts, all work comes to a halt as organisational data is stored on the cloud. The aspect of mobility can work against adoption amongst organisations in instances where theft and a complete disregard of best computer security practices by employees is undermined. Thus depending on the level of sensitive data being handled by organisations, organisations can be dissuaded from adopting cloud computing practices. Lastly, legislation can act as a prohibiting factor (Schofeld, 2013).

With regards to Small, Medium and Micro-sized Enterprises (SMMEs), general studies have found that cloud computing provides various solutions to the problems faced by SMMEs. These include instances where organisations enter into unprofitable software licencing agreements with software providers. Labour relations processes and a lack of skills can be solved by organisations signing Service Level Agreements (SLAs) with organisations like Lexus Nexis who provide legal and professional services on a pay-as-you-use setting. On more complex matters, organisations can utilise more professional services, to automate their

supply chain processes by utilising cloud services like an Electronic Data Interchange (EDI) solution and stock management systems (Kumalo & van der Poll, 2015).

In terms of frameworks that were used to guide these studies, various Information Systems (IS) Theories stand out which include the Technology-Organisation-Environment (TOE) framework which evaluates technology adoption based on three (3) factors, these being technological, organisational and environmental considerations. The Diffusion of Innovation (DOI) Theory evaluates adoption based on three (3) factors, these being the technologies' compatibility, complexity and perceived need. Institutional Theory evaluates the social structure within organisations with regards to technology adoption. The Technology Acceptance Model (TAM) evaluates technology adoption based on two (2) factors, being perceived usefulness and ease of use. Lastly the DeLone and Mclean IS success model evaluates technology adoption based on three (3) factors being system, information and service quality (Larsen et al., 2015).

This study takes on a different tone, as compared to previous studies conducted in the field of cloud computing. Here the objective is to analyse/investigate the implications of cloud computing adoption from a technological, organizational and environmental context. This study narrows down the scope of study towards the North West Province, which is a generally rural province within the Republic of South Africa (FEED, 2015). Within that scope, emphasis is upon the Small, Medium and Micro-sized Enterprises (SMMEs) which exist within the Ngaka Modiri Molema and Bojanala Platinum Districts of the North West Province and how they can utilise cloud computing services to derive benefits, which have been outlined in this study.

In terms of the framework used in this study, the underlying framework is the Technology-Organisation-Environment (TOE) framework that borrows some attributes which include relative advantage, complexity and compatibility from the Diffusion of Innovations (DOI) Theory, and user satisfaction from the DeLone and McLean IS Success Model, amongst others. The view here is to assist the study to get a more formulated analysis as we investigate factors affecting cloud computing adoption amongst Small, Medium and Micro-sized Enterprises (SMMEs) within the Ngaka Modiri Molema and Bojanala Platinum Districts of the North West Province.

2.7 Theoretical Models and Frameworks

In this section of the study, we shall outline the four (4) theoretical frameworks that underpin the foundation of this study. These are the Technological-Organizational-Environmental

(TOE) framework, Technology Acceptance Model (TAM), Diffusion of Innovation (DOI) Theory and the DeLone & McLean IS Success Model. Thereafter by taking specific constructs from the four (4) theoretical frameworks, the objective will be to formulate a Conceptual Research Model based on the Technology-Organization-Environment (TOE) framework.

2.7.1 Technological-Organizational-Environmental (TOE) framework

The Technological-Organizational-Environmental (TOE) framework, which was formulated by DePietro, Wiarda and Fleischer in 1990, saw that the process of adopting technological innovations within an organisation involved the process of analysing and taking three factors into account (Alshamaila & Papagiannidis, 2012).

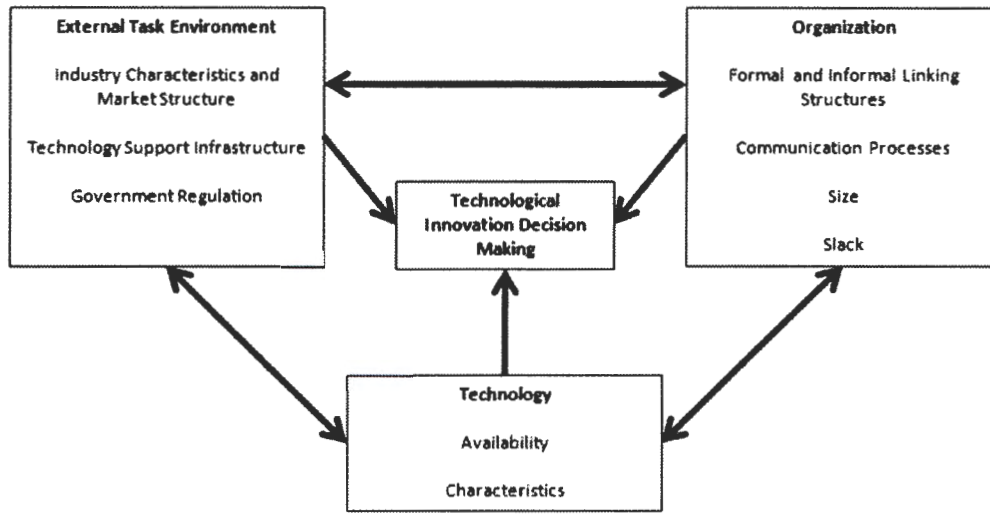


Figure 8 - Technology-Organization-Environment Framework (Larsen et al., 2015)

This meant taking into consideration the technological, organizational and environmental conditions at play that affect the organization as outlined in Figure 8. These three (3) aspects are outlined in detail:

- Technological aspect

The technological aspect as a result means that as organizations endeavour to adopt innovations within their enterprises, they are affected during the decision-making process, by micro and macro technological innovations that exist within the organization's context. These are the technologies that are currently being employed by the organisation and the technologies that are available in the marketplace. As such this factor is critical in the

decision-making process as, after fully analysing the technological context at play, organisations can conduct a technology needs analysis to review how current technologies are assisting the organisation in attaining competitive advantage. Thereafter, organizations would enter the marketplace to find suitable technologies that will complement the organisation in achieving its technological objectives (Senarathna, 2016).

- Organisational aspect

The organisational aspect means that the character of the organisation itself needs to be taken into consideration as organisations endeavour to adopt new innovations. This means that factors such as organisational culture, size, strength of the human resource, communication channels, etc. all need to be taken into consideration as decisions to adopt new technologies are being made. This means that, for example, as decision makers analyse the size factor, they will begin to realise that different conditions apply to Small, Medium and Micro-sized Enterprises (SMMEs) as compared to Large Enterprises in that deficiencies in resources, skills, or experience will be recorded. In addition to this the organisational aspect includes analysing the behaviours of top management as critical decision makers in the enterprise who directly affect the programme of adopting new technologies within the enterprise (Oliveira & Martins, 2011).

- Environmental aspect

The environmental aspect means the factors that affect the organisation externally. These factors could be competitors, government policies and industry bodies that directly hamper the on-going operations of the enterprise. As decision makers within organisations are faced with adoption issues, the leap towards adoption could be triggered by competitive pressure, where competitors are seen by management as highly competitive and efficient due to them having adopted new technologies that enhance business processes and promote efficiency within their organisations. Management could also be triggered by pressures from governments who, through regulations, could make it easier for enterprises to upgrade their technological infrastructure, and professional bodies, who would make technology upgrades compulsory amongst enterprises who wish to associate with them (Zhu et al., 2003).

2.7.2 Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) outlined in Figure 9 was formulated by Davis in 1986. The objectives of this model is to explain the behaviour users have as they interact with Information Technology (IT) systems.

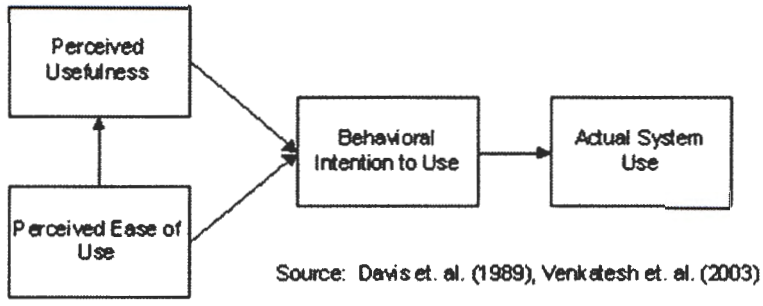


Figure 9 - Technology acceptance model (Larsen et al., 2015)

This model is important, in the sense that it gives decision makers within organisations the ability to understand the reasoning behind why users accept or reject technological innovations. This point is achieved by analysing variables of attitudes and behaviour, the gist of which is perceived usefulness and ease of use (Park, 2009).

2.7.3 Diffusion of Innovations (DOI) Theory

The Diffusion of Innovations (DOI) Theory outlined in Figure 10 was formulated by Rogers in 1962 with the intention to measure the success of technology adoption amongst organisations. The process is achieved by analysing through observation the level through which knowledge about the technology is disseminated throughout the organisation, where ultimately decisions to adopt or reject the technology will be made. Tornatzky and Klein in 1982 posited that after analysing the value of all the variables defined by Rogers, the critical variables of relative advantage, complexity and compatibility were driving forces in the adoption of innovations within organisations (Tweel, 2012).

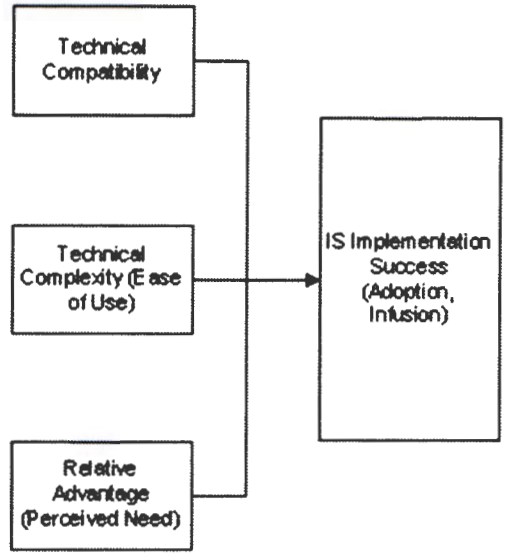


Figure 10 - Diffusion of Innovations (DOI) Theory (Larsen et al., 2017)

As such, relative advantage describes the degree to which the technology to be adopted is seen to be better than its predecessor. This view can be triggered by management's belief that new technologies reduce overall Information Technology (IT) costs, promoting efficiency and effectiveness in the process; they are an upgrade from the current technology in use that is no longer enhancing the organization's competitive advantage. Complexity describes the level at which users perceive the technology as easy or difficult to understand and use. Complexity as such is a critical variable to consider, as the adoption of technologies is dependent on complexity, in that if decision makers feel that the technology is complex and difficult to understand and use, they will most likely be against adopting it throughout the organisation. Lastly, compatibility is viewed as the degree through which the technology to be adopted is seen to be consistent with existing organisational Information Technology (IT) systems, values, experiences and overall needs of the users (Trope, 2014).

2.7.4 DeLone & McLean IS Success Model

The DeLone & McLean IS Success Model outlined in**Error! Reference source not found.** was formulated in 1992 by DeLone & McLean, and deals overall with net benefits accruable to the introduction of new technologies within an organisation. This means, in retrospect, that the process of defining success in the implementation of new technologies all boils down to how users view the technology in terms of how value can be drawn from system and information quality, and the overall impact the technology has within the organisation including the individual impact where user satisfaction can be derived.

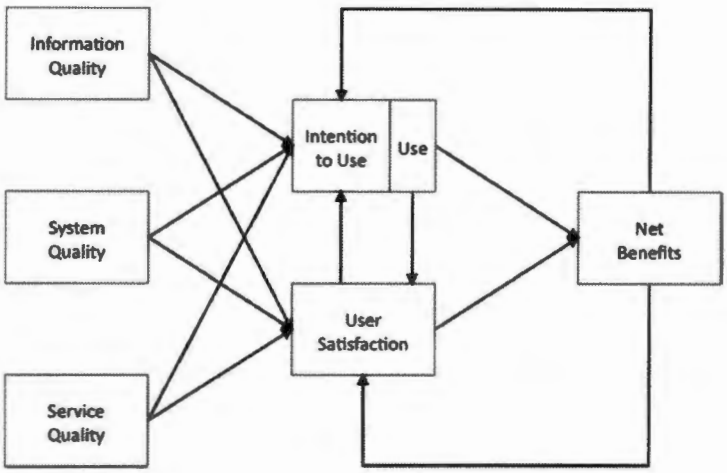


Figure 11 - DeLone & McLean (Larsen et al., 2015)

As such, the DeLone & McLean IS Success Model posits that net benefits can be accruable to an organisation, provided that the users of technology utilise the technology in a method that will promote the operational and strategic objectives of the organisation (Green, 2005).

2.7.5 Theoretical framework

Having outlined the four Information Systems (IS) theories that guide this study, emphasis will be placed on analysing cloud computing adoption amongst SMMEs in the Ngaka Modiri Molema and Bojanala Platinum Districts of the North West Province through the Conceptual Research Model based on the Technological-Organisational-Environmental (TOE) framework.

As outlined in Figure 12, the Conceptual Research Model is based on the Technological-Organisational-Environmental (TOE) framework as the core structure. In essence the TOE framework seeks to analyse the effects of Information Technology (IT) innovations within the organisation. This is achieved by analysing the direct effects, the technological context (analysis of existing technologies versus the impact of adopting new technologies and the overall effect on the organisation), organisational context (analysing the effects organisational culture, size and management support have on adoption) and environmental contexts (analysis of the micro and macro environmental effects have on adoption) have in adopting and implementing technological innovations within the organisation (Larsen et al., 2015).

The TOE framework serves as the foundation of the conceptual model as outlined above. The other three models were inadequate for the purpose of this thesis. As such the foundation of this study's framework is not to measure success of technology adoption through the Diffusion of Innovations. In addition the foundation of this study's framework is not to

explain the behaviour of users as they interact with IT systems. And lastly the foundation of this study's framework is not to assess the net benefits accruable to the introduction of new technologies within an organisation.

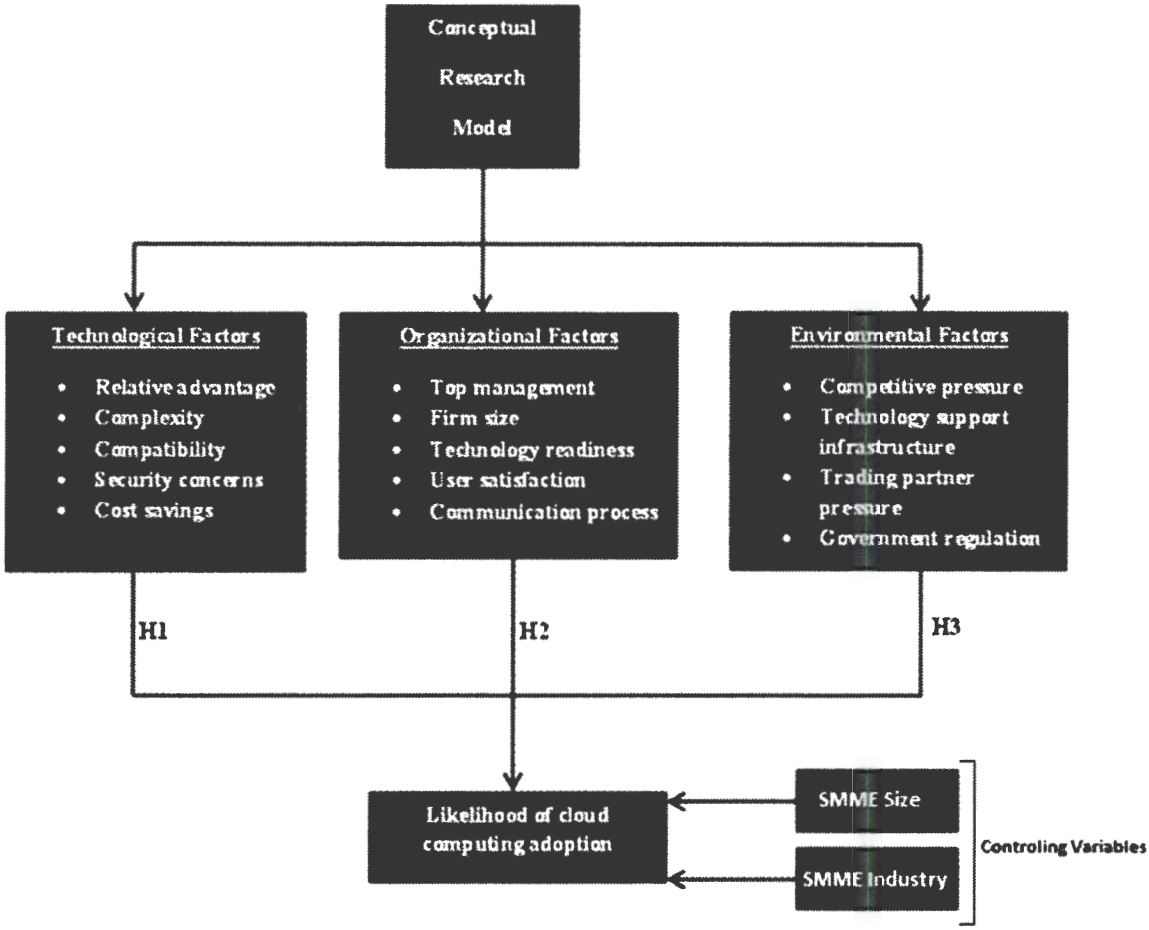


Figure 12 - Conceptual Research Model based on TOE framework

In order to derive a full assessment of the reality space affecting Small, Medium and Micro-sized Enterprises (SMMEs), attributes from related Information Systems theories have been utilised to form the Conceptual Research Model that guides this study. These comprise the DeLone and Mclean IS success model, which seeks to evaluate levels of success through the adoption and implementation of new technologies. These levels are measured in terms of information, system and service quality, in order to see whether or not new technologies are well perceived by users. In addition to this, the Technology Acceptance Model (TAM), which seeks to determine the behavioural patterns regarding system use and intent to use, is also included. This analysis is achieved by examining the thought processes of users, to identify whether or not users believe that the adoption and implementation of new technologies will contribute towards their productivity within the organisation (Larsen et al., 2015).

Lastly, the Diffusion of Innovations theory constitutes the last component in the Conceptual Research Model. This theory seeks to establish whether the adoption or possible rejection of new technologies in an organisation depends on certain factors. As such for the purpose of this study emphasis is on three factors, which include relative advantage, complexity and compatibility (Larsen et al., 2015).

As such, from the perspective of the Conceptual Research Model based on the Technological-Organisational-Environmental (TOE) framework, the first aim is to analyse technological innovations that affect adoption of cloud computing internally and externally from the organisation. Second to that is to analyse organisational attributes that affect cloud computing adoption, and lastly to analyse how environmental factors affect cloud computing adoption from a micro-macro perspective. In addition to this, two (2) controlling variables have been selected, being SMME Size and Industry to give insight into the likelihood to adopt cloud computing practices amongst SMMEs.

2.7.6 Hypothesis development

2.7.6.1 Technological factors

Hypothesis 1 posits that the technological context plays a positive pivotal role in the adoption of cloud computing services amongst SMMEs. As outlined in Figure 12, these are the technological attributes that will be analysed, which include relative advantage, complexity, compatibility, security concerns and cost savings as outlined below:

- Relative advantage

Relative advantage: a Diffusion of Innovations (DOI) theory variable can be understood as the perceived need for the technology. This from a broader sense can be interpreted in the way decision makers within the organisation perceive that the adoption of information systems technologies like cloud computing could result in positive advantages that will be enjoyed by the organisation, as opposed to traditional systems that have been in operation. As such, relative advantage is a very important factor that is critical towards the adoption of cloud computing services. This is done after decision makers weigh the advantages and disadvantages associated with moving to the cloud (Powelson, 2009).

As such, this study hypothesises the following:

H1 (a) – Relative advantage affects cloud computing adoption positively.

- Complexity

Complexity: a Diffusion of Innovations (DOI) theory variable refers to a situation where the technology under review for adoption is perceived as difficult to utilise and understand. In this perspective, the view is that if cloud computing is perceived as a difficult technology to understand by Small, Medium and Micro-sized Enterprises (SMMEs), its adoption is quite unlikely. As such, complexity can be viewed as a critical factor that influences adoption, in the sense that if decision makers in the organisation do not understand the value of cloud computing, and its inherent value towards improving processes and functions as well as promoting competitive advantage, the organisation will reject cloud computing, due to a lack of know-how (Alshamaileh, 2013).

As such, this study hypothesises the following:

H1 (b) – Complexity of cloud computing services affects cloud computing adoption negatively.

- Compatibility

Compatibility: a Diffusion of Innovations (DOI) theory variable is another important attribute that influences adoption faced by decision makers within an organisation. Here decision makers have to analyse on whether or not the proposed technology aligns itself with current organisational values. In this perspective, decision makers need to analyse cloud computing practices, to evaluate whether or not adoption will complement existing organisational processes, functions, practices and values (Powelson, 2009).

Compatibility as such becomes a very important attribute, in the sense that it could hinder adoption should the cloud computing service be wholly incompatible with existing business processes, function and values. In addition, it could be critical in ensuring that the organisation maintains a strong sense of competitive advantage against its competitors, as it leverages new technologies like cloud computing to complement organisational processes, functions, practices and values (Powelson, 2009).

As such this study hypothesises the following:

H1 (c) – Compatibility issues affect cloud computing adoption positively.

- Security concerns

Security concerns in a cloud computing environment is a critical factor that should be considered by adopters and possible adopters, this being the notion that adoption has the propensity to leave the SMME vulnerable to technical and operational threats (privacy risks, information loss, etc.) (Al Isma'ili et al., 2016).

As such, this study hypothesises the following:

H1 (d) – Security concerns affect cloud computing adoption negatively

- Cost savings

Costs underpin any organization's desire to adopt new technologies, this being triggered by the need to reduce the amount spent on the overall Information Technology (IT) Infrastructure. Cloud computing adoption as a result comes with obvious cost saving benefits, such as decreased energy consumption, infrastructure costs, maintenance costs, etc. (Al Isma'ili et al., 2016).

As such, this study hypothesises the following:

H1 (e) – Cost savings affect cloud computing adoption positively

2.7.6.2 Organizational factors

Hypothesis 2 posits that the organisational context plays a positive central role in the adoption of cloud computing services amongst SMMEs. Outlined in Figure 12 are the organizational attributes that will be analysed, which include top management support, firm size, technology readiness, user satisfaction and communication process and channels as outlined below:

- Top management support

Top management support: a Technological-Organisational-Environmental (TOE) variable which is vital for any programme within the organisation to be championed successfully, and as such becomes a critical function that needs to be observed. In this perspective of adopting cloud computing practices within the organisation, top management support becomes critical, precisely due to the nature of Small, Medium and Micro-sized Enterprises (SMMEs) where the owner is the final decision maker (Masset & Sekkat, 2011).

Based on this, top management support becomes a critical attribute towards adoption, as without it, despite being clear contenders for adoption, organisations could miss the

opportunity due to a lack of top management support. This support can inherently be translated into the will to disburse capital for cloud computing services, aligning the overall corporate strategy with the cloud strategy and an overall spirit or rallying cry within top management in support of adopting cloud computing practices (Masset & Sekkat, 2011).

As such this study hypothesises the following:

H2 (a) - Top management has a positive effect on cloud computing adoption

- Firm size

Firm size: a Technological-Organisational-Environmental (TOE) variable which refers to a situation where adoption could be triggered by the size of the organisation. As such in this perspective, cloud computing adoption amongst SMMEs has its benefits. Because infrastructure and resources, combined with Research and Development (R&D), is the responsibility of cloud service providers, a huge burden is relieved from SMMEs, allowing them to make/utilise industry standard Information Technology (IT) services at a fraction of the cost (Alsanea, 2015).

SMMEs are mostly geared towards organisational core competencies, and direct capital towards core processes and functions. And in most cases, the Information Technology (IT) department often gets undermined by decision makers within their organisations. In this sense, SMMEs are able to leverage cloud computing services, to improve competitive advantage (Alsanea, 2015).

As such this study hypothesises the following:

H2 (b) - Firm size has a positive effect on cloud computing adoption

- Technology readiness

Technological readiness: a Technology Acceptance Model (TAM) variable which refers to the ability of the organisation's workforce to understand the new technologies being adopted within the organisation, and furthermore how the workforce is able to leverage such new technologies to meet organisational objectives.

From this perspective, the workforce should be conversant with cloud computing technologies, and how they can be leveraged to improve the organisation's competitive advantage. Technological readiness also refers to the levels of support being given towards adopted technologies. In addition to this, the inherent lack of support supplied to new

technologies like cloud computing within the organisation could be seen in the technologies' impact towards the organisation not being realised (Vaskovich, 2015).

As such this study hypothesises the following:

H2 (c) - Technology readiness has a positive effect on cloud computing adoption

- User satisfaction

User satisfaction: a DeLone and Mclean IS success model variable. In essence the view is that a system (in this case the adoption of cloud computing practices,) is perceived as useful when it adds value towards the organisation's functions and processes. Based on this understanding, users having utilised traditional systems are able to see value in using cloud computing practices. By quantifying user satisfaction, organisations, particularly SMMEs, are able to justify the continued use of the adopted information system (Alshamaileh, 2013).

In addition to this, cloud computing offers users the ability to work from anywhere in the world, at any time, provided that it is through a web-enabled device. This advantage of cloud computing, compared to traditional systems, is bound to resonate well with users (Alsanea, 2015).

As such this study hypothesises the following:

H2 (d) - User satisfaction plays a significant positive role in cloud computing adoption

- Communication processes and channels

Communication processes and channels is a DeLone and McLean IS success model variable, which talks about how effectively an organisation is able to communicate with its stakeholders, and in this context how cloud computing can assist the SMME in this endeavour. SMMEs as such should have the overall ability to communicate the organisation's strategy and core objectives coupled with the role technologies like cloud computing play in achieving these objectives. This view should be able to be reflected from within the organisation and outside the organisation (Tweel, 2012).

As such this study hypothesises the following:

H2 (e) – Communication processes and channels influence cloud computing adoption positively

2.7.6.3 Environmental factors

Hypothesis 3 posits that the environmental context plays a positive role in the adoption of cloud computing services amongst SMMEs. Outlined in Figure 12 are the environmental attributes that will be analysed, which includes competitive pressure, technology support infrastructure, trading partner pressure and government regulation as outlined below:

- Competitive pressure

Competitive pressure: a Technology-Organization-Environment (TOE) framework variable, which states that Small, Medium and Micro-sized Enterprises (SMMEs) are not immune from the pressures of the industries they find themselves in. As a result, competitors often affect the attitudes of the SMME, which affects how it perceives technology adoption.

In an industry where many enterprises utilise modern technologies like cloud computing, organisations that do not adapt to the ever-changing market conditions face the risk of being left behind, thus becoming uncompetitive amongst their peers. Competitive pressure becomes an important attribute that affects cloud computing adoption amongst Small, Medium and Micro-sized Enterprises (SMMEs) (Adam, 2015).

As such this study hypothesises the following:

H3 (a) – Competitive pressure plays a positive role towards cloud computing adoption

- Technology support infrastructure

Technology support infrastructure: a Technology-Organization-Environment (TOE) framework variable, which outlines the ability for Small, Medium and Micro-sized Enterprises (SMMEs) to adopt various technologies, is often governed by the availability of supporting infrastructure. As such irrespective of whether or not an organisation decides to adopt technologies like cloud computing, factors like bandwidth cost and availability, Information Technology (IT) hardware which is below standard has the propensity to dissuade SMME owners from adopting these technologies (Seda, 2012).

