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Determinants Influencing Adoption of Cloud Computing by Small Medium Enterprises in South Africa

A

Research Report

By

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Submitted in partial fulfillment of the requirements for the degree of

Master of Commerce in Information Systems
(Coursework)

at the

School of Economic and Business Sciences
University of the Witwatersrand

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DECLARATION

I, Wanda Matandela, hereby declare that this research report is my own work and it has never been submitted to any other university for assessment or for any another qualification. It is being submitted to the Department of Information Systems at Wits University, School of Economics and Business Sciences in partial fulfillment of the requirements for the degree of Masters in Information Systems.

ABSTRACT

Small Medium Enterprises (SMEs) are now recognized as the driving force behind most thriving economies. This is mainly attributed to the role they play in most economies in reducing unemployment and their contribution towards Gross Domestic Product. This means that SMEs should have the right resources to enable them to enhance performance. Choosing the right technology to support their businesses is one of the important decisions that SMEs should make. Understanding the benefits and challenges of different technologies is often a problem for most SMEs.

One of the new technologies that has gained prominence in recent years is cloud computing. Even though the value associated with this technology has been widely researched especially for large enterprises, the rate at which SMEs adopt cloud computing still remains low. The purpose of this research sought to explore and describe the determinants influencing the adoption of cloud computing by SMEs in South Africa. The study used Technology Organization Environment (TOE) framework as the theoretical lens in understanding the adoption of Could Computing phenomenon.

Further, this qualitative exploratory and descriptive study used semi-structured interviews to collect data from five SMEs based in Johannesburg, Gauteng Province, operating in different industries and belonging to the National Small Business Chamber.

The main factors that were identified as playing an important role in the adoption of cloud computing by SMEs are, relative advantage, complexity, compatibility, awareness, trialability, culture, top management support, size, regulation and trade partner relationship. It is worth noting that there was not enough evidence that competitive pressure played a significant role in SME cloud adoption.

Keywords: Small Medium Enterprise, Cloud Computing, Adoption, Information Technologies, TOE framework, Innovation, Cloud Service Providers, Infrastructure as a Service, Software as a Service, Platform as a Service.

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TABLE OF CONTENTS

Contents

1 INTRODUCTION AND BACKGROUND 9

1.1 INTRODUCTION TO THE FIELD OF STUDY 9
1.1.1 Kick-starting Entrepreneurship Using Technology & Innovation 10
1.1.2 Advantages of Cloud Computing 11

1.2 BACKGROUND TO THE RESEARCH PROBLEM 12

This section formulates the research problem by giving the background to the research problem the study addressed. 12

Study context and location 12

1.3 PROBLEM STATEMENT 14

1.4 RESEARCH GOAL & OBJECTIVES 14

1.5 PRIMARY RESEARCH QUESTION 15

1.6 SECONDARY RESEARCH QUESTIONS 15

1.7 THEORETICAL AND PRACTICAL CONTRIBUTION 15

1.8 LIMITATIONS OF THE STUDY 16

1.9 SUMMARY OF CHAPTER ONE 16

2 INTRODUCTION..... 17

2.1 WHAT IS CLOUD COMPUTING? 18

2.2 CLOUD COMPUTING SERVICE MODELS 19
2.2.1 Software-as-a-Service (Saas) 19
2.2.2 Platform-as-a-Service (PaaS) 20
2.2.3 Infrastructure-as-a-Service (IaaS) 21

2.3 CLOUD COMPUTING DEPLOYMENT MODELS 21
2.3.1 Public Cloud Computing 22
2.3.2 Private Cloud Computing 22
2.3.3 Community Cloud Computing 22
2.3.4 Hybrid Cloud Computing 22

2.4 ESSENTIAL CHARACTERISTICS OF CLOUD COMPUTING 23
2.4.1 On-demand Self-service 23
2.4.2 Broadband Network Access 23
2.4.3 Resource Pooling 24
2.4.4 Rapid Elasticity or Expansion 24
2.4.5 Measured Service 24

2.5 Advantages and Disadvantages of Cloud Computing 25
2.5.1 Advantages of Cloud Computing 25
2.5.2 Disadvantages of Cloud Computing 29

2.6 SMALL AND MEDIUM ENTERPRISES IN THE SOUTH AFRICAN ECONOMY 31
2.6.1 SME Definition 32
2.6.2 SMEs and the Competition Act 89 of 1998 33

2.7 CRITICAL FACTORS AFFECTING SMEs IN SOUTH AFRICAN ECONOMY 34
2.7.1 Human Capital 34
2.7.2 Fear of Failure 35
2.7.3 Socio–economic Problems 35
2.7.4 Risk Management 36
2.7.5 Finance 36
2.7.6 Technology 36
2.7.7 Products and Services 36
2.7.8 Competition 37

2.8 ROLE OF ICT IN ORGANIZATIONS 37

2.9 CLOUD COMPUTION ADOPTION IN SME - BENEFITS & CHALLENGES 41
2.9.1 Benefits of Cloud Computing Adoption in SME 41
2.9.2 Challenges faced by SMES for Adoption of Cloud Computing 44

2.10 SUMMARY OF CHAPTER TWO 46

3 INTRODUCTION 47

3.1 TECHNOLOGY-ORGANIZATION-ENVIRONMENT FRAMEWORK (TOE) 47

3.2 CONCEPTUAL RESEARCH FRAMEWORK 50

3.3 CLOUD COMPUTING ADOPTION 51

3.4 TECHNOLOGY CONTEXT 52
3.4.1 Relative Advantage 52
3.4.2 Complexity 52
3.4.3 Compatibility 52

3.5 ORGANIZATIONAL CONTEXT 53
3.6.1. Top Management Support and Firm Size 53
3.6.2. Technology Readiness 53

3.6 ENVIRONMENTAL CONTEXT 54
3.6.1 Competitive and Trading Partner Pressure 54

3.7 SUMMARY OF CHAPTER THREE 54

4 INTRODUCTION 55

4.1 RESEARCH PARADIGM AND APPROACH 55

4.2 JUSTIFICATION FOR INTERPRETIVE PARADIGM 55

4.3 RESEARCH STRATEGY 57

4.4 RESEARCH DESIGN 58

4.5 CASE STUDY DESCRIPTION 59

4.6 DATA COLLECTION TECHNIQUE FOR THE STUDY 60

4.7 RESEARCH INSTRUMENT 61
4.7.1 Sampling Method 61
4.7.2 Data Analysis 62
4.7.3 Validity 63
4.7.4 Reliability 63

4.8 LIMITATIONS OF THE STUDY 64

4.9 ETHICAL CONSIDERATIONS 64

4.10 SUMMARY OF CHAPTER FOUR 65

5 INTRODUCTION 66

5.1 ANALYSIS OF QUALITATIVE DATA COLLECTED 66
5.1.1 Participants 67
5.1.2 Regulatory Bodies 68
5.1.3 Geographical Presence 68

5.2 THEME A: SME CHALLENGES – OBJECTIVE 1 (TO EXPLORE CHALLENGES FACING SMES IN SOUTH AFRICA) 69
- Payment Terms 72
- Cost cutting by big business 72
- Exposure to Technology 73
- Business Development Challenge and Lack of Support from Big Business 73

5.3 THEME B: CLOUD COMPUTING AWARENESS & CHALLENGES – OBJECTIVE 2 (TO EXPLORE WHAT CLOUD COMPUTING IS AND CHALLENGES IN THE CONTEXT OF SOUTH AFRICAN SMES) 73

5.4 THEME C: CLOUD COMPUTING VALUE – OBJECTIVE 3 (TO DESCRIBE HOW SMES CAN DERIVE VALUE FROM CLOUD COMPUTING) 76

5.5 THEME D: TOE FACTORS – OBJECTIVE 4: (TO DESCRIBE HOW TOE FACTORS INFLUENCE CLOUD COMPUTING ADOPTION) 78

5.6 Conceptual Framework for cloud computing adoption 85
5.6.1 Technological: Relative advantage 87
5.6.2 Compatibility 87
5.6.3 Complexity 88
5.6.4 Environmental 88
5.6.5 Trade Partner pressure 88
5.6.6 Organizational 88

5.7 SUMMARY OF CHAPTER FIVE 89

6 INTRODUCTION 90

6.1 OVERVIEW OF CHAPTERS 90
6.1.1 Chapter 1 90
6.1.2 Chapter 2 90
6.1.3 Chapter 3 91
6.1.4 Chapter 4 91

6.1.5 Chapter 5 91

6.2 RESEARCH GOALS AND OBJECTIVES 91
6.2.1 Primary Research Question 92
6.2.2 Secondary Research Questions 92

6.3 Challenges facing SMEs in South Africa 92

6.4 Cloud computing and its challenges 92

6.5 What is the definition of an SME in South Africa? 92

6.6 Describe cloud computing value enjoyed by SMEs in South Africa: 93

6.7 How do Technology, Organization and Environmental factors influence cloud computing adoption? 93

6.8 CONTRIBUTIONS OF THE STUDY 93
6.8.1 Limitations of the study 93
6.8.2 Future Research 94
6.8.3 Contributions to the Research 94

6.9 CONCLUSION 95

7 REFERENCES 96

6. APPENDIX I: (INTERVIEW SCHEDULE) 103

7. APPENDIX II : (PARTICIPATION REQUEST LETTER) 104

List of Tables

Table 1: Cloud Computing Application Areas in Developing Countries 12
Table 2: Examples of TOE based studies (Alshamaila et al. 2012) 48
Table 3: Companies Participating in the Study 67
Table 4: Summary of findings 855

Table of Figures

Figure 1: Cloud Market growth in South Africa: Source: (Paralles, 2014) 13
Figure 2: Cloud Computing Architecture: Source: (Zhang, Q., et al. 2010) 19
Figure 3: Cloud Computing Deployment Model 21
Figure 4: Cloud Computing Adoption Conceptual Research Framework 500
Figure 5: Conceptual Framework based on findings: SME Cloud Computing Adoption 866

CHAPTER 1

1 INTRODUCTION AND BACKGROUND

Small Medium Enterprises (SMEs) are now recognized as the driving force behind most thriving economies. This is mainly attributed to the role they play in most economies in reducing unemployment and their contribution towards Gross Domestic Product. This means that SMEs should have the right resources to enable them to enhance performance. Choosing the right technology to support their businesses is one of the important decisions that SMEs should make. Understanding the value and challenges of adopting different technologies is often a problem for most SMEs. This research report is about the determinants influencing the adoption of Cloud Computing by SMEs in South Africa.

1.1 INTRODUCTION TO THE FIELD OF STUDY

In a tough trading South African environment, multinationals and large enterprises are looking for cost-effective and efficient ways of improving overall business performance. These initiatives sometimes mean that companies must cut costs to improve performance which might include shedding of jobs. However, Small and Medium Enterprises (SMEs) have been touted as a key propeller to reduce unemployment. Researchers have estimated that, in South Africa, small and medium-sized enterprises make up 91% of formalized businesses, providing employment to about 60% of the labor force and total economic output accounts for roughly 34% of GDP, (Abor & Quartey, 2010). In developing countries, SMEs have become vital as they have the potential to improve income distribution, create new employment, reduce poverty and facilitate export growth. As such, SMEs are seen as fostering development of entrepreneurship, industry and the rural economy (Love & Roper, 2013).

A strong SME sector improves production volumes, increases exports and introduces innovation and entrepreneurship skills. Since the democratic elections in 1994, the South African Government has placed Small, Medium Enterprises' (SMEs) development high on its agenda to focus on job creation, sustainable growth and equity

growth. Government has facilitated, through national strategies, programs and policies to keep SMEs as equal partners in all economic sectors in order to maximize the sector's contribution to the development of the South African economy.

Despite all the effort put in for the growth of this sector, it still faces numerous challenges that hinder the growth of entrepreneurship. As a developing country, there is an expectation for entrepreneurial uptake to exceed 10% of the adult population. In South Africa, only around 7% of the adult population is involved in early-stage entrepreneurship and less than 2% of the SMEs have been in existence for more than three years (Alert, Issue Paper 2013).

Lack of appropriate technology and low production capacity are perceived as one of the biggest challenges faced by this sector, followed by high interest rates, crime and corruption, skills deficit and no regulatory compliance (Kshetri, 2013).

In today's difficult economy and economic downturn, the need for reliable yet affordable information technology plays an important role in creating a sustainable model. It can directly contribute to the productivity of the SME Sector.

1.1.1 Kick-starting Entrepreneurship Using Technology & Innovation

There's no doubt that smart, strategic innovation can change the entrepreneurial world. The adoption of Cloud Computing is seen as a game changer among small and medium businesses in South Africa. Cloud-centred improvements and services are becoming an important source of societal change, especially for economies in sub-Saharan Africa (Kshetri, 2013; Adam et al., 2015). SMEs are showing remarkable interest in cloud computing these days which could assist in revolutionising the information technology (IT) landscape.

'Cloud computing', is a term for Internet - based computing service and was launched by industry giants Google, Amazon.com, etc. in the late 2006. Cloud Computing promises to provide on-demand computing power with quick implementation, low maintenance, fewer IT staff, and consequently lower cost. (Yang & Tate, 2012).

Studies like Ksheri (2013) have indicated that there is no doubt that cloud computing is a breakthrough technology that will continue to unleash new innovations and bring new efficiencies and advantages to business.

1.1.2 Advantages of Cloud Computing

There are benefits for all kinds of business in the cloud environment. One of the most persuasive arguments in favour of cloud computing is the fact that it helps Small, Medium and Micro enterprises to manage their resource planning and provisioning by allowing them to scale up only when there is a rise in service demand. The idea of organizations getting charged only for the time they have used for a particular service is very attractive for growing businesses (Aleem et al., 2012).

Furthermore, cloud computing interfaces do not require users to change their working habits and environments (Wang & Laszewski, 2008), which is just one feature that makes cloud computing different from other technologies, such as grid computing.

Contributing to its adoption is the fact that cloud computing is considered to be an operational expense (OpEx) as opposed to a capital expense (CapEx), i.e. usage is billed on a pay-per-use model due to the fact that there is no hardware infrastructure or software to be purchased (Mather et al., 2009, p.26; Aleem *et al.* 2012). Cloud computing has therefore removed infrastructure and capital expense as a barrier to entry and allows start-ups to scale up cheaply and rapidly, (Hofmann, 2010).

While it is true that the use of this technology is limited to those who have access to the Internet, as companies continue to grow bigger, not only in the number of employees but in the number of departments, cloud computing is a resource that is readily available to help these companies meet their needs and accomplish their goals. (Aljabre, 2012)

Regardless of what cloud computing can offer the IT industry, the development of cloud computing technology is still in its early stages, especially in South Africa. In a research study conducted by Kshetri (2010), it was discovered that cloud computing in the

developing world is still in its infancy, in terms of awareness and adoption, across all developing economies covered by his study, including South Africa.

Table 1: Cloud Computing Application Areas in Developing Countries

(Source: Kshetri, 2010; Trope, 2014)

Country	E-education	E-health	E-Commerce	E-Governance	E-Environment	Tele-Commuting
China	X	X	X		X	
East Africa	X					
India	X	X				
Korea			X			
Qatar	X					
South Africa			X			X
Turkey						
Vietnam	X			X		
West Africa					X	

The table above depicts the limited application of cloud computing in developing countries.

1.2 BACKGROUND TO THE RESEARCH PROBLEM

This section formulates the research problem by giving the background to the research problem the study addressed.