As such this study hypothesises the following:

H3 (b) - Technology support infrastructure does not influence cloud computing adoption

- Trading partner pressure

Trading partner pressure also has effects on technology adoption. This view is supported on the premise that, when the entire supply chain network which the SMME is a part of employs high end technologies such as cloud computing to leverage competitiveness, the SMME using traditional systems will find it difficult to synchronise its processes and practices with other trading partners in its supply chain (Adam, 2015).

In other words, an SMME will feel the pressure to update its systems, when its trading partners are coordinating their processes in a community cloud in order to leverage efficiency and effectiveness in the supply chain network. As such the trading partner pressure attribute becomes an important factor, which affects adoption.

As such this study hypothesises the following:

H3 (c) - Trading partner pressure has a positive effect on cloud computing adoption

- Government regulation

Government regulation: a Technology-Organization-Environment (TOE) framework variable which has the ability to affect the adoption of technologies amongst SMMEs in instances where, for the adoption of cloud computing practices within SMMEs, organisations have to take into consideration the various laws put in place by governments. In the South African context, the Protection of Personal Information (POPI) Act was put in place primarily to govern how public and private institutions collect, store and process the data of South African citizens, with strong emphasis given towards upholding applicable privacy laws (Trivedi, 2013).

Seeing that the back-bone of the cloud relies on data being stored and processed off-site on the infrastructure of cloud service providers, the POPI Act becomes a key piece of legislation that has the ability to advocate in favour of or against adoption within Small, Medium and Micro-sized Enterprises (Sibanyoni, 2015).

As such this study hypothesises the following:

H3 (d) - Government regulation has a positive effect on cloud computing adoption

2.8 Summary

As with any future, the future of cloud computing is unpredictable. However, despite this notion, the future of cloud computing will rely on the expansion of the characteristics of cloud

computing as outlined in the National Institute of Standard and Technology (NIST). As societies progress, more and more people and organisations will see value in associating themselves and their organisations with the cloud. This means that cloud service models like SaaS, PaaS and IaaS, will become increasingly popular within society, as they too evolve. This chapter as such captured the essential tenets of cloud computing which revolve around being an on-demand self-service, ubiquitous access, multi-tenancy, resource pooling, rapid elasticity, resiliency and above all a measured service. Moving through the chapter, it becomes clear that more and more organisations should adopt hybrid clouds as they provide advantages of management convenience and on-premises solutions. In addition to this, a more evolved type of cloud computing practice will emerge as big data and the Internet of Things (IoT) begin to correlate with cloud computing at its foundations.

This chapter further defined SMMEs relating to the South African context. Through this, studies made by the Small Enterprise Development Agency (SEDA) have found a series of challenges faced by SMMEs of which the lack of Information Technology (IT) skills was a part. A five- step process towards adoption has been proposed by the study, which includes awareness, assessment, acceptance, learning and usage. This model is designed to assist in the implementation of the Conceptual Research Model as it relates to cloud computing adoption amongst SMMEs.

The Conceptual Research Model based on the Technological-Organisational-Environmental (TOE) framework is the backbone of this study. Through it, the objective is to analyse factors affecting cloud computing adoption amongst SMMEs in the North West Province within the Republic of South Africa. In doing this the Conceptual Research Model bases its fundamental analysis on three factors that will either advocate in favour of adopting new technologies like cloud computing within SMMEs or argue against adopting the same technology.

The first factor in this analysis is technological factors. Through this, the objective is to analyse various attributes that could hinder or promote cloud computing adoption internally and externally of the organisation. This includes examining relative advantage, complexity, compatibility, security concerns and cost savings. Second to this are organizational factors that affect the organisation internally and externally. This includes examining top management and its support levels, firm size, technology readiness and communication processes at play and, lastly, user satisfaction. The last factor entails an analysis of environmental factors at play that affect the organisation internally and externally. This

includes analysing competitive pressure, trading partner pressure, government regulation and technology support infrastructure.

The view is that from this analysis of critical adoption factors, Small, Medium and Micro-sized Enterprises will be in an empowered state to make relevant decisions associated with their information system's needs. The next chapter delves into the research methodology in detail, where the research philosophy, approach, strategy and methods that underpin this study will be outlined.

Chapter 3 - Research Methodology

In this chapter of the study, emphasis is directed towards the research methodology, a process through which the researcher systematically analyses factors affecting cloud computing adoption amongst Small, Medium and Micro-sized Enterprises in the North West Province within the Republic of South Africa. In achieving this objective, the Research Onion as outlined in Figure 13 serves as a guideline for this study outlining the research philosophy, approach, strategy and methods. In addition to this, it outlines the data analysis and collection strategies that were employed in answering the research question in a systematic way.

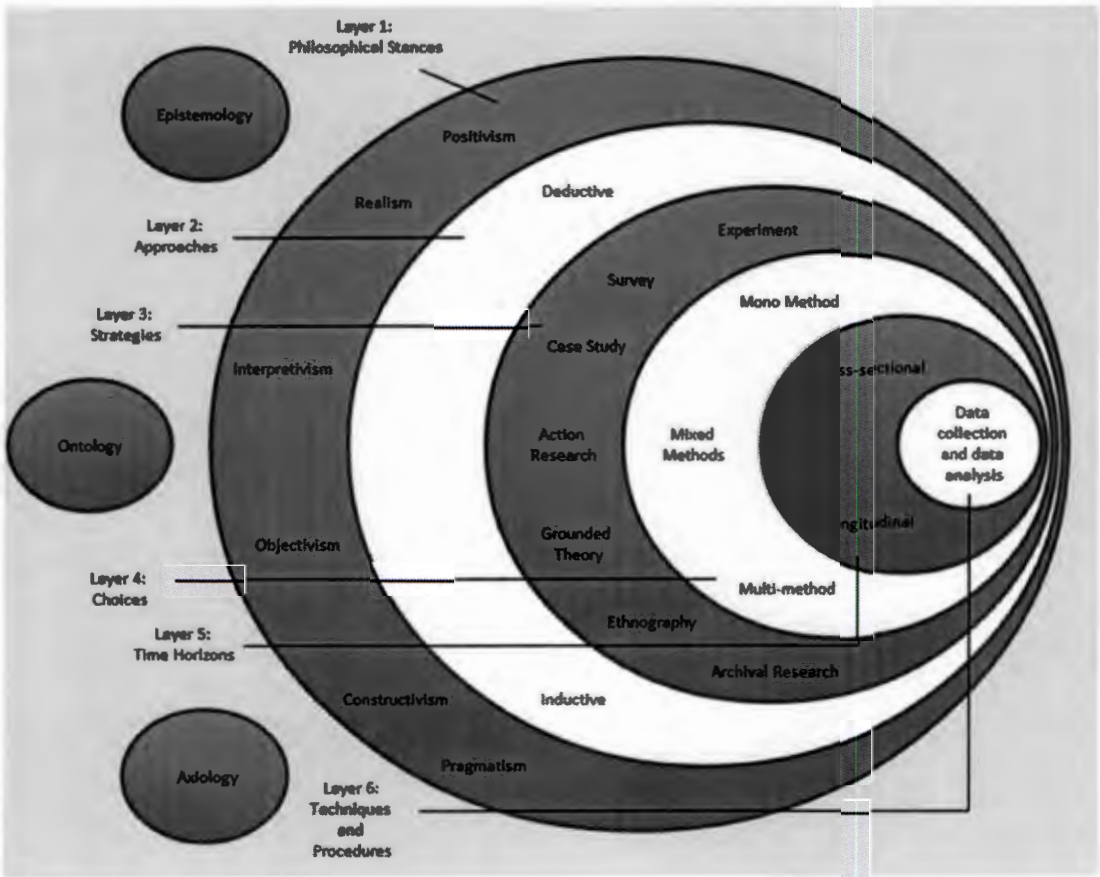


Figure 13 - Research Onion based on Saunders et al. (Anon., 2017)

This chapter starts by interpreting the various layers of the research onion, first by outlining the research philosophy that underpins the research, research approach, strategy and method. Time horizons, research population and sample are outlined secondly and lastly data collection and ethical considerations are outlined.

From this perspective the study takes on an epistemological-positivist philosophy through deductive means. The study will employ a quantitative mono-method survey to constitute its research strategy. Through convenience sampling, 111 SMMEs from Ngaka Modiri Molema

and Bojanala Platinum Districts of the North West Province, with fully completed surveys, will take part in this study.

3.1 Research Philosophy

In order to grasp the research philosophy that underpins this research, it becomes necessary to outline the true meaning of a research philosophy. A research philosophy simply means the engaged process of assumptions involved in the creation/development of new knowledge in a particular field of study and the nature of that knowledge. As in this research, the mere act of analysing the effects of cloud computing adoption amongst SMMEs in the North West Province effectively contributes to the creation of new knowledge within a particular sector of the South African society, by testing various assumptions through hypothesis (Saunders et al., 2009).

3.1.1 Ontology, Epistemology and Axiology explained

There are three main philosophies that underpin the study of research as outlined in Figure 13, and broadly influence the manner in which the research process is contemplated, being ontology, epistemology and axiology, as outlined below:

- Ontology

Ontology refers to study of the nature of being or reality. Here a researcher is obsessed with studying the way things are, and their relation to the research question. In addition to this, the researcher is obsessed with finding out what is true and real in his or her quest to acquire knowledge (Xi, 2014).

As such the ontological question such a researcher would be concerned with is understanding "whether reality is of an objective nature, or the product of individual cognition; whether reality is a given out there in the world, or the product of one's mind." (Byrne, 2013).

Ontology as such can be subdivided into two constructs. The first is objective/positivist ontology and the second is subjective/interpretivist ontology. Objective ontology as a result posits that the social reality under observation is pre-existing; meaning it already exists external of social actors. On the other hand subjective ontology posits that the social reality under observation is highly dependent on the subject making the observation, that social actors play a role in the social reality (Aliyu et al., 2014).

- Epistemology

Epistemology essentially is the study of knowledge, and as such epistemological assumptions simply refer to a researcher's quest to acquire authentic knowledge in the field of study. As such, researchers are concerned with asking in the first instance what knowledge is, and in the second instance how that knowledge can be attained (Ambrose et al., 2010).

As such, the epistemological question such a researcher would be concerned with is on understanding what knowledge means, how this knowledge could be acquired and, overall, justifying what would form the basis of true knowledge. (Byrne, 2013)

Epistemology as a result also takes the form of two constructs, the first of which is objective/positivist epistemology and the second is subjective/interpretivist epistemology. As such the positivist view posits that legitimate knowledge is that which can be attained through scientific means, whereas the interpretivist view posits that the research should be able to distinguish the differences that exist between humans and other objects (Ambrose et al., 2010).

- Axiology

Axiology refers to the study of value, and as such outlines a researcher's perspective on how ethics and values play a role in the research process. This means that researchers portray the ability to exert their values or ethics whilst taking decisions that guide the nature of the research being undertaken (Saunders et al., 2005).

Based on this, axiology can take the form of two constructs, which are objective/positivist axiology and subjective/interpretivist axiology. With objective axiology, the view is that the research process is being conducted in a value-free manner, where the researcher is independent of the process itself. With subjective axiology, the view is that the research process is attached to the values of the researcher who is part of the research process (Ambrose et al., 2010).

3.1.2 Adopted research philosophy

Despite there being various philosophical approaches that underpin the study of research, these three approaches are being deliberately outlined on the basis that they underpin the thoughts of various researchers who opted to study the various effects of cloud computing in

the broader society. As such the philosophical context gains prominence within this study, as it outlines the overall structure of the research.

Through investigating factors affecting cloud computing adoption amongst SMMEs in the North East of England, Alshamaileh (2013) resolved on adopting a positivist epistemology. The researcher in this view saw himself as an interpreter of the social reality who relied on objectivity to be unaffected by the research subject. Alshamaileh (2013) saw positivist epistemology as a tool necessary to predict the causal relations that exist between components through deductive hypothesis testing (Alshamaileh, 2013).

Black (2013), through investigating factors that lead to successful cloud computing adoption in Irish Small and Medium-sized enterprises, resolved on adopting an interpretivist epistemology. In this, the researcher saw himself playing an integral role in the research process, with the aims of trying to properly articulate and understand the views of respondents subjectively. This was aimed to see whether the social phenomena at play are created from the perceptions and consequences of social actors, being how cloud computing adoption in a social context can be adopted by human beings within their enterprises (Black, 2013).

Epistemology as such becomes the appropriate philosophy of this study in the sense that it is concerned with the creation of acceptable knowledge in this field of cloud computing as it relates to Small, Medium and Micro-sized Enterprises (SMMEs). In addition to this, positivism becomes an appropriate tool, as knowledge will be attained in a scientific manner through hypothesis testing.

3.2 Research Approach

Research can take the form of either a deductive approach or an inductive approach as outlined in Figure 13. These approaches are different from each other, and their selection comes after a research philosophy is adopted by the researcher. These fundamental differences are outlined below:

- Deductive approach

A deductive approach involves the process of hypothesis testing. This is using scientific methods or methodologies to test and confirm a theory. As such, key attributes come to light in respect of the deductive approach. As it involves scientific methods to test hypothesis, this means that the researcher strides the path to test the relationships that exist between various factors through data collection using quantitative methods that follow an extremely structured approach (Young, 2015).

Based on this, some scholars opted to investigate cloud computing adoption as a business strategy in relation to SMMEs, like Shoniwa (2016), who based his study on the deductive approach, as it moved from theory to data in a bid to outline the relationships that exist between variables (Shoniwa, 2016).

- Inductive approach

An inductive approach involves a process of using data obtained from research to derive a theory for the research. This means that prior work needs to exist, in order to frame the data-gathering process that will develop the theory under review. As such the inductive approach emphasises the human element attached to the research process. This translates into the meanings attached to situations, bridging the gap from the research question. This process is achieved through qualitative methods which have unstructured tendencies where the researcher is central to the research process itself (Ambrose et al., 2010).

Some cloud computing scholars who analysed adoption within SMMEs, like Gustafson et al, opted to base their studies on the inductive approach, citing that the intention is to investigate cloud computing adoption through a process of collecting and analysing data, in order to form a theory (Gustafson & Orrgren, 2012).

Based on the understanding of these two research approaches, it becomes clear that this study opts to utilise the deductive approach as we investigate factors affecting cloud computing adoption amongst Small, Medium and Micro-sized Enterprises (SMMEs) in the Ngaka Modiri Molema and Bojanala Platinum Districts of the North West Province.

This viewpoint is confirmed by the three hypothesis outlined in Chapter one where we posit the following:

- Hypothesis 1: The technological context plays a positive pivotal role in the adoption of cloud computing services amongst SMMEs.
- Hypothesis 2: The organisational context plays a positive central role in the adoption of cloud computing services amongst SMMEs.
- Hypothesis 3: The environmental context plays a positive role in cloud adoption amongst SMMEs.

Deductive testing follows certain steps in order to derive a conclusion, the first of which is to derive a hypothesis as outlined above and in Chapter one. This is followed by elaborating the hypothesis context to the overall research as outlined in Chapter two, followed by testing and

examining the hypothesis. Lastly, based on findings, the framework, is modified in order for it to give a realistic perspective for the reality space under review (Ramothibe, 2012).

3.3 Research Strategy

This study has structured itself into adopting an epistemological-positivist philosophy, through deductive means. Figure 13 outlines the various employable strategies that exist within the research process. A research strategy indicates the method that will be used to answer the research question. These range from experiments, surveys, case studies, action research, grounded theory, ethnography and archival research (Chiyangwa, 2014). Based on this, the adopted research strategy revolves around a survey.

A survey constitutes a part of the deductive approach, which was utilised to distribute, collect and analyse data. This research strategy gave the researcher enhanced control over the research process, by gathering large quantities of data in an economical way. The surveys were distributed to a particular segment of the society, utilising objective questions that are closed ended (Ramothibe, 2012).

3.4 Research Method

Research methods can take various forms, from mono-methods, mixed-methods or multi-methods as outlined in Figure 13. A mono-method is a type of method that utilises either a quantitative research method or a qualitative research method. Mixed-methods on the other hand is a method that comprises both qualitative and quantitative research methods. Lastly a multi-method utilises more than one method on a multi-level basis. This could be a combination of multiple quantitative methods or qualitative methods (Azorín & Cameron, 2010).

Based on this it becomes clear to distinguish the differences that exist between qualitative and quantitative research methods. A quantitative research method is one method of data collection that researchers opt for. It employs techniques such as surveys, where data can be analysed in the form of graphs. Most quantitative methods employ closed-ended questions which are quick to translate and analyse. On the other hand a qualitative research method is another method of data collection that researchers can opt for. It employs techniques such as interviews, and data is analysed by categorising it in a non-numeric format. Qualitative methods are generally open-ended, and due to this, the process of translating and analysing data is very slow (Powelson, 2009).

As a result this study utilised a mono-method that is strictly quantitative. In addition to this close-ended questions were used objectively.

3.5 Time horizon

In this section of the study, emphasis will be placed on outlining the time horizon of the study. Saunders et al. (2005) posit that there are two formats/horizons that underpin the study of research, these being cross-sectional and longitudinal studies.

Cross-sectional studies are planned to acquire information on various variables in diverse contexts within the same timeframe. This is the process of collecting data from various contexts/samples at the same time, with the objective of conducting statistical tests to establish the relationships that exist between variables. Cross-sectional studies become the appropriate choice in studies where there are resource and time constraints, and where the objective of collecting, analysing and interpreting data timeously is of the essence. On the other hand longitudinal studies are ones conducted over a period of time, without time constraints. Here the objective is to allow researchers the ability to observe and investigate the reality space under review through time until the research question is answered (Saunders et al., 2005).

This study is a cross-sectional study. With this study, the objective was to analyse factors affecting cloud computing adoption amongst Small, Medium and Micro-sized Enterprises (SMMEs) within the North West Province, which constitutes a particular phenomenon at a certain time.

3.6 Research Population and Sample

A research population can be defined as a large collection of groups or individuals being researched which are known to have similar characteristics. Subsequently a sample becomes a subset of the population. The reason why most academic researchers opt for a sample is based on the notion that the population is too big to test, and as such needs to be broken down into an acceptable size. As such a sample needs to be representative of the entire population, allowing the researcher the ability to draw a balanced statistical analysis of the entire population (Explorable, 2017).

The research population that informs this study are Small, Medium and Micro-sized Enterprises (SMMEs) operating within the Ngaka Modiri Molema and Bojanala Platinum Districts of the North West Province. These SMMEs, as defined by the Small Enterprise

Development Agency (SEDA), are organisations that employ less than 200 employees with an annual turnover of less than R50 million (SEDA, 2016).

According to SEDA, there are 17299 SMMEs operating in the Bojanala Platinum district, and 8049 SMMEs operating in the Ngaka Modiri Molema district (SEDA, 2017). As such due to financial constraints, the researcher opted for convenience sampling where the SMMEs were selected due to their accessibility to the researcher (Ilker et al., 2015).

As a result, the sample, a subset of the population that informs this study, are Small, Medium and Micro-sized Enterprises (SMMEs) operating within the Ngaka Modiri Molema and Bojanala Platinum Districts, in North West Province within the Republic of South Africa. Based on this 340 surveys were distributed to SMMEs, and only 111 SMMEs responded with fully completed surveys.

It should be noted that due to the low number of respondents whom took part in this study, the study cannot generalise its findings to the entire population. This entire process of data collection was centred on voluntarism amongst SMMEs which resulted in 111 responses. Lastly, the processes followed the direct prescripts according to the Protection of Personal Information Act, No 4 of 2013 where data was collected exclusively for this study.

3.7 Data collection and analysis

Due to cloud computing advancements, Google Forms, an online survey web-based software tool, was utilised exclusively to develop the survey. From there it was distributed to Small, Medium and Micro-sized Enterprises in the North West Province in the form of a link that arrived in their email addresses and social networking platforms. Once each survey was completed, Google Forms updated itself on the researcher's profile, allowing for automatic statistical analysis every time a survey was received from respondents (GoogleForms, 2017).

In terms of data analysis, SPSS 24 statistical software was utilised exclusively to analyse the data collected using Google Forms.

3.8 Data reliability

The constructs used in this study have been utilised in prior studies on cloud computing adoption amongst Small, Medium and Micro-sized Enterprises worldwide. A Cronbach's Alpha test was conducted, to test the reliability of 14 constructs amongst themselves using SPSS 24. Table 2 indicates that the constructs utilised within this study are highly reliable (Cronbach alpha = 0.785).

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items/Constructs
.785	.789	14

Table 2 - Reliability test

Table 3 shows the Cronbach Alpha test per construct. It can be noted that these alpha tests revolve close to and around the value of 0.785 outlined in Table 2. In addition to that, Table 3 outlines the various studies that utilised the same constructs employed within this study.

	Construct	**Reliability (Cronbach alpha)**	**Items**
	Technological		(Alshamaileh, 2013) (Trope, 2014) (Powelson, 2009) (Alsanea, 2015) (Adam, 2015) (Senarathna, 2016) (Al Isma'ili et al., 2016) (McKinnie, 2016) (Harfoushi et al., 2016) (Kinuthia, 2014) etc.
1.	Relative advantage	0.764	
2.	Complexity	0.783	
3.	Compatibility	0.753	
4.	Security concerns	0.805	
5.	Cost savings	0.780	
	Organizational		
6.	Top management	0.769	
7.	Firm size	0.793	
8.	Technology readiness	0.758	
9.	User satisfaction	0.756	
10.	Communication process	0.772	
	Environmental		
11.	Competitive pressure	0.738	
12.	Technology support infrastructure	0.784	
13.	Trading partner pressure	0.770	
14.	Government regulation	0.771	

Table 3 - Item statistics

3.9 Ethical considerations

Ethical considerations are important aspects that researchers need to take into consideration when conducting research. This means that the researcher should bind him or herself in an ethical manner when conducting the process of collecting, analysing and reporting data. In addition to this, respondents should be assured that the data collected will be used for purposes relating to this study only. This element ensures that the rights to privacy and confidentiality of respondents are protected (Pallivathukal, 2016).

As such in relation to this study, the researcher was bound along ethical lines according to the Policy and Rules for Research Ethics (NWU, 2016), as this study has been approved by the Human Sciences Research Ethics Committee (HSREC) and subsequently by the North-West University Institutional Research Ethics Regulatory Committee (NWU-IRERC).

3.10 Summary

This study adopts an epistemological philosophy, on the basis that we are here to create new knowledge in the field of cloud computing as it relates to adoption amongst Small, Medium and Micro-sized Enterprises in the North West Province. Through this, the study takes on a positivist philosophical perspective in the sense that we create this new knowledge in the field of cloud computing within the set reality space, where we seek to empirically test these observations through scientific means like hypothesis testing objectively. Through this, the deductive approach was chosen as the research approach to guide the research process.

A survey was constituted as the research strategy that allowed the researcher to gain access to an appropriate sample size of participants whom are Small, Medium and Micro-sized Enterprise business owners within the two districts of the North West Province. By adopting a quantitative mono-method as our research method, this allowed us the ability to develop objective closed-ended questions that were distributed to our participants.

In conclusion Google Forms, a cloud computing web-based survey tool, was utilised for data collection procedures, as well as utilising the embedded tools for statistical data analysis. The research was bound along ethical lines as prescribed by the North West University (NWU). The following chapter is where we will analyse the data collected statistically, using SPSS 24.

Chapter 4 - Data Analysis

4.1 Introduction

Chapter three of this study indicated that a survey which constitutes the research strategy will be utilised to analyse factors affecting cloud computing adoption amongst Small, Medium and Micro-sized Enterprises within the North West Province in the Republic of South Africa. In this section of the study an overall picture of the data collected through the surveys distributed will be presented statistically.

The data collection process commenced from July 2017 to October 2017, and during that process, 340 surveys were distributed to SMMEs using Google Forms. Out of that, only 111 SMMEs took part in fully completing surveys submitted online through Google Forms, an online Software-as-a-Service platform that enables users to formulate and distribute surveys online. SPSS Version 24, a statistical analysis software package, was utilised by the researcher to assist in the comprehensive hypothesis testing and statistical analysis of the data collected.

This chapter starts off by analysing the demographic characteristics followed by analysing the cloud computing perspectives held by SMMEs. From there on, we shall analyse the three constructs, namely the technological, organizational and environmental context constructs coupled with bivariate correlation analysis. Lastly, regression tests will be conducted to test each construct.

4.2 Demographic Characteristics

One hundred and eleven surveys (111) were fully completed by SMMEs. As such Figure 14 outlines the location and size variables in the demographic section, where 72% of the respondents reside within Bojanala Platinum District, and 28% of the respondents reside within Ngaka Modiri Molema District.

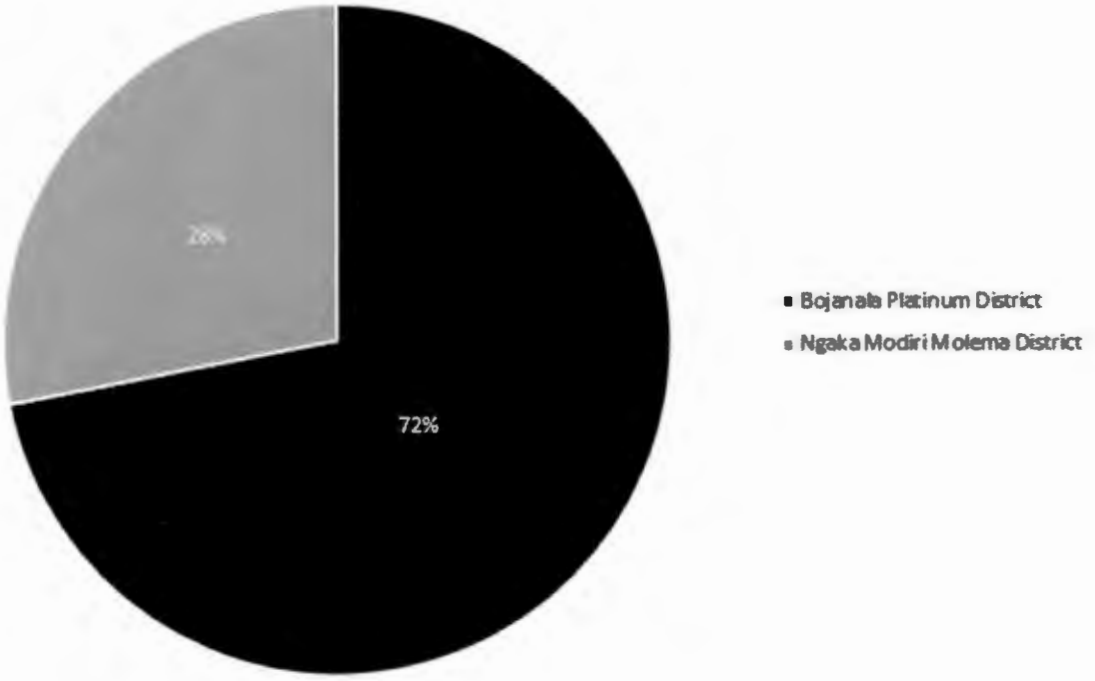


Figure 14 - SMME districts

Figure 15 outlines a cross tabulation between the SMME's location and SMME's size. Through this tabulation it becomes clear that 2% of SMMEs from Bojanala Platinum District belong in the Medium SMME range, whilst none were recorded from the Ngaka Modiri Molema District. In the Micro SMME range, 26% of SMMEs were recorded for Bojanala Platinum District, whilst in Ngaka Modiri Molema District, 5% were recorded. In the Small SMME range, 14% of SMMEs were recorded for Bojanala Platinum District, whilst in Ngaka Modiri Molema District, 7% of SMMEs were recorded. Lastly in the Very Small SMME range, 30% of SMMEs were recorded for Bojanala Platinum District, whilst in Ngaka Modiri Molema District, 15% of SMMEs were recorded.

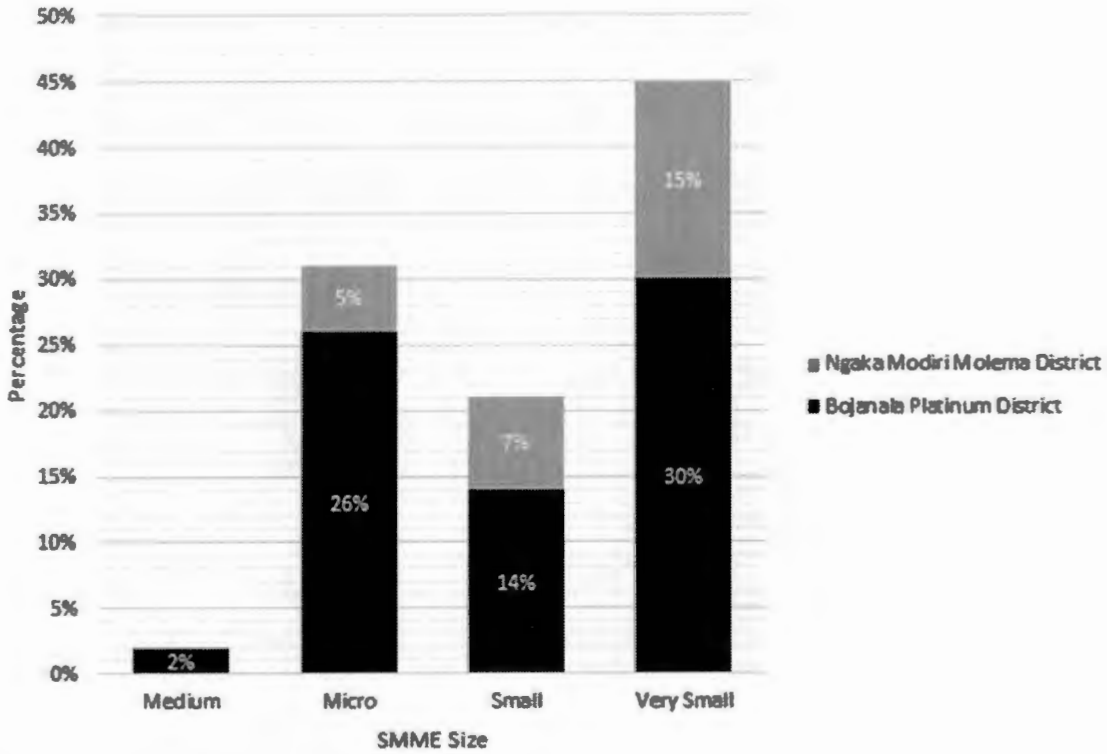


Figure 15 - SMME location and size

Figure 16 outlines a cross tabulation between SMME location and the SMMEs industry space. From the overall data collected it becomes clear that from Bojanala Platinum District, 8% were Agricultural SMMEs, 14% were Catering, Accommodation and other trade related SMMEs, 3% were Community, Social and Personal Service related SMMEs, 4% were Construction SMMEs, 2% were Electricity, Gas and Water SMMEs, 13% were Finance, ICT, Legal and Business service SMMEs, 11% were Manufacturing SMMEs, 3% were Mining and Quarrying SMMEs, 5% were Retail, Motor Trade and Repair service SMMEs, 5% were Transportation SMMEs and 5% of SMMEs were in the Wholesale Trade, Commercial Agents and Allied Services industry.

In addition to that Figure 16 also outlines data collected from within the Ngaka Modiri Molema District, 7% were Catering, Accommodation and other trade related SMMEs, 2% were Community, Social and Personal Service related SMMEs, 3% were Construction SMMEs, 6% were Finance, ICT, Legal and Business service SMMEs, 5% were Manufacturing SMMEs, 2% were Retail, Motor Trade and Repair service SMMEs and 3% of SMMEs were in the Wholesale Trade, Commercial Agents and Allied Services industry.

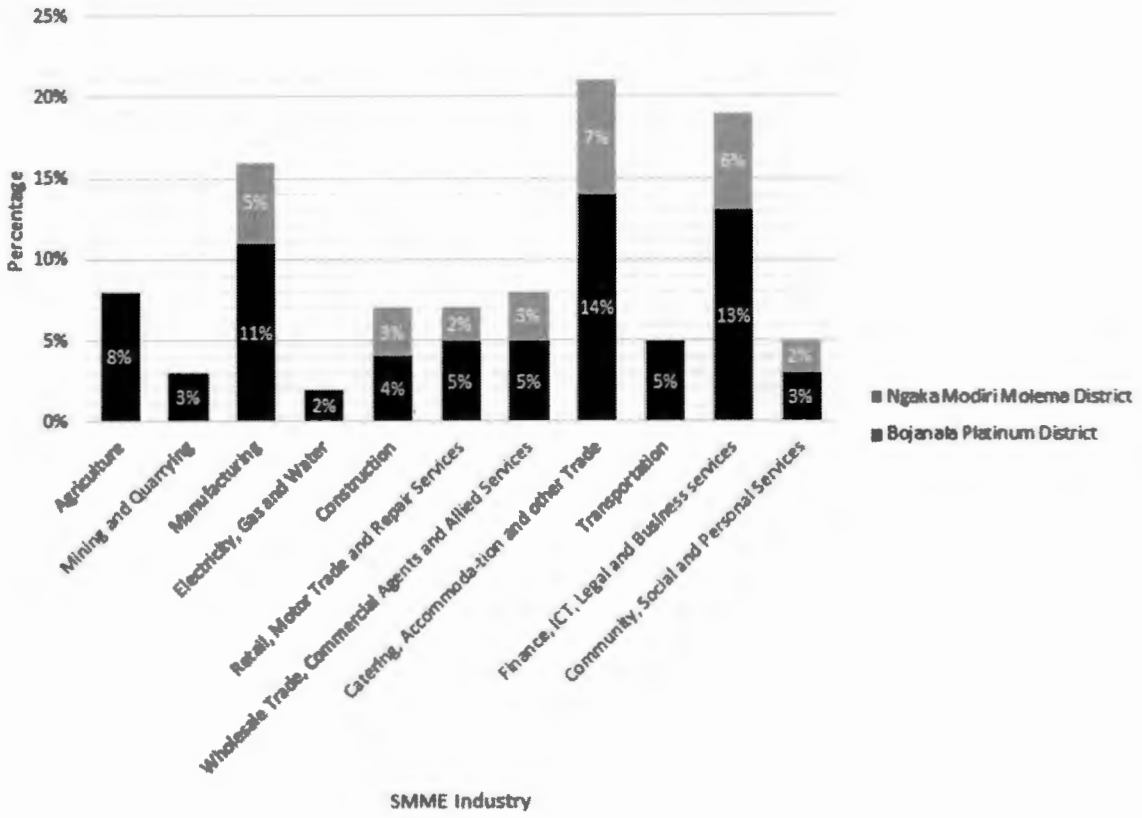


Figure 16 - SMME industry

Figure 17 outlines a cross tabulation between the presence of IT departments within SMMEs and their corresponding industries. As such based on this it is clear that 7% of SMMEs in the Finance, ICT, Legal and Business services industry, 3% of SMMEs in the Manufacturing industry, 3% of SMMEs in the Retail, Motor Trade and Repair Services industry, 1% of SMMEs in the Transportation industry and 1% of SMMEs in the Wholesale Trade, Commercial Agents and Allied Services industry have dedicated Information Technology (IT) departments to support business processes and functions. The remaining 86% of SMMEs that took part in the study do not have dedicated Information Technology departments.

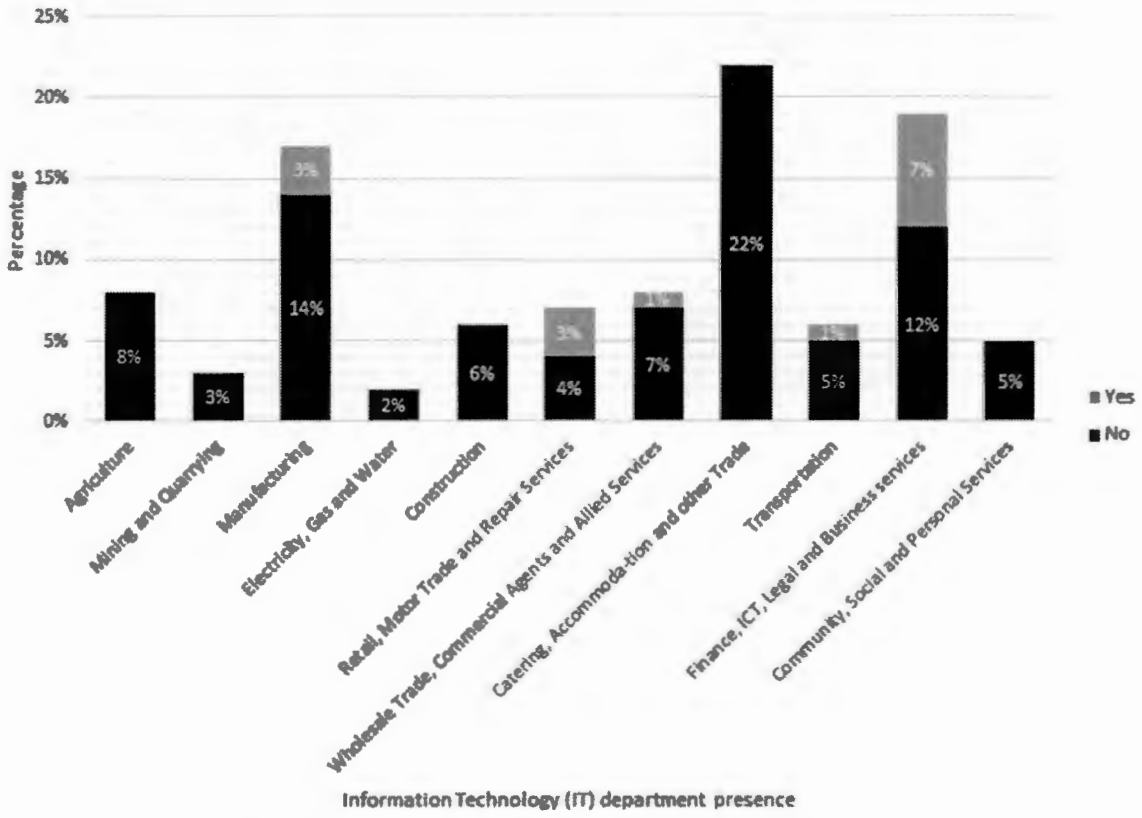


Figure 17 - IT department presence

Figure 18 represents the type of information that is managed within SMMEs. It should be noted that this pie chart stems from question five (5) from the survey, which allowed respondents to tick multiple answers. Translating it means that, for example, 47.7% of respondents only manage inventory, general ledgers (accounts), sales and human resources. Based on this understanding it becomes clear that 47.7% of SMMEs first manage inventory, general ledgers (accounts), sales and human resources. This is followed secondly by 20.7% of SMMEs that manage inventory and general ledgers (accounts), and thirdly 17.1% of SMMEs that manage inventory, general ledger (accounts) and human resources.

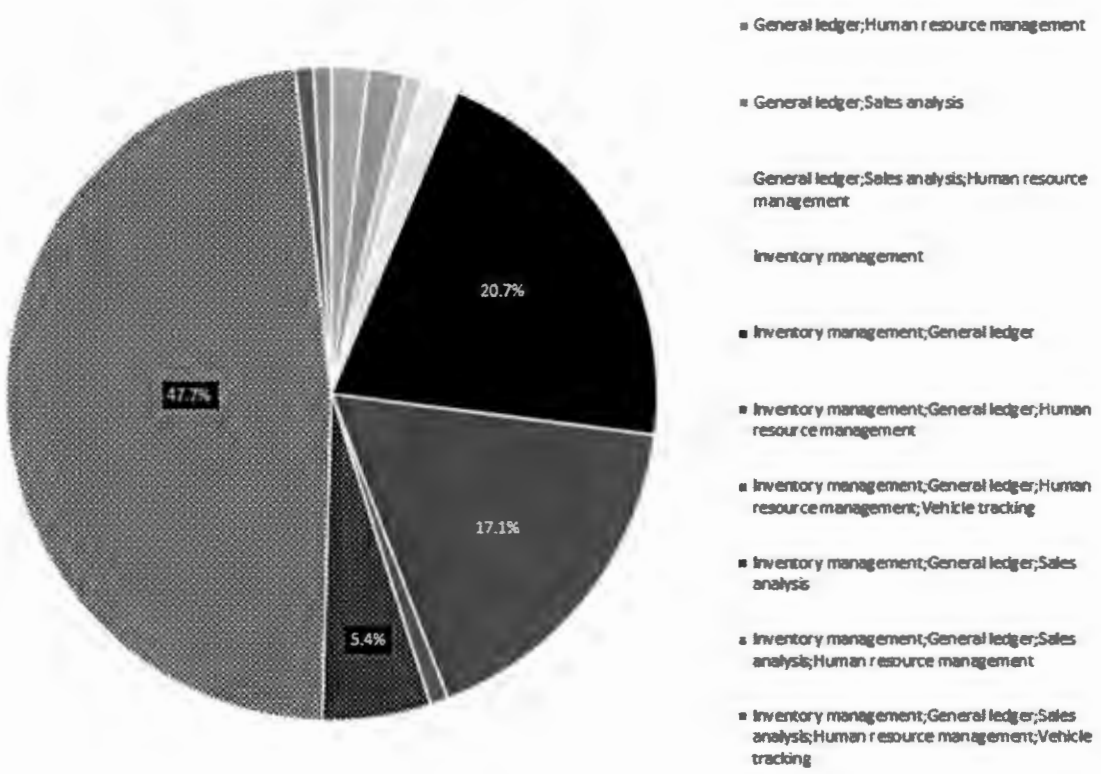


Figure 18 - SMME Information Management

Figure 19 outlines the types of Information Technology (IT) services utilised by SMMEs to support business functions and processes. It should be noted that this pie chart stems from question six (6) from the survey, which allowed respondents to tick multiple answers. Translating this means that for example, 18.9% of respondents only utilize email and the internet. Based on this understanding it becomes clear that at a glance all the SMMEs that took part in the study utilize email and the internet to support business functions, where all the categories in **Error! Reference source not found.** feature the use of email and the internet. Within the class types, 18.9% of SMMEs utilize email and the internet in particular to support business functions, whilst 13.5% utilize both email and the internet including Enterprise Resource Planning (ERP) tools.

In addition to this Figure 19 indicates that 13.5% of SMMEs utilize email and internet, Enterprise Resource Planning (ERP), Transaction Processing Systems and Human Resource management tools, 12.6% of SMMEs utilize email and internet, Enterprise Resource Planning (ERP) and Human Resource management tools. Lastly 10.8% of SMMEs utilize email and internet, Enterprise Resource Planning (ERP), Transaction Processing Systems and Human Resource management tools.

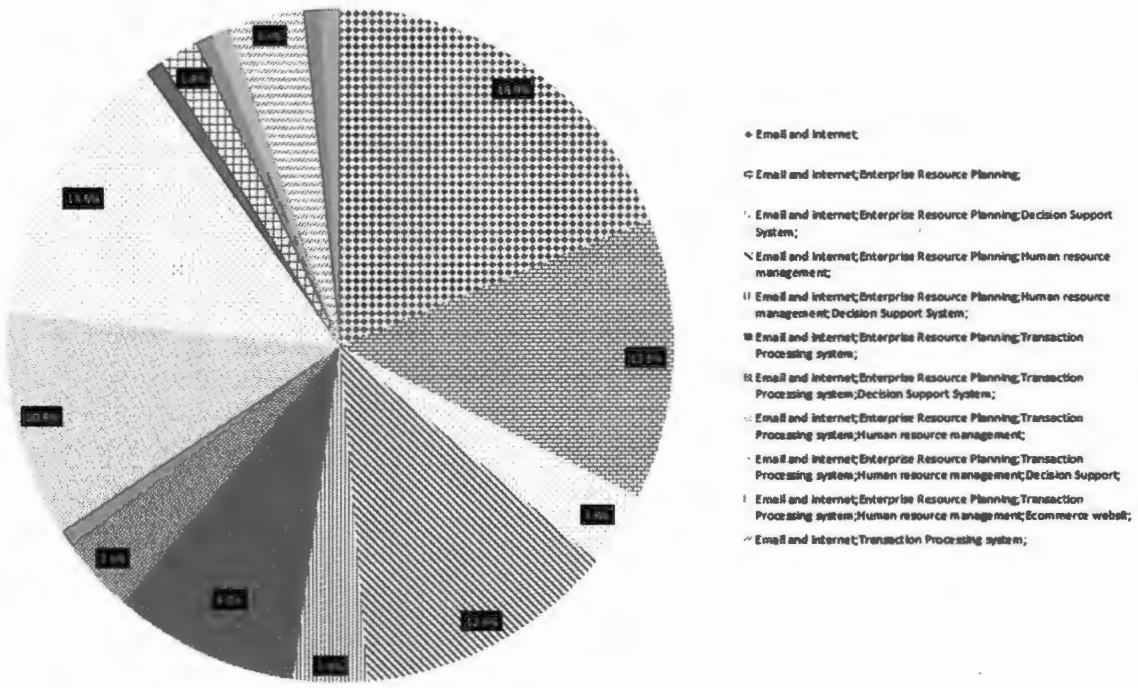


Figure 19 - SMME IT service utilization

4.2.1 Summary of demographic characteristics

Based on the demographic variables drawn from the data collected, a summary can be drawn to outline the type of participating SMMEs of this research. Based on this, one hundred and eleven (111) Small, Medium and Micro-sized Enterprises took part, where 80 SMMEs originated from Bojanala Platinum District and 31 SMMEs originated from the Ngaka Modiri Molema District within the North West Province of the Republic of South Africa.

Through a cross tabulation in Figure 15, the researcher has compared the SMME locations with the SMME size, and furthermore compared in Figure 16 a cross tabulation between SMME location and SMMEs industry space. This exercise is meant to outline the full extent of the type of SMMEs involved in the study from a demographic stance. In **Error! Reference source not found.**, the researcher wanted to ascertain whether or not SMMEs operating within the two (2) districts of the North West Province had dedicated Information Technology (IT) departments to support business operations. As such, through the cross tabulation of data analysed it became clear that 85.6% of SMMEs had no IT department/function whilst 14.4% of SMMEs had IT departments to support business functions and processes.

In trying to identify the type of information that needs to be managed by SMMEs, Figure 18 outlined that 47.7% of SMMEs manage inventory, general ledgers (accounts), sales and human resources, followed by 20.7% of SMMEs that manage inventory and general ledgers

(accounts) with 17.1% of SMMEs that manage inventory, general ledger (accounts) and human resources. This analogy is important on the basis that it gives impetus to the direction SMMEs take as they explore the introduction of information Technology services within their organisations.

Lastly Figure 19 outlines the types of Information Technology services that are being utilised by SMMEs to support business processes and functions. Based on the data, it becomes clear that in Figure 19, all the rows include the use of email and the internet by SMMEs in one form of the other, and show that 18.9% of SMMEs utilize email and the internet exclusively to support business processes and functions.

4.3 Data analysis of cloud computing adoption amongst SMMEs

In this section of the data collected, an extensive statistical analysis was conducted to view how Small, Medium and Micro-sized Enterprises relate with Cloud Computing practices, as far as its adoption is concerned, to support business processes and functions.

Figure 20 outlines the frequencies of cloud computing service models adopted by SMMEs. 97% of SMMEs utilise Software-as-a-Service (SaaS), whilst 3% of SMMEs utilise Software-as-a-Service (SaaS) and Platform-as-a-Service (PaaS).

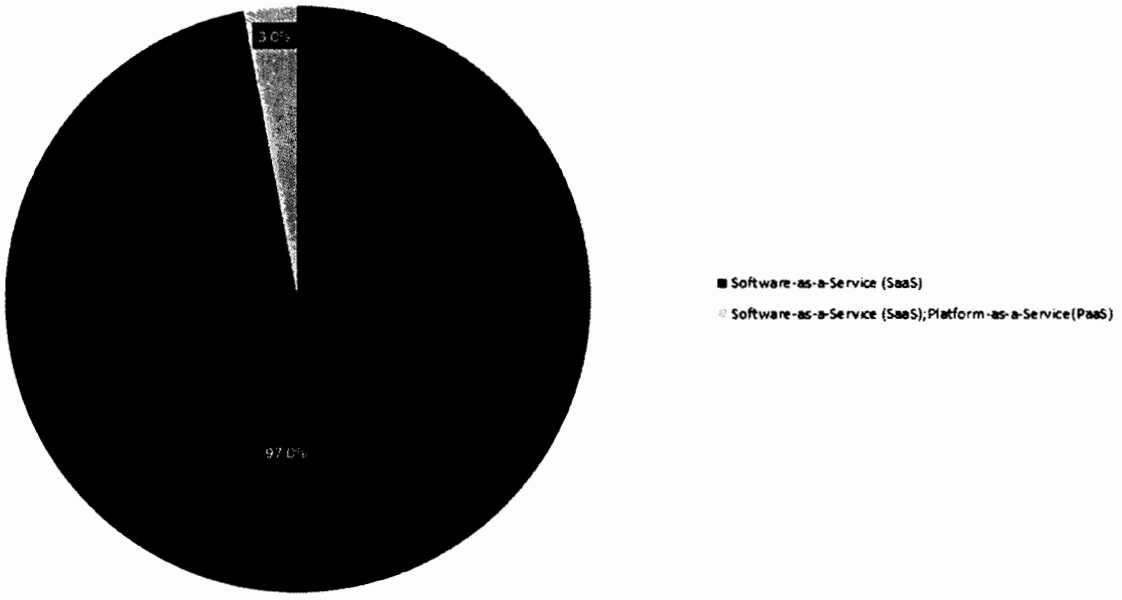


Figure 20 - Computing service models adopted by SMMEs

Figure 21 outlines the extent to which cloud computing services are used to support business operations within SMMEs. Through this, it is clear that 69% of SMMEs believe that the impact is to a medium extent, whilst 20% of SMMEs believe that the impact is to a high extent.

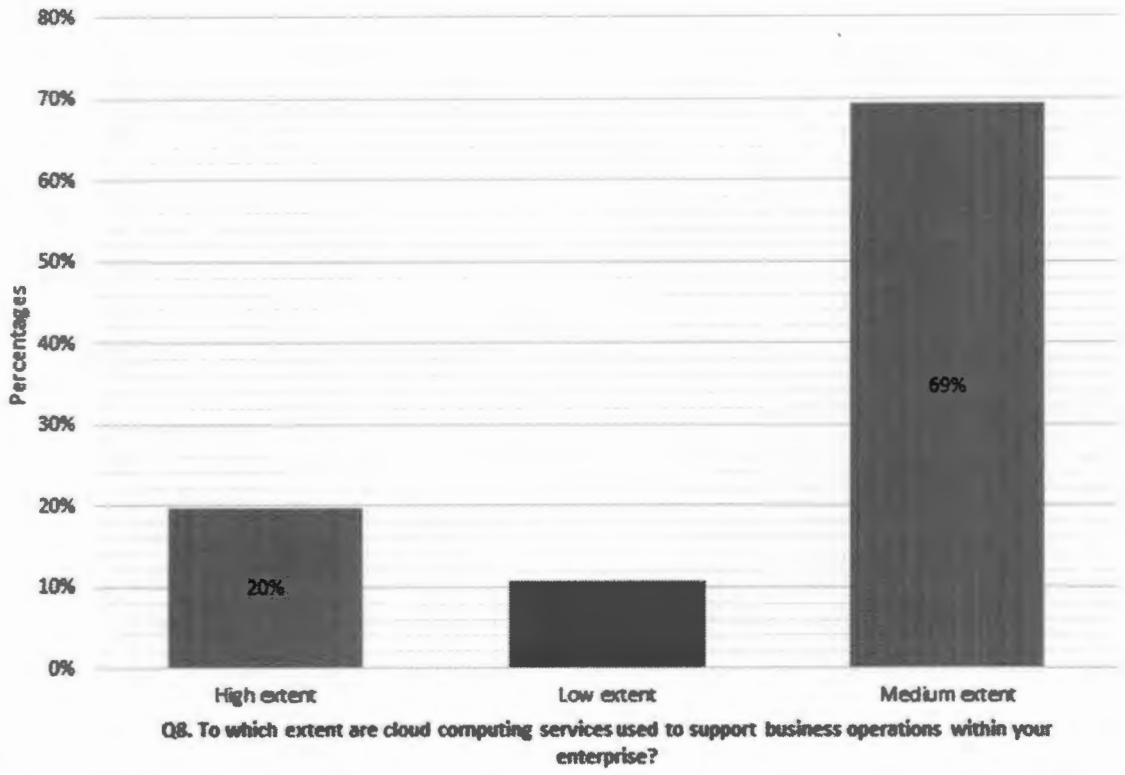


Figure 21 - Extent to which cloud computing services are used to support business operations within the SMME

Figure 22 outlines the extent to which cloud computing services are used to support management-decision making amongst SMMEs. It becomes clear that 59% of SMMEs believe that the impact is to a medium extent, whilst 34% of SMMEs believe that the impact is to a high extent.

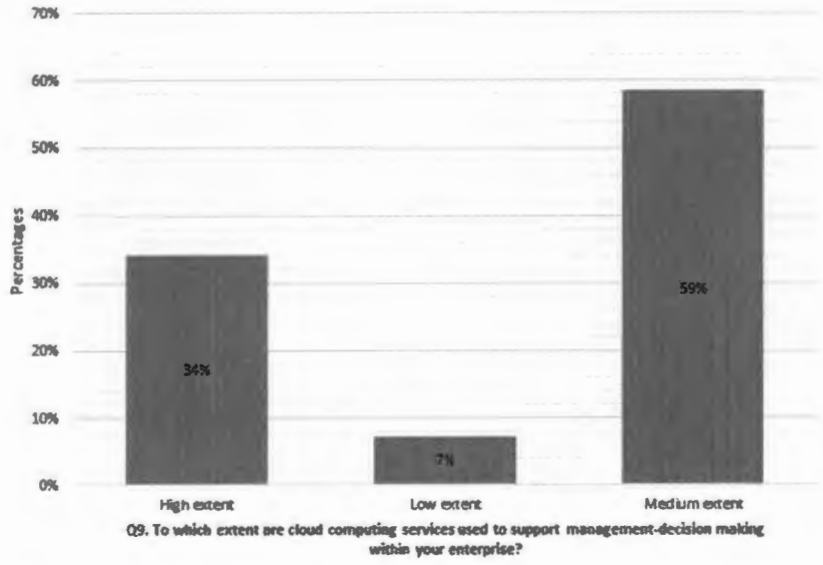


Figure 22 - Extent to which cloud computing services are used to support management-decision making amongst SMMEs

Figure 23 outlines the frequency distribution between perceived cloud computing benefits amongst SMMEs. It should be noted that this pie chart stems from question ten (10) from the survey, which allowed respondents to tick multiple answers. Translating, it means that, for example, 5.4% of respondents only chose simplicity as a cloud computing benefit. Based on this understanding 24.3% of SMMEs believe that attributable benefits associated with cloud computing include remote access, simplicity and lower Information Technology (IT) costs. This is followed by 14.4% of SMMEs who believe that simplicity and remote access are attributable benefits for cloud computing utilization. 13.5% of SMMEs believe that lower IT costs, simplicity, specialized technical support and remote access are attributable benefits associated with cloud computing. It ought to be noted that in every category outlined in Figure 23, lower IT costs, remote access and simplicity are recurring factors.