Study context and location

SMEs are now recognized as the driving force behind most thriving economies. This is mainly attributed to the role they play in reducing unemployment and their contribution towards Gross Domestic Product. The South African Government recently created a dedicated ministry to foster a culture of entrepreneurship with the aim of increasing the number of SMEs in South Africa. For this vision to be realized, it means that the environments in which SMEs operate must be conducive for them to make a meaningful

contribution to the economy. It also means that SMEs should have the right resources to enable them to enhance their performance. Choosing the right technology to support their businesses is one such resource needed by any organization to prosper. However, understanding the value and challenges of different technologies is often a problem for most SMEs for the simple reason that not all SMEs are technologically savvy. Unlike large enterprises, very few SMEs have dedicated Information Technology departments to help them make sound decisions and recommendations on different technologies to deploy. This has been cited as one of the main reasons behind the digital divide between large and small enterprises.

One of the new technologies that has gained prominence in recent years is cloud computing. The value associated with cloud computing such as cost reduction and productivity improvement has attracted interest in the market, resulting in increased demand. The cloud computing market in South Africa is growing and is expected to increase in the near future as can be seen below.

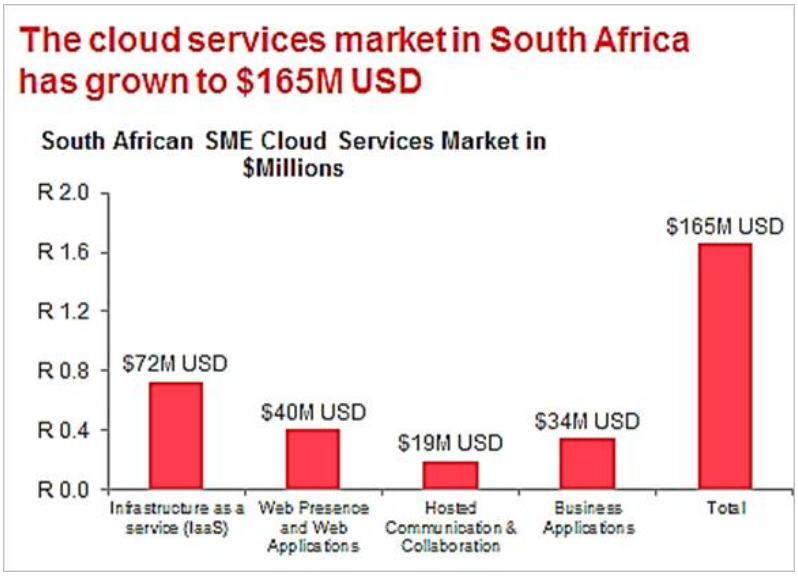


Figure 1: Cloud Market growth in South Africa: (Source: Paralles, 2014)

However, the rate at which SMEs adopt cloud computing still remains low. This study investigated this phenomenon and sought to understand the factors that promote cloud computing adoption by SMEs. The study location for this research was the Sandton area in the Gauteng province of South Africa which is the financial hub of Africa. Gauteng province has the highest SME density where most of these SMEs operate both

within and outside of South African borders. The following are the SME density numbers: 45% of SMEs are based in Johannesburg, 35% in Cape Town, 13% in KZN, 6% in EC and 9% in the remaining regions, (NSBC Survey, 2012). This study chose five SMEs from different industries being Hospitality, Legal, Engineering, IT and Human Resources. All the SMEs participating in the study are based in the Gauteng province, Johannesburg area.

1.3 PROBLEM STATEMENT

Most organizations are deliberating whether they should migrate to cloud computing or not, given the value that this technology promises. However, even though its value has been widely publicized, the results from a SME survey done by World Wide Worx revealed that the proportion of SMEs using the cloud is 27% overall, substantially up from 9% in 2012 (Goldstruck, 2014). The results further revealed that three in four of the participants surveyed did not use cloud computing in their businesses (SME survey, 2014). Why are SMEs not adopting the Cloud in numbers? It is against this backdrop that this study is premised on - to explore and describe the determinants influencing cloud computing adoption by SMEs in South Africa. This study also sought to understand the challenges and risks associated with cloud computing technology.

1.4 RESEARCH GOAL & OBJECTIVES

The goal of this study was to develop a conceptual framework using the Technology, Organization, and Environment framework (TOE) as a theoretical lens. TOE elements were used in the interview process to determine how these elements influence the SME adoption of cloud computing.

In order to achieve the goal, the following research objectives were identified for this study:

- To explore general challenges facing SMEs in South Africa
- To explore cloud computing and its challenges, in the context of South African SMEs
- To describe how SMEs can derive value from cloud computing
- To describe how TOE factors influence SME cloud computing adoption

1.5 PRIMARY RESEARCH QUESTION

- What determinants influence cloud computing adoption by SMEs in the South African context?

1.6 SECONDARY RESEARCH QUESTIONS

- What are the challenges facing South African SMEs?
- What is cloud computing in the context of SMEs in South Africa?
- How can South African SMEs derive value out of cloud computing?
- How do Technology, Organization and Environmental factors influence cloud computing adoption?

1.7 THEORETICAL AND PRACTICAL CONTRIBUTION

The conceptual framework developed in this study was derived from the TOE framework to help determine the factors influencing cloud adoption at an organizational level. Previous studies such as Rogers (1995) in technology innovation mainly focused on adoption of innovation at individual level using theories like TAM, Grounded theory, DOI theories. It is against this background that this study will add to the growing body of academic research in the field of technology innovation. The study also gives a view of cloud computing adoption behaviour from a South African SME segment point of view. The findings can also be checked for consistency against previous similar studies from the rest of the world.

The results of this study may also have practical implications for SME organizations debating whether or not to adopt cloud and will also assist cloud service providers in understanding factors that promote or inhibit SMEs from cloud adoption. Lastly, this study will provide an opportunity for SMEs in developing countries to gain a better understanding of the benefits of cloud computing, especially those that have ambitions of doing business globally and competing at the same level as large organizations.

1.8 LIMITATIONS OF THE STUDY

In scope and out of scope

The study focuses on the adoption of cloud computing within the SME segment and not large enterprises. It is confined to South Africa and more specifically SMEs based in Gauteng province and, as such, the results cannot be generalized to the rest of the world. The SME cloud computing adoption phenomenon investigated in this study cuts across all three cloud service delivery models being Platform as a service, Infrastructure as a service and Software as a service and did not focus on one service model.

1.9 SUMMARY OF CHAPTER ONE

The study seeks to describe and explore determinants influencing adoption of cloud computing by SME's in South Africa. This chapter introduced the topic by giving background to the research problem, problem statement, its goals and objectives, research questions both primary and secondary questions, theoretical and practical contributions of the study and the limitations. The next chapter will examine in detail the literature on the topic of determinants influencing cloud adoption by SME's in South Africa.

CHAPTER 2
SURVEY OF SCHOLARSHIP AND THE REVIEW OF LITERATURE

2 INTRODUCTION

This chapter surveys the scholarship by reviewing existing works available on the different databases on the subject of cloud computing and adoption by SMEs in developing countries, especially South African SMEs. It presents a descriptive overview of relevant literature and also provides information from the reviewed resources on the cloud computing offering.

The subsections talk about the pros and cons of adopting cloud computing, its challenges and risks and how we link it to industry's need and, therefore, offer compelling reasons for SMEs to adopt this technology. An effort was also made to scan through the content to exclude articles that are duplicates or the ones that did not address the topic.

To compile this section, 187 referred journal articles were shortlisted for review. All shortlisted articles focus on cloud computing and the factors affecting adoption of cloud computing by SMEs. A holistic approach was adopted to review the literature on cloud computing and small business enterprises' appetite for it.

The shortlisted 187 articles were grouped into

- Cloud computing and its adoption and determinants
- South African SMEs
- SME and cloud computing adoption
- IT adoption framework
- Benefits and challenges of cloud computing by SME

2.1 WHAT IS CLOUD COMPUTING?

Scholars have tried defining cloud computing from different perspectives. At present, there is no standardized or universally accepted definition for cloud computing, however, the term 'cloud computing' has always been related to Information Technology Services that can help in accessing information remotely (Oliveira et al. 2013). It refers to both the applications delivered as services over the Internet, hardware and systems or software in the data centers provided by Cloud Service Providers (Armbrust et al. 2010).

There have been efforts to standardize the definition of cloud computing. For this study, we opted to use the definition of cloud computing provided by **The National Institute of Standards and Technology** (NIST), as most of the reviewed articles in this area have adopted the NIST definition and it has therefore gained recognition and popularity (Yang & Tate, 2012).

According to the official NIST definition, "Cloud computing *is a model for enabling ubiquitous, 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 service provider interaction*."

This definition offers a common and brief explanation that includes essential features of cloud, making it suitable for common cloud-related research studies (Asatiani, 2015). NIST not only provides a working definition for cloud computing but also provides three cloud computing service models, four categories to deliver cloud service and five essential characteristics of cloud computing (Mell & Grace, 2011).

There are different dimensions to cloud adoption, such as individual users, organizations, specific industries and services. Therefore, in order to limit the scope of this review the researcher decided to focus on adoption of cloud computing among Small and Medium organizations. Cloud computing is not a new technology; it brings together existing technologies to run business in an effective way, (Example: Virtualization and utility based pricing).

2.2 CLOUD COMPUTING SERVICE MODELS

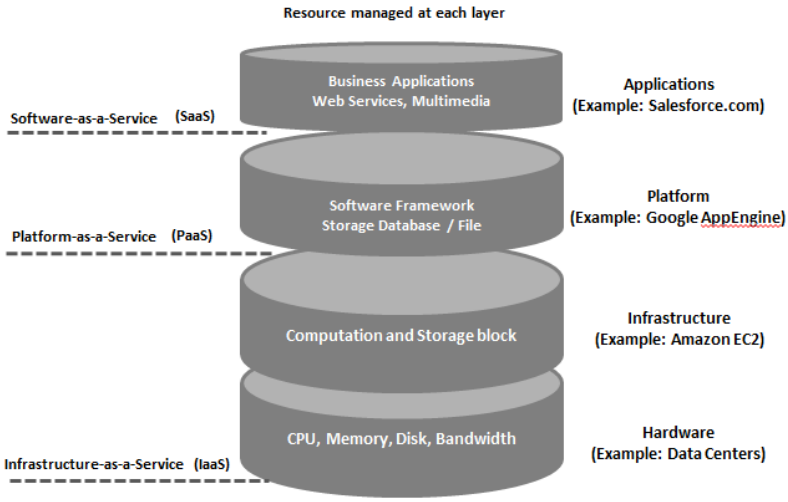


Figure 2: Cloud Computing Architecture: Source: (Zhang et al. 2010)

There are three cloud service delivery models.

- **Software-as-a-Service (SaaS)** - designed for end-users, delivered over the web
- **Platform-as-a-Service (PaaS)** - set of tools and services designed to make coding and deploying applications quick and efficient
- **Infrastructure-as-a-Service (IaaS)** - the hardware and software that powers it all - servers, storage.

Apart from the abovementioned three main service delivery models, a number of variations are currently found in literature. The new format of everything as a service, or 'X' as a service (Xaas), is therefore going to stay (Adam *et al.*, 2015).

2.2.1 Software-as-a-Service (Saas)

In this model, the **Cloud Service Providers** (CSP) manage applications including servers, bandwidth, and software at their location (Adam *et al.* 2015). The customer is able to purchase SaaS applications easily from the providers as per its need, which

makes this service model very popular (Aleem *et al.* 2012). This model offers on-demand applications over the Internet (Leavitt, 2009). Complex systems like CRM or ERP can easily be offered through SaaS. *Example: Salesforce.com's online* CRM system.

Applications that are hosted as services in the cloud can be accessed by subscribers through Internet browsers which eliminate the need to install, run, and maintain the application on local computers. Even if all users are using the single code base (multi-tenant architecture) maintained by the provider, strict security policies, authentication and authorization are applied to ensure the separation of user data. It eases out the user's burden of software maintenance and reduces purchase of expensive software. It also helps SaaS service provider to offer a competitive price compared to traditional off-the-shelf software (Yang & Tate, 2012).

2.2.2 Platform-as-a-Service (PaaS)

Platform as a service (PaaS) is a category of cloud computing services that provides a platform allowing customers to develop, run and manage applications without the complexity of building and maintaining the infrastructure typically associated with developing and launching an application *Wiki*. This model provides a platform to build and run SaaS.

PaaS is put together on top of Infrastructure-as-a-Service (IaaS) (Zhang *et al.* 2010) which helps Cloud Service Providers offer their operating systems and services over the Internet, thus excluding the need to download or install applications on the end-user's system (Adam *et al.* 2015). It is extremely useful in creating a collaborative environment where multiple developers and external parties are involved in a development project. A web based user interface helps develop, modify, test and deploy different UI scenarios, and maintain applications in the same integrated development environment (Cloud U, 2011).

2.2.3 Infrastructure-as-a-Service (IaaS)

Infrastructure as a Service (IaaS) is a form of cloud computing that provides virtualized computing resources over the Internet. It provides the hardware, software and network equipment required for running software application. Customers get to access the latest network technology at a low cost (Aleem *et al.* 2012). It is a combination of a hardware layer and infrastructure layer that is responsible for managing the physical resources of the cloud. It includes servers, routers, switches, power and cooling systems, storage and computing resources for virtualization. Provides on-demand infrastructure resources required for virtual machines. Example: Amazon EC2 (Zhang *et al.*, 2010). IaaS offers processing, storage and other forms of lower level network and hardware resources virtually through the Internet, based on customer needs (Leavitt, 2009). The users do not manage the infrastructure but will have control over operating systems, storage, deployed applications, and in some cases limited control of networking components (Yang & Tate, 2012).

2.3 CLOUD COMPUTING DEPLOYMENT MODELS

NIST further categorizes ways to deliver cloud service into

- Public Cloud Computing
- Private Cloud Computing
- Community Cloud Computing
- Hybrid Cloud Computing

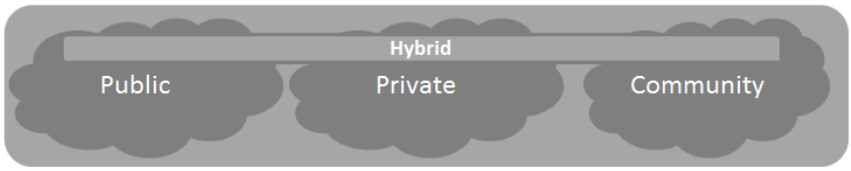


Figure 3: Cloud Computing Deployment Models (Source: Zhang et al. 2010)

These are the different types of cloud technologies that an organization or user can choose from, depending on their needs.

2.3.1 Public Cloud Computing

In this delivery model, the Cloud Service Providers (CSPs) are responsible for managing infrastructure, security and operation of cloud services. The biggest advantage this model offers is that there is no initial capital investment in infrastructure (Zhang *et al.* 2010). While this model is cost-effective, it gives the customer less control (Aleem *et al.* 2012).

2.3.2 Private Cloud Computing

This deployment model can be managed by an organization itself or by a third party and can deployed on or off premises. It gives an organization more control over their data (Aleem *et al.* 2012). This offers dedicated and exclusive use by a single organization. Highest degree of reliability, security and confidentiality is the benefit of this type of cloud (Zhang *et al.* 2010). This service is offered exclusively for a unique client by allocating systems in a specific infrastructure to maintain data confidentiality. This type is service is normally opted for by organizations that require a high level of security and privacy over their IT infrastructure (Oliveira *et al.* 2013).

2.3.3 Community Cloud Computing

A community cloud in computing is a collaborative effort in which infrastructure is shared between several organizations from a specific community with common concerns (security, compliance, jurisdiction, etc.), whether managed internally or by a third party and hosted internally or externally. This type of cloud allows the CSP to design firewall rules and strong dedicated security settings. It leverages VPN (Virtual Private Network) technology (Zhang *et al.* 2010).