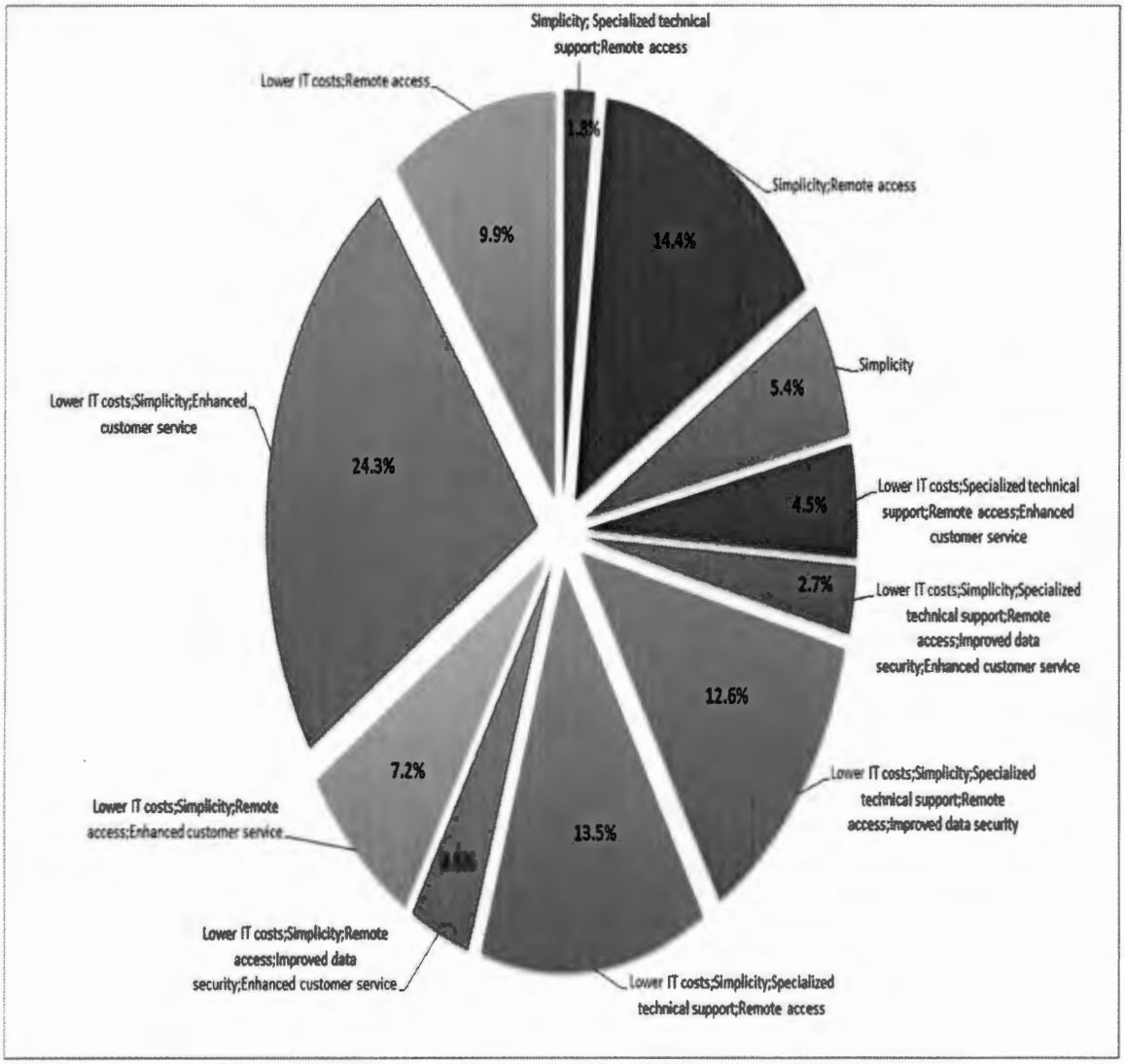


Figure 23 - Cloud computing benefits

Figure 24 outlines the frequency distribution of perceived disadvantages associated with cloud computing adoption amongst SMMEs. It should be noted that this pie chart stems from

question eleven (11) from the survey, which allowed respondents to tick multiple answers. Translating, it means that for example 44.1% of respondents only view internet availability as a significant disadvantage. Based on this understanding it becomes clear that 49 SMMEs representing 44.1% of the overall perceive the dependence on internet availability as significant disadvantage, followed by 34 SMMEs representing 30.6% of the overall who perceive uptime dependency from the service provider and the dependency on internet availability as significant disadvantages associated with cloud computing adoption from a SMME perspective.

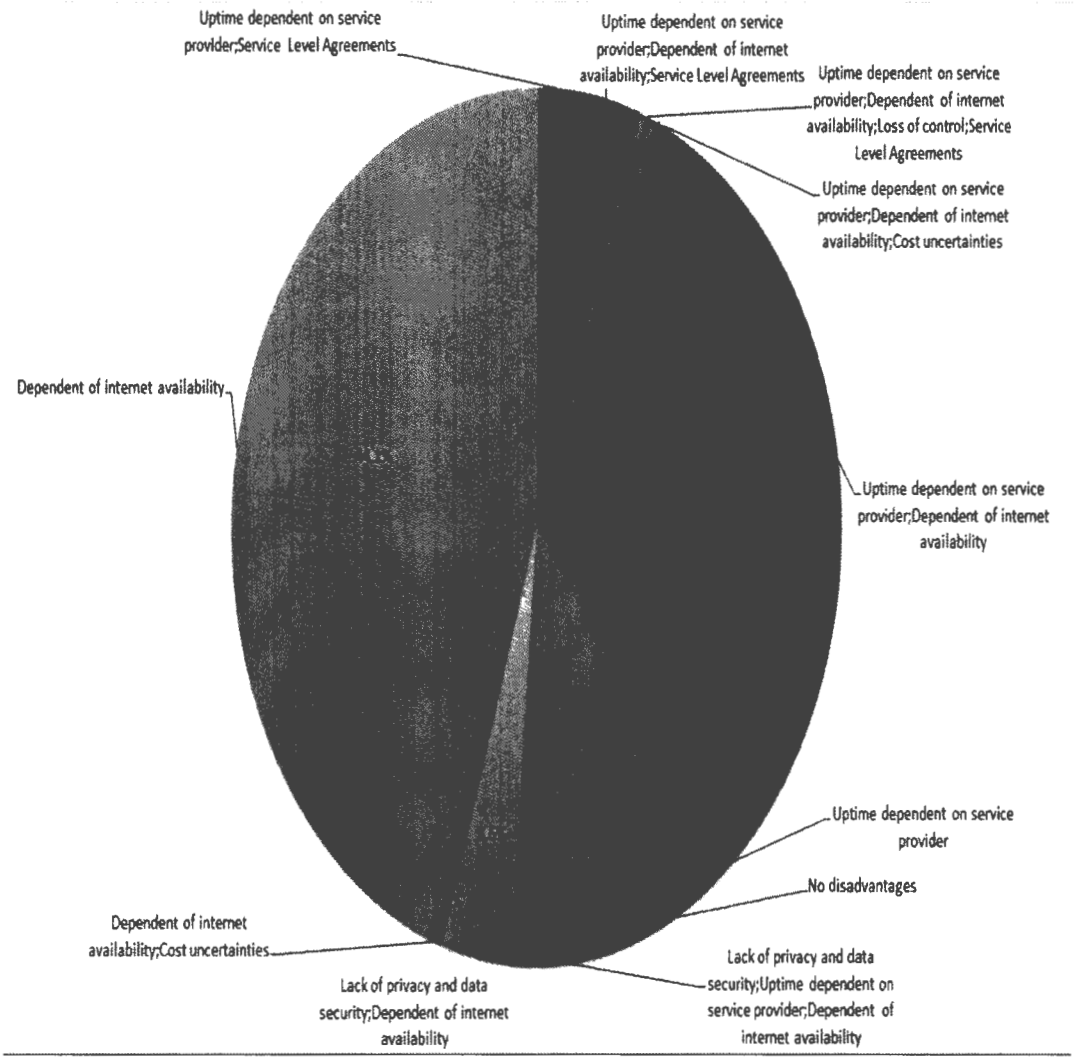


Figure 24 - Cloud computing disadvantages

4.3.1 Summary on cloud computing adoption

In this section of the study, the objective was to obtain a clear picture of the dynamics that underpin the perceptions of Small, Medium and Micro-sized Enterprises as they relate to their view on cloud computing and its inherent adoption. As such through the data obtained it became clear that 97% of SMMEs utilised Software-as-a-Service (SaaS) within them, whilst

an overwhelming majority of the respondents utilised email and the internet to underpin the SaaS model. The researcher further analysed the extent to which cloud computing services are used to support business operations within SMMEs. Through this analysis, it was found that 69% of SMMEs utilised cloud computing services to support business operations to a medium extent as outlined in Figure 21. In addition to that further analysis was done in analysing the extent to which cloud computing services are used to support management decision within SMMEs. As such it was found that 59% of SMMEs utilised cloud computing services in that way to a medium extent as well, as outlined in Figure 22.

In determining the cloud computing perceptions on the benefits attributable, 24.3% of SMMEs saw lower IT costs, simplicity and enhanced customer service as key factors for adoption. However disadvantages noted by SMMEs in relation to cloud computing adoption saw 44.1% of SMMEs viewing internet availability dependence as a factor, whilst 30.6% of SMMEs saw uptime dependency from the service provider and the dependency on internet availability as critical factors that dissuade the adoption of loud computing practices within SMMEs.

4.4 Constructs

In this section of the study the hypotheses outlined in Chapter 2 will be analysed. This study utilises the Conceptual Research Model based on the Technological-Organizational-Environmental framework as outlined in **Error! Reference source not found.**. This section of the hypothesis testing will be sub-divided into three (3) parts to accommodate the Technological, Organizational and Environmental aspects of the framework.

4.4.1 Technological context construct

This section of the study hypothesises that the technological context plays a positive pivotal role in the adoption of cloud computing services amongst SMMEs.

4.4.1.1 Relative advantage affects cloud computing adoption positively

In this section, an analysis into relative advantage was conducted by Questions 12 and 14 from the survey. A Likert scale was employed to assist in analysing this variable where Strongly Disagree was represented -2 and Strongly Agree represented by 2. Figure 25 indicates that 78% of SMMEs agree and 14% of SMMEs strongly agree that cloud computing services enable SMMEs to perform tasks more quickly and efficiently

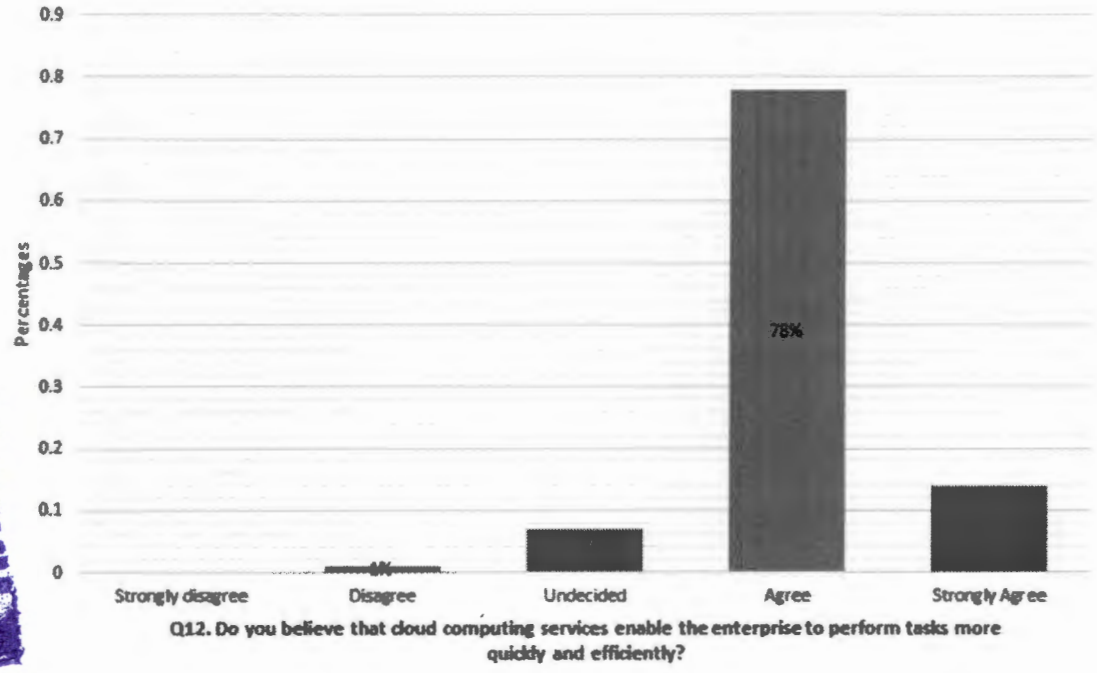


Figure 25 - Cloud computing services enabling SMMEs to perform tasks more quickly and efficiently

Figure 26 indicates that 62% of SMMEs agree and 27% of SMMEs strongly agree that cloud computing services contribute towards greater work productivity within SMMEs.

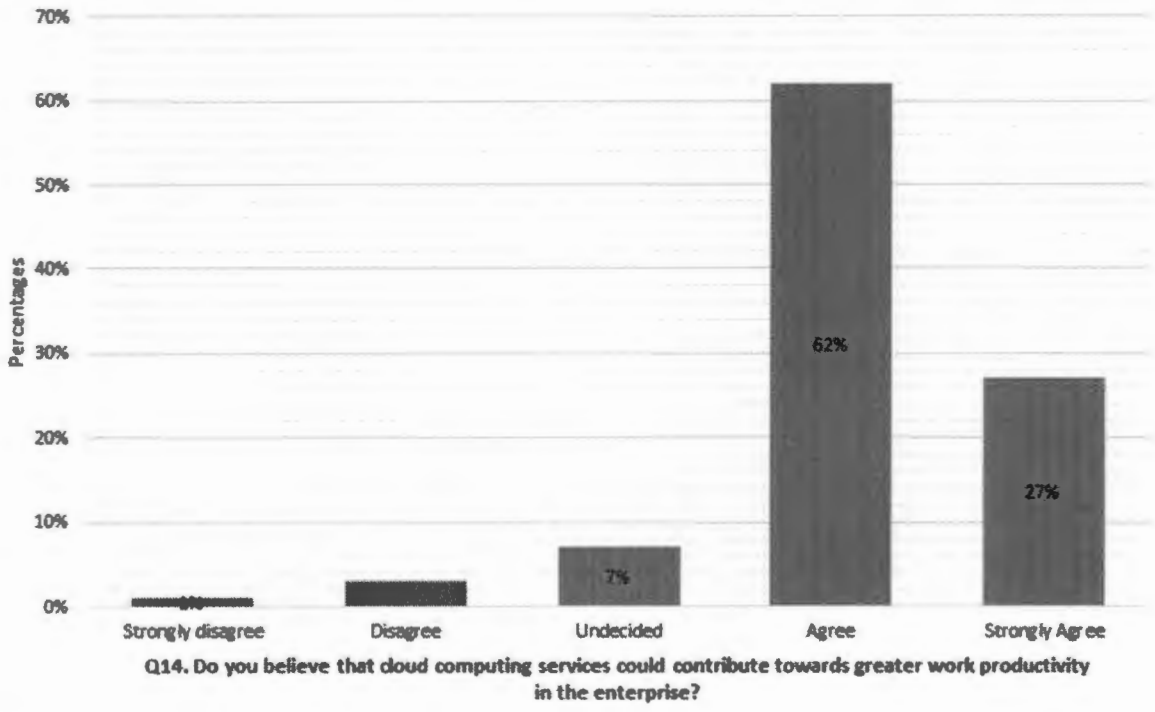


Figure 26 - Cloud computing services contributing towards greater work productivity within SMMEs

This is the first indication based on the data that this variable is supported and that relative advantage affects cloud computing adoption positively.

4.4.1.2 Complexity of cloud computing services affects cloud computing adoption negatively

In this section, an analysis into complexity was conducted by Question 15 from the survey. A Likert scale was employed to assist in analysing this variable where Strongly Disagree represented -2 and Strongly Agree represented by 2. Figure 27 outlines the frequency distribution on the variable for complexity, where cloud computing services are perceived to be difficult to understand and complex to implement.

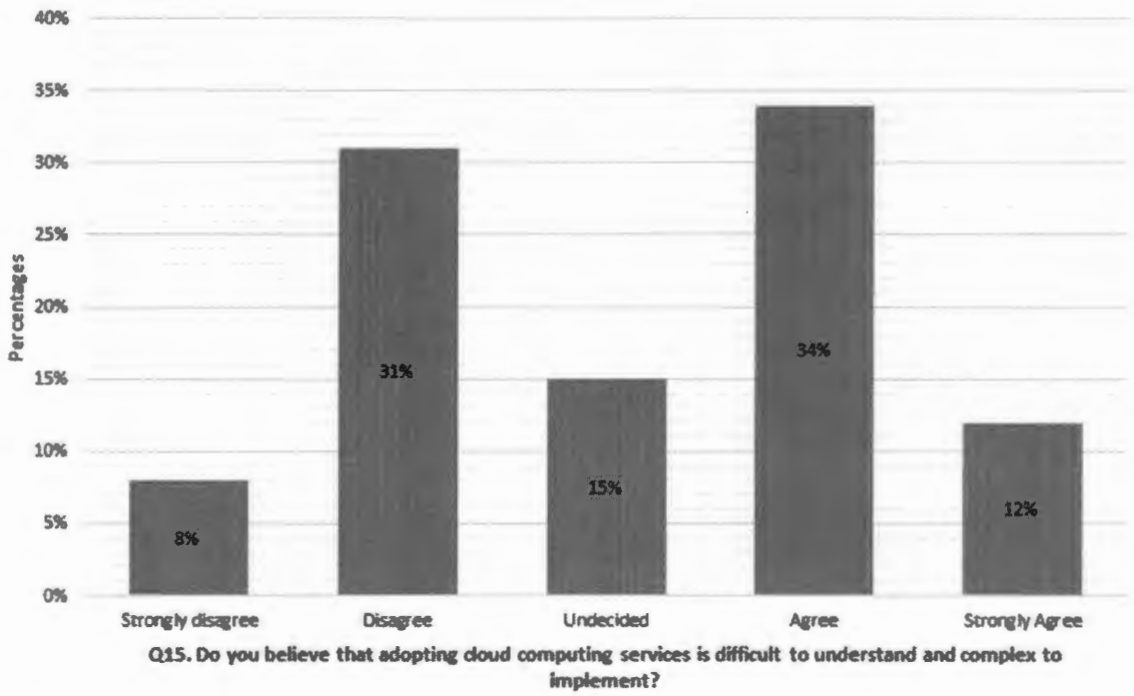


Figure 27 - Complexity variable

Figure 27 outlines the frequency distribution on complexity, where 31% of SMMEs disagree and 8% of SMMEs strongly disagree that cloud computing services being difficult to understand and complex to implement. This is coupled with 34% of SMMEs agreeing and 12% of SMMEs strongly agreeing that cloud computing services are difficult to understand and complex to implement. Based on the data, this is the first indication that this variable is supported and that complexity of cloud computing services affects cloud computing adoption negatively.

4.4.1.3 Compatibility issues affect cloud computing adoption positively

In this section, an analysis into compatibility was conducted by Questions 17 and 18 from the survey. A Likert scale was employed to assist in analysing this variable where Strongly Disagree was represented by -2 and Strongly Agree represented by 2. Figure 28 indicates that 65% of SMMEs agree and 18% of SMME strongly agree that cloud computing services would be compatible with existing Information Technology (IT) systems within the SMME.

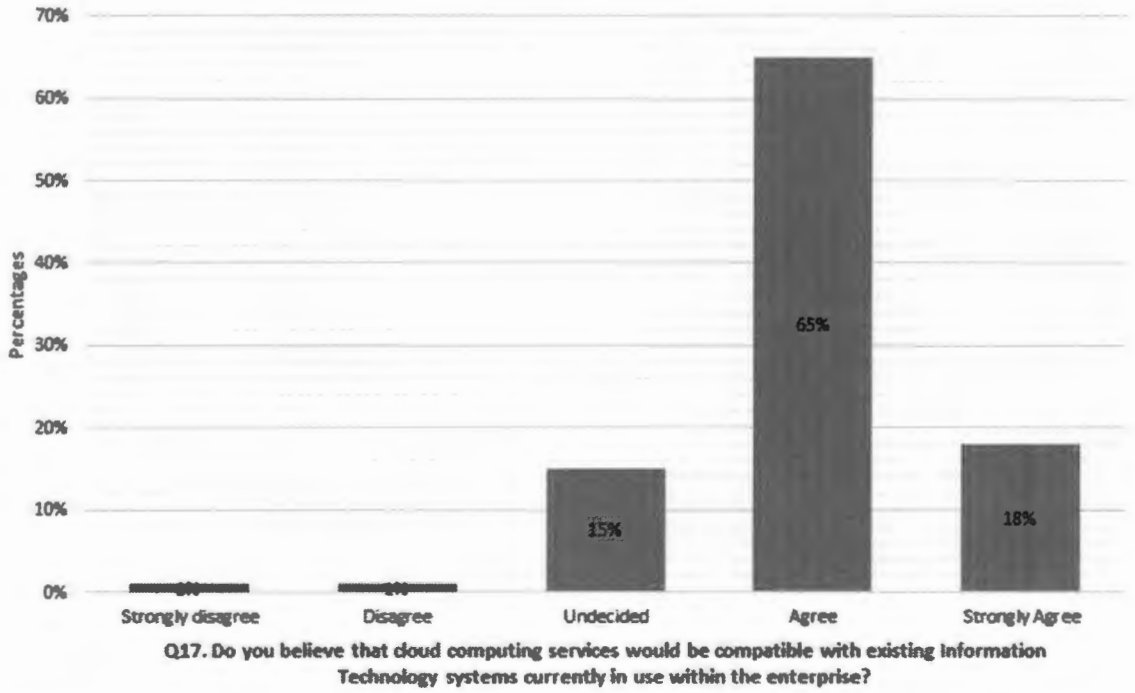


Figure 28 - Cloud computing services enabling compatibility amongst existing Information Technology systems

Figure 29 indicates that 60% of SMMEs agree and 36% of SMMEs strongly agree that they can find best-fit cloud computing solutions for their SMMEs.

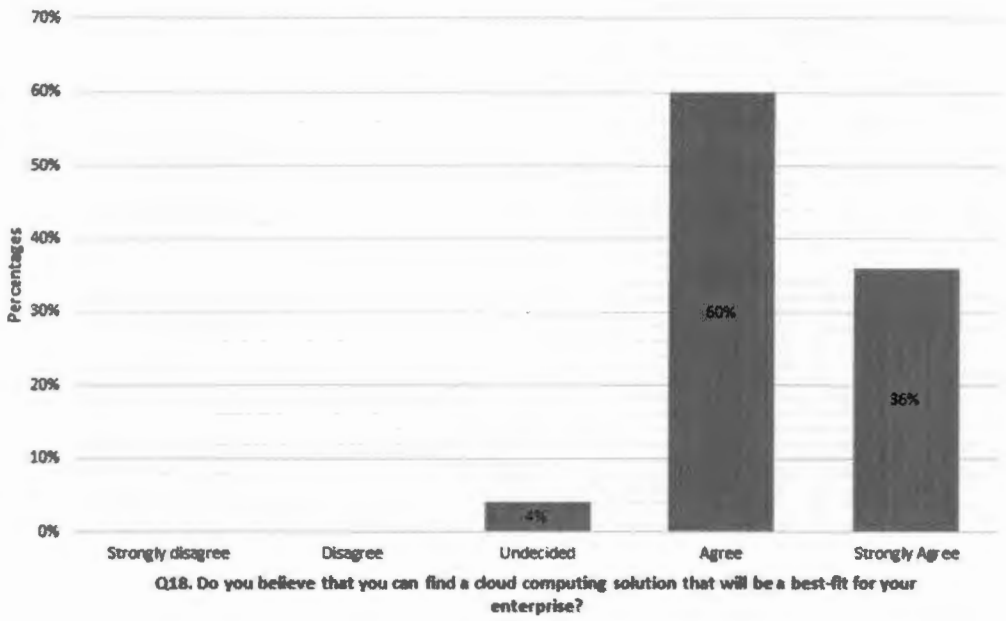


Figure 29 - Finding best-fit cloud computing solution for SMME

Based on the data, this is the first indication that this variable is supported, and that compatibility issues affect cloud computing adoption positively.

4.4.1.3 Security concern issues affect cloud computing adoption negatively

In this section, an analysis into the security concerns was conducted by Question 16 from the survey. A Likert scale was employed to assist in analysing this variable where Strongly Disagree represented -2 and Strongly Agree represented by 2.

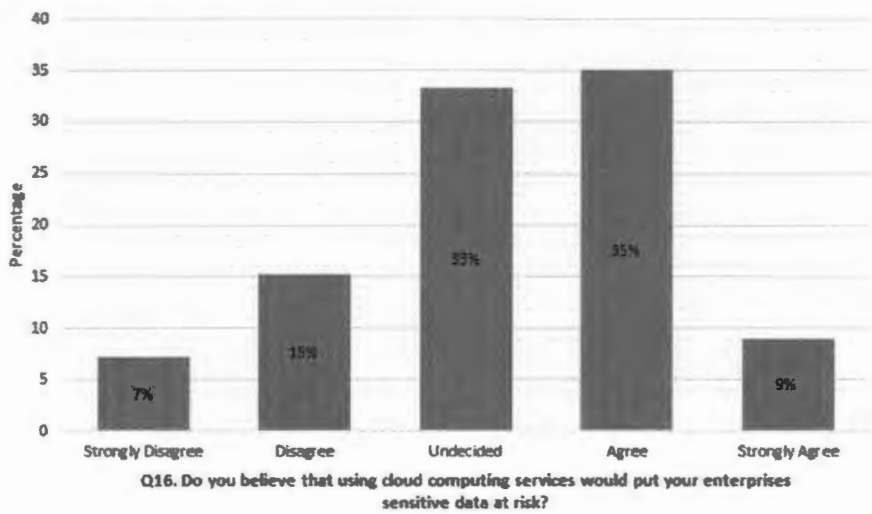


Figure 30 - Security concern variable

Figure 30 outlines the frequency distribution for security concerns, where 35% of SMMEs agree and 9% of SMMEs strongly agree that using cloud computing services would put the SMMEs sensitive data at risk. This is the first indication that the variable is supported, and that security concerns affect cloud computing adoption negatively.

4.4.1.3 Cost saving issues affect cloud computing adoption positively

In this section, an analysis into cost saving issues was conducted by Question 13 from the survey. A Likert scale was employed to assist in analysing this variable where Strongly Disagree is represented by -2 and Strongly Agree represented by 2.

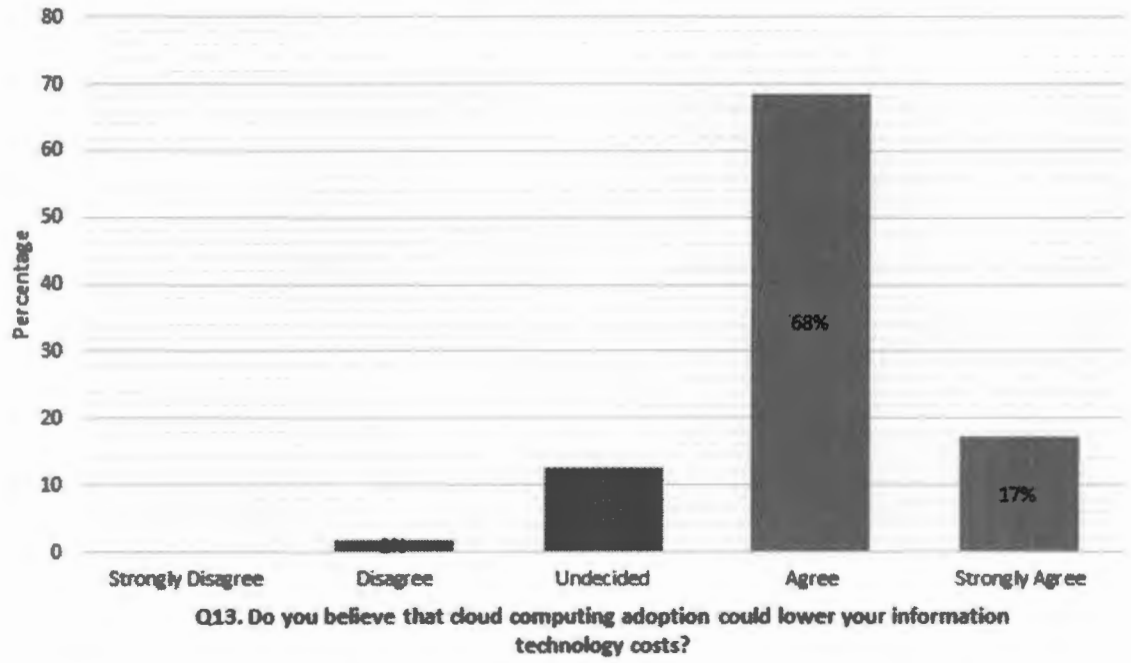


Figure 31 - Cost saving variable

Figure 31 outlines the frequency distribution for cost savings issues. As such 68% of SMMEs agree and 17% of SMMEs strongly agree that cloud computing adoption could lower information technology costs. This is the first indication that this variable is supported, and cost savings issues affect cloud computing adoption positively.

4.4.1.4 Bivariate correlation analysis on the technological construct

The technological construct posits that the technological context plays a pivotal role in the adoption of cloud computing services amongst SMMEs. This construct is supported by five (5) variables namely relative advantage, complexity, compatibility, security concerns and cost savings based on the data collected.

Table 4 outlines the correlation matrix for the technological construct. Here the variables are tested statistically to determine the strength of the linkage between them. The strength thereof is a single value between -1 and +1 expressed as the correlation coefficient (r).

		H1aRelativeAdvantage	H1bComplexity	H1cCompatability	H1dSecurityConcerns	H1eCostSavings
H1aRelativeAdvantage	Pearson Correlation	1	.177	.588**	-.098	.375**
	Sig. (2-tailed)		.063	.000	.305	.000
	N	111	111	111	111	111
H1bComplexity	Pearson Correlation	.177	1	.097	.239*	-.001
	Sig. (2-tailed)	.063		.313	.012	.989
	N	111	111	111	111	111
H1cCompatability	Pearson Correlation	.588**	.097	1	.025	.353**
	Sig. (2-tailed)	.000	.313		.793	.000
	N	111	111	111	111	111
H1dSecurityConcerns	Pearson Correlation	-.098	.239*	.025	1	-.003
	Sig. (2-tailed)	.305	.012	.793		.972
	N	111	111	111	111	111
H1eCostSavings	Pearson Correlation	.375**	-.001	.353**	-.003	1
	Sig. (2-tailed)	.000	.989	.000	.972	
	N	111	111	111	111	111
**. Correlation is significant at the 0.01 level (2-tailed).						
*. Correlation is significant at the 0.05 level (2-tailed).						

Table 4 - Correlation matrix for the technological construct

Based on Table 4, it is clear that there is a positive correlation between relative advantage and compatibility (r = 0.588), a positive correlation between relative advantage and cost savings (r = 0.375), a positive correlation between complexity and security concerns (r = 0.239) and a positive correlation between compatibility and cost savings (r = 0.353). Therefore the results demonstrate statistical significance between the variables in the technological context, which implies that we can reject the null hypothesis and conclude that the variables are positively and linearly associated.

4.4.2 Organizational context construct

This section of the study hypothesises that the organizational context plays a positive central role in the adoption of cloud computing services amongst SMMEs.

4.4.2.1 Top management support has a positive effect on cloud computing adoption

In this section, an analysis of top management support was conducted by Questions 19 and 20 from the survey. A Likert scale was employed to assist in analysing this variable where Strongly Disagree was represented by -2 and Strongly Agree was represented by 2.

Figure 32 indicates that 81% of SMMEs agree and 14% of SMMEs strongly agree that senior management does believe that cloud computing offers significant benefits to the SMME.

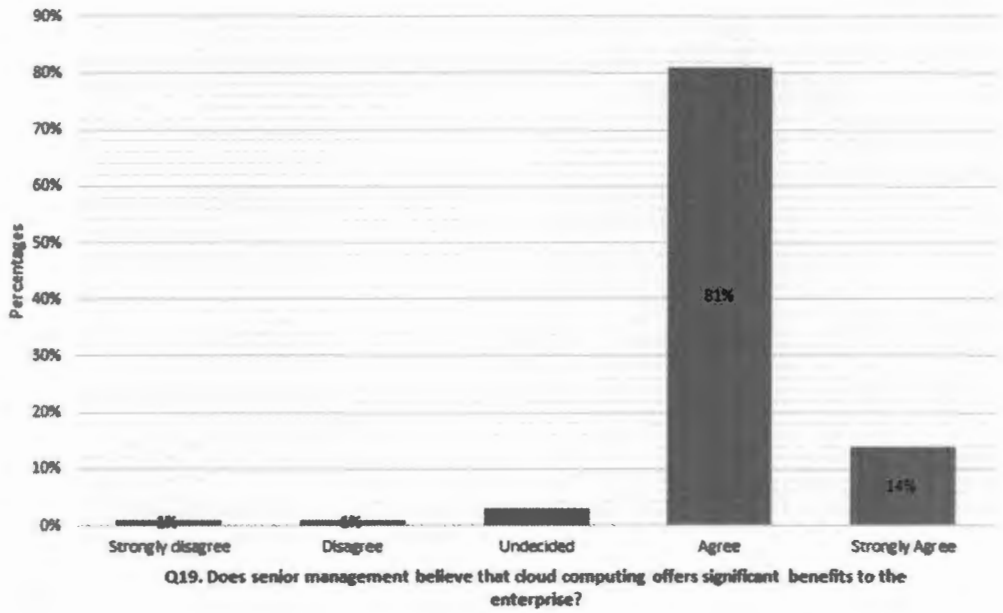


Figure 32 - Does senior management believe that cloud computing offers significant benefits to the SMME?

Figure 33 indicates 52% of SMMEs agree and 45% of SMMEs strongly agree that senior management should play a significant role in the selection, monitoring and evaluation processes of an adopted cloud computing solution.

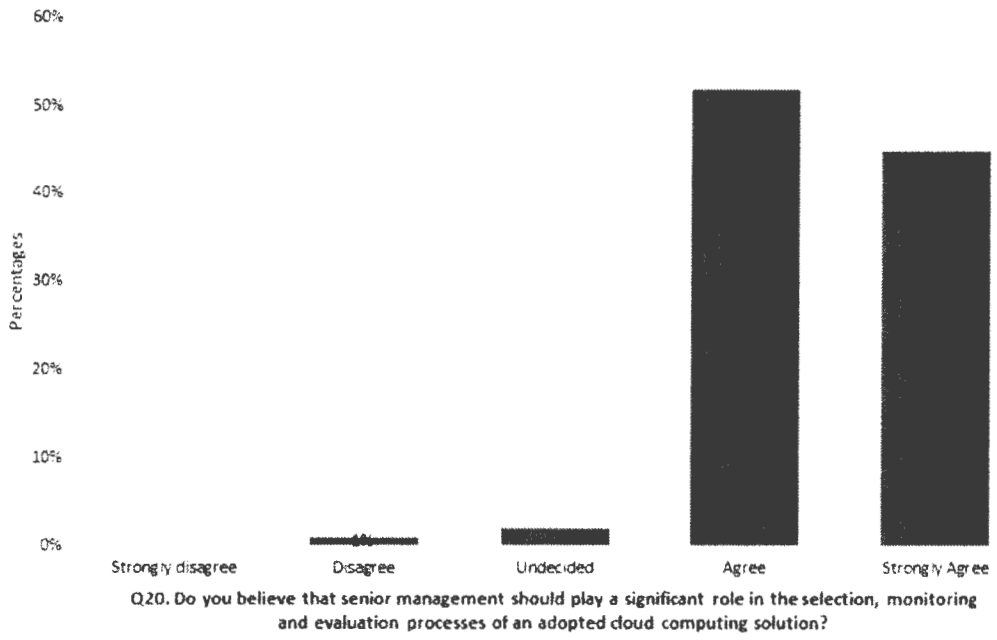


Figure 33 - Do you believe that senior management should play a significant role in the selection, monitoring and evaluation processes of an adopted cloud computing solution?

Based on the data, this is the first indication that this variable is supported, and that top management support has a positive effect on cloud adoption.

4.4.2.2 Firm size has a positive effect on cloud computing adoption

In this section, an analysis into firm size was conducted by Question 22 from the survey. A Likert scale was employed to assist in analysing this variable where Strongly Disagree was represented by -2 and Strongly Agree represented by 2.

Figure 34 outlines the frequency distribution of firm size, where it is perceived that firm size plays a significant role in the adoption of cloud computing services. Based on the data it is clear that 36% of SMMEs agree and 11% of SMMEs strongly agree that firm size plays a significant role in the adoption of cloud computing services within the SMME, as compared to 24% of SMMEs that disagree and 7% of SMMEs that strongly disagree that firm size plays a significant role in the adoption of cloud computing services within the SMME.

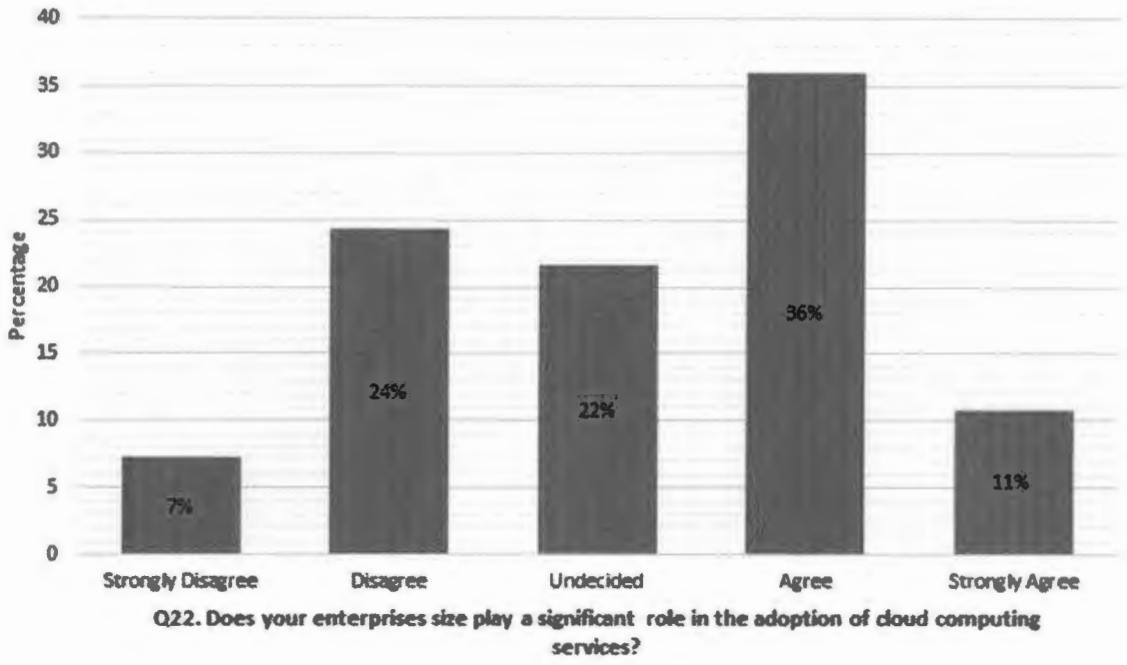


Figure 34 - Firm size variable

Based on the data, it is clear that this is the first indication that this variable is supported, and that firm size has a positive effect of cloud adoption.

4.4.2.3 Technology readiness has a positive effect on cloud computing adoption

In this section, an analysis of technology readiness was conducted by Questions 21 and 26 from the survey. A Likert scale was employed to assist in analysing this variable where Strongly Disagree was represented by -2 and Strongly Agree represented by 2. Figure 35 indicates that 73% of SMMEs agree and 12% of SMMEs strongly agree that their SMMEs have adequate technical support for using cloud computing services.

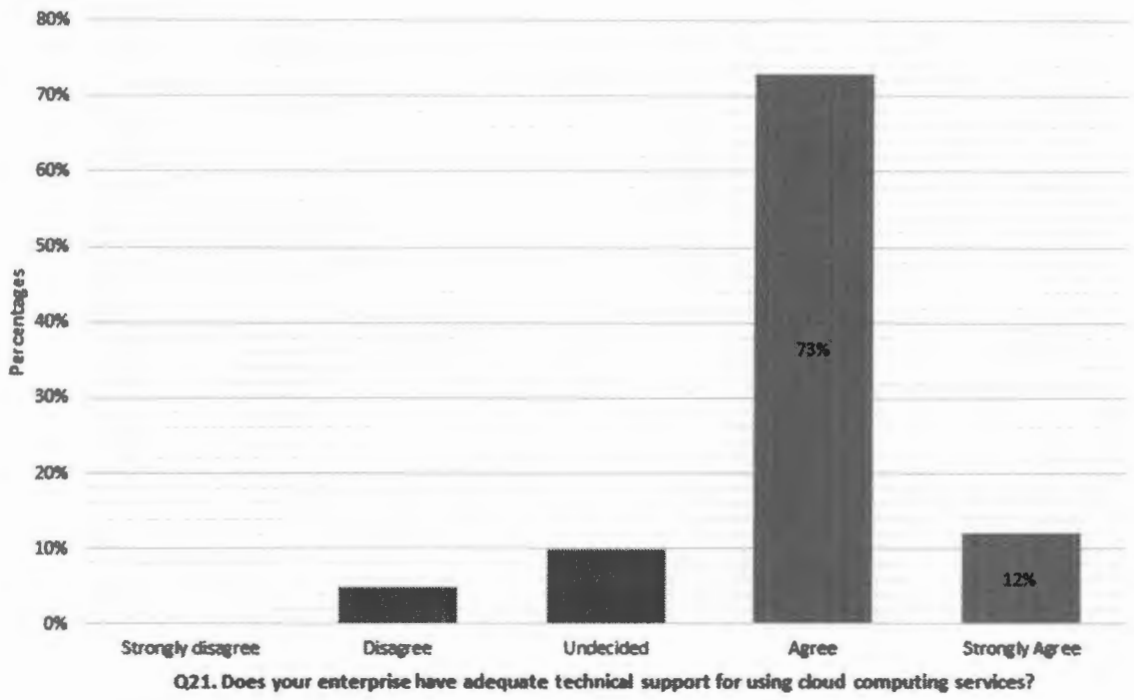


Figure 35 - Does your enterprise have adequate technical support for using cloud computing services?

Figure 36 indicates that 62% of SMMEs agree and 35% of SMMEs strongly agree that their SMMEs are technologically ready to adopt cloud computing services.

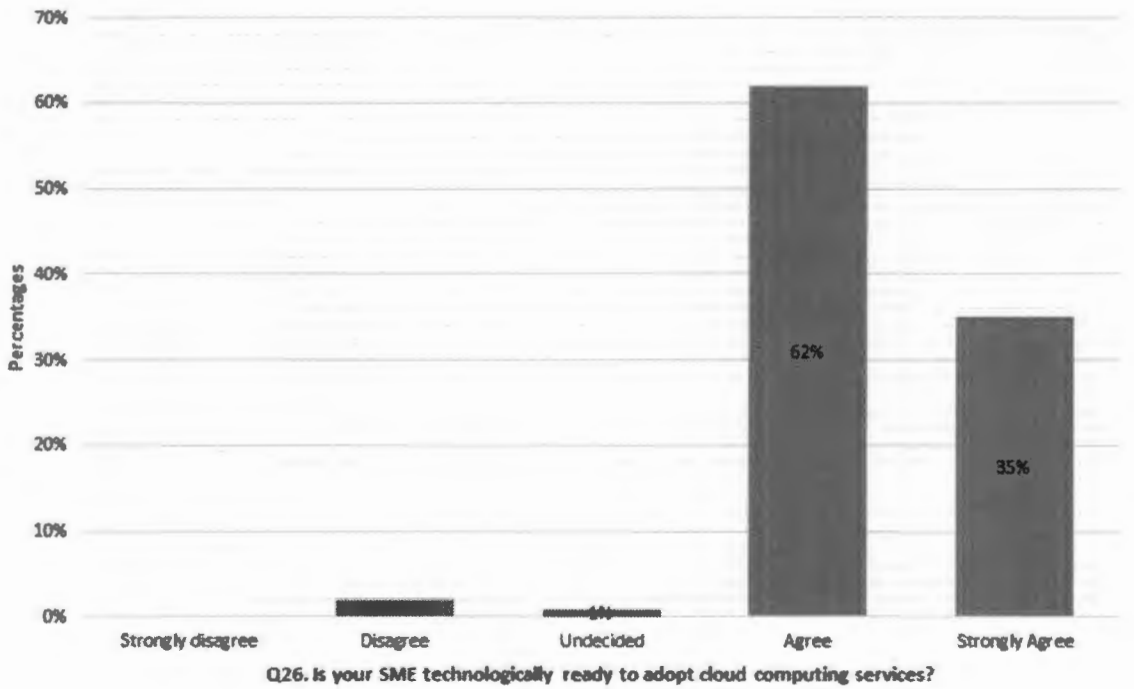


Figure 36 - Is your SME technologically ready to adopt cloud computing services?

Based on the data, it is clear that this is the first indication that this variable is supported, and that technological readiness has a positive effect on cloud computing adoption.

4.4.2.4 User satisfaction plays a significant positive role in cloud computing adoption

In this section, an analysis of user satisfaction was conducted by Questions 23 and 24 from the survey. A Likert scale was employed to assist in analysing this variable where Strongly Disagree was represented by -2 and Strongly Agree represented by 2.

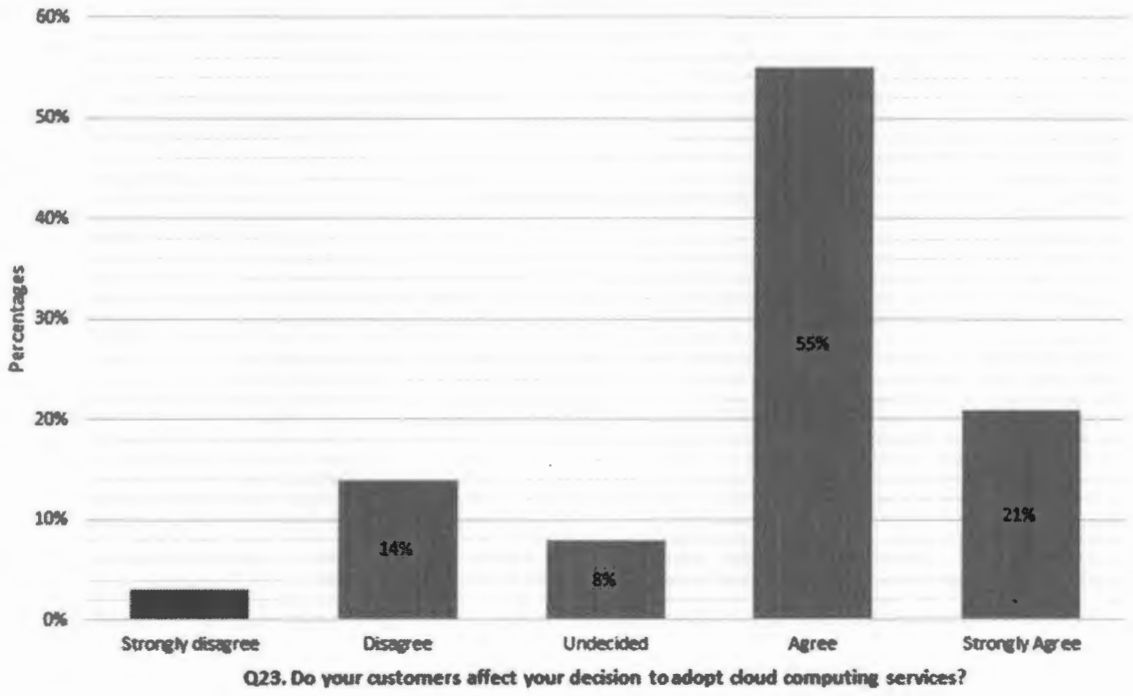


Figure 37 - Do your customers affect your decision to adopt cloud computing services?

Figure 37 indicates that 55% of SMMEs agree and 21% of SMMEs strongly agree that their customers affect their decision to adopt cloud computing services.

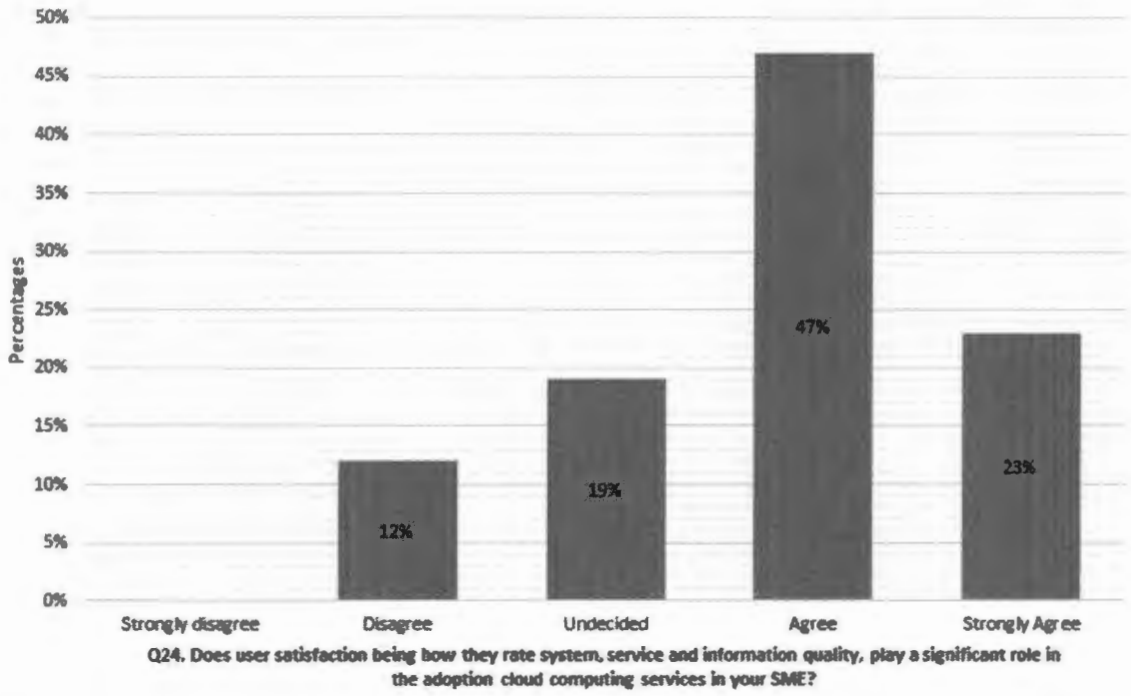


Figure 38 - Does user satisfaction being how they rate system, service and information quality, play a significant role in the adoption cloud computing services in your SME?

Figure 38 indicates that 47% of SMMEs agree and 23% of SMMEs strongly agree that user satisfaction plays a significant role in the adoption of cloud computing services within SMMEs.

Based on the data, it is clear that this is the first indication that this variable is supported, and that user satisfaction plays a significant positive role in cloud computing adoption.

4.4.2.5 Communication processes and channels influence cloud computing adoption positively

In this section, an analysis of communication processes was conducted by Question 25 from the survey. A Likert scale was employed to assist in analysing this variable where Strongly Disagree was represented by -2 and Strongly Agree represented by 2.

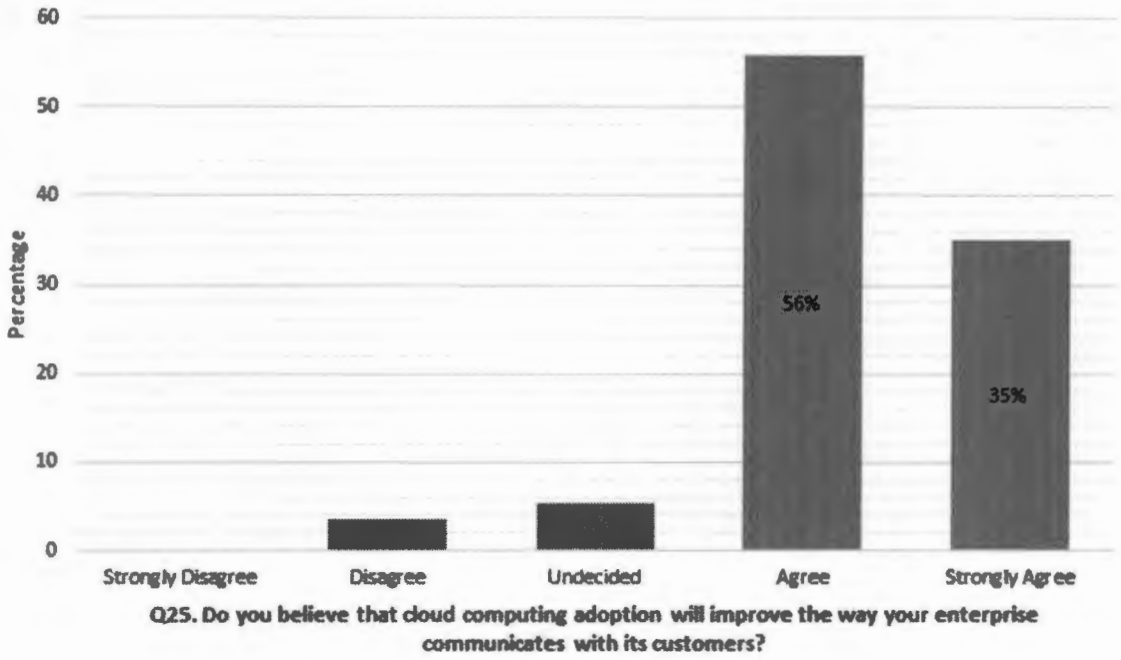


Figure 39 - Communication processes variable

Figure 39 outlines a frequency distribution for communication channels, where SMMEs where asked if whether or not they believed cloud computing adoption would improve the way the SMME communicates with its customers. From the data it became clear that 56% of SMMEs agreed and 35% of SMMEs strongly agreed that cloud computing adoption improves the way the SMME communicates with its customers. Based on this data, this is the first indication that this variable is supported, and that communication processes and channels influence cloud computing adoption positively.