2.3.4 Hybrid Cloud Computing

In this delivery model the customer is able to run critical applications in a public cloud while keeping critical ones in private cloud. A certain part of this service runs on a private infrastructure platform and remains on public clouds. It offers more flexibility as on-demand expansion and contraction is much easier in this type of cloud (Zhang *et al.* 2010).

2.4 ESSENTIAL CHARACTERISTICS OF CLOUD COMPUTING

NIST also lists five essential characteristics of cloud computing.

2.4.1 On-demand Self-service

Through cloud computing the customer is empowered to provision required server time, network storage etc. without any assistance from the provider (Mell & Grace 2011). It therefore eliminates the need for up-front commitment on the resources going to be used by the customers. This helps organizations to start small and request resources as and when required (Armbrust *et al.,* 2010). It also allows efficient operation with a significant cost reduction and customizes offerings as per the customer's need and charges them according to the bandwidth consumption, data transaction, data storage space used, software and applications upgrade etc. (Oliveira *et al.* 2013).

For example, an organization's urgent requirement for resource can be met rapidly through cloud's service without attaching any physically acquired storage component (Trope 2014). The IaaS model provides a server, storage networks, operating system and application software to organizations as a service on demand. These services are assigned and reassigned according to a customer's demand (Marston *et. Al.,* 2010). Many applications available on cloud can provide free trials to the customer to establish whether it is the right choice for their organization. Customers can quickly access different options that are available for the same requirement. Once this decision is made, adding new software or applications is very simple. CSPs even provide regular upgrades of downloaded applications (Christauskas *et al.* 2012).

2.4.2 Broadband Network Access

The essence of cloud computing is that services are available over broadband network, which means that it can be accessed through mobile phones, laptops or normal workstations. It is a service that is consumed just like any other utility based service, for example, electricity, (Subashini & Kavitha, 2011). Heterogeneous thin or thick client platforms such as mobile phones, tablets etc. can be used to access cloud computing capabilities over the network (Mell & Grace, 2011). This characteristic eliminates the constraint of working from a set location as consumers would be able to

access cloud computing services from different devices and operating systems (Oliveira *et al.* 2013). Some applications like Google reader have offline availability which allows consumers to continue with their work even when there is no access to the Internet. However, this facility is not applicable for all cloud-based applications (Dwivedi & Mustafee, 2010). It improves efficiency that is difficult to replicate and achieve with traditional in-house IT infrastructure. Broad Network Access makes it easier for the organization in terms of back-up systems' availability and disaster recovery management (Trope, 2014).

2.4.3 Resource Pooling

Service providers are able to serve multiple consumers using a multi-tenant model, for example, storage, processing, memory and network bandwidth (Mell & Grace 2011). Virtualization is a key enabling technology which allows cloud service providers to pool resources including memory, CPUs, network devices and disks. This allows multiple operating systems to be run on a single physical hardware resource (Trope, 2014). Resource pooling also opens up new opportunities for collaboration by enabling access to sources of information that is shared between consumers on community cloud computing deployment model.

2.4.4 Rapid Elasticity or Expansion

SMEs can enjoy the flexibility of cloud computing through acquiring services that are scalable as and when required, on a utility based model. Resources can be provisioned and released and in some cases, it can be conducted automatically (Mell & Grace, 2011). It allows companies to convert capital expense to operational expense (CapEx to Opex) with the usage-based service model, thus allowing organizations to redirect these funds to business investment (Armbrust *et al.,* 2010).

2.4.5 Measured Service

Cloud computing is able to expand and shrink resources at a detailed level in minutes, compared to the traditional IT structure where it may even take weeks to match the same requirement (Armbrust *et al.,* 2010). Leveraging a metering capability for storage, processing, bandwidth usage and managing active user accounts, optimizes and controls cloud system automatically. Keeping virtualization technology in mind, Service Level Agreement (SLA) Resource Allocator helps CSPs in managing resources and measuring usage. The pricing mechanism works based on the availability of

resources, submission time, etc., whereas accounting mechanism in the SLA Resource Allocator keeps a log of actual usage of resources by consumers. It serves as a base for managing supply and demand of Cloud Computing (CC) resources. It also helps in prioritizing resource allocation effectively. Virtual Machine (VM) monitor mechanism, Dispatcher mechanism and the service request monitor helps in keeping a track on the availability of resources, execution and progress of the service requests, (Oliveira, Thomas & Espadanal, 2014). SMEs profit from pay-per-use high performance cloud computing model as it encourages them to innovate and improvise their competitiveness in the market (Christauskas *et al.* 2012).

2.5 Advantages and Disadvantages of Cloud Computing

Like all other technologies, cloud computing also has its advantages and disadvantages. One can use cloud computing in many ways. Some virtualize their information technology resource and some use it as a software development and deployment platform (Aljabre, 2012). When advantages promote the adoption of cloud computing, there are possible challenges that interrupt its usefulness (Wu, 2011).

2.5.1 Advantages of Cloud Computing

2.5.1.1 Reliability

The reliability of cloud solutions impacts the collaboration and usage of cloud computing solutions. The reputation of service providers and the standards used by them for better service is a more important factor than costing and pricing (Gangwar, et al., 2015). Even if the cloud service provider use pooled computing resources for multiple customers, these resources are separated and secured with logical partitions to meet the security requirements of multiple customers (Khan, 2015). Reliability refers to the dependability for least outage and back-up readiness service whenever required. The higher the assurance provided by the service providers on security and privacy, the higher the probability of reliable resources. It also creates dependency on the service provider to look for back-up data during a time of disaster (Gupta et al., 2013).

2.5.1.2 Manageability

Self-service portals provided by cloud service providers make it easier for the user to access basic IT services (Khan, 2015). Transparent Asset Utilization provided by CSPs to the consumer helps in administering and controlling the usage of resources (Khan,

2015). Software and services needed for customers' day-to-day business needs are taken into account by cloud service providers. (Example: Emails, licensing of software). Economies of scale can be achieved by CSP offering frequent upgrades, regular patch updates for applications like MS office, Customer Relationship Management (CRM), Enterprise Resource Planning (ERP) and making it easily available to end-users (Gupta *et al.,* 2013). Software-as-a-service increases the flexibility of application installations. It allows the customer to lease and access application through the Internet as a service (Opala et al., 2015*).*

2.5.1.3 Flexibility and Scalability

Rapid upgrade abilities favor organizations to deliver innovative products and services that are suitable for market requirements. The wide range of services offered by cloud computing can remove all technological barriers in the global market (Khan 2015). As the organization matures in the usage of cloud computing, service providers help the organization to scale up their resources and infrastructure (Example: Storage, number of servers, processing and connection bandwidth, etc.) (Gangwar *et al.,* 2015). The cloud computing model integrates shared multi-tenant resources, software, provisioning of on-demand resources with flexible pricing. This model uses virtualization to store data thus increasing availability. The challenges faced by traditional IT infrastructure, such as lack of agility in server architecture to store and access data, can be solved with this model (Gupta *et al.* 2013).

2.5.1.4 Reduced Support and Hardware Needs

With some parameters and triggers fixed in the system, the process of provisioning and releasing resources can be automated which reduces the need for support availability all the time (Khan, 2015).

2.5.1.5 Cost Savings

The main objective of cloud computing technology is to reduce infrastructure cost. Irrespective of the size of the business, they all try to keep operational expenses to a minimum. Depending upon the deployment model of cloud computing used, the capital cost for server storage and application requirements can reduce substantially. The most noteworthy benefit of cloud computing is IT cost savings for the customer. No on-premises infrastructure strategy saves customers operational costs in the form of

reduced power consumption. It also reduces the requirement of skilled in-house manpower to manage the infrastructure. This directly helps the ICT department in an organization to manage their capital expenses (Alsanea & Wainwright, 2014). The employer does not have to provide high powered computer resources to their employees, as required applications for these computers run in the cloud, not in the desktop or PC. Moreover, it improves the performance of the desktop or PC used (Aljabre, 2012). There is a misconception that cloud computing technology is only affordable to large enterprises but the reality is that cloud services are extremely affordable for SMEs too. SMEs are using cloud computing to reduce their IT costs and increase capabilities (ENISA, 2009). Cloud computing will continue to attract SMEs especially because of its cost-effectiveness (Aleem *et al.,* 2012). Consumers only pay as per the services contracted for (Oliveira *et al.,* 2013). Since cloud service providers can host hundreds of customers on one server, it allows them to offer a pool of shared resources at the lowest cost of delivery (Opala *et al.,* 2015).

2.5.1.6 Improved Mobility, Enhanced Collaboration and Better Efficiency

If a user has a computer and Internet access, they would be able to access and work on their artifacts from anywhere in the world. Cloud service providers offer automatic updates and upgrades to the organization (Gangwar *et al.* 2015). Cloud computing enables users to access documents from a distance and allows multiple users to collaborate on projects or documents in the cloud, (Aljabre, 2012). Convenience and ease of use with better accessibility and availability from anywhere and at any time makes companies more inclined towards cloud computing adoption. Integration of information becomes smooth and simple. Features like document sharing and the possibility of editing the artifact at the same time by several people (Example: Google Docs), makes it easier for the end-users to collaborate. Cloud file storage helps customers to store, share and retrieve information with each other. This has a high weightage in today's competitive world and it compels companies to adopt cloud computing technology (Gupta *et al.,* 2013)

Aljabre's (2012) article on Cloud Computing for Increased Business Value in the *International Journal of Business and Social Science*, suggests that cloud computing service providers, like Amazon, can be very useful for all business types especially

ideal for start-up companies. It will not only improve company efficiency but also its profits and productivity. In a tightened economy, usability and popularity of cloud computing services would continue to increase (ENISA, 2009). Better access to market information and superior customer communication helps organizations to co-ordinate between stakeholders effectively (Wu, 2011).

Automation and optimization of business process helps organizations to improve efficiency. Projects in Controlled Environment Version 2 (PRINCE 2), ITIL Version 3, and IBM Service Oriented Architecture Framework, are some of the industry led frameworks that focus on business models and process that can influence the successful execution, management and control of IT projects (Chang *et al.*, 2013).

2.5.1.7 Technological Competence and Strategic Edge

Having access to the cloud can help enterprises, customers and suppliers face their competition, increase their business value and shorten the decision-making time between stakeholders (Aljabre, 2012). Companies with knowledgeable manpower who have an understanding of implementation and usage of cloud computing, would be better able to leverage the services available to achieve organizational goals (Khan 2015). Support from the top management team and the technological strategic resources play a crucial role in the adoption of cloud computing. Larger firms may be ready to take risks and be flexible compared to smaller firms. Increasing user awareness about the benefits of cloud computing can impact positively on the decisions made (Wu, 2011).

Creating a private and secured environment on employees' personal devices is helping organizations to implement strategies like Bring-Your-Own-Device (BYOD). This not only reduces the cost of providing separate company laptops but increases the performance of employees (Gupta *et al.*, 2013).

2.5.1.8 Top Management and Size of the firm

The size of an organization plays an important role in being flexible to the changes required during adoption. Backing up by top management is identified as one of the main advantages for IT innovation in an organization. Clear vision, suggestions and

continuous support from the top level can reduce organizational conflict on the adoption of new technology. Acceptance of such systems is completely dependent on the firmness of the top executives (Gupta *et al.* 2013). Organizations are able to use resources for computing wherever needed, without building and maintaining their own infrastructure physically. They are able to manage work load effectively and allow controlling and making changes to resource consumption. It empowers the end-user to control the resources as per the company's interest (Khan, 2015).

2.5.2 Disadvantages of Cloud Computing

2.5.2.1 Downtime

Availability of Internet connection to users requires strong speed Internet connection to access software, applications, or documents from the cloud (Aljabre, 2012). Unforeseen outages occur and execution of server maintenance can affect the performance of cloud computing (Wu, 2011).

2.5.2.2 Security

Cloud computing service providers must ensure that they can offer a secured connection, information security, data protection and privacy to encourage SMEs to adopt this technology (Aljabre, 2012). Complex structure and data compatibility issues are real challenges faced by organizations while trying to integrate, customize or migrate to new resources. Issues related to data transmission and data storage pose a big risk in cloud computing adoption (Gangwar *et al.,* 2015). Data handled by a third party may increase the risk (Khan, 2015).

Authentication through strong passwords, data encryption and selective access to users etc. can make the cloud more secure. The drawback is standard services like public cloud are affordable, while the customized services come with a premium which compels small and medium enterprises to stick with public cloud. However, the trend of using secure e-banking, online shopping, travel bookings via the Internet on hybrid cloud models are gaining attention due to high security measures and ease of use (Gupta *et al.* 2013).

Security aspect applies to each layer or service model to ensure authentication and authorization. Data encryption, identity management, access control, auditing of process are a few of the measures taken to ensure security of assets (Chang *et al.* 2013). Anonymity and complexity of cloud network access over the Internet creates vulnerabilities in virtualization and multi-tenant features. The migration of data from traditional network architecture to cloud exposes data to much vulnerability such as data deletion, exploitation, and leakage of private and confidential data. Data security breaches and system failure can be found out through regular audits and such violation leads to penalties based on the regulatory policies and procedures. System administrators, having unlimited access to multiple servers and databases, poses a threat to users. Exploitation of a known weakness in an application or operating system can risk all client data situated in multiple virtual machines on the same server (Opala *et al.* 2015).

2.5.2.3 Organizational Culture and Executive Support

The complexity of managing IT infrastructure reduces the effective adoption of cloud computing. If the organization is new to the technology, the manager who handles the IT department may not have confidence in cloud computing technology resulting in resistance of adoption. Sometimes complexity factors, where process adjustments and considerable training are required for this technology, can affect the decisions of company stakeholders negatively (Wu, 2011).

2.5.2.4 Lack of Monitoring Solutions and Auditability

Importance of government regulations at a national and international level is strongly emphasized by most of the scholars. Lack of government regulations can affect cloud adoption. Cloud service providers who have data centers in multiple locations find it very difficult to comply with all the rules and regulations of a customer's home country. However, to gain a good reputation and trustworthiness among their potential clients, providers are compelled to comply with industry standards and government regulations. Companies tend to lose control over their IT governance because the data storage and applications are under the control of CSPs. Enterprises must conduct regular audits to ensure the provider is abiding by the regulations, standards and enterprise policies (El-Gazzar, 2014).

Customers expect cloud service providers to be compliant and abide by the regulatory laws. The stakeholders from both providers and customers are forced to act as per legal and compliance requirements when immature cloud computing technology and unclear charging mechanisms are practiced (Gangwar *et al.* 2015). Agreed SLAs between service providers and the customer, signed contracts and policy documents play a vital role in risk management as physical control over outsourced infrastructure is very limited (Cloud Security Alliance, 2010).

2.5.2.5 Competition

Adoption of cloud computing benefits companies in collecting more accurate data and better market visibility. Companies face competitive and trading partner pressure to adopt new technologies to compete in the market. Firms are now alert and aware of the necessity of responding quickly to the market need (Wu 2011). Organizational stakeholders need an understanding of the importance of cloud computing adoption for the competitive readiness and survival in the market, else it can act as a major challenge in the adoption of cloud computing (Gangwar *et al.* 2015).

2.6 SMALL AND MEDIUM ENTERPRISES IN THE SOUTH AFRICAN ECONOMY

SME or SMME sector includes a wide range of enterprises. SMEs contribute as much as large enterprises towards the GDP of the South African economy. They may not be contributing the same as other sectors from a capital formation point of view, but the negative growth of the large enterprise sector and government sector increases the importance of SMEs in the socio-economic context.

SME in South Africa consists of a broad spectrum of enterprises which even contains an informal survivalist sector. However, most of the factors that are discussed in this paper focus on formal micro, small and medium enterprises (Kampel, *et al.*, 2003).

Small Medium Enterprises are often referred to as an indispensable factor in the South African economy. The success of these SMEs is mainly attributed to their agility, flexibility and innovation, especially when compared to large organizations (Adobi, 2010).

2.6.1 SME Definition

Numerous factors in the geography where SMEs are placed gets influenced while attempting to define SME. At present, there is no globally standardized definition for the term 'Small and Medium Enterprises (SMEs) (Smit et al., 2012). Most of the studies attempt to define the term SME by number of employees, asset criteria, size of the organization and formulas. Prominent South African studies and policies uses the number of employees to define SMEs but it runs the risk of not considering its efficiency and value addition (Gibson et al., 2008). *National Small Business Act 102 of 1996 (South Africa, 1996)* amended by *Act 29 of 2004 (South Africa, 2004)* defines SME both qualitatively and quantitatively. It also provides the supporting framework for this sector. The act qualitatively classifies the business into very small, micro, small and medium enterprises and quantitatively it categorizes based on the total number of full-time employees, total annual turnover and the gross asset value.

A SME is described by the National Small Business Act of South Africa of 1996, as amended in 2004 as:

" ...a separate distinct entity including cooperative enterprises and non-governmental organisations managed by one owner or more, including branches or subsidiaries if any is predominately carried out in any sector or sub-sector of the economy mentioned in the schedule of size standards and can be classified as SME by satisfying the criteria mentioned in the schedule of size standards" (Government Gazette of the Republic of South Africa,2008).

According to the Act, a company that employs up to 200 people is regarded as an SME except in the Agricultural sector where the limit is 100 employees. Small Enterprise scope is 1-50 employees whereas Medium Enterprise falls within the 51 to 200 employees. On the other hand, companies with up 20 employees are regarded as very small enterprises and in some cases referred to as Small Office Home Office (SOHO). Even though these SMEs play a vital role in the economy, it has been recorded that seven out of every ten SMEs fail within the first year of operation, (Adobi, 2010).

SMEs are dominant in most of the African countries. In South Africa alone, the SME sector contributes to the economy largely with an estimation of 90%. When large enterprises adopt retrenchment as a cost saving measure, SMEs create jobs for the employees who come from public and private sectors (Ntsika, 2001) (Smit *et al.,* 2012). South Africa faces an estimated unemployment rate of up to 40%. In such scenarios, performance of SMEs is crucial for the growth of the South African economy by creating jobs and mitigating poverty to some extent (Smit *et al*., 2012).

2.6.2 SMEs and the Competition Act 89 of 1998

SMEs and the Competition Act 89 of 1998 became operative in September 1999. The purpose of the South African Competition Act is to ensure that small and medium sized enterprises have an equal opportunity to participate in economic growth. The Act mainly tries to promote the efficiency, adaptability and development of the economy. It also provides competitive prices and products of consumer choice. It promotes employment and improves participation of SA firms in a wide marketplace. The Act specifically states SMEs opportunity to participate in the economy. The Act is also designed to cater for Black Economic Empowerment (BEE) companies and SMEs. This act specifically mandates the merger of BEE & SME interest by stating *'the ability of small and black owned firms to be competitive'.* The Competition Act tries to reflect government's attention to public interest and post-apartheid intentions (Kampel et al., 2003).

The overall purpose of the Competition Act is to promote and maintain competition, in order:

> *(a) to promote the efficiency, adaptability and development of the economy;*
>
> *(b) to provide consumers with competitive prices and product choices;*
>
> *(c) to promote employment and advance the social and economic welfare of South Africans;*
>
> *(d) to expand opportunities for South African participation in world markets and recognise the role of foreign competition in the Republic;*
>
> *(e) to ensure that small and medium-sized enterprises have an equitable opportunity to participate in the economy; and*

(f) to promote a greater spread of ownership, in particular to increase the ownership stakes of historically disadvantaged persons.' Government of South Africa: Competition Act, no 89 of 1999'

2.7 CRITICAL FACTORS AFFECTING SMEs IN SOUTH AFRICAN ECONOMY

There are number of factors that influence SMEs growth in the South African Economy.

2.7.1 Human Capital

To perform well and sustain this growth in the market, SMEs require qualified, skilled and motivated employees. Employees become expensive with the qualification and skills they acquire. If SMEs face any financial constraints, it becomes difficult to access this pool of resources (Chimucheka, 2013). Entrepreneurs with higher education and professional training are more likely to perform better and adapt their organization to changing technology and business environment. Lack of technical or managerial skills can be a factor which determines the success or failure of SMEs. Non-availability of skilled workers, high attrition and multi-functional departments are affecting the quality of products or services produced and offered in the market.

Lack of managerial skill can trigger many problems in the organization, such as an inability to draw a business plan, an inability to determine credit risk and poor general communication (Smit *et al.* 2012). Lack of education is seen as a significant barrier which affects the survival and growth of a business venture, especially newly established ones (Chimucheka, 2013). Low skilled workers are more likely to be employed in SMEs which is the chronic group when it comes to the country's unemployment rate (Alert: Issue Paper 2013). This sector has the potential to absorb unskilled labor (Smit *et al.* 2012). It is instrumental in creating jobs and contributing towards economic growth (Chimucheka, 2013).

2.7.2 Fear of Failure

The Global Entrepreneurship Monitor (GEM) states that fear of failure is a factor which influences a person's decision whether to start a business, irrespective of the opportunities and capabilities they have. Within the growing youth population of South Africa, identification and successful implementation of policies are necessary to portray entrepreneurship as a good career choice (Herrington et al., 2012). South Africa has fallen behind compared to other developing countries and entrepreneurial uptake is closer to that of a poorly performing developed country. A clear understanding of South African SME and its dynamics is essential for the better uptake of this sector in the economy (Alert: Issue Paper 2013).

2.7.3 Socio–economic Problems

The success factor of SMEs is very much dependent on the socio-economic conditions. If there is a downturn in the South African economy, SMEs find it very difficult to survive (Smit *et al.* 2012). Exchange rates and inflation are also considered major factors impacting South African SMEs. Inflation not only affects SMEs but also consumers, who have less disposable income due to an increase in expenses (Cant et al., 2013). There has been a considerable interest and increase in SMEs exploring opportunities in foreign markets. SMEs who are exporters have clearly gained advantages and adaptability compared to non-exporter SMEs in SA (Alert: Issue Paper 2013). Socio-economic problems like skills shortage, escalating crime rate, poverty, illiteracy and unemployment rate need urgent attention from the South African Government for the growth and survival of the SME sector. The South African Government has recently acknowledged the importance of this sector and shown commitment to promoting and supporting SMMEs. The Government has identified this sector as the key to alleviating poverty to some extent. This sector can effectively combine skilled and unskilled workers to produce goods and services for a very demanding market. It can help in reducing income inequality between population groups within SA, which is still estimated on the higher side. SME can be considered a path to widespread creation of wealth and employment (Chimucheka, 2013).

2.7.4 Risk Management

SMEs face high competitive pressure due to globalization, relaxing trade barriers, emerging technologies and innovation. It is highly necessary for SMEs to have a risk management process to identify any potential risk and to manage it proactively. Increased competition, market size, fluctuating commodity prices, declining consumer spend, location and poor understanding of the market, are some of the external factors that are affecting the performance of SMEs in South Africa. Entrepreneurs must analyze the situation and identify problematic areas to mitigate this risk to an extent (Smit *et al.* 2012).

2.7.5 Finance

To start trading, all business requires financial support. Poor presentation of business plans, lack of collateral security, insufficient bank deposit or credit records stand as a challenge for SMEs to avail bank loans (Chimucheka 2013). Even though there are risk evaluation models for SMEs in place, there is no suitable risk model emphasized by any studies. This creates a resistance from the banking sector to provide a helping hand to SMEs (Smit *et al.* 2012). There is a need for more research in this area, especially the financing available to SMEs, to identify the specific needs and to assess whether the current offerings from financial institutions are sufficient to meet the needs in terms of quality and quantity (National Credit Regulator (NCR), Dec 2011).

2.7.6 Technology

Keeping up with the latest information technology available is very important to all businesses. It involves cost and SMEs are dependent on investors for same. The quality of infrastructure affects the growth aspect of SMEs (Chimucheka 2013).

2.7.7 Products and Services

Innovative and quality products and services and feedback from the client through satisfaction surveys, determine SME's competitiveness and performance in the market. It can also determine long term sustainability of the firm (Smit *et al.* 2012). The SME sector is compelled to compete against large players in the market and this indirectly

influences the improvement in the quality of products, services offered and pricing. SME owners must understand and interpret market dynamics and related environmental changes to develop skills and competencies accordingly to maintain better performance in the market. The bargaining power of suppliers determines the cost price and selling price of a product. With greater supply and lesser demand of a product in the market, customers' bargaining power is usually very high. An entrepreneur or SME owner must never underestimate and assume that there is no competition in the market for what they are offering (Chimucheka, 2013).

2.7.8 Competition

High market concentration and competition needs to be addressed urgently with proper standards and measurements, in order to promote SME participation in the South African economy. There have been many discussions and recommendations to enhance the regulatory efficiency of competitive culture and for the effective implementation of a strong competition policy, however nothing has yet been published in the public domain. SMEs are highly susceptible to restricted access to raw materials, less cash flow and other strategic resources. Large firms controlling these factors compel SMEs to get out of the market. Awareness of this factor will step-up SMEs to the next level by bringing in innovation in products, services, processes, technology and a lower cost base (Kampel *et al.*, 2003).

2.8 ROLE OF ICT IN ORGANIZATIONS

Information technology is an integral part of global business (Chia-An-Chao, 2009). Information, Communication and Technology (ICT) development have been growing at a fast pace worldwide. The number of Internet users is also rapidly and continuously growing. SMEs can leverage this large pool of potential global customers by adopting Internet based ICT. The widespread offering from ICT and its use can help SMEs in improving their potential significantly both from an operational and strategic perspective (Shiels, McIvor & O'Reilly, 2003). Watad (1995) proposed an organizational outcome model where he defined it as '*attempting to secure customer loyalty through linking related services, introducing new services and improving the quality of service'* (Proudlock, 1999).

Adoption of information technology helps SMEs to compete with larger businesses (Chia-An-Chao, 2009). It enables SMEs to cater for increased opportunities with innovative products and streamline organizational process. It provides better co-ordination between departments within the organization resulting in internal transparency. Adoption of industry specific IT solutions not only improves internal efficiency but also positively impacts on service levels in sales and post-sales activities (Neirotti et al., 2012).

The level of ICT adoption among SMEs can range from a simple mobile phone/fixed line or a personal computer with basic software with no connectivity, to Internet connection with advanced technology like e-commerce, ERP and CRM usage. Micro and Small enterprises that are on a basic IT infrastructure can upgrade themselves to the next level and leverage communication through e-mails, file sharing, display company information and product catalogues on websites or even sell products online (O'Reilly et al., 2003). Sometimes due to the nature of the business or the industry sector, especially from a micro and small enterprises point of view, it may not be necessary to move to a highly sophisticated IT infrastructure. However, steps to basic information technology can transfer them to a secured position.

SMEs must conduct an analysis to determine where they are currently in terms of IT adoption and take strategic steps to enhance their position in the market by exploiting available IT solutions. The important factor that determines SMEs technical infrastructure sophistication is mainly the commitment from senior management. Organizations who adopt IT as part of a planned process, are better able to utilize its benefits compared to the firms who implement it on a reactive basis (Proudlock, 1999).

Technology like cloud computing creates more business opportunities that can be delivered through the medium of the Internet (Sultan, 2010). Adoption of updated solutions in IT such as cloud computing is widely accepted and promoted by many countries. It empowers SMEs to deliver product and services on a global scale by providing access to new markets. IT helps in the integration of process and systems with the organization and between suppliers or trade partners (Mokaya, 2012). Implementing the right solution has the potential to increase the competitiveness of

SMEs in the global market and help in streamlining internal business processes too. It is essential that development and design of IT strategy must be in concurrence with business strategy for smooth transition and alignment of process and technology (O'Reilly, 2003).

In today's world, customers are mostly dependent on integrated technologies for their day–to-day life. SMEs can exploit this opportunity by using several technology platforms to promote market, sell and support their products/services. It can also help SMEs to be in regular contact with suppliers, customers and trading partners by sharing information and resources (O'Reilly, 2003). SMEs tend to implement industry standard hardware and software to reduce potential risk. Small enterprises that are looking for an effective IT infrastructure must consider adopting off-the-shelf solutions or building it on existing platforms. However, there should be a continuous evaluation process of IT infrastructure to keep up with the recent developments in the market. Availability of user-friendly software and reduction in implementation costs attract more SMEs now than ever towards IT adoption (Proudlock, 1999).

Environmental factors play a very important role in adoption of information and communication technology by SMEs. External pressure from competitors, suppliers and buyers and government intervention can influence an organization to adopt technology (Gibbs 2007). Proudlock (1999) also mentions in his research that motivating factors for ICT adoption in SMEs are mostly from an external environment and the remaining come from within the organization.

Benefits and barriers of ICT adoption are influenced by the demography SMEs are placed in. The noticeable benefits of ICT adoptions include;

- Reduced operating cost
- Increased productivity and speed in delivery of products and supplier goods
- Better co-ordination with trade partners
- Better access to market information
- Effective tools to manage business and enhanced efficiency
- Reach customers across geographical borders
- Better relationship with customers, suppliers and trade partners (O'Reilly 2003)

- Business and revenue growth
- Improved business processes (Neirotti *et al,* 2012)
- Faster decision-making capacity
- Effective supply chain (Chia-An-Chao 2009)

Neirotti's (2012) study shows that '*returns from IT investments are higher when firm uses IT for product development capabilities and for its relationship with customers and suppliers in this process*'. He also recommends SMEs to analyze their industry condition before deciding to adopt emerging IT solutions. A generalized approach towards IT adoption may not take care of most of the competitive forces specific to that industry (Neirotti *et al.* 2012). In addition to the integrated marketing operations and strategic importance benefits of IT, SMEs must wisely invest in IT resource allocation. The resources allocation must reflect business priorities (Chia-An-Chao 2009).

Globalization has made ICT a basic requirement for enterprises. It helps in closing the gaps within the business sectors by enhancing efficiency, improving market reach and generating revenue. Limited availability of money and expertise act as a barrier to SMEs for the effective use of technology. Small enterprises normally stick to the basic communication or ICT tools such as mobile phones or e-mails due to financial limitations (Mokaya, 2012). There is a significant relationship between financial capacity and ICT adoption.

Lack of managerial time and lack of domain knowledge are other major barriers for the adoption of ICT. Small firms normally work in an uncertain climate which makes it difficult for them to take decisions and long-term planning to adopt IT solutions. Poor telecommunication infrastructure, especially in the rural areas, limited knowledge about ICT, inability to integrate company's business process to the recent technology, costs associated with the implementation and maintenance of IT infrastructure, also become barriers for SMEs to adopt ICT. These barriers are widespread among SMEs in both developed and developing countries (Proudlock 1999).

Limited level of knowledge about ICT tools and equipment make business owners believe that ICT is not necessary for business operations and assume that the cost of ICT adoption is very high and unaffordable. Entrepreneurs with more knowledge in this

area are more likely to adopt IT solutions compared to less knowledgeable ones (Mokaya 2012). Adopting technology like cloud computing helps SMEs to overcome the knowledge gap as the service provider will recommend implementation of appropriate IT systems and provide continuous support (Proudlock, 1999).