4.4.2.6 Bivariate correlation analysis on the organizational construct

The organizational construct posits that the organizational context plays a central role in the adoption of cloud computing services amongst SMMEs. This construct is supported by five (5) variables, namely top management support, firm size, technology readiness, user satisfaction and communication processes and channels based on the data collected.

Table 5 outlines the correlation matrix for the organizational construct. Here the variables are tested statistically to determine the strength of the linkage between variables. The strength thereof is a single value between -1 and +1 expressed as the correlation coefficient (r).

		H2aTopManagmentSupport	H2bFirmSize	H2cTechnologyReadiness	H2dUserSatisfaction	H2eCommunicationProcess
H2aTopManagmentSupport	Pearson Correlation	1	.032	.451**	.165	.215*
	Sig. (2-tailed)		.739	.000	.084	.023
	N	111	111	111	111	111
H2bFirmSize	Pearson Correlation	.032	1	-.083	.190*	.149
	Sig. (2-tailed)	.739		.387	.046	.118
	N	111	111	111	111	111
H2cTechnologyReadiness	Pearson Correlation	.451**	-.083	1	.314**	.299**
	Sig. (2-tailed)	.000	.387		.001	.001
	N	111	111	111	111	111
H2dUserSatisfaction	Pearson Correlation	.165	.190*	.314**	1	.342**
	Sig. (2-tailed)	.084	.046	.001		.000
	N	111	111	111	111	111
H2eCommunicationProcess	Pearson Correlation	.215*	.149	.299**	.342**	1
	Sig. (2-tailed)	.023	.118	.001	.000	
	N	111	111	111	111	111
**. Correlation is significant at the 0.01 level (2-tailed).						
*. Correlation is significant at the 0.05 level (2-tailed).						

Table 5 - Correlation matrix for the organizational construct

Based on Table 5, it is clear that there is a positive correlation between top management support and technology readiness (r = 0.451), a positive correlation between top management and communication processes (r = 0.215), a positive correlation between firm size and user satisfaction (r = 0.190), a positive correlation between technology readiness and user satisfaction (r = 0.314), a positive correlation between technology readiness and communication processes (r = 0.299) and a positive correlation between user satisfaction and communication processes (r = 0.342). As such the results demonstrate statistical significance between the variables in the organizational context, which implies that we can reject the null hypothesis and conclude that the variables are positively and linearly associated.

4.4.3 Environmental context construct

This section of the study hypothesises that the environmental context plays a positive role in the adoption of cloud computing services.

4.4.3.1 Competitive pressure plays a positive role towards cloud computing adoption

In this section, an analysis of competitive pressure was conducted by Question 27 and 28 from the survey. A Likert scale was employed to assist in analysing this variable where Strongly Disagree was represented by -2 and Strongly Agree represented by 2.

Figure 40 indicates that 55% of SMMEs agree and 17% of SMMEs strongly agree that main competitors affect an SMME's decision to adopt cloud computing services.

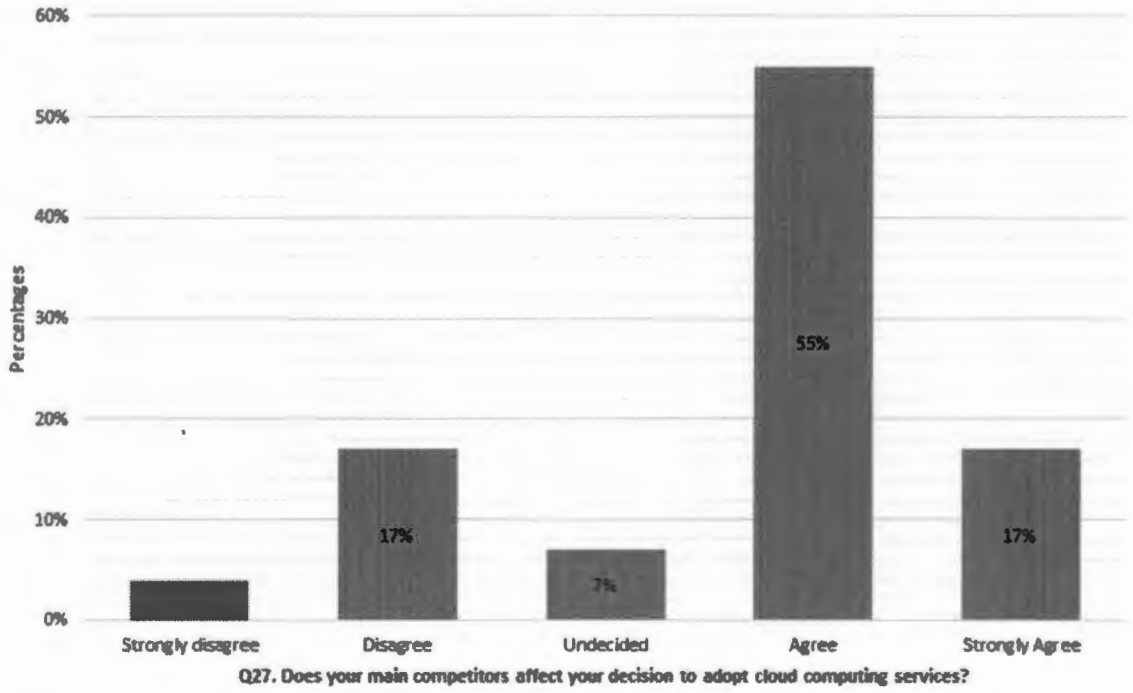


Figure 40 - Does your main competitors affect your decision to adopt cloud computing services?

Figure 41 indicates that 47% of SMMEs agree and 12% of SMMEs strongly agree that competitive conditions in their respective industries require them to use cloud computing services.

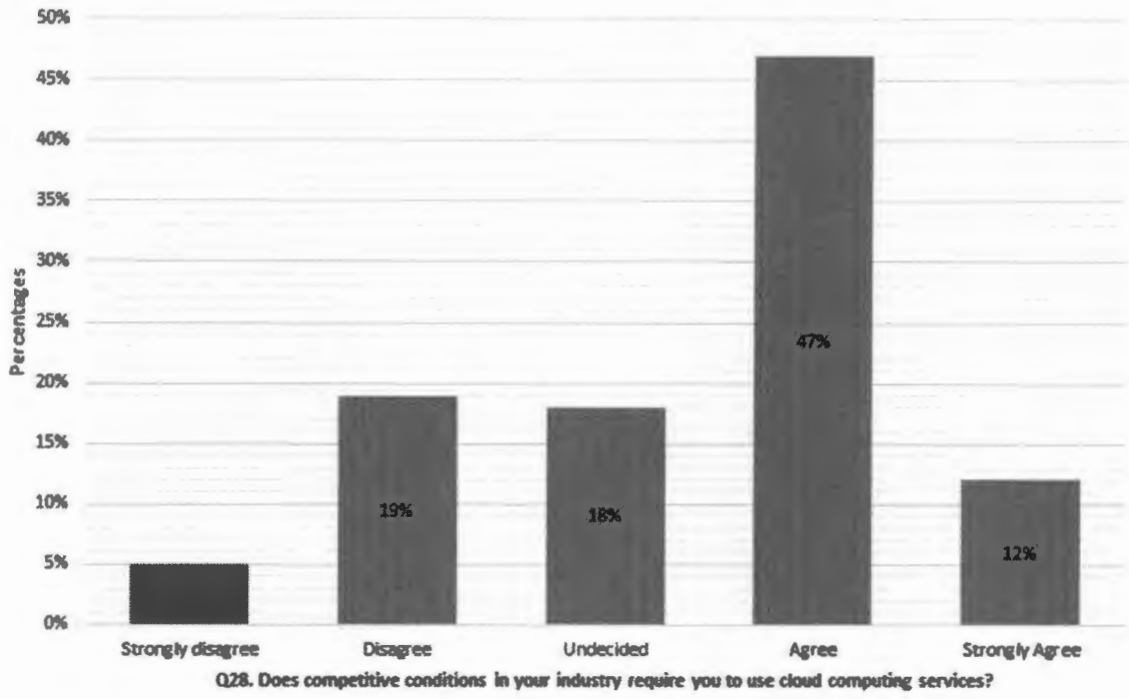


Figure 41 - Does competitive conditions in your industry require you to use cloud computing services?

This becomes the first indication that this variable is supported, and that competitive pressure plays a positive role towards cloud computing adoption.

4.4.3.2 Technology support infrastructure does not influence cloud computing adoption

In this section, an analysis of technology support infrastructure was conducted by Question 29 from the survey. Figure 42 outlines a frequency distribution for technology support infrastructure, where SMMEs were asked if whether or not they participated in professional bodies where they were exposed to cloud computing promotion, information and adoption.

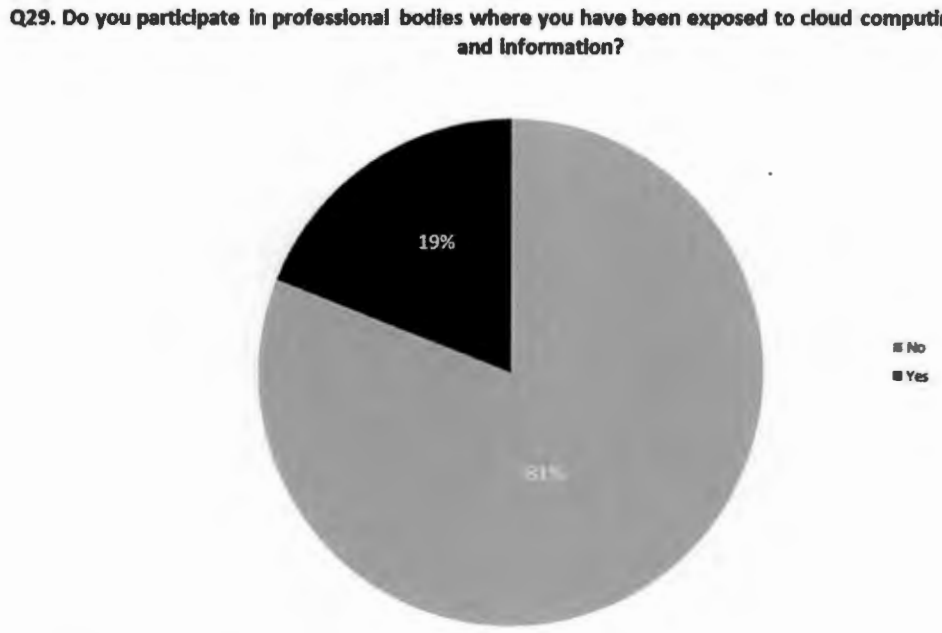


Figure 42 - Technology support infrastructure variable

81% of SMMEs said that they did not participate in any professional body that could have exposed them to cloud computing promotion, information and adoption. This is the first indication that this variable is supported, and that technology support infrastructure does not influence cloud computing adoption.

4.4.3.3 Trading partner pressure has a positive effect on cloud computing adoption

In this section, an analysis into trading partner pressure was conducted by Question 30 from the survey. A Likert scale was employed to assist in analysing this variable where Strongly Disagree was represented by -2 and Strongly Agree represented by 2.

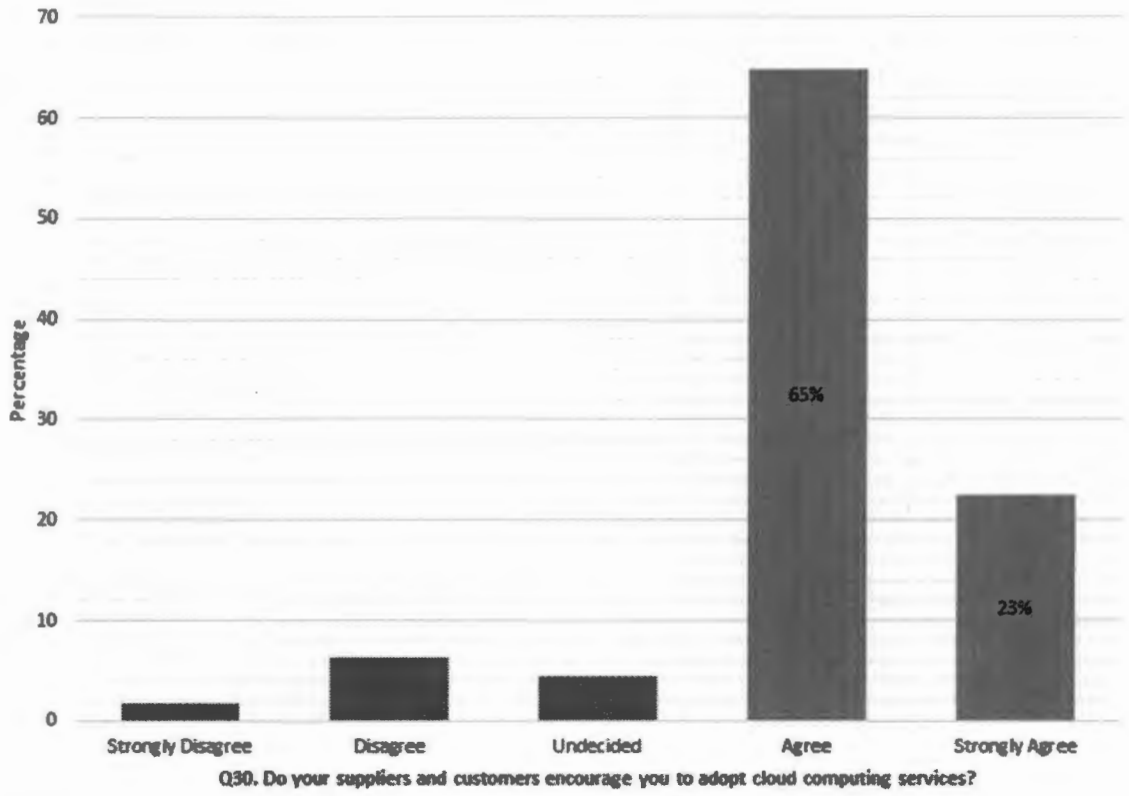


Figure 43 - Trading partner pressure variable

Figure 43 outlines a frequency distribution for trading partner pressure, where SMMEs were asked if whether or not supplier and customers encouraged them to adopt cloud computing services. 65% of SMMEs agreed and 23% of SMMEs strongly agreed that suppliers and customers do encourage them to adopt cloud computing services. This is the first indication that this variable is supported, and that trading partner pressure has a positive effect on cloud computing adoption.

4.4.3.4 Government regulation has a positive effect on cloud computing adoption

In this section, an analysis of government regulation was conducted by Question 31 from the survey. A Likert scale was employed to assist in analysing this variable where Strongly Disagree was represented by -2 and Strongly Agree represented by 2.

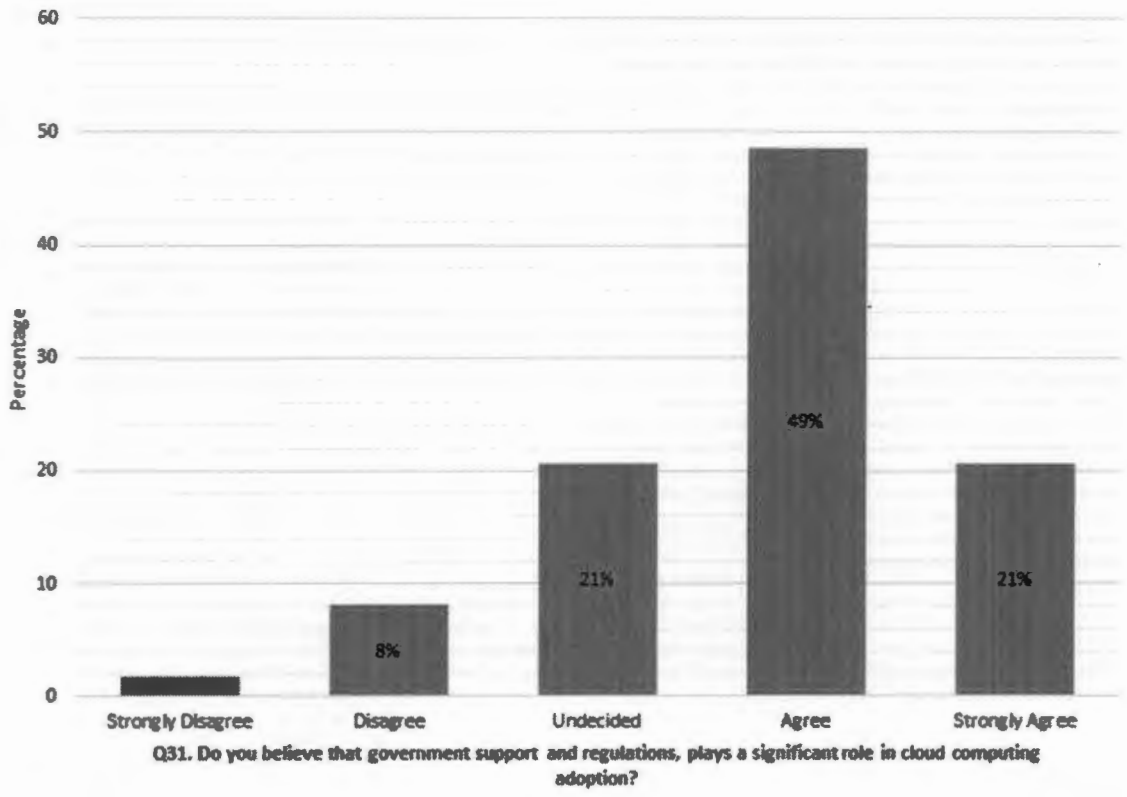


Figure 44 - Government regulation variable

Figure 44 outlines the frequency distribution for government regulations, where SMMEs were asked whether or not they believed that government support and regulations play a significant role in the adoption of cloud computing services. 49% of SMMEs agreed and 21% of SMMEs strongly agreed that government support and regulations played a significant role in the adoption of cloud computing services. This is a first indication that the hypothesis is supported, where government regulation has a positive effect on cloud computing adoption.

4.4.3.5 Bivariate correlation of the environmental construct

The environmental construct posits that the environmental context plays a positive role in the adoption of cloud computing services amongst SMMEs. This construct is supported by four (4) variables namely competitive pressure, technology support infrastructure, trading partner pressure and government regulation based on the data collected.

Table 6 outlines the correlation matrix for the environmental construct. Here the variables are tested statistically to determine the strength of the linkage between variables. The strength thereof is a single value between -1 and +1 expressed as the correlation coefficient (r).

		H3aCompetitivePressure	H3bTechnologySupportInfrustructure	H3cTradingPartnerPressure	H3dGovernmentRegulation
H3aCompetitivePressure	Pearson Correlation	1	.339**	.432**	.422**
	Sig. (2-tailed)		.000	.000	.000
	N	111	111	111	111
H3bTechnologySupportInfrustructure	Pearson Correlation	.339**	1	.250**	.138
	Sig. (2-tailed)	.000		.008	.149
	N	111	111	111	111
H3cTradingPartnerPressure	Pearson Correlation	.432**	.250**	1	.471**
	Sig. (2-tailed)	.000	.008		.000
	N	111	111	111	111
H3dGovernmentRegulation	Pearson Correlation	.422**	.138	.471**	1
	Sig. (2-tailed)	.000	.149	.000	
	N	111	111	111	111
**. Correlation is significant at the 0.01 level (2-tailed).					

Table 6 - Correlation matrix for the environmental construct

Based on Table 6, it is clear that there is a positive correlation between competitive pressure and technology support infrastructure (r = 0.339), a positive correlation between competitive pressure and trading partner pressure (r = 0.432), a positive correlation between competitive pressure and government regulations (r = 0.422), a positive correlation between technology support infrastructure and trading partner pressure (r = 0.250) and a positive correlation between trading partner pressure and government regulation (r = 0.471). Therefore the results demonstrate statistical significance between the variables in the environmental context, and implies that we can reject the null hypothesis and conclude that the variables are positively and linearly associated.

4.4.5 Regression analysis

The objective of this study, is generally to determine the likelihood of cloud computing adoption by Small, Medium and Micro-sized Enterprises (SMMEs) within the two identified regions/districts of the North West Province within the Republic of South Africa. Having conducted a bivariate correlation analysis into the variables associated with each context, the results posited that there was a positive linear correlation that existed between the variables associated with the technological, organizational and environmental contexts.

Therefore a regression test analysis will be conducted, where the control variables are SMME Size (Q2) and SMME Industry (Q3). These two (2) control variables will be computed to serve as dependent variables to test regression against the variables in the three (3) contexts which are independent variables.

4.4.5.1 Multiple regression analysis conclusion on hypothesis testing

Table 7 indicates that the linear regression test explains 47.7% of the variance in the overall data. In addition to this, the F-test in the linear regression indicated that there was a linear relationship between the variables with F = 2.023 and 110 degrees of freedom.

Model		Sum of Squares	Df	Mean Square	R	R^2	Adjusted R^2	F	Sig.
1	Regression	278.189	14	19.871	.477[a]	.228	.115	2.023	.024[b]
	Residual	942.910	96	9.822					
	Total	1221.099	110						

a. Dependent Variable: AdoptionIndustrySize

b. Predictors: (Constant), H3dGovernmentRegulation, H1dSecurityConcerns, H1aRelativeAdvantage, H3bTechnologySupportInfrustructure, H2bFirmSize, H1bComplexity, H2eCommunicationProcess, H1eCostSavings, H3cTradingPartnerPressure, H2dUserSatisfaction, H2aTopManagment, H2cTechnologyReadiness, H3aCompetitivePressure, H1cCompatability

Table 7 - ANOVA test

Table 8 outlines the multiple regression tests done to analyse the independent variables. The objective is establish the whether or not the independent variables significantly affect the likelihood of cloud computing adoption by SMMEs.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	6.182	1.470		4.206	.000
	H1aRelativeAdvantage	.884	.437	.262	2.022	.046
	H1bComplexity	.382	.295	.138	1.295	.198
	H1cCompatability	.200	.464	.063	.432	.667
	H1dSecurityConcerns	-.080	.321	-.025	-.250	.803
	H1eCostSavings	1.591	.566	.292	2.809	.006
	H2aTopManagment	-.180	.428	-.051	-.421	.675
	H2bFirmSize	-.132	.284	-.045	-.463	.645
	H2cTechnologyReadiness	-.319	.460	-.097	-.695	.489
	H2dUserSatisfaction	-.399	.253	-.195	-1.579	.118
	H2eCommunicationProcess	.406	.498	.086	.815	.417
	H3aCompetitivePressure	.144	.249	.081	.577	.565

	H3bTechnologySupportInfrustructure	-.346	.879	-.041	-.394	.695
	H3cTradingPartnerPressure	-.190	.446	-.047	-.427	.670
	H3dGovernmentRegulation	.195	.409	.054	.477	.634
a. Dependent Variable: AdoptionIndustrySize						

Table 8 - Coefficients test

4.4.5.2 Technological context regression

The technological construct posited that the technological context played a positive pivotal role in the adoption of cloud computing services amongst SMMEs. In order to conclude on the technological context, five (5) sub hypotheses need to be concluded upon as follows:

- H1 (a) – Relative advantage affects cloud computing adoption positively.

Table 8 indicated a positive and significant relationship between the relative advantage and cloud computing adoption ($\beta = 0.262$, $t = 2.022$, $p = 0.046$). Beta weights as such indicate that for every rise in relative advantage, cloud adoption rose on average by 0.262 units. As such the hypothesis is supported.

- H1 (b) – Complexity of cloud computing services affects cloud computing adoption negatively.

Table 8 indicated a positive and significant relationship between complexity and cloud computing adoption ($\beta = 0.138$, $t = 1.295$, $p = 0.198$). Beta weights as such indicate that for every rise in complexity, cloud adoption rose on average by 0.138 units. As such the hypothesis is supported.

- H1 (c) – Compatibility issues affect cloud computing adoption positively.

Table 8 indicated a positive and significant relationship between compatibility and cloud computing adoption ($\beta = 0.063$, $t = 0.432$, $p = 0.667$). Beta weights as such indicate that for every rise in compatibility, cloud adoption rose on average by 0.063 units. As such the hypothesis is supported.

- H1 (d) – Security concerns affect cloud computing adoption negatively

Table 8 indicated a negative relationship between security concerns and cloud computing adoption ($\beta = -0.025$, $t = -0.250$, $p = 0.803$). Beta weights as such indicate that for every decrease in security concerns, cloud adoption decreased on average by -0.025 units. As such the hypothesis is supported.

- H1 (e) – Cost savings affect cloud computing adoption positively

Table 8 indicated a positive and significant relationship between cost savings and cloud computing adoption ($\beta = 0.292$, $t = 2.809$, $p = 0.006$). Beta weights as such indicate that for every rise in cost savings, cloud adoption rose on average by 0.292 units. As such the hypothesis is supported.

Based on this, it is clear that hypothesis 1 is supported, and that the technological context plays a positive pivotal role in the adoption of cloud computing services amongst SMMEs in the Ngaka Modiri Molema and Bojanala Platinum Districts of the North West Province.

4.4.5.3 Organisational context regression

The organizational construct posited that the organisational context played a positive central role in the adoption of cloud computing services amongst SMMEs. As such in order to conclude on the organizational context, five (5) sub hypotheses need to be concluded upon as follows:

- H2 (a) - Top management has a positive effect on cloud computing adoption

Table 8 indicated a negative relationship between top management and cloud computing adoption ($\beta = -0.051$, $t = -0.421$, $p = 0.675$). As such the hypothesis is rejected.

- H2 (b) - Firm size has a positive effect on cloud computing adoption

Table 8 indicated a negative relationship between firm size and cloud computing adoption ($\beta = -0.045$, $t = -0.463$, $p = 0.645$). As such the hypothesis is rejected.

- H2 (c) - Technology readiness has a positive effect on cloud computing adoption

Table 8 indicated a negative relationship between technology readiness and cloud computing adoption ($\beta = -0.097$, $t = -0.695$, $p = 0.489$). As such the hypothesis is rejected.

- H2 (d) - User satisfaction plays a significant positive role in cloud computing adoption

Table 8 indicated a negative relationship between user satisfaction and cloud computing adoption ($\beta = -0.195$, $t = -1.579$, $p = 0.118$). As such the hypothesis is rejected.

- H2 (e) – Communication processes and channels influence cloud computing adoption positively

Table 8 indicated a positive and significant relationship between communication processes and channels with cloud computing adoption ($\beta = 0.086$, $t = 0.815$, $p = 0.417$). Beta weights as such indicate that for every rise in communication processes and channels, cloud adoption rose on average by 0.086 units. As such the hypothesis is supported.

Based on this, it is clear that hypothesis 2 is rejected, and that the organisational context does not play a positive central role in the adoption of cloud computing services amongst SMMEs in the Ngaka Modiri Molema and Bojanala Platinum Districts of the North West Province.

4.4.5.4 Environmental context regression

The environmental construct posited that the environmental context played a positive role in the adoption of cloud computing services amongst SMMEs. Therefore in order to conclude on the environmental context, four (4) sub hypotheses need to be concluded upon as follows:

- H3 (a) – Competitive pressure plays a positive role towards cloud computing adoption

Table 8 indicated a positive and significant relationship between competitive pressure and cloud computing adoption ($\beta = 0.081$, $t = 0.577$, $p = 0.565$). Beta weights as such indicate that for every rise in competitive pressure, cloud adoption rose on average by 0.081 units. As such the hypothesis is supported.