Government must facilitate programs related to technology adoption to promote the practice of using technology within the SME sector. Small businesses are mostly part of the social network of similar business owners and suppliers. Studies agree that peer groups and social network influence the decision of an individual (Gibbs, 2007). Creating awareness about ICT adoption and SMEs understanding its advantages can improve the adoption rate (O'Reilly 2003).

Continuous evolution of information and communication technology in the past few years may remove many of the obstacles faced by SMEs while adopting IT solutions. Platforms like Software-as-a-Service and Service Oriented Architecture (SOA) can take away the burden of managing in-house infrastructure, responsibility of ownership and provide flexibility (Neirotti *et al.* 2012).

2.9 CLOUD COMPUTION ADOPTION IN SME - BENEFITS & CHALLENGES

TOE Framework is used as the theoretical lens in this section to list the major factors that may act as benefits or barriers for the adoption of cloud computing in SMEs.

2.9.1 Benefits of Cloud Computing Adoption in SME

2.9.1.1 Technological Benefits

- **Security and Data Protection**

SMEs look for data protection when adopting cloud computing. Cryptography solutions can secure sensitive data thus ensuring confidentiality. Redundancy assures data availability and integrity. Elementary data disposal techniques ensure complete destruction of data including log references, back up registries when required (Gonzaleze *et al., 2012*).

- **Rapid Elasticity**

It takes only minutes to add, remove or replace resources to a detailed level compared to traditional IT infrastructure where it may take weeks for same level of task. Responsibility to manage server utilization, resource scale-up/ elasticity and risk estimation have been shifted to service provider from SMEs in cloud computing model. It reduces underutilization (Armbrust *et al., 2009)*

- **Reliability**

Cloud computing service providers offer 24/7/365 days with 99.99% up-time. Availability of back-up servers also helps in case of failure of applications to keep up reliability (Khan, *2015*).

- **On-Demand Computing Services**

SMEs can access required technology on-demand and get support whenever they require, unlike in-house infrastructure where one requires time to obtain resources, install and configure the resources as per requirement. Quick implementation service delivery attributes of cloud computing enables SME to reengineer their business operations and change IT infrastructure (O'Reilly, *2003*). SMEs can use this characteristic of cloud computing to enhance or change the internal computing resources (Aljabre, *2012*).

- **Better Accessibility**

Availability of cloud computing in a commoditized way enables SMEs on a daily basis to fulfill their computing requirements (Khan, *2015*). Even if the infrastructure, hardware and software is owned by vendor, the services can be accessed and utilized by cloud users anytime, anywhere (O'Reilly, *2003*). Availability of cloud computing in a commoditized way enables SMEs to fulfill their computing requirements on a daily basis (O'Reilly, *2003*).

- **Utilizing Web-Based Licensed Software And Its Regular Updates**

SME does not have to invest separately large amount on licenses as cloud computing service providers offer tailored web based solutions. No installation required on every

single computer and can be accessed from any location makes cloud computing model easy to manage (Khan, *2015*).

2.9.1.2 Organisational Benefits

- **Lower cost and reduced IT expenditure**

IT operational cost comes down. Rebooting of server becomes very easy. The cost of power cooling and physical space for IT infrastructure also comes down (Armbrust, *et al., 2009*). It helps in saving substantial cost due to in-house storage infrastructure and minimum IT administration, air conditioning and power cost (Khan, *2015*).

- **Improved Agility, Efficiency and Flexibilty**

This dimension talks about alignment of business process and technology to improve various business functions and improve competitiveness. It helps in streamlining internal operation. ICT implementation in an organization must be in such a way that internal systems and applications are consistent across department, irrespective of their functional differences (O'Reilly, *2003*).

Business agility which is the key to commercial success helps SMEs to reduce time-to-market. A degree of flexibility in IT resources provided by cloud computing helps SMEs to adapt changing demands of their business needs (Sahandi *et al., 2012*).

- **Improved Mobility and Collaboration**

Ability of users to access application and data from anywhere anytime is found to be key reason for SMEs adopting cloud computing. It is an ideal solution for the organisations that need on-demand remote access to tools and data (Sahandi *et al., 2012*). Cloud computing technology is compatible enough and allows users to share documents with other users who even have a different operating system. It provides ability to collaborate between multiple users or projects or documents. With the help of a computer and internet connection, users are able to access documents from distance (Aljabre, *2012*). Service provider rents out resources from cloud as per need. SMEs pay for the usage. Services provided are generally web-based which makes it easy to access from variety of devices (Zhang et al., *2010*)

2.9.1.3 Environmental Benefits

- **Competitive Advantage**

A wide range of services provided by cloud computing help SMEs to remove most of the technological barriers they face in global market and enhance competitiveness (Khan, *2015*). Adoption of cloud computing technology can take the business beyond geographic restrictions. Understanding the benefits and challenges help SMEs to bring out its potential and improve presence in wider geographic markets (O'Reilly, *(2003*). It allows SMEs to focus on innovation and creation of new products and services (Sahandi *et al., 2012*).

2.9.2 Challenges faced by SMES for Adoption of Cloud Computing

2.9.2.1 Technological Challenges

- **Security**

Even though there is logical isolation in Virtual Machines (VMs), hypervisor (software component in virtualization) vulnerabilities affect data confidentiality. This increases the chance of stealing cryptographic keys and VM placement attacks (Gonzalez *et al.* 2012). The multi-tenant nature of this technology raises the question of data privacy and confidentiality (Sahandi *et al.* 2012). Faulty authentication checks and unauthorized access may provide opportunities for security breaches. Data centers are also vulnerable to physical attacks and hardware theft. Insecure application programming interfaces and security loopholes increase the vulnerability. Phishing, domain name system attacks and access management issues are some of the major threats faced by SMEs from a cloud computing security management point of view (Hutchings et al. 2013).

- **Dependency on connectivity and third party**

Cloud computing adoption makes SMEs fully dependent on Internet connectivity for their business operations (Khan 2015). This technology requires uninterrupted high bandwidth Internet connection. In order to collaborate effectively, there is a high dependency on access to the Internet. Downloading documents and heavy files require larger bandwidth and high speed Internet connection. Remote areas where there is a connectivity issue may experience poor cloud services (Aljabre 2012).

- **Interoperability**

Lack of well-established standards sometimes makes it very difficult for SMEs to migrate the services to another CSP, even in the case of service termination (Gonzalez *et al.* 2012). It is not easy for a customer to extract their data and programs. It is definitely an advantage for CSPs but users find it a risk (Armbrust *et al.* 2009). SMEs looking for maximum efficiency through combining a range of services offered by different providers may experience difficulty (Sahandi *et al.* 2012).

2.9.2.2 Organizational Challenges

- **Top Management Resistance**

This factor can act as a benefit or a challenge. Business owners' or senior management's attitude, knowledge and experience become a driving force for adoption of technology in an organization. Sometimes top management lack ICT domain knowledge and do not clearly understand how to exploit the latest technology opportunities. It can be difficult to fulfill their strategic goals of efficiency and effectiveness without adopting updated technology like cloud computing (O'Reilly 2003). Financial constraint is also a reason for resistance from top management for the adoption of cloud computing. SMEs normally do not have large amounts to invest in implementation and upgrade of advanced technologies (Khan 2015). Poor technical and legal knowledge, along with no proper investors to fund technology adoption and limited personal resources, often gives minimal bargaining power (Hutchings *et al.* 2013). Cloud computing technology is still new in the market. It takes good business and technical knowledge to fully reap its benefits (Sahandi *et al.* 2012).

- **Transparency of quality assurance and monitoring**

Strong contracts on legal regulations are necessary for transparent and efficient audit methodologies for continuous analysis of service provided (Gonzalez *et al.* 2012). Most of the SMEs find it difficult to process improvement data to analyze the company's performance after cloud computing adoption. Infrastructure fully owned, managed and monitored by CSP makes it difficult for the customers to keep a control over their IT management (Khan 2015). A service driven operating model of cloud computing

emphasizes service management. SLA assurance is a critical factor from every provider expected by users (Zhang *et al.* 2010).

2.9.2.3 Environmental Challenges

- **Compliance and Regulatory Requirements**

Law enforcement becomes challenging when customer data is held in multiple jurisdictions by cloud service providers (Gonzalez *et al.* 2012). Careful consideration of legal issues is required because the physical location of data centers usually determines the law that can govern the management of data (Sahandi *et al.* 2012). Standard clauses on contracts may need additional review because of the nature of the technology. Both the parties should pay attention to ensure clauses are effectively addressing security risks, change of control and allocation of liability (ENISA, 2009).

2.10 SUMMARY OF CHAPTER TWO

This chapter surveyed the scholarship that informed this study. Different definitions of cloud computing where discussed in detail, including service and deployment models applied in cloud computing. This chapter went further to define SME's in South African context, their contribution to the overall GDP of the country, challenges facing SME's in South Africa. The next chapter discusses the theoretical framework and the research framework that underpins this study together with its elements.

CHAPTER 3

THEORETICAL FRAMEWORK AND THE CONCEPTUAL RESEARCH FRAMEWORK

3 INTRODUCTION

This chapter discusses the theoretical underpinnings and the conceptual research framework based on the TOE. This chapter uses the elements from the TOE to understand the cloud computing adoption by SMEs in South Africa.

3.1 TECHNOLOGY-ORGANIZATION-ENVIRONMENT FRAMEWORK (TOE)

Numerous studies have been conducted with the aim of understanding the factors driving technology adoption at organizational level (Alkhater, et al., 2014; Oliveira *et al.* 2014). Most of these studies used Rogers' (1995) DOI theory to explain innovation adoption and others have combined DOI and TOE, (Oliveira et al. 2014). Similarly, (Tornatzky, & Fleischer, 1990) developed the TOE framework to explain the process of introduction of new innovation in the context of organizations. Unlike DOI that used technology and organization elements, the TOE framework provides a holistic picture of the factors that influence technology adoption as it includes the environmental context to investigate the adoption phenomenon, (Oliveira, T. & Martins, 2011). Even though Tornatzky & Fleischer (1990) didn't specify the size of organization in which to apply their framework, Alshamaila *et al.* (2012) used the TOE framework in understanding cloud computing adoption by SMEs in the North East England. Baker (2011) described TOE as representing one segment of the innovation process i.e. how the firm context influences the adoption and implementation of innovations.

According to Oliveira *et al.* (2014) the technology context refers to the internal and external technology relevant to the organization and the technologies available for possible adoption. The organization context refers to the descriptive characteristics of the organization (i.e. organizational structure, size, managerial structure and degree of centralization), resources and process of communication among employees. Lastly, the

environment context comprises the market elements, competitors and regulatory environment. Based on the literature reviewed which included technology, organizational and environmental factors, this study sought to understand to what extent these factors influence the adoption of cloud computing by SMEs.

Most studies reviewed seemed to be consistent on the three factors suggested by TOE, for example Lin & Chen (2010) found that adoption of IT innovations depends on advantageous technology portfolio, structure of the organization and environment. The same TOE framework was used by Chau & Tam (1997) and the same three factors, technology, organizational and environment were found to influence the adoption of IT.

Finally, Low, Chen, & Wu (2011) found that three features influence cloud computing, i.e. technology context (relative advantage, complexity, and compatibility), organizational context (top management support, firm size, and technology readiness), and environmental context (competitive and trading partner pressures) which will be the same elements to be reflected on in this study's conceptual framework.

Table 2: Examples of TOE based studies (Alshamaila et al. 2012)

IS Adoption and context	Authors	Technology Variables	Organizational analyzed variables	Environment analyzed variables
Open systems: Firms in Hong Kong	Chau & Tam (1997)	Perceived benefits Perceived barriers Perceived importance of compliance with standards, interoperability, interconnectivity	Complexity of IT infrastructure Satisfaction with existing systems Formalization of system development and management	Market uncertainty
E commerce development level Firms in Shaanxi, China	Liu (2008)	Support from technology Human capital Potential support from technology	Management level for information Firm size	User satisfaction E commerce security

E business usage Firms in developed countries EDI Small firms in Hong Kong Enterprise systems SMEs in North West England	Zhu and Kraemer (2005) Kuan and Chau (2001) Ramdani et al. (2009)	Technology competence Perceived direct benefits Perceived indirect benefits Relative advantage Compatibility Complexity Trialability observability	Size International scope Financial commitment Perceived financial cost Perceived technical competence Top management support Organizational readiness IS EXPERIENCE SIZE	Competitive pressure Regulatory support Perceived industry pressure Perceived government pressure Industry Market scope Competitive pressure External IS support
Websites Small and large firms in Portugal Communication technologies Small business in rural communities in the USA	Oliveira, T. and Martins, M.F., (2008) Premkumar, G. and Roberts, M., (1999)	Technology Readiness Technology integration Security applications Relative advantage Cost Complexity Compatibility	Perceived benefits of electronic correspondence IT training programs access to the IT system of the firm Internet and email norms Top management support IT expertise Size of the business	Website competitive pressure Competitive pressure Vertical linkages and external support
IS Small business in Singapore	Thong, J.Y., (1999)	Relative advantage Complexity Compatibility	Size Employees IS knowledge Information intensity CEO's innovativeness CEO's IS knowledge	Competition

3.2 CONCEPTUAL RESEARCH FRAMEWORK

Although TOE in IS has mostly been used in quantitative research, it has also been used in qualitative research especially in complex phenomena that needs to be investigated in a natural setting and in real life context (Mbuyisa & Leonard, 2015). TOE framework was adopted in this study as the base in exploring and describing how the TOE factors influence the adoption of cloud computing by SMEs.

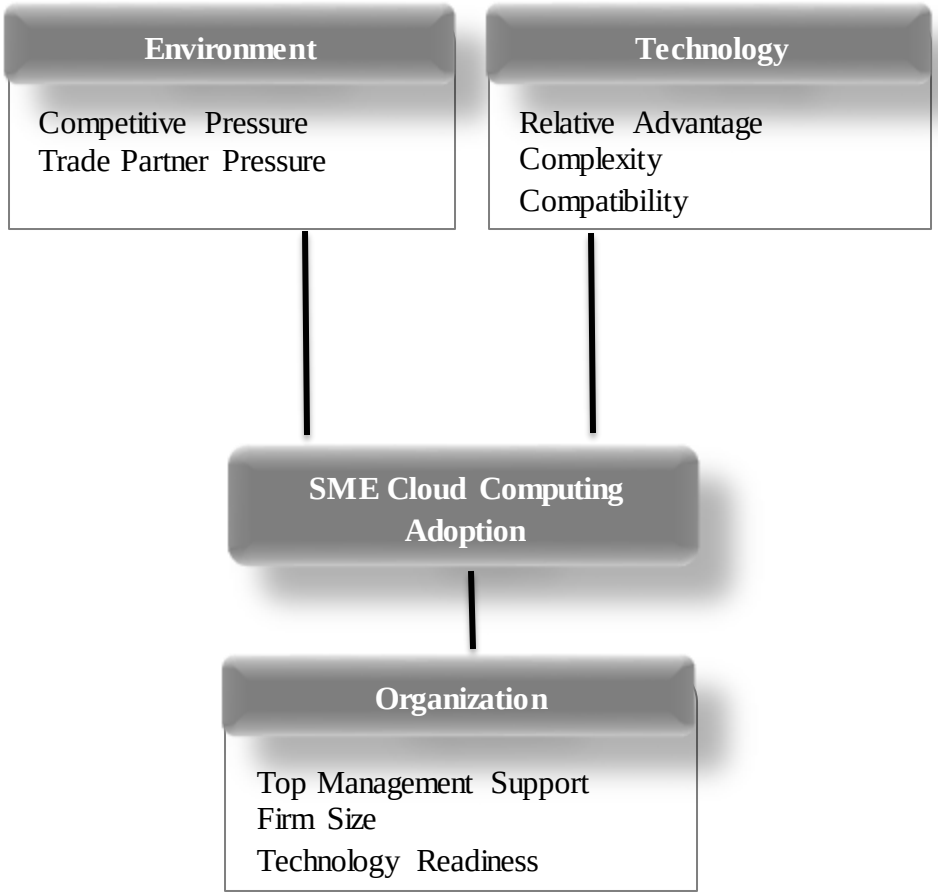


Figure 4: Cloud Computing Adoption Conceptual Research Framework

The conceptual research framework above depicts cloud computing adoption as the phenomenon influenced by technological, organizational and environmental factors. Each factor has items that were identified through literature review (Top management, Firm size, Technology readiness, Relative advantage, Complexity, Compatibility, Competitive pressure and Trade partner pressure). This process followed a systematic

review approach by conducting an extensive search of scholarly databases, EBSCO Host and business source complete. The researcher then grouped the most cited literature on adoption studies. Thereafter, researcher examined each item to determine its relevance to cloud computing adoption. Rogers (1985) explains innovation adoption as a rational process that provides a framework exploring different types of relationships between the organizational structure, its strategy and the environment. This definition resonates very well with the objectives of this research and the proposed conceptual framework in examining how the identified elements influence cloud computing adoption.