- H3 (b) - Technology support infrastructure does not influence cloud computing adoption

Table 8 indicated a negative relationship between technology support infrastructure and cloud computing adoption ($\beta = -0.041$, $t = -0.394$, $p = 0.695$). Beta weights as such indicate that for every decrease in technology support infrastructure, cloud adoption decreased on average by -0.041 units. As such the hypothesis is supported.

- H3 (c) - Trading partner pressure has a positive effect of cloud computing adoption

Table 8 indicated a negative relationship between trading partner pressure and cloud computing adoption ($\beta = -0.047$, $t = -0.427$, $p = 0.670$). As such the hypothesis is rejected.

- H3 (d) - Government regulation has a positive effect on cloud computing adoption

Table 8 indicated a positive and significant relationship between government regulation and cloud computing adoption ($\beta = 0.054$, $t = 0.477$, $p = 0.634$). Beta weights as such indicate that for every rise in government regulation, cloud adoption rose on average by 0.054 units. As such the hypothesis is supported.

Based on this, it is clear that hypothesis 3 is supported, and that the environmental context plays a positive role in the adoption of cloud computing services amongst SMMEs in the Ngaka Modiri Molema and Bojanala Platinum Districts of the North West Province.

4.4.6 Summary

In Chapter 4, the objective was to statistically analyse the data collected from the surveys distributed. Through this process, valuable insight was gained in understanding the views of SMMEs from two districts of the North West Province, and their attitudes towards cloud computing adoption. Moving forward, the Conceptual Research Model was evaluated, and the hypothesis tested by using multiple regression analysis. Out of the three hypotheses tested, hypothesis 1 (Technological context) and hypothesis 3 (Environmental context) were supported, whilst hypothesis 2 (Organizational context) was rejected.

Chapter 5 – Discussion and conclusion

5.1 Introduction

This study has investigated factors affecting adoption of cloud computing amongst Small, Medium and Micro-sized Enterprises (SMMEs) within the North West Province. In addition to this, the objective of the study has been to develop a cloud computing adoption model amongst SMMEs that is rooted in the Conceptual Research Model based on the Technology-Organization-Environment (TOE) framework. In this chapter, the findings that were obtained from analysing the Conceptual Research Model in Chapter 4 will be presented. This includes consolidating elements from Chapter 2 in order to provide a full conclusion on factors affecting cloud computing adoption amongst SMMEs in the Ngaka Modiri Molema and Bojanala Platinum Districts of the North West Province.

Thereafter an overview of the study will be conducted, where we re-visit the underlying research objectives of the study. Following this we will revisit the Conceptual Research Model based on the Technology-Organization-Environment (TOE) framework in order to contrast the model with the findings obtained from the study. Theoretical contributions made by the research in the field will be outlined and presented, and lastly limitations coupled with future space for research will be outlined.

5.2 Overview of the research

Cloud computing adoption is a critical element that ought to be entertained by Small, Medium and Micro-sized Enterprises (SMMEs), particularly those operating in the developing parts of world like the Republic of South Africa. Chapter 1 captures the essential need for SMMEs to adopt cloud computing practices, as a majority of these enterprises operating within the Republic of South Africa suffer from availability of general resources and skills (SEDA, 2016). As such the overall intention is to ensure that SMMEs, no matter how small or disadvantaged they may seem to be, are exposed to high end Information Technology (IT) services, by using cloud computing services (i.e. Software-as-a-Service (SaaS), Platform-as-a-Service (PaaS) and Infrastructure-as-a-Service (IaaS)) as a medium (Bellamy, 2014). Through this adoption, SMMEs are most likely bound to achieve greater success, through efficient business processes and functions. This will allow greater flexibility, accessibility, data security and cost savings adding towards the greater goals of achieving competitive advantage over industry peers (Mohlameane & Ruxwana, 2014).

This study as outlined in Chapter 1 roots itself within the Conceptual Research Model based on the Technology-Organization-Environment (TOE) framework. As such it comprises four (4) frameworks, where relevant attributes or variables were used to evaluate the effect of cloud computing adoption amongst SMMEs in the Ngaka Modiri Molema and Bojanala Platinum Districts of the North West Province. As such the Technological-Organizational-Environmental (TOE) framework, Technology Acceptance Model (TAM), Diffusion of Innovation (DOI) Theory and the DeLone & McLean IS Success Model were used to reinforce the Conceptual Research Model.

Chapter 2 reviewed extensively the various factors that affect cloud computing adoption amongst SMMEs. This stemmed from outlining in detail and contrasting cloud computing effects to the nature of Small, Medium and Micro-sized Enterprises (SMMEs) operating within the North West Province. The literature review, however, showed a wide range of research conducted to assess cloud computing amongst SMMEs worldwide. This is coupled with a small amount of research on cloud computing amongst SMMEs within the Republic of South Africa, coupled with little research analysing the North West Province context in relation to SMMEs.

An epistemological philosophy is utilised as outlined in Chapter 3 utilising a deductive approach. As such a survey constituted the mono-method research strategy that is strictly quantitative. This study is streamlined towards assessing the North West Province context, focusing on two regions or districts, namely the Ngaka Modiri Molema and Bojanala Platinum Districts. Three hundred and forty (340) surveys were distributed and only 111 were used to investigate factors affecting cloud computing adoption amongst SMMEs.

In order to assess the likelihood of cloud computing adoption amongst SMMEs, the study put forward three (3) hypotheses as outlined below:

- Hypothesis 1: The technological context plays a positive pivotal role in the adoption of cloud computing services amongst SMMEs.
    - H1 (a) – Relative advantage affects cloud computing adoption positively.
    - H1 (b) – Complexity of cloud computing services affects cloud computing adoption negatively.
    - H1 (c) – Compatibility issues affect cloud computing adoption positively.
    - H1 (d) – Security concerns affect cloud computing adoption negatively
    - H1 (e) – Cost savings affect cloud computing adoption positively

- Hypothesis 2: The organisational context plays a positive central role in the adoption of cloud computing services amongst SMMEs.
    - H2 (a) - Top management has a positive effect on cloud computing adoption
    - H2 (b) - Firm size has a positive effect on cloud computing adoption
    - H2 (c) - Technology readiness has a positive effect on cloud computing adoption
    - H2 (d) - User satisfaction plays a significant positive role in cloud computing adoption
    - H2 (e) – Communication processes and channels influence cloud computing adoption positively
- Hypothesis 3: The environmental context plays a positive role in the adoption of cloud computing services amongst SMMEs.
    - H3 (a) – Competitive pressure plays a positive role towards cloud computing adoption
    - H3 (b) - Technology support infrastructure does not influence cloud computing adoption
    - H3 (c) - Trading partner pressure has a positive effect of cloud computing adoption
    - H3 (d) - Government regulation has a positive effect on cloud computing adoption

Based on the above hypotheses, the task of proving each hypothesis was reliant on analysing the three constructs, these being the technological, organizational and environmental constructs. As such, five variables associated with the technological construct were relative advantage, complexity, compatibility, security concerns and cost savings. The general theme was to analyse the technological construct and its association with SMME cloud computing adoption. Five variables associated with the organizational construct were top management, firm size, technology readiness, user satisfaction and communication processes. The theme here was to analyse the organizational construct in its totality, and its effect on SMME cloud computing adoption. Lastly four variables associated with the environmental construct were competitive pressure, technology support infrastructure, trading partner pressure and government regulation. The general theme here was to analyse the environmental construct and its effect on cloud computing adoption on SMMEs.

In chapter 5 of this study, the objective was to statistically test the significance of the Conceptual Research Model on its ability to influence the likelihood of cloud computing

adoption amongst SMMEs. The sample that informed the study comprised 111 Small, Medium and Micro-sized Enterprises (SMMEs) from the Ngaka Modiri Molema and Bojanala Platinum Districts within the North West Province. From this, the first step was to test statistical significance by conducting bivariate correlations on the variables, and lastly to conduct regression test analysis.

5.3 Discussion

In this section on the study, we will discuss the results presented in Chapter 4 of this study. Here the technological, organizational and environmental constructs will be presented, and contrasted against the literature in Chapter 2.

5.3.1 Technological construct

The technological construct was outlined in detail in section 4.1.1 of the study; five variables were tested. Based on the relative advantage variable, the hypothesis in this relation, H1 (a) outlined in section 4.4.5.2 of this study, posited that relative advantage affected cloud computing adoption positively. As such respondents to a high degree believed that cloud computing enabled SMMEs to perform tasks more quickly and efficiently and in addition it contributed towards greater work productivity amongst SMMEs. The findings are as such in agreement with the hypothesis on the basis that a positive and significant relationship existed between relative advantage and cloud computing adoption.

Based on the complexity variable, the hypothesis in this relation, H1 (b) outlined in section 4.4.5.2 of this study, posited that complexity of cloud computing services affected cloud computing adoption negatively. As such, respondents to a high degree believed that cloud computing services are difficult to understand and complex to implement. The findings are in agreement with the hypothesis on the basis that a positive and significant relationship existed between complexity and cloud computing adoption.

Based on the compatibility variable, the hypothesis in this relation, H1 (c), outlined in section 4.4.5.2 of this study, posited that compatibility issues affected cloud computing adoption positively. As such respondents to a high degree believed that cloud computing services would be compatible with existing Information Technology (IT) systems currently in use within their SMMEs. In addition to that, a large percentage of respondents believed that they could find a best-fit cloud computing solution for their SMMEs. The findings are in agreement with the hypothesis on the basis that a positive and significant relationship exists between compatibility and cloud computing adoption.

Based on the security concern variable, the hypothesis in this relation, H1 (d), outlined in section 4.4.5.2 of this study, posited that security concerns affected cloud computing adoption negatively. As such respondents to a high degree believed that using cloud computing services would put the sensitive data of their SMME at risk. The findings are in agreement with the hypothesis on the basis that a negative and significant relationship exists between security concerns and cloud computing adoption.

Lastly with the cost saving variable, the hypothesis in this relation, H1 (e), outlined in section 4.4.5.2 of this study, posited that cost savings affected cloud computing adoption positively. As such, a large number of respondents believed that cloud computing adoption could lower their Information Technology (IT) costs. The findings are in agreement with the hypothesis on the basis that a positive and significant relationship exists between cost savings and cloud computing adoption.

Therefore the above observations are in line with prior studies on cloud computing adoption amongst SMMEs. A positive correlation between the variables was noted, and furthermore a regression test analysis revealed that a positive and significant relationship existed between the variables, and the control variable (cloud computing adoption) (Alshamaileh, 2013) (Powelson, 2009) (Alsanea, 2015) (Adam, 2015).

As such, hypothesis 1 is supported, and the technological context plays a positive pivotal role in the adoption of cloud computing services amongst SMMEs in the Ngaka Modiri Molema and Bojanala Platinum Districts of the North West Province

5.3.2 Organizational construct

The organizational construct was outlined in detail in section 4.4.2 of the study; five variables were tested. Based on the top management variable, the hypothesis in this relation, H2 (a), outlined in section 4.4.5.3 of this study, posited that top management has a positive effect on cloud computing adoption. As such respondents to a high degree believed that senior management believed that cloud computing offered significant benefits to the SMME. This is coupled with a large number of respondents believing that senior management should play a significant role in the selection, monitoring and evaluation processes of an adopted cloud computing solution. The findings are as such in disagreement with the hypothesis on the basis that a negative relationship exists between top management and cloud computing adoption.

Based on the firm size variable, the hypothesis in this relation, H2 (b), outlined in section 4.4.5.3 of this study, posited that firm size has a positive effect on cloud computing adoption.

As such respondents to a high degree believed that the size of an SMME played a significant role in the adoption of cloud computing services. The findings are in disagreement with the hypothesis on the basis that a negative relationship existed between firm size and cloud computing adoption.

Based on the technology readiness variable, the hypothesis in this relation, H2 (c), outlined in section 4.4.5.3 of this study, posited that technology readiness has a positive effect on cloud computing adoption. As such respondents to a high degree said that their SMMEs had adequate technical support for using cloud computing services. This is coupled with a large number of respondents saying that their SMMEs were technologically ready to adopt cloud computing services. The findings are in disagreement with the hypothesis on the basis that a negative relationship existed between technology readiness and cloud computing adoption.

Based on the user satisfaction variable, the hypothesis in this relation, H2 (d), outlined in section 4.4.5.3 of this study, posited that user satisfaction played a significant positive role in cloud computing adoption. Respondents to a high degree said that their customers affect their decision to adopt cloud computing services, and in addition to a high degree said that user satisfaction, being how they rated system, service and information quality, played a significant role in the adoption of cloud computing services amongst their SMMEs. The findings are in disagreement with the hypothesis on the basis that a negative relationship existed between user satisfaction and cloud computing adoption.

Lastly based on the communication process and channels variable, the hypothesis in this relation H2 (d) outlined in section 4.4.5.3 of this study, posited that communication processes and channels influence cloud computing adoption positively. To a high degree, respondents believed that cloud computing adoption would improve the way their SMME communicates with its customers. The findings are in agreement with the hypothesis on the basis that a positive and significant relationship existed between communication processes and channels, and cloud computing adoption.

The above observations are in line with prior studies on cloud computing adoption amongst SMMEs. A positive correlation between the variables was noted, and furthermore a regression test analysis revealed that a negative relationship existed between the variables, and the control variable (cloud computing adoption) (Alshamaileh, 2013) (Senarathna, 2016) (Al Isma'ili et al., 2016) (McKinnie, 2016). Therefore hypothesis 2 is rejected, and the organisational context does not play a positive central role in the adoption of cloud computing

services amongst SMMEs in the Ngaka Modiri Molema and Bojanala Platinum Districts of the North West Province.

5.3.3 Environmental construct

The environmental construct was outlined in detail in section 4.4.3 of the study; four variables were tested. Based on the competitive pressure variable, the hypothesis in this relation H3 (a) outlined in section 4.4.5.4 of this study, posited that competitive pressure plays a positive role towards cloud computing adoption. To a high degree respondents believed that main competitors affected their decision to adopt cloud computing services coupled with a high degree of respondents confirming that competitive conditions in their industries required SMMEs to use cloud computing services. The findings are in agreement with the hypothesis on the basis that a positive and significant relationship existed between competitive pressure and cloud computing adoption.

Based on the technology support infrastructure variable, the hypothesis in this relation H3 (b) outlined in section 4.4.5.4 of this study, posited that technology support infrastructure does not influence cloud computing adoption. A large number of respondents did not participate in professional bodies that could have exposed them to cloud computing promotion and information. The findings are in agreement with the hypothesis on the basis that a negative and significant relationship existed between technology support infrastructure and cloud computing adoption.

Based on the trading partner pressure variable, the hypothesis in this relation H3 (c) outlined in section 4.4.5.4 of this study, posited that trading partner pressure has a positive effect on cloud computing adoption. To a high degree respondents said that suppliers and customers encouraged them to adopt cloud computing services. The findings are in disagreement with the hypothesis on the basis that a negative relationship existed between trading partner pressure and cloud computing adoption.

Lastly, based on the government regulation variable, the hypothesis in this relation H3 (d) outlined in section 4.4.5.4 of this study, posited that government regulation has a positive effect on cloud computing adoption. Respondents believed that government support and regulations, played a significant role in cloud computing adoption amongst SMMEs. The findings are in agreement with the hypothesis on the basis that a positive and significant relationship existed between government regulations and cloud computing adoption.

The above observations are in line with prior studies on cloud computing adoption amongst SMMEs. A positive correlation between the variables was noted, and furthermore a regression test analysis revealed that a positive and significant relationship existed between the variables, and the control variable (cloud computing adoption) (Alshamaileh, 2013; Harfoushi et al., 2016; Kinuthia, 2014).

Therefore hypothesis 3 is supported, and the environmental context plays a positive role in the adoption of cloud computing services amongst SMMEs in the Ngaka Modiri Molema and Bojanala Platinum Districts of the North West Province.

5.4 Conclusions on research objectives, findings and results

In this section of the study, we shall outline a conclusion and summarise the findings of the study.

5.4.1 Research objective

The primary objective of this study is evaluating the benefits of cloud computing in Small, Medium and Micro-sized Enterprises (SMMEs) in the Ngaka Modiri Molema and Bojanala Platinum Districts of the North West Province. To achieve this objective, the following sub-objectives were used, namely:

- To understand the technological context's effect on cloud computing adoption amongst SMMEs.
- To understand the organizational context's effect on cloud computing adoption amongst SMMEs.
- To understand the environmental context's effect on cloud computing adoption amongst SMMEs.
- To develop a conceptual framework that will guide SMME owners on how to adopt cloud computing within their organizations

Therefore, in order to realise the sub-objectives, a Conceptual Research Model based on the Technology-Organization-Environment (TOE) framework was utilised, centred around three constructs, namely the technological, organizational and environmental constructs.

The data employed within this study was collected using Google Forms (an online survey system), and captured statistically using SPSS 24. In addition to this, the demographic statistics of the study, analysis of variance, correlations and regression tests, were conducted and presented in Chapter 4 of this study.

The objectives set out by the study were achieved, in that the data was analysed statistically. This was followed by an analysis of the constructs, and a detailed analysis of the variables within the constructs, where the technological, organizational and environmental constructs were tested against the likelihood to adopt cloud computing adoption amongst SMMEs. All the hypotheses outlined in section 2.7.6 of the study were tested, and presented in Chapter 4 of this study.

5.4.2 Research question

In this section of the study, we revisit the research questions outlined in Chapter 1 of this study. In order to answer the research questions, a survey was employed and distributed to participating SMMEs within the Ngaka Modiri Molema and Bojanala Platinum Districts of the North West Province. In addition to this, the data was presented statistically as outlined in Chapter 4 of the study using correlation and regression techniques.

The main research question as outlined in section 1.4 of the study was, "What are the main factors influencing the adoption of cloud computing services amongst SMMEs in districts of the North West Province?" In order to aid in answering this research question, sub-research questions were developed to assist in the process as outlined below:

- What is the technological context's effect on cloud computing adoption amongst SMMEs?
- What is the organizational context's effect on cloud computing adoption amongst SMMEs?
- What is the environmental context's effect on cloud computing adoption amongst SMMEs?

5.4.2.1 Research question one

What is the technological context's effect on cloud computing adoption amongst SMMEs?

This research question was answered using five variables as outlined in section 4.4.1 of the study. These variables include relative advantage (Figure 25 and Figure 26), complexity (Figure 27), compatibility (Figure 28 and Figure 29), security concerns (Figure 30) and cost savings (Figure 31). By analysing the technological construct, it is clear that the technological context has a positive effect on cloud computing adoption amongst SMMEs. This view is supported by the technological context regression outlined in section 4.4.5.2 of the study.

5.4.2.2 Research question two

What is the organizational context's effect on cloud computing adoption amongst SMMEs?

This research question was answered using five variables as outlined in section 4.4.2 of the study. These variables include top management support (Figure 32 and Figure 33), firm size (Figure 34), technology readiness (Figure 35 and Figure 36), user satisfaction (Figure 37 and Figure 38) and communication processes and channels (Figure 39). By analysing the organizational construct, it is clear that the organizational context has a negative effect on cloud computing adoption amongst SMMEs. This view is supported by the organizational context regression outlined in section 4.4.5.3 of the study.

5.4.2.3 Research question three

What is the environmental context's effect on cloud computing adoption amongst SMMEs?

This research question was answered using four variables as outlined in section 4.4.3 of the study. These variables include competitive pressure (Figure 40 and Figure 41), technology support infrastructure (Figure 42), trading partner pressure (Figure 43) and government regulation (Figure 44). By analysing the environmental construct, it is clear that the environmental context has a positive effect on cloud computing adoption amongst SMMEs. This view is supported by the environmental context regression outlined in section 4.4.5.4 of the study.

5.4.2.4 Research question summary

In order to answer the main research question of this study, three sub-research questions were developed to aid us in this process. Based on this, we now know that the technological context has a positive significant effect on the adoption of cloud computing practices amongst SMMEs in the Ngaka Modiri Molema and Bojanala Platinum Districts of the North West Province. In addition to this, an analysis of the organizational context revealed that the organizational context had a negative and non-significant effect on the adoption of cloud computing practices amongst SMMEs in the Ngaka Modiri Molema and Bojanala Platinum Districts of the North West Province. Lastly, an analysis of the environmental context revealed that the environmental context had a positive and significant effect on the adoption of cloud computing practices amongst SMMEs in the Ngaka Modiri Molema and Bojanala Platinum Districts of the North West Province. Therefore the main research question has been answered, based on this analysis.

5.5 Theoretical contributions

This study makes a significant contribution to the Information and Communications Technology (ICT) field, particularly on literature that informs the adoption of cloud computing practices amongst Small, Medium and Micro-sized Enterprises (SMMEs). In addition to this, the study utilised the Conceptual Research Model based on the Technological-Organisational-Environmental (TOE) framework, as the backbone of the research, which means that a significant contribution has been made in terms of how the conceptual framework can be utilised by SMMEs that seek to adopt ICT innovations. This study found that that the technological and environmental factors were significant, and affected cloud computing adoption positively. In addition, organizational factors were not significant and affected cloud computing adoption negatively. Despite there being various studies done throughout the world and within the Republic of South Africa on cloud computing adoption amongst SMMEs, this study contributes to the South African perspective in general, and within the North West Province in particular where only a few such studies have been commissioned to the best of our knowledge

As outlined above, various studies have been done on cloud computing adoption amongst SMMEs where pre- and post- adoption phases have been analysed extensively. In addition to this outlook, various researchers have investigated the effects of the various frameworks in use within this study on the adoption of innovations by organizations big and small e.g. (Gide & Sandu, 2015; Kumalo & van der Pol, 2015; Tjikongo & Uys, 2013) etc.

With this study however, the difference is with the attributes utilised, to analyse the independent variables technology, organization and environmental contexts and their overall relation to the dependent variable adoption. Lastly this research can be used by cloud service providers and Small, Medium and Micro-sized Enterprise (SMME) business owners in their pursuit of adopting cloud computing practices within the North West Province context.

5.6 Limitations

This study grows our insight on Information Technology (IT) innovations, and its impending adoption amongst SMMEs. Through the Conceptual Research Model, a framework has been established to guide SMMEs along their journey of cloud computing adoption. However despite the study satisfying its objectives, certain limitations ought to be recorded when translating its findings.

The study initially was set to investigate factors affecting cloud computing adoption amongst SMMEs in the North West Province. This means that the objective was to analyse Small, Medium and Micro-sized Enterprises (SMMEs) within the four districts of the North West Province namely Bojanala Platinum, Ngaka Modiri Molema, Dr Kenneth Kaunda and Dr Ruth Segomotsi Mompati Districts. However, due to funding constraints, only two districts/regions, namely the Ngaka Modiri Molema and Bojanala Platinum Districts, were used. In addition to that, 111 SMMEs out of an expected 340 were used to inform the study as a result of convenience sampling, where 72.1% of the SMMEs originated from the Bojanala Platinum District whilst 27.9% of the SMMEs originated from the Ngaka Modiri Molema District.

This means that the findings of this study cannot be generalised across all SMMEs in the two districts under review. As such with proper funding, an extensive sample size could be utilised spanning the four regions of the North West Province.

5.7 Future research and recommendations

Cloud computing is a recent phenomenon in the field of information systems. The concept is also new amongst Small, Medium and Micro-sized Enterprises (SMMEs) operating within the North West Province. This means that generally further research is required to analyse the effects of cloud computing adoption amongst SMMEs, by utilising a variety of information systems theories.

In addition to this, various attributes/variables and contexts could be utilised to further understand their relation to cloud computing adoption. These contexts could include the analysis of cultural and social aspects on adoption. Further research could include conducting similar research utilising other research philosophies, approaches, strategies and methods. Contributions to future studies could also involve the Conceptual Research Model based on the Technological-Organisational-Environmental (TOE) framework being used to assist research development on Information Technology (IT) innovations notwithstanding cloud computing adoption in developing countries in general, and in particular regions with the same characteristics as the North West Province within the Republic of South Africa and abroad.

The study found that top management, firm size, technology readiness and user satisfaction within the organizational context, were attributes that were not significant enough to affect the likelihood of cloud computing adoption amongst SMMEs. In addition to this the study found that trading partner pressure, an attribute associated to the environmental context, was also

not significant enough to affect the likelihood of cloud computing adoption amongst SMMEs. As such, this element contributes to future research, as other researchers can explore the Conceptual Research Model based on the Technology-Organization-Environment (TOE) framework to evaluate the organizational contexts relation to the adoption of cloud computing services amongst SMMEs.

The expected outcomes of this study are meant to bring a solution to a practical problem, in particular. This means that SMMEs in the North West Province are not discouraged from adopting cloud computing services due to a lack of appreciation and understanding. The solution as a result is to identify the benefits of cloud computing for SMMEs, and to outline adoption strategies/methods to assist wary entrepreneurs.

It is therefore expected that once SMME entrepreneurs have a full understanding of cloud computing services, more and more SMMEs will opt for service providers that provide Software as a Service (SaaS), Platform as a Service (PaaS) or Infrastructure as a Service (IaaS) solutions.

6 References

Adam, E., 2015. *Knowledge management cloud-based solutions in small enterprises.* Jonkoping International Business School.

Al Isma'ili, S., Li, M., Shen, J. & He, Q., 2016. Cloud computing adoption determinants: an analysis of Australian SMEs. *Pacific Asia Conference on Information Systems 2016 Proceedings*, pp.1-17.

Aliyu, A., Bello, M., Kasim, R. & Martin, D., 2014. Positivist and Non-Positivist Paradigm in Social Science Research: Conflicting Paradigms or Perfect Partners? *Journal of Management and Sustainability;*, 4(3).

Alsanea, M., 2015. *Factors Affecting the Adoption of Cloud Computing in Saudi Arabia's Government Sector.* University of London.

Alshamaila, Y. & Papagiannidis, S., 2012. Cloud computing adoption by SMEs in the north east of England: A multi-perspective framework. *Journal of Enterprise Information Management.*

Alshamaileh, Y., 2013. *AN EMPIRICAL INVESTIGATION OF FACTORS AFFECTING CLOUD COMPUTING ADOPTION AMONG SMEs IN THE NORTH EAST OF ENGLAND.* Newcastle University.

Ambrose, W., Dagland, N. & Athley, S., 2010. *Cloud Computing -Security Risks, SLA and Trust.* Jonkoping International Business School.

Anon., 2017. *Research Onion Diagram.* [Online] Available at: https://onion.derby.ac.uk/.

Apprenda, 2016. *IaaS, PaaS, SaaS (Explained and Compared).* [Online] Available at: https://apprenda.com/library/paas/iaas-paas-saas-explained-compared/.

Azorín, J. & Cameron, R., 2010. The Application of Mixed Methods in Organisational Research: A Literature Review. *Electronic Journal of Business Research Methods.*

Bassett, C., 2015. *Cloud computing and innovation: its viability, benefits, challenges and records management capabilities.* UNISA.

Bellamy, M., 2014. *Cloud computing in the Large Scale Organisation Potential benefits and overcoming barriers to deployment V1.1.* Imperial College London.

Bhattacharjee, R., 2009. *An Analysis of the Cloud Computing Platform.* Massachusetts Institute Of Technology.

Bieber, K., Grivas, S. & Giovanoli, C., 2015. Cloud Computing Business Case Framework: Introducing a Mixed-Model Business Case Framework for Small and Medium Enterprises to Determine the Value of Cloud Computing. *IEEE*, p.8.

Black, D., 2013. *Factors that lead to Successful Cloud Computing Adoption in Irish Small and Medium-sized Enterprises.* Liverpool John Moore's University.

Byrne , G., 2013. *Cloud Computing adoption and perceptions of its impact on business-IT alignment in large organisations operating in Ireland.* Liverpool John Moore's University.