3.3 CLOUD COMPUTING ADOPTION

Rogers (1995) explained the clear distinction between the term adoption and rejection. He refers to adoption as the individual's or firm's decision to make use of the innovation as the best course of action, whereas rejection is the firm's decision not to make use of the available innovation.

Applying the above definition in this study, adoption then means a decision by an SME to make use of cloud computing technology at its disposal and thereby ensuring that all employees of the organization make full use of this innovation. Hsu et al. (2014) explains cloud computing adoption as handing over part of a firm's daily operation, equipment and even critical data to a cloud service provider. Thereafter, the firm needs to upload their data into the provider's environment which increases heavy reliance on the single service provider.

An SME or user has options of subscribing and paying for the services consumed in a given day, week or month through the three main cloud computing service models:

- Software as a Service (SaaS): where the user can access applications hosted in the cloud using the Internet e.g. Salesforce.com;
- Infrastructure as a service (IaaS): where the consumer has control of the operating systems, storage and deployed applications and not the cloud infrastructure e.g. Amazon; and

- Platform as a service (PaaS): refers to services that allow access to databases and storage functionalities in a virtual environment and the consumer does not control the underlying cloud infrastructure, (Low *et al.* 2011).

3.4 TECHNOLOGY CONTEXT

The technology context refers to both the internal and external technologies relevant to the organization that influences the adoption of cloud technology, (Oliveira & Martins, 2010).

3.4.1 Relative Advantage

Rogers (1983) defines relative advantage as the degree to which an innovation is perceived to be better than the idea it supersedes. If the expected or perceived benefits that come with adopting cloud computing (speed to market, better customer communication, cost reduction and affordability) exceed the existing practices, then relative advantage will positively influence adoption, (Oliveira *et al.* 2014).

3.4.2 Complexity

New technologies have to be easy to use in order to increase adoption rate (Alshamaila *et al.* 2012). This is also true for cloud computing in that migration of legacy infrastructure such as servers to the cloud might require a certain degree of skill and competence within the organization. Lack of this skill may result in the adopting organization perceiving cloud computing as being complex. Rogers, E.M., (2003) describes complexity as the degree to which an innovation is perceived as relatively difficult to understand and use. On the other hand, the perceived complexity of the innovation coupled with the firm's ability to use cloud computing can greatly influence satisfaction of cloud computing technology.

3.4.3 Compatibility

Prior studies have found compatibility to be an important aspect of diffusing innovation, in that the more an innovation is perceived to be compatible with existing values and systems of the adopting organization, the higher the chances of adoption, (Premkumar,

et al., 1994). This statement is consistent with Rogers' (2003) definition of compatibility as the degree to which an innovation fits with the potential adopter's values, previous practices and current needs. The reverse is true in that incompatibility can be a hindrance in further diffusion of innovation as a result of incompatibility with internal information systems applications (Cooper & Zmud, 1990).

3.5 ORGANIZATIONAL CONTEXT

3.6.1. Top Management Support and Firm Size

The role that top management plays in adopting new innovations is critical as it involves creating the right climate and culture for the adoption process. Doing so might include influencing the organization to have the right attitude towards accepting the change and giving both the financial and human resource support needed, (Alshamaila *et.al* 2012).

On the other hand, size can also influence cloud adoption because smaller firms are often found to be more innovative and tend to respond quicker to changes in their environment compared to large organizations. Because of their size, they tend to be agile and thanks to the pay-as-you-go cloud model, SMEs are now able to access IT services previously enjoyed by large enterprises, thereby leveling the playing field for competition (Damanpour, 1991).

3.6.2. Technology Readiness

This concept refers to both technology and human resource capabilities needed to adopt cloud computing (Oliveira & Martins, 2010). In the case of cloud computing technology, capabilities include enterprise systems and network elements needed to provide the platform to accommodate cloud applications, whereas IT human resource capabilities refers to the skill sets needed by the organization to implement cloud services (Low *et al.* 2011).

3.6 ENVIRONMENTAL CONTEXT

The environmental context is influenced by the type of industry where an organization conducts its business, its competitors and suppliers (Oliveira *et al.* 2014).

3.6.1 Competitive and Trading Partner Pressure

Competitive pressure represents the current environment that SMEs operate under, (Oliveira & Martins, 2010). Intense competition from a rapidly changing environment is seen as a significant determining factor in technology adoption. An organization that adopts cloud computing will reap the benefits provided by this technology such as greater operational efficiencies, better market visibility and access to real time information (Low *et al.*, 2011).

Additionally, firms do business with their trade partners and in most instances, they share operating systems for the ease of doing business like stock management systems. In some cases, organizations adopt CRM systems to manage customer databases and new systems like salesforce.com to improve customer lead times. Adopting new systems usually necessitates trading partners to follow suit in order to stay competitive (Low *et al.* 2014).

3.7 SUMMARY OF CHAPTER THREE

This chapter introduced TOE as the theoretical framework used, the rationale behind choosing TOE for this study. Other related studies that used TOE theoretical framework were also highlighted and explored. The chapter went on to propose a conceptual research framework based on the TOE elements. The next chapter will look at the research methodology used in the study in describing and exploring the determinants influencing adoption of cloud computing by SME's in South Africa.

CHAPTER 4
RESEARCH METHODOLOGY

4 INTRODUCTION

This chapter deals with the research methodology used to respond to the study's research objectives by using the conceptual framework elements as a base in understanding which elements had an impact in cloud computing adoption by SMEs. This chapter outlines the different processes involved in the study such as explaining the research paradigm and approach taken, data collection process, analysis and interpretation of data, the research instrument, the sampling process used for the study and ethical considerations.

4.1 RESEARCH PARADIGM AND APPROACH

A research paradigm refers to a set of assumptions of how things work in reality, whereas the research approach outlines the way of doing things which involves a framework of how data was gathered, the instrument used in gathering this data, how it was analyzed and used in the cloud computing adoption phenomenon, (Creswell 2009). Walsham (1993) suggested that research paradigms are concerned with translating things that are believed into things that are known. In doing so, the research paradigm can either take on a positivist or an interpretive philosophy. This study did not follow a positivist paradigm as it is associated with quantitative research which involves hypothesis testing to get to the truth without involving personal feelings or opinions, instead the study used the interpretive paradigm (Walsham, 1993).

4.2 JUSTIFICATION FOR INTERPRETIVE PARADIGM

Cloud computing has been around for some time in South Africa, yet its adoption rate by SMEs is considerably slow (Goldstuck, World Wide Worx, 2014). The researcher assumes that there might be some underlying factors that are at play that hinder the uptake of cloud computing by SMEs. In trying to understand these factors, it was critical to understand the participants' feelings and opinions towards cloud computing

and the only way to achieve this was through human interaction (one on one) in an interview process, hence the interpretive paradigm was used.

This study used the Orlikowski & Baroudi (1991) suggestion in investigating the cloud computing adoption phenomenon which highlighted that the aim of interpretive research is to understand how members of a social group, through their participation in social processes, enact their realities and endow them with meaning, and to show that these meanings, beliefs and intentions of the members help to constitute their social action. The researcher in this case believed that having one on one discussion with the business owners would give a deeper understanding of why they have adopted, or not adopted, cloud computing. The interview approach taken in this study also gave the participants an opportunity to highlight other factors which were not included in the interview questionnaire. These factors are discussed in detail in the research findings section.

Interpretive research starts from the position that our knowledge of reality, including the domain of human action, is a social construction by human actors and that this applies equally to researchers (Walsham, 1993). This paradigm further suggests that there is no objective reality which can be discovered by researchers and replicated by others. Interpretive research posits that the researcher uses his/her preconceptions to guide the process of enquiry and through interactions with human subjects can change the perceptions of the researcher and subjects (Walsham, 1995).
The interpretive approach differs considerably from the positivist approach in that real events can be observed empirically and explained through logical analysis and that researchers can take a scientific perspective when observing social behavior (Travers, 2001).

Mbuyisa & Leonard (2015) quoted Oates (2006) that *"interpretive research in information systems and computing is concerned with the social context of an information system: the social processes by which it is developed and constructed by people and through which it influences, and is influenced by its social setting…"*

4.3 RESEARCH STRATEGY

There are two types of data sets for empirical research according to Creswell (2009), quantitative data, which is the type of data that takes on the form of numbers, and qualitative data, data that is mostly in words. Trope (2014) suggests that, given that questions are key characteristics of a research, research questions may require different methods to answer them. For example, quantitative questions require quantitative methods, and qualitative questions require qualitative methods to answer them.

Depending on the complexity of the study phenomenon, Mohlameane & Ruxwana, (2013) suggests a phenomenological approach. This is because phenomenology is concerned with the study of individual experience regarding a particular phenomenon. They go further to suggest that, if one seeks to gain a deeper understanding and complexity of a particular phenomenon, that particular phenomenon is better investigated in a natural setting and real life context.

Based on the above, the highlighted approach seems to resonate with this study of interest for two reasons:

- Cloud computing is a fairly new technology innovation, perceived to be complex if you do not have an in-depth understanding of how it works
- Given that cloud computing adoption is slow amongst SMEs, in order to fully address our objectives, it makes sense to get a deeper understanding of the individual experiences regarding this technology to help us understand why there is a slow adoption rate amongst SMEs

Based on the above and the study of interest for this research, a qualitative data approach will be used.

This case study used multiple site interviews to answer the 'how' and 'what' questions on the determinants of cloud adoption by SMEs in South Africa. Since this study is descriptive and exploratory in nature, it is worth explaining the difference between the two. Exploratory case studies look into clear cases characterized by the lack of detailed preliminary research whereas descriptive case studies explain the occurrences and the context in which it occurred (Baxter & Jack, 2008). The interview research approach is

suitable for this study as it is concerned with describing real world phenomena rather than developing normative decision models. The approach is also ideal as the study sought to explore and describe the cloud computing adoption factors and their relationships in an area where research is in its infancy (Gibbert, Ruigrok & Wicki, 2008). One of the main advantages of conducting interviews is that it shows how things occur in practice, straight from the people involved in the area of study and therefore can be useful to organizations (Boodhoo & Purmessur, 2009).

In most cases samples of qualitative study, especially when using multi-site interviews, are usually smaller compared to quantitative approach. This is based on the fact that qualitative research is more interested in the meaning of a particular phenomenon than the generalized hypothesis (Mason, 2010).

There are no hard-and-fast rules about the number of cases to be sampled for a multiple case study design. The size of the sample is influenced by a number of factors, such as: heterogeneity of the population, the number of selection criteria, groups of special interest that require intensive study, multiple samples within one study, types of data collection methods, budget, time, human resources. The number of cases needs to be sufficient to reach a point of theoretical saturation. Theoretical saturation is reached when the results from new data do not provide new insight on the phenomenon being studied, (lshamaila et al, 2013). This study interviewed five SMEs operating in different sectors of the economy in South Africa as part of data collection.

4.4 RESEARCH DESIGN

The study explored and described the cloud computing adoption determinants by SMEs in South Africa. It sought to understand to what extent these determinants influenced the cloud computing adoption by SMEs. Based on the above, the study used SME organizations as units of analysis. The case study method was used to do an in-depth analysis of the cloud computing adoption phenomenon. This is an exploratory and descriptive study which used semi-structured interviews. The interviews included participants from five SMEs operating in different industries - Human resources, Engineering, IT, Legal and Hospitality sectors.

4.5 CASE STUDY DESCRIPTION

This section briefly discusses the case units for the study. Each SME studied was taken as a case unit. All the names used below are pseudonyms for purposes of confidentiality. This study used purposive sampling as discussed below as research instrument. The reason for selecting different sectors was to gauge if there would be consistency in behavior amongst SMEs from different sectors when it comes to the manner in which they adopt cloud computing.

- **Case Unit 1: Over the Top Pty Ltd**

This SME is based in Sandton, Johannesburg. They are an executive search company primarily offering their services to multinationals and large enterprises. Their business model is based on end to end recruitment services which includes succession planning and sourcing individuals of high caliber across the African continent. They have a staff compliment of five, made up of three researchers, one finance and administration and the owner and founder of the company.

- **Case Unit 2: Cipal Telecoms**

Telecommunications Company based in Midrand, offering engineering managed and installation services to one of the leading tier 1 cellphone companies in South Africa. Their main focus is improving network performance and stability, driving down opex for their customers and assisting capital projects in terms of design architecture and implementation. Staff compliment of over 80 people made up of technicians, engineers, and executive management. Cipal Telecoms was formed about three years ago and has grown tremendously in that time.

- **Case Unit 3: Alex Restaurant**

Upmarket Italian restaurant based in Bryanston, Johannesburg. The restaurant is all about family quality eating. Alex restaurant opened its doors just over a year and half ago. Their business model is about offering a fine dining experience at an affordable cost. They employ just over 50 people made up of chefs, waiters, managers and the business owner.

- **Case Unit 4: N & H Attorneys**

A legal firm practicing in the heart of Sandton, north of Johannesburg. This SME offers legal services to business clients, mainly large corporates and State owned companies, in South Africa. Their services include litigations, conveyancing, civil cases, amongst others. They have been around for 10 years starting with three employees to just over 40 people currently made up of clerks, candidate attorneys, administrators and Directors of the company. They have a satellite office in Pretoria to service the Pretoria based clients.

- **Case Unit 5: Infraset IT Services**

IT solutions company with headquarters in Sandton, Johannesburg with branches in India and Dubai. Their services include website design and maintenance, mobile application development, digital services focusing on the SME segment. The business has been around for over two years with eight permanent and 18 contractor staff made up of software developers, designers, content writers and search engine optimization specialists.

4.6 DATA COLLECTION TECHNIQUE FOR THE STUDY

This study used multi-site interviews made up of five SMEs based in Johannesburg, South Africa operating from different industries being Hospitality, IT, Engineering, Human Resources and Legal as the primary data collection method. The participants were mainly business owners as they are the decision makers within their businesses. The results from these interviews identified the relations between the elements used to the acceptance adoption of cloud computing services. The participants in the interviews were given an opportunity to discuss factors that they perceive as relevant and important in their working environment without prescribing and advancing those factors highlighted in the TOE framework. Taking that approach helped in eliminating doubts regarding cherry-picking elements from the TOE framework to bias the study.