Chiyangwa, T., 2014. *BELIEF AND ACTUAL BEHAVIOUR IN GREEN INFORMATION TECHNOLOGY WITHIN A SOUTH AFRICAN TERTIARY INSTITUTION.* UNIVERSITY OF SOUTH AFRICA.

Chovancová, E., L.Vokorokos, L. & Chovanec, M., 2015. Cloud computing system for small and medium corporations. *IEEE*, p.4.

Cloudcomputingwire, 2012. *Platform as a Service (PaaS) Providers.* [Online] Available at: https://www.slideshare.net/cloudcomputingwire/platform-as-a-service-paas-providers.

CSCC, 2014. *Practical Guide to Cloud Computing Version 2.0.* Cloud Standards Customer Council.

CSCC, 2017. *Making cloud standards customer driven.* [Online] Available at: www.cloud-council.org/about-us.htm.

Delgado, R., 2014. *Where will cloud computing be in 2020?* [Online] Available at: www.tech.co/will-cloud-computing-2020-2014-10.

Explorable, 2017. *Research Population.* [Online] Available at: https://explorable.com/research-population.

FEED, 2015. *Regional Economic Review. Current realities in the North West Province.* Finance, Economy and Enterprise Development (the FEED) North West Provincial Government.

Gide, E. & Sandu, R., 2015. A Study to Explore the Key Factors Impacting on Cloud Based Service Adoption in Indian SMEs. *IEEE*, p.6.

GoogleForms, 2017. *Google Forms.* [Online] Available at: https://www.google.com/forms/about/.

Gorelik, E., 2013. *Cloud Computing Models.* Massachusetts Institute of Technology.

Green, I., 2005. *THE EMANCIPATORY POTENTIAL OF A NEW INFORMATION SYSTEM AND ITS EFFECT ON TECHNOLOGY ACCEPTANCE.* University of Pretoria.

Gustafson, B. & Orrgren, A., 2012. *Cloud Computing. The Adoption of Cloud Computing for Small and Medium Enterprises.* Jonkoping International Business School.

Harfoushi, O. et al., 2016. Factors Affecting the Intention of Adopting Cloud Computing in Jordanian Hospitals. *Communications and Network*, pp.88-101.

Ilker, E., Sulaiman, A. & Rukayya, S., 2015. Comparison of Convenience Sampling and Purposive Sampling. *American Journal of Theoretical and Applied Statistics*, pp.1-4.

Khalid, A., 2010. Cloud Computing: Applying Issues in Small. *IEEE*, p.4.

Kinuthia, J., 2014. *Technological, Organizational, and Environmental Factors Affecting the Adoption of Cloud Enterprise Resource Planning (ERP) Systems*. Eastern Michigan University.

Korongo, J., Samoei, D. & Gichoya, D., 2013. Cloud Computing: An Emerging Trend for Small and Medium Enterprises. *IST-Africa 2013*.

Kumalo, N. & van der Poll , J., 2015. The Role of Cloud Computing in Addressing SME Challenges in South Africa. *IEEE*, p.9.

Larsen, K., Allen, G., Vance , A. & Eargle, D., 2015. *Welcome to the Theories Used in IS Research Wiki*. [Online] Available at: http://is.theorizeit.org/wiki/Main_Page [Accessed 28 February 2017].

Larsen, K., Allen, G., Vance, A. & Eargle, D., 2015. *Delone and McLean IS success model*. [Online] Available at: https://is.theorizeit.org/wiki/Delone_and_McLean_IS_success_model.

Larsen, K., Allen, G., Vance, A. & Eargle, D., 2015. *Technology acceptance model*. [Online] Available at: https://is.theorizeit.org/wiki/Technology_acceptance_model.

Larsen, K., Allen, G., Vance, A. & Eargle, D., 2015. *Technology-organization-environment framework*. [Online] Available at: https://is.theorizeit.org/wiki/Technology-organization-environment_framework.

Larsen, K., Allen, G., Vance, A. & Eargle, D., 2015. *Theories Used in IS Research Wiki*. [Online] Available at: http://is.theorizeit.org/wiki/Main_Page.

Larsen, K., Allen, G., Vance, A. & Eargle, D., 2015. *Welcome to the Theories Used in IS Research Wiki*. [Online] Available at: http://is.theorizeit.org/wiki/Main_Page [Accessed 15 September 2016].

Larsen, K., Allen, G., Vance, A. & Eargle, D., 2017. *Diffusion of innovations theory*. [Online] Available at: https://is.theorizeit.org/wiki/Diffusion_of_innovations_theory.

Masset, B. & Sekkat, I., 2011. *Implementation of Customer Relationship Management in the Cloud - The example of SMEs through a multiple case study analysis*. University of Halmstad.

McGilvary, A., 2014. *Ad hoc Cloud Computing*. University of Edinburgh.

McKinnie, M., 2016. *Cloud Computing: TOE Adoption Factors By Service Model In Manufacturing*. Georgia State University.

Mell, P. & Grance, T., 2011. The NIST Definition of Cloud Computing. *National Institute of Standards and Technology*, (Special Publication 800-145), p.7.

Menegaz, G., 2014. *The future of cloud computing: 5 predictions*. [Online] Available at: www.ibm.com/blogs/cloud-computing/2014/05/future-cloud-computing-5-predictions.

Mohlameane, M. & Ruxwana, N., 2014. The Awareness of Cloud Computing: A Case Study of South African SMEs. *International Journal of Trade, Economics and Finance, Vol. 5, No. 1*, p.6.

Murhula, S., 2015. *Understanding the Cloud Computing Stack: SaaS, PaaS, IaaS and Big Data*. [Online] Available at: https://www.linkedin.com/pulse/understanding-cloud-computing-stack-saas-paas-iaas-big-steven-murhula.

Muyengwa, G., Mukhuba, K., Battle, K. & Mbohwa, C., 2013. Barriers to Enterprise Development: The Case of SMMES Operating in the South African Motor Body Repair Sector. *International Conference on Law, Entrepreneurship and Industrial Engineering*.

Nkwinika, M. & Munzhedzi, P., 2016. The Role of Small Medium Enterprises in the Implementation of Local Economic Development in South Africa. *SAAPAM Limpopo*.

NWDC, 2015. *Economy, sector and investment overview of the North West Province of South Africa*.

NWU, 2016. *POLICY AND RULES FOR RESEARCH ETHICS*. NWU.

Oliveira, T. & Martins, M., 2011. Literature Review of Information Technology Adoption Models at Firm Level. *The Electronic Journal Information Systems Evaluation*.

Pallivathukal, J., 2016. *Adoption of Cloud Computing by SMEs in emerging markets (India)*. John Moores Liverpool University.

Pallivathukal, M., 2016. *Adoption of Cloud Computing by SMEs in emerging markets (India)*. John Moores Liverpool University.

Park, S., 2009. An Analysis of the Technology Acceptance Model in Understanding University Students' Behavioral Intention to Use e-Learning. *International Forum of Educational Technology & Society*.

Powelson, S., 2009. *An Examination of Small Businesses' Propensity to Adopt Cloud-Computing Innovation*. Walden University.

Ramothibe, L., 2012. *A Framework for Cloud Computing Readiness Assessment*. TSHWANE UNIVERSITY OF TECHNOLOGY.

Ramsaran, , 2014. *Cloud Computing: Benefits and Challenges*. [Online] Available at: http://transformcustomers.com/cloud-computing-benefits-and-challenges/.

Ray, D., 2016. Cloud Adoption Decisions: Benefitting from an Integrated Perspective. *The Electronic Journal Information Systems Evaluation*, pp.3-21.

Saedi, A. & Iahad, N., 2013. An Integrated Theoretical Framework for Cloud Computing Adoption by Small and Medium-Sized Enterprises. *Association for Information Systems*, p.12.

Saunders, M., Lewis, P. & Thornhill, A., 2005. *Research methods for business students fifth edition*. Harlow: Pearson Education Limited.

Saunders, M., Thornhill, A. & Lewis, P., 2009. Understanding research philosophies and approaches. In *Research Methods for Business Students*. Prentice Hall.

Schofeld, A., 2013. *Research Study on the Economic Impact of Cloud Services on South African SMMEs*. Joburg Centre for Software Engineering at Wits University.

Seda, 2012. *Analysis of the needs, state and performance of Small Medium Businesses in the Agriculture, Manufacturing, ICT and Tourism Sectors in South Africa*. Mthente Research and Consulting Services.

SEDA, 2016. *THE SMALL, MEDIUM AND MICRO ENTERPRISE SECTOR OF SOUTH AFRICA*. Bureau for economic research.

Seda, 2016. *THE SMALL, MEDIUM AND MICRO ENTERPRISE SECTOR OF SOUTH AFRICA*. Bereau for economic research.

SEDA, 2017. *SMME figures in North West*. Interview Report.

Senarathina, I., 2016. *Cloud Computing Adoption by SMEs in Australia*. Deakin Universit.

Senarathna, I., 2016. *Cloud Computing Adoption by SMEs in Australia*. Deakin University.

Shoniwa, R., 2016. *Exploring the Adoption of Cloud Computing as a Business Strategy: A Bulawayo Small to Medium Enterprises (SMEs) Study*. University of South Africa.

Sibanyoni, L., 2015. *Factors influencing cloud computing readiness in small and medium enterprises*. TSHWANE UNIVERSITY OF TECHNOLOGY.

TJIKONGO, R. & UYS, W., 2013. The viability of cloud computing adoption in SMME's in Namibia. *IEEE Conference Publications*, p.11.

Trivedi, H., 2013. *Cloud Computing Adoption Model for Governments and Large Enterprises*. MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

Trope, J., 2014. *ADOPTION OF CLOUD COMPUTING BY SOUTH AFRICAN FIRMS: AN INSTITUTIONAL THEORY AND DIFFUSION OF INNOVATION THEORY PERSPECTIVE*. University of Johannesburg.

Tweel, A., 2012. *Examining the Relationship between Technological, Organizational, and Environmental Factors and Cloud Computing Adoption*. Northcentral University.

Vaskovich, D., 2015. *Cloud Computing and Sensitive Data – A Case of Beneficial Co-Existence or Mutual Exclusiveness?* Stockholm: KTH.

Xi, L., 2014. *Readiness Assessment of Cloud-Computing Adoption within a Provincial Government of South Africa*. University of the Western Cape.

Xyfon, 2014. *What is SaaS, PaaS, and IaaS? [Part 4 of 6]*. [Online] Available at: http://xyfon.com/what-saas-paas-and-iaas-part-4-6/.

Young, D., 2015. *Improving the adoption of cloud computing by Small & Medium Scale Enterprises (SMEs) in Nigeria*. University of South Africa.

Zahoor, 2013. *A Technology Guide to Software as a Service (SaaS) Cloud Computing Series.* [Online] Available at: https://www.internetsearchinc.com/a-technology-guide-to-software-as-a-service-saas-cloud-computing-series/.

Zhu, K., Kraemer, K. & Xu, S., 2003. Electronic business adoption by European firms: A cross-country assessment of the facilitators and inhibitors. *European Journal of Information Systems*.

7 Appendix

7.1 Letter of consent

North West University

School of Economic Sciences

Dear Respondent,

Mcom – Information Systems and Computer Science

Evaluating the Benefits of Cloud Computing in Small, Medium and Micro-sized Enterprises (SMMEs) within the North West Province in South Africa.

Researcher: Phenyo Modisane (071 628 6374)

Supervisor: Dr Osden Jokonya (018 389 2853)

I, **Phenyo Modisane** a student at the Department of Information Systems, at NWU invites your SMME to participate in a research project entitled **Evaluating the Benefits of Cloud Computing in Small, Medium and Micro-sized Enterprises (SMMEs) within the North West Province in South Africa.** The aim of this study is to understand perceptions SMMEs have on cloud computing, and the impending adoption thereof.

Your participation in this project is voluntary. You may refuse to participate or withdraw from the project at any time with no negative consequence. There will be no monetary gain from participating in this survey. Confidentiality and anonymity of records identifying you as a participant will be maintained. If you have any questions or concerns about completing the questionnaire or about participating in this study, you may contact me or my supervisor at the numbers listed above.

The survey should take you about 15 minutes to complete. I hope you will take the time to complete this survey.

Sincerely

Researchers signature : 

Date : 2 July 2017

This page is to be retained by participant

Mcom – Information Systems and Computer Science

Evaluating the Benefits of Cloud Computing in Small, Medium and Micro-sized Enterprises (SMMEs) within the North West Province in South Africa

Researcher: Phenyo Modisane (071 628 6374)

Supervisor: Dr Osden Jokonya (018 389 2853)

CONSENT

I..... (Full names of participant) hereby confirm that I understand the contents of this document and the nature of the research project, and I consent to participating in the research project.

I understand that I am at liberty to withdraw from the project at any time, should I so desire.

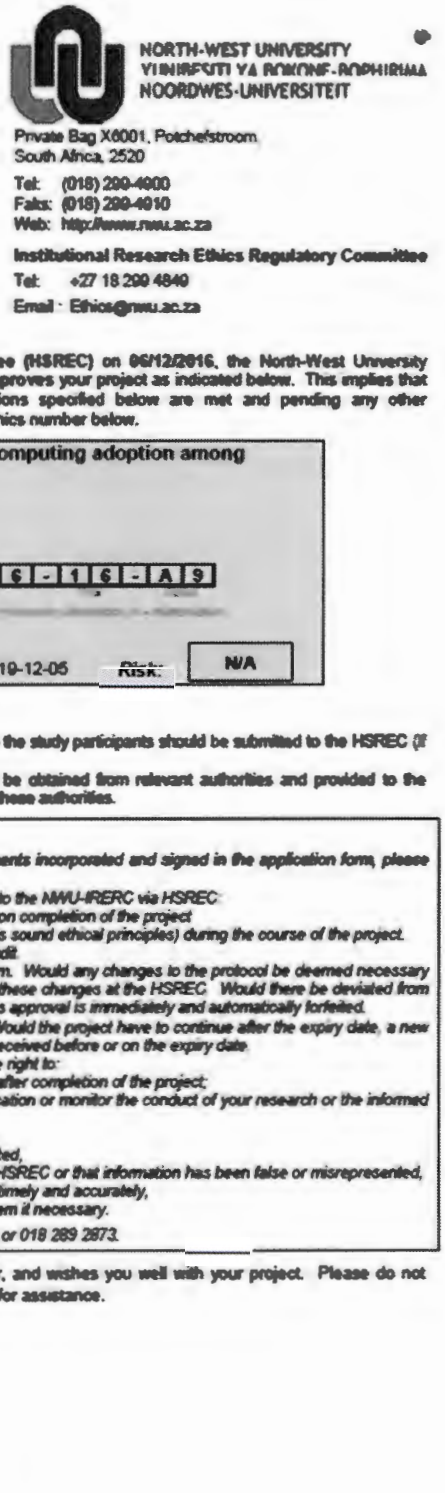
SIGNATURE OF PARTICIPANT

DATE

.....

This page is to be retained by researcher

7.2 Ethics approval certificate of project



NORTH-WEST UNIVERSITY
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT

Private Bag X6001, Potchefstroom
South Africa, 2520

Tel: (018) 299-4900
Faks: (018) 299-4910
Web: http://www.nwu.ac.za

Institutional Research Ethics Regulatory Committee
Tel: +27 18 299 4849
Email: Ethics@nwu.ac.za

ETHICS APPROVAL CERTIFICATE OF PROJECT

Based on approval by the Human Sciences Research Ethics Committee (HSREC) on 06/12/2016, the North-West University Institutional Research Ethics Regulatory Committee (NWU-IRERC) hereby approves your project as indicated below. This implies that the NWU-IRERC grants its permission that, provided the special conditions specified below are met and pending any other authorisation that may be necessary, the project may be initiated, using the ethics number below.

Project title: Investigating factors affecting cloud computing adoption among SMME's in the North West Province.

Project Leader/Supervisor: Dr O Jokonya
Student: PB Modisane

Ethics number: NWU-00556-16-A9

Application Type: Master application
Commencement date: 2016-12-06 Expiry date: 2019-12-05 Risk: N/A

Special conditions of the approval (if applicable):

- Translation of the informed consent document to the languages applicable to the study participants should be submitted to the HSREC (if applicable).
- Any research at governmental or private institutions, permission must still be obtained from relevant authorities and provided to the HSREC. Ethics approval is required BEFORE approval can be obtained from these authorities.

General conditions:

While this ethics approval is subject to all declarations, undertakings and agreements incorporated and signed in the application form, please note the following:

- *The project leader (principle investigator) must report in the prescribed format to the NWU-IRERC via HSREC:*
  - *annually (or as otherwise requested) on the progress of the project, and upon completion of the project*
  - *without any delay in case of any adverse event (or any matter that interrupts sound ethical principles) during the course of the project.*
  - *Annually a number of projects may be randomly selected for an external audit.*
- *The approval applies strictly to the protocol as stipulated in the application form. Would any changes to the protocol be deemed necessary during the course of the project, the project leader must apply for approval of these changes at the HSREC. Would there be deviated from the project protocol without the necessary approval of such changes, the ethics approval is immediately and automatically forfeited.*
- *The date of approval indicates the first date that the project may be started. Would the project have to continue after the expiry date, a new application must be made to the NWU-IRERC via HSREC and new approval received before or on the expiry date.*
- *In the interest of ethical responsibility the NWU-IRERC and HSREC retains the right to:*
  - *request access to any information or data at any time during the course or after completion of the project;*
  - *to ask further questions, seek additional information, require further modification or monitor the conduct of your research or the informed consent process.*
  - *withdraw or postpone approval if:*
    - *any unethical principles or practices of the project are revealed or suspected,*
    - *it becomes apparent that any relevant information was withheld from the HSREC or that information has been false or misrepresented,*
    - *the required annual report and reporting of adverse events was not done timely and accurately,*
    - *new institutional rules, national legislation or international conventions deem it necessary.*
- *HSREC can be contacted for further information via Estie.Emtoch@nwu.ac.za or 018 299 2873.*

The IRERC would like to remain at your service as scientist and researcher, and wishes you well with your project. Please do not hesitate to contact the IRERC or HSREC for any further enquiries or requests for assistance.

Yours sincerely

Linda du Plessis

Digitally signed by Linda du Plessis
DN: cn=Linda du Plessis, o=NWU, ou=Vaal Triangle Campus, email=linda.duplessis@nwu.ac.za, c=ZA
Date: 2016.12.13 17:48:14 +02'00'

Prof Linda du Plessis
Chair NWU Institutional Research Ethics Regulatory Committee (IRERC)

Figure 45 - Ethics approval certificate of project

7.3 Turnitin (Plagiarism report)

Phenyo_Investigating_factors_1.doc

ORIGINALITY REPORT

13%	12%	6%	5%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	researchspace.ukzn.ac.za Internet Source	1%
2	research.gold.ac.uk Internet Source	1%
3	uir.unisa.ac.za Internet Source	1%
4	agba.us Internet Source	<1%
5	link.springer.com Internet Source	<1%
6	146.230.128.141 Internet Source	<1%
7	www.ijbssnet.com Internet Source	<1%
8	Seham S.. "Factors Influencing the Adoption of Cloud Computing by Saudi University Hospitals", International Journal of Advanced Computer Science and Applications, 2017 Publication	<1%

Figure 46 - Turnitin (Plagiarism report)

7.4 Language editing certificate

1065 Hector Petersen Drive

Unit 5

Mmabatho

14/06/2018

This is to certify that the dissertation entitled

EVALUATING THE BENEFITS OF CLOUD COMPUTING IN SMALL, MEDIUM AND MICRO-SIZED ENTERPRISES (SMMES) WITHIN THE NORTH WEST PROVINCE IN SOUTH AFRICA

Submitted by **PHENYO BAGNOLD MODISANE**

For the degree of

MASTER OF COMMERCE

(COMPUTER SCIENCE AND INFORMATION SYSTEMS)

At the

MAFIKENG CAMPUS

NORTH WEST UNIVERSITY

Has been edited for language by

Mary Helen Thomas (B.Sc. Hons. PGCE)

Helen Thomas

Figure 47 - Language editing certificate

7.5 Plagiarism Declaration

Name: **Phenyo Modisane**

Student Number: **20912137**

Course: **Master of Computer Science and Information Systems**

Declaration

I know that plagiarism is wrong. Plagiarism is to use another's work and pretend that it is one's own.

I have used the Harvard convention for citation and referencing. Each contribution to, and quotation in, this research from the work(s) of other people has been attributed, and has been cited and referenced.

This research is my own work.

I have not allowed, and will not allow, anyone to copy my work with the intention of passing it off as his or her own work.

Signature: 

Date: **17 November 2017**

7.6 Survey

Survey

This survey is for Small, Medium and Micro-sized Enterprises (SMMEs) operating in the Ngaka Modiri Molema and Bojanala Platinum Districts of the North West Province. The objective for this survey is set on Evaluating the Benefits of Cloud Computing in Small, Medium and Micro-sized Enterprises (SMMEs) within the North West Province in South Africa. In this survey an SME refers to enterprises that employ less than 200 employees, whilst cloud computing can simply be defined as a computing solution where users can store and access data and programs over the internet instead of using a computer hard-drive.

Cloud computing services can be subdivided into three (3) service models/areas as outlined below:

- Software-as-a-Service (SaaS) – Here an SMME can subscribe to an application it accesses over the internet like Salesforce.com, a company that specialises in Customer Relationship Management (CRM) products.
- Platform-as-a-Service (PaaS) – Here an SMME can develop its own applications online, and roll them out for use within the company. A company that offers this service would be Amazon through its Elastic Compute Cloud (EC2) which allows SMMEs to rent out virtual computers where they can then operate their own applications.
- Infrastructure-as-a-Service (IaaS) – This is a model that delivers computer infrastructure on an outsourced basis to support an SMMEs operations. This could be when an SMME does not have the relevant information technology infrastructure like servers and network components etc., and wishes to contract a cloud computing company for these services. A company that offers such a service would be Microsoft Azure which provides solutions to SMMEs for building, deploying and managing applications and services through the internet.

The link attached below is the Ethical Clearance form from the North West University that informs this questionnaire:

https://drive.google.com/file/d/0B1ZWAs1AVw4dNGVTalppUHZHVk0/view?usp=drivesdk

Section 1 – Demographic Characteristics/Data

In this section, we will be analysing your Small, Medium and Micro-sized Enterprises (SMMEs)'s context.

Q1. Where is your SMME located?

Bojanala Platinum District	Ngaka Modiri Molema District

Q2. What size is your enterprise?

1-Micro (5 and below employees)	2-Very Small (6 - 10 employees)	3-Small (11 - 50 employees)	4-Medium (51- 100 employees)

Q3. Which industry does your SMME operate?

Agriculture			Wholesale Trade, Commercial Agents and Allied Services	
Mining and Quarrying			Catering, Accommodation and other Trade	
Manufacturing			Transportation	
Electricity, Gas and Water			Finance, ICT, Legal and Business services	
Construction			Community, Social and Personal Services	
Retail, Motor Trade and Repair Services				
Other Specify				

Q4. Does your SME have an Information Technology department/function?

Yes	No

Q5. What kind of information has to be managed within your enterprise?

Inventory management (suppliers + stock)			Sales analysis	
General Ledger (accounts)			Human resource management (payroll, leave etc.)	
Other specify				

Q6. Which Information Technology service/s does your enterprise utilise?

Email and internet			Transaction Processing system (Payroll, order tracking etc.)	
Enterprise Resource Planning (Sales and inventory management etc.)			Decision Support System (sales and cost analysis etc.)	
			Ecommerce website	
Other Specify				

Section 2 – Cloud computing adoption

In this section, we will be analysing your SMMEs view on cloud computing.

Q7. Based on your understanding of Cloud Computing, which cloud computing service model has your SMME adopted?

Software-as-a-Service (SaaS)	Platform-as-a-Service (PaaS)	Infrastructure-as-a-Service (IaaS)	None

Q8. To which extent are cloud computing services used to support business operations within your enterprise?

Low extent	Medium extent	High extent

Q9. To which extent are cloud computing services used to support management-decision making within your enterprise?

Low extent	Medium extent	High extent

Q10. Which of the following do you regard as perceived benefits for cloud computing adoption?

Lower IT costs			Improved data security	
Simplicity			Enhanced customer service	
Specialized technical support			No benefits	
Remote access				

Other specify	

Q11. Which of the following do you regard as perceived disadvantages for cloud computing adoption?

Lack of privacy and data security			Loss of control	
Uptime dependent on service provider			Service Level Agreements (SLA's)	
Dependent of internet availability			Data portability	
Cost uncertainties			No disadvantages	
Other specify				

Section 3 – Technological factors

In this section, we will be analysing technological factors that play a role in cloud computing adoption. This will be achieved by analysing factors such as relative advantage, complexity, compatibility and availability.

	Strongly disagree	Disagree	Undecided	Agree	Strongly Agree
Q12. Do you believe that cloud computing services enable the enterprise to perform tasks more quickly and efficiently?					
Q13. Do you believe that cloud computing adoption could lower your information technology costs?					
Q14. Do you believe that cloud computing services could contribute towards greater work productivity in the enterprise?					
Q15. Do you believe that adopting cloud computing services is difficult to understand and complex to implement?					
Q16. Do you believe that using cloud computing services would put your enterprise's sensitive data at risk?					
Q17. Do you believe that cloud computing services would be compatible with existing Information Technology systems currently in use within the enterprise?					
Q18. Do you believe that you can find a cloud computing solution that will be a best-fit for your enterprise?					

Section 4 – Organizational factors

In this section, we will be analysing organizational factors that play a role in cloud computing adoption. This will be achieved by analysing factors such as senior management support, firm size, technology readiness and user satisfaction.

	Strongly disagree	Disagree	Undecided	Agree	Strongly Agree
Q19. Does senior management believe that cloud computing offers significant benefits to the enterprise?					
Q20. Do you believe that senior management should play a significant role in the selection, monitoring and evaluation processes of an adopted cloud computing solution?					
Q21. Does your enterprise have adequate technical support for using cloud computing services?					
Q22. Does your enterprises size play a significant role in the adoption of cloud computing services?					
Q23. Do your customers affect your decision to adopt cloud computing services?					
Q24. Does user satisfaction being how they rate system, service and information quality, play a significant role in the adoption cloud computing services in your SME?					
Q25. Do you believe that cloud computing adoption will improve the way your enterprise communicates with its customers?					
Q26. Is your SME technologically ready to adopt cloud computing services?					

Question 5 – Environmental factors

In this section, we will be analysing environmental factors that play a role in cloud computing adoption. This will be achieved by analysing factors such as competitive and trading partner pressure, government regulation and technology support infrastructure.

Q27. Does your main competitors affect your decision to adopt cloud computing services?

Strongly disagree	Disagree	Undecided	Agree	Strongly Agree

Q28. Does competitive conditions in your industry require you to use cloud computing services?

Strongly disagree	Disagree	Undecided	Agree	Strongly Agree

Q29. Do you participate in professional bodies where you have been exposed to cloud computing promotion and information?

Yes	No

Q30. Do your suppliers and customers encourage you to adopt cloud computing services?

Strongly disagree	Disagree	Undecided	Agree	Strongly Agree

Q31. Do you believe that government support and regulations, plays a significant role in cloud computing adoption?

Strongly disagree	Disagree	Undecided	Agree	Strongly Agree

Q32. Based on your understanding of cloud computing, which best explains your SMMEs position on cloud computing?

We haven't any intention to adopt cloud computing services	We have an intention to adopt cloud computing services	We have already adopted cloud computing services

Thank you!