4.7 RESEARCH INSTRUMENT

Semi-structured, face to face interviews approach, was conducted with key decision-making individuals from selected SMEs who are involved in choosing the type of technology being used by the firm and the adoption process. Semi-structured interviews are when an interviewer attempts to verbally get information from an identified person through questioning (Walsham 1995).

Although the interviewer prepared questions beforehand, semi-structured interviews followed a conversational approach. Participants were allowed to choose where these interviews should be conducted, with their offices being the preferred place. The duration of these interviews was between 45 minutes and one hour. Participants were asked for their permission beforehand to record these sessions using a tape recorder. The structure of the questions asked included the background of the firm, the size and industry, awareness and use of cloud computing services. The interview script also included factors from the TOE framework as part of the discussion, their understanding of cloud computing and challenges facing SMEs. Lastly, participants were given an opportunity to highlight other factors outside of TOE factors that they felt promoted cloud computing adoption by SMEs. (See appendix for the script). The structure of the interview questionnaire was based on the Alshamaila *et al. (*2013) research paper on the cloud adoption factors by SMEs in North East London.

4.7.1 Sampling Method

Sample, by definition, refers to the representative part of the targeted population that is methodologically selected to participate in a study, (Mohlameane & Ruxwana 2013). Purposive sampling was used for selecting the various participants. Babbie (2005) suggests that purposive sampling involves the selection of units to be observed on the basis of your own judgment about which ones will be most useful.

Using purposive sampling, five SMEs were selected from the National Small Business Association database from different sectors in Gauteng province. The reason for selecting different sectors was to gauge if there would be consistency in behavior amongst SMEs from different sectors when it comes to the manner in which they adopt

cloud computing and, secondly, observe the different influences that TOE elements have between sectors.

4.7.2 Data Analysis

The interviews were analyzed using thematic analysis. Thematic analysis is used in cases of identifying, analyzing and reporting patterns or themes within data and as a result thematic analysis helps to interpret various elements of the research topic (Boyatzis, 1998). This type of analysis is different from both interpretative phenomenological analysis (IPA) and grounded theory as these seek to describe patterns in the data, but within the boundaries of theory (Braun & Clarke, 2006). Thematic analysis acknowledges the researcher as active when identifying themes to report on.

The main steps of the Thematic framework that were followed in this study are detailed below (Colaizzi, 1978):

- Read each participant's narratives or protocols to acquire a sense of them.
- Go back to the protocols and take from them the phrases that relate to the phenomenon under study.
- Formulate meanings of the sentences/phrases taken from the protocols.
- Organise each meaning into theme clusters, which can then be categorised.
- Consolidate the theme clusters into an "exhaustive description" of the phenomenon (thematic analysis).
- Formulate an exhaustive description of the investigated phenomena in as unequivocal a statement of identification of its fundamental structure as possible.
- Validate the study further by bringing the statement and exhaustive description back to the participants in an interview and ask the participants if this reflects their description of their experiences.

In this study, each objective or research question was viewed as a theme with subthemes as they emerged from the data. These themes captured something important about the

data that is related to the research questions or objectives and represented a level of response or meaning within the data set (Braun & Clarke, 2006). The analysis is represented as a theme and subsequent subthemes; the researcher discusses that using a table of what could be ontology of the participants. The ontology elements are based on Weber (2012) conceptualization of IS ontology and are described as: *individuals/objects*-basic or ground level objects, classes-sets, collections or types of objects; *attributes*-properties, features or characteristics that properties can share; *relations*-the way objects can be related to one another; and *events*-the changing of attributes or relations.

4.7.3 Validity

Validity of data in research is described as seeking to understand if the research indeed measured that which it intended to measure and how truthful and trustworthy the results of the research. This is often done by asking a number of questions and will also look at the answers in other research, (Creswell 2009). Creswell & Miller (2000) suggested in qualitative research, validity is affected by the researcher's perception of validity in the study, also by his choice of paradigm assumption. As a result of the above assumption by Creswell and Miller (2000), Golafshani (2003) points out that many researchers have developed their own concepts of validity and in most instances generated or even adopted what they themselves consider as more appropriate such as quality, rigor, and trustworthiness.

Triangulation was used in this research to test validity and also to control bias of the study. Creswell and Miller (2000) defines triangulation as the validity procedure where researchers search for convergence among multiple and different sources of information to form themes or categories in the study. These themes were formed in this study through thematic analysis method and each theme was developed using the objective of the study and the research questions.

4.7.4 Reliability

Reliability in research on the other hand refers to the consistency of a research results from a group of individuals. If the findings from the research are replicated consistently, then the results are deemed reliable. Creswell and Miller (2000) suggests that a

correlation coefficient can be used to assess the degree of reliability. They further assume that if there is high positive correlation then the test results are seen to be reliable.

The internal consistency reliability is normally used in quantitative research to measure and evaluate the degree to which different test items probing the same construct produced similar results, as such validity tests were used in this research instead of testing reliability.

4.8 LIMITATIONS OF THE STUDY

The limitations of this research also present opportunities for future research. The fact that the sample size is made up of South African SMEs, might not be enough to generalize to the whole SME community around the globe. This study excluded all organizations that fall outside of the SME category as defined by DTI (>200 employees). Furthermore, the level of understanding of cloud computing varies between SMEs with IT resources and those without, which might bias their responses to some interview questions.

In investigating the cloud computing adoption by SMEs, this study looked at adoption of all three different cloud computing service models, (IaaS, SaaS, PaaS). There is an opportunity for further research focusing only on one of the service delivery models, its popularity amongst SMEs and the reasons behind it in different parts of the world.

4.9 ETHICAL CONSIDERATIONS

The selected participants were asked to voluntarily participate in the interviews after background about the researcher himself and the objectives of the research were presented to them. Those interested were asked to give consent to participate in the interview process.

The participants had the right not to declare who they were, in other words their responses remained anonymous for the purposes of confidentiality. The responses from

the participants were used for the purposes of this research only and at no stage will the researcher make contact to try and bias the responses. Participants were also assured of their right to privacy and that the interviews will by no means be used to harm them or their businesses. Participants were also given the approval letter from the Ethics Committee of Wits University which gave permission for the researcher to approach potential participants for the study.

4.10 SUMMARY OF CHAPTER FOUR

This chapter discussed the research methodology together with the different methods used for this study. Reasons for choosing a multiple case study were clearly articulated and the research instruments were covered. Chapter five discusses the empirical data collected and its findings.

CHAPTER 5
DATA ANALYSIS AND DISCUSSION OF FINDINGS

5 INTRODUCTION

This chapter analyses data from the interviews conducted. As highlighted in Chapter 4, the study used a qualitative method to collect data and the method of analysis chosen for this study was Thematic analysis. This chapter goes on to discuss the results, and interprets the findings against the reviewed literature. After having analyzed, discussed and interpreted findings, the results from the findings were then used to develop a recommended conceptual framework that included all the elements which were found to be significant in the study.

5.1 ANALYSIS OF QUALITATIVE DATA COLLECTED

The process of data analysis used four themes (labeled theme A to theme D) which emerged from the data collection process, then each theme has subthemes which were based on the theoretical framework elements and the research objectives of the study. The themes identified were: SME Challenges, Cloud computing & Challenges, Cloud computing value and TOE factors.

- Theme A probing "SME challenges" objective 1 (To explore challenges facing SME's in the South African context.)
- Theme B probing "cloud computing and challenges" relating to objective 2 (To explore what cloud computing is in the context of South African SMEs)
- Theme C probing "cloud computing value" relating to objective 3 (To describe how SMEs can derive value out of cloud computing adoption)
- Theme D probing "TOE factors" relating to objective 4 (To describe how TOE factors influence SME cloud computing adoption)

The data collected was recorded using a tape recorder, then transcribed and coded to develop the themes and subthemes above. The questions asked in the interview aimed to address the research objectives highlighted above, and also asked questions relating to the elements of the theoretical framework.

The analysis highlights the questions asked by the researcher including answers from participants, followed by the researcher's comments. In cases where participants gave similar responses to a question, their answers were grouped and recorded as one response to avoid duplication. In instance where participants were not clear about a concept or question, these were thoroughly explained to gain a better understanding and answers to the questions.

5.1.1 Participants

A total of five SMEs participated in this study all coming from different industries, being Information Technology, Human Resources, Engineering, Legal and Hospitality. All the participants in these interviews were business owners with years of experience in their respective industries. The tenure in business varies from one-and-a-half years to 13 years in business. The research done by Adobi (2010) revealed that seven of ten SMEs fail within one year of operation.

Table 3: Companies Participating in the Study

No.	Industry	Adoption stage	Size/employees	Person Interviewed
Over the Top PTY LTD	Human Resources	Already adopted: Laggard	5	Owner
Infraset IT Services	Information Technology	Already adopted: early adopter	8	Owner
Alex Restaurant	Hospitality	Laggard: already adopted	54	Owner
Cipal Telecoms	Engineering	Already adopted: early adopter	80	Owner
N & H Attorneys	Legal	Already adopted: laggard	42	Owner

The table above summarizes the five organizations that participated in the interviews. The level of adoption varies from organization to organization as shown above.

Only Infraset IT and Alex Restaurant have been in business for less than two years whereas Over the Top has been around for 13 years, Cipal for five years and N&H has been in existence for 10 years. Taking the above research results from Adobi into consideration, one could assume that there was a lot to learn from our participants on the challenges they faced in their journey and on how to survive going forward.

5.1.2 Regulatory Bodies

It is worth noting that all the participants' organizations operate in industries that are regulated by different industry bodies.

5.1.3 Geographical Presence

Only Over the Top and Infraset are doing business inside and outside of South Africa with Over the Top having clients in the rest of Africa and Infraset operating in other parts of the globe Johannesburg, India and Dubai and the rest all operate within South Africa.

"*Globalization is a reality in our business and our clients are doing business all over the show and are demanding our services where they have presence, thanks to cloud technology we have been able to meet these challenging demands as we do a lot of Skype calls saving on travel costs, use LinkedIn to search for candidates in these areas*"

The analysis of the different themes followed a similar process: interview questions were asked, then responses from participants followed in italics with similar responses recorded and written as one, and thereafter the researcher's brief comment and review findings against literature.

5.2 **THEME A:** SME CHALLENGES – OBJECTIVE 1 (TO EXPLORE CHALLENGES FACING SMES IN SOUTH AFRICA)

Q1. What is your understanding of how SMEs are classified in South Africa?

"*So, we use the sectorial codes of classification, any business with employees less than 300 people and with revenues of R250 million, so that's what we understand as the definition of SMEs*"

The participant's understanding of classification based on two categories, being number of employees and turnover, is correct even though the numbers aren't correct. DTI cut off points are 200 employees and R50 million turnover revenue.

"*The description of SMEs varies based on the number of employees plus turnover, eehhh if you take our business for example our turnover is just less than R50mil, so yes we do consider ourselves as an SME, I think the threshold is R50mil from a financial point of view"*

This participant's view is correct on the threshold from a turnover perspective, even though he did not mention the number of employees in this question he did mention later on in the interview that they have 44 employees in the company.

"*We know that our clients view us as an SME based on the turnover and the number of employees*"

The categories used by this participant are indeed correct by using number of employees and turnover.

"*SME in my view is not an MTN or Vodacom but smaller in size*"
It seems as though this participant wasn't sure what the definition of an SME is in South Africa even though size does matter.

Findings against literature

The researcher found that there is a general understanding of what constitutes an SME as it was fairly consistent across all participants. Adobi (2010) states that the act regards any company that employs up to 200 people as an SME except in the Agricultural sector

where the limit is 100 employees. Small Enterprise scope is 1-50 employees whereas Medium Enterprise falls within the 51 to 200 employees.

On the other hand, companies with up 20 employees are regarded as very small enterprises and in some cases referred to as Small Office Home Office (SOHO). All participants used the Department of Trade and Industry code of classification which classifies SMEs using the number of employees and company's annual turnover. Table 1 shows the number of employees for each participant, however none of the participants was willing to share their annual turnover as they considered it to be confidential but all confirmed that their annual turnover was less than R50 million.

Q2: In your view, what are the challenges facing SMEs in South Africa?

"We do supplier development right across our organization for small companies like yours, unfortunately that doesn't extend to the legal division, when it comes to legal we don't mess around, we prefer our established law firms who we have done business with since 1927"

In this case business development was highlighted as the major stumbling block for this SME especially from the multinationals who have developed strong relationships and trust over the years with large organizations.

"You need to make sure that you have funds that will cover you for six months when you start a business, simply because things like getting on companies' databases on average takes 2 to 3 months, then their payment terms of between 30 to 90 days before you can receive your first payment"

All participants mentioned access to finance or capital funding as the biggest challenge for SMEs in South Africa especially when you are a start-up company.

"*We offer technical services to our customers and you need technical people to deliver superior service. IT professionals are hard to find in South Africa, and when you do find them you pay a fortune for their skill."*

"*We find ourselves having to compete with large corporates who have bigger budgets and more resources for the same job, as such we have to be more creative, faster and nimble to stay in the game*"

This participant, in particular, operates in a highly skilled environment where acquiring and retaining individuals with specialized skill is a challenge as they seem to compete with large enterprises with bigger resources for the same talent pool.

"*If you are doing business with large corporates, they expect anything between 30 to 90 days before you can smell your payment, delayed payments or longer payment terms can easily put you out of business"*

Payment terms was generally seen as the common issue which puts most SMEs out of business. Large organizations including the public sector are seen as dictating these payment terms to suit their own business model with little or no regard for SME business.

Findings against literature:

Challenges experienced by our participants were fairly similar in that, those who have just started their businesses have similar experiences to those who have been around for a longer period of time. This in essence tells us that not much has changed in the South African SME landscape in the past 10 years given that some of our participants had the same challenges when they started their business. Some of the challenges highlighted include, finance: lack of capital funding and cash flow management; skills shortage; payments terms; budget cuts by big business; exposure to technology; business development; lack of track record or references; lack of SME support from big business.

- **Finance**

All participants highlighted lack of funding as the major challenge in getting their business going and also in managing it effectively. Lack of funding was split into two:

- Access to start-up capital in order to fund the upfront requirements of running a business. These might include securing office space, to procuring tools of the

trade like all technology equipment (printers, phones, laptops, and connectivity), materials, transport etc.

- Cash flow management includes paying salaries and other operating expenses.

The finance challenges experienced by SMEs from the interviews is consistent with what Smit *et al.* (2012) established regarding the banks' reluctance in extending a helping hand because this sector is deemed as high risk. Chimucheka (2013) also highlighted the lack of security as the big stumbling block in advancing capital to the SMEs.

- **Skills shortage**

Smit *et al.* (2012) suggests that a lack of skilled employees might trigger many problems to the organization and potentially hinder business growth. The skills shortage issue was highlighted by our participants as a major challenge especially in the technology space. The survey done by National Small Business Chamber in 2012 also highlighted the shortage of IT professional skills in South Africa.

- **Payment Terms**

Our participants' experience is that big business tends to dictate payment terms without taking into consideration the impact it has on small businesses.

- **Cost cutting by big business**

The South African growth economy has been under pressure in recent years, with the devaluation of the Rand and increases in the cost of borrowing as a result of increased interest rates. All these factors are putting strain on company performance and big businesses are looking for innovative ways to cut costs. Services that were previously outsourced to SMEs are now performed in-house.

- **Exposure to Technology**

Exposure technology is seen as a big challenge facing SMEs in South Africa. Results from the interviews revealed that big business tend to impose the kind of technology an SME should adopt in order to do business. However, the argument from SMEs is that the cost of acquiring these technologies is sometimes high yet there are no guarantees for work based on the technology adopted.

- **Business Development Challenge and Lack of Support from Big Business**

Almost all our participants complained about the stringent requirements for doing business with established/big businesses which make it difficult for an SME to even be shortlisted due to not meeting the minimum requirements. Lack of track record, referrals and testimonials was cited as one of the hindrances in acquiring new clients. There is a growing perception that big companies are reluctant to support SMEs unless forced by legislation. They acknowledge that it takes time to build trust and, as such, they have to put in double the effort in order to be recognized as worthy of being given an opportunity.

5.3 **THEME B:** CLOUD COMPUTING AWARENESS & CHALLENGES – OBJECTIVE 2 (TO EXPLORE WHAT CLOUD COMPUTING IS AND CHALLENGES IN THE CONTEXT OF SOUTH AFRICAN SMES)

Q1: **Are you aware of what cloud computing is?**

"eehhh Cloud, mhh I keep hearing about cloud from my IT service provider and from friends but not sure exactly what it is, I don't want to embarrass myself but please explain"

This participant sounded unconfident about his understanding of cloud computing, however after explaining the concept using examples it immediately became clear that they have indeed adopted some elements of cloud computing for their business like LinkedIn, Microsoft Office 365.

"*No I don't know what cloud computing is, as I said I'm good with technology, explain it further for me, (giggling) school me*"

Based on his response, and his body language, the two participants appeared lost to a point that it seemed as if it was the first time they were hearing of cloud computing.
"*(giggles), cloud its up there, joking, I think so we do use Dropbox, all our files and client information is on Dropbox somewhere"*

The cloud concept was explained and both participants acknowledged using some elements of cloud, Skype for business, Dropbox, advanced booking system and LinkedIn.

"*Oh, is that cloud, ok, we have three companies that we rely on for IT service and support, one that does our connection support being Netsurit, two doing Digital support including social media, three being the company that hosts my website and does our storage and backup*"

"*We are a young dynamic company with young engineers and technicians, we have adopted cloud fully in our business, we use Google drive for emails and sharing of documents, we have no servers at our offices, thanks to our client, they are all in the cloud*"
"Cloud is fairly new in the market, so as digital business we have to adopt all kinds of technology including cloud, we host our clients' websites, we do search engine optimization, we develop software for the auction industry all in the cloud my man"

Excellent understanding of what cloud is and its functionality! Of particular interest was the fact that both participants were proud that they have adopted cloud computing and they are amongst the few companies either who have adopted, or offer, cloud-based solutions to customers.

Levels of awareness varied amongst our participants. Infraset and Cipal were fully aware of the cloud computing concept, its benefits and challenges and as a result they have fully adopted most forms of cloud and are really ambassadors of cloud computing. On the other hand, Over the top, Alex, N&H and Cipal did not understand exactly what cloud computing is but as we explained and gave examples, we soon realized that they have somewhat adopted cloud computing.

The researcher's view is that, although cloud computing is a new concept, most people are not aware of the concept until it is explained, except for a few that are technology savvy and are fully aware of what the concept is about. It was clear from the results that cloud computing awareness is definitely an issue. However, all participants did not have a technical / IT department and they rely on outsourced vendors for their IT needs. Most businesses even though not aware that they have adopted cloud computing to some degree, are using at least one of the cloud service delivery models, in this case SaaS.

Challenges of cloud computing

"Mhhh, the only thing that concerns me is if one day I wake up and my data is gone, that's my business gone, but I'm not really worried because cloud services providers have a reputation to protect, if someone hacks into Google's servers, it's not my problem but Google's"

General observation was that a lot of trust is placed on the service provider's reputation.

"I focus on my business and the IT Company must ensure that I get my information when I need it"

"We are a legal firm, so security and privacy is of utmost important and I don't trust these fly-by-night IT companies with my business"

Data security and privacy topped the list regarding our participants' concerns and challenges of cloud. Responses regarding perceived challenges of cloud technology were consistent in all our interviews. What was interesting to note is that almost all our participants are not worried about where the data is stored but rather want access to it as and when the need arise. They have trust in the well-known cloud service providers like Microsoft, Amazon, Google and other multinationals.

"As much as cloud services can potentially reduce capex cost, however if the price of data remains where it is today, then the perceived cost reduction benefit will not be real"

The issue of data cost was another concern especially from the two participants who have fully adopted cloud. Network stability and high speeds are key for cloud computing usage. This view is consistent with what Aljabre (2012) suggested, that cloud service providers must ensure that they offer a secure connection, information security, data protection and privacy to encourage SMEs to adopt cloud computing.

Findings against literature

There was a general view that the authentication measures put in place by the reputable cloud service providers are enough to gain SME's trust and overcome the security fears around cloud. (Gupta *et al.* 2013) confirms that authentication through passwords; data encryption and selective access to users can make cloud more secure. They further suggest that there is a growing trend of using secure e-banking, online shopping and travel bookings via the Internet due to their high security measures and ease of use.

"*Yaah, South Africa has power shortages, remember we call it load shedding, it's a problem when you have to rely on cloud computing because you won't be able to access your data without power*"

Infrastructure challenges: instability in power supply, also referred to as load shedding, in South has proved to be a major challenge not only to accessing cloud services but to running a business as well. Most SMEs have had to invest in a back-up electricity supply in order to keep the lights on. Accessing cloud services is heavily reliant on stable network infrastructure and high speed of data. Cost of data is perceived to be extremely high in South Africa, as such there has been ongoing campaigns like "# data must fall campaign" towards the network operators to reduce their price of data.

5.4 **THEME C:** CLOUD COMPUTING VALUE – OBJECTIVE 3 (TO DESCRIBE HOW SMES CAN DERIVE VALUE FROM CLOUD COMPUTING)

Q1. Please describe the value that you derive from cloud computing

"It helps with managing and lowering operating costs, it's an off balance sheet cost because there is no investment in hardware and infrastructure"

This basically means that through cloud computing this participant has been able to manage costs for his business. This view was also shared by Alex Restaurant saying *"it's affordable, I don't have to fork out cash upfront"*

"Adopting cloud services has given us the ability to enter new markets especially in Africa without incurring that much travelling costs, we are now able to complete the full search process using cloud, for example, search for candidates via LinkedIn, arrange for interviews via Skype, share documents via Dropbox whilst exchanging information using O365."

The value that most of the participants gain from cloud computing seem be clear and identifiable from all participants from different sectors.

"Through cloud computing, we appear as cool and professional when we deal with corporates, for example, I can suggest video conferencing to save time on business travel, suggest instant messaging or sharing of files as forms of communications"

Leveling the playing field was seen as a major benefit of adopting cloud computing for this participant to the extent of even wanting to show off when dealing with large enterprises of cloud computing functionalities.

"Through booking application, I'm now able to do predict analysis of my regular customers. This application helps me to retain my customers, know their behaviors much better, before but most importantly I'm able to plan better from inventory management to planning shifts"

This participant is gaining value from a scalability point of view. His ability to plan and manage shifts through his cloud-based booking system helped him with better forecasting and shift planning.

General conclusion from the researcher was that there is clearly an overwhelming view from all participants that, yes, they are deriving different kinds of value from adopting cloud computing depending on the type of cloud solution they have adopted ranging from costs, to affordability, to better planning and scalability.

Findings against literature

The findings above are consistent with the literature reviewed at least on some of the benefits they derive. The view about the ability to scale up or down based on business demand is consistent with Gangwar *et al.* (2015) that as the organizations mature in the usage of cloud computing, cloud service providers help the organization to scale up or down in their resources and infrastructure.

Cloud computing brings about the ability to level the playing field with large business. It makes SMEs' business look bigger and more professional. It also gives access to the same technology and resources used by large enterprises at a fraction of the cost of traditional technologies, (Goldstuck, World Wide Worx 2014).

Cost reduction and affordability: feedback from our interviews suggests that there's a common view that cloud computing does reduce infrastructure cost. This view is supported by many studies around cloud computing like Oliveira *et al.* (2013) pointing out that consumers only pay as per the services contracted for. The fact that cloud service providers can host multiple customers in one server gives them the ability to offer shared resources at the lowest cost, (Opala *et al.* 2015).

Access to new markets: our participants felt that if it wasn't for cloud computing, they would be restricted in terms of where they can do business.

5.5 **THEME D:** TOE FACTORS – OBJECTIVE 4: (TO DESCRIBE HOW TOE FACTORS INFLUENCE CLOUD COMPUTING ADOPTION)

Q1: In your view, how does relative advantage, complexity and compatibility influence cloud adoption

Technology Context

"If it's not going to give you competitive advantage, then why waste money on it, technology isn't cheap bra (slang for brother)"

The general view from this participant was that all three elements definitely influence cloud computing adoption.

Lee (2004) suggests that if a firm sees a particular technology as bringing about relative advantage, it is more likely to adopt such technology. This was found to be the case with all our participants as they perceived cloud computing to be technology that gives them a relative advantage. Infraset ITand Cipal Telecoms confirmed, based on their knowledge of cloud computing, they clearly understood the benefits that cloud computing could bring to their businesses such as cost reduction, improving efficiency, scalability, opening new opportunities in other markets and better planning and, as such, it was not a difficult decision to adopt this technology.

Complexity

"*Our engineers are used to operating in complex environments, but when it comes to adopting new technologies they prefer ease of use as it will determine their attitudes towards adoption*"

"*Our legal suite application is not an easy technology but just because it makes us look professional all our employees are obliged to use it to an extent that we impose penalties where they have not used it"*

Infraset IT and Cipal didn't find cloud computing to be complex, they referred to it as a 'plug and play' and easy to implement without any assistance from cloud service providers.

On the other hand, Over the Top, Alex Restaurant and N&H did not see complexity as a major problem provided that the benefits to the organization are clearly articulated and understood by the decision makers.

The statement above seems to differ from what Rogers, (2003) stated, that adoption will be less likely if the innovation is considered as being more challenging to use.

Compatibility

"One of our company values is speed of delivery, therefore I will not consider any technology if it's not going to help us deliver with speed"

All our participants' views on compatibility were consistent, in that their company values serve as a guide in all the decisions they take. Similarly, a decision to adopt a particular technology will have to be guided and compatible with their company values.

All the participants considered cloud computing as fairly compatible with their values and business needs. Our findings on compatibility were not surprising as most of the previous research like Lee (2004), Premkumar, G., (2000), Alshamaila et al. (2012) found compatibility to be a significant factor in adopting new innovation.

In general, all the three elements being relative advantage, complexity and compatibility were found to be significant factors that influence cloud adoption for SMEs.

Q2: Organization context: In your view, how does firm size, management support and technology readiness influence cloud computing adoption?

Top Management support

"*As soon as we adopt new innovation, we give no option or alternative to our employees, it's the highway or no way type of approach, remember the saying, water will follow the path of least resistance, so is the case in our organization when it comes to adoption and use"*

All our participants agreed that top management's involvement and support is critical in cloud computing adoption. As the owners of their businesses they are responsible for ensuring that they get returns out of every investment made by the business.

Findings against literature

The study findings are consistent with those of Alshamaila *et al.* (2012), Ramdani & Kawalek, (2007) who found that without top management support SMEs are less likely to adopt new technologies.

Size

"*It's always easier to implement things with a business our size as you do not have to convince the whole world before a decision is made".*

Size of the organization was considered a significant factor on cloud computing adoption by all participants

"*Speed is everything, if the market changes today, I should be ready tomorrow otherwise I will be out of business*"
"*Size alone does not matter, small or big but if you don't have a culture that supports agility and embraces change, you are doomed to fail"*
"*We preach to our staff that the only way for the business to survive is if we adopt the right culture that allows flexibility and being dynamic"*

Given the tough trading environment in which our SMEs operate, especially competition against large organizations, the ability to make decisions faster and consistent innovation, remains the only competitive edge to help them stay in business. Size of the organization was seen as a significant factor in adopting cloud services.

However, the results also highlighted that size alone is not enough; another factor that plays a significant role is organizational culture, i.e. being agile and nimble.

Findings against literature

The findings from the interviews in the subject of organizational size are consistent with the literature reviewed. Damanpour, (1991) stated that smaller firms were found to be more innovative and respond quickly to changes in their environment compared to larger organizations.

Technology Readiness

"*Well, no, no I don't worry myself about such, I pay for technology and someone else must worry about its implementation and maintenance"*

All the study participants did not have dedicated IT personnel in-house, the IT function has been outsourced except for Infraset IT because they are IT experts and it is their core business. Technology readiness was not perceived to be a significant factor as they believed that the outsource partner should worry about developing technological capabilities and the right personnel to support. This finding is contrary to Oliveira & Martins (2010) as they found technology readiness to be a significant factor even though they did not specify whether in large or small organizations.

Q3: Environment: In your view, what is the impact of competitive pressure, trade/suppliers' pressures on cloud computing adoption?

This is what Alex Restaurant had to say, "*I believe that I have a good brand and as such I don't run my business based on what competition is doing, I listen to what my customers say, look at the needs of my business and then decide where and how to deploy my resources".*

This view was shared amongst the rest of our participants except Infraset IT. Infraset IT's view is that due to the nature of its industry their business cannot afford to ignore what the competition is doing and what technologies they are adopting.

"*Competition in our industry is cut-throat, we are always on a look out for what is new in the market, when we see that another business has adopted new technology we immediately investigate it and decide whether to adopt or not so that we don't lose out on business, so yes competition does determine what we do to some extent"*

Competitive pressure was found not to be a significant factor to influence cloud adoption in Over the Top, Alex, Cipal and N&H

Findings against literature

Our findings on competitive pressure are consistent with those of Alshamaila *et al.* (2012) who also found no evidence to support that competitive pressure indeed influenced cloud computing adoption. These findings are contrary to those of Premkumar & Roberts (1999), Zhu and Kraemer (2005), who found competitive pressure as a significant factor influencing SME adoption.

Trade partner pressure

"*In order to get into some of the large organizations' supplier databases you are expected to adopt a certain type of technology"*

The same view was shared by all our participants in the interviews. Over the Top said, "*it's a no brainer, if you want to get paid on time you must just adopt that technology, it's as simple as that"*

The findings from the interviews revealed trade partner pressure as playing a significant role in cloud computing adoption and are consistent with literature. Adopting new systems usually necessitates trading partners to follow suit in order to stay competitive, (Low *et al.* 2014).

Q6. What other factors influence cloud computing adoption by SMEs

This study revealed that most of the benefits highlighted in this study, for example ease of use, flexibility, cost reduction, scalability, connectivity and affordability, all play a role in promoting cloud computing adoption by SMEs. We also found that the opposites of these factors will inhibit adoption, i.e. complexity, perceived to be expensive, rigidity, and poor connectivity. However, further findings from the interviews also revealed that over and above these factors highlighted above and the TOE factors, there were other factors that they felt played a key role in cloud computing adoption in the SME environment.

The researcher felt that it was critical to give participants an opportunity to say things from their perspective about what they consider to be other factors that influence cloud computing adoption outside of those factors from the TOE framework. Taking this approach was also supported by Alshamaila *et al.* (2012) to avoid being biased and criticized of cherry-picking elements from the TOE framework.

Organizational culture

Over the Top, Cipal and N&H companies suggested that "*company culture has to be such that it promotes employees to be open and embrace new innovation and encourage them to be ambassadors of change, small things like incentivizing employees for new*

innovation will go a long way in driving the right behavior towards adoption of such innovation like cloud computing"

Technology Trialability

Cloud service providers must give SMEs proof of concepts so that they test these new technologies like cloud computing. N&H and Alex Restaurant suggested that "*if someone came to me and offered cloud computing trial to test and feel the benefits of this technology, say for a month, depending on the results of the trial, if I'm happy then chances are I will adopt that technology*".

These findings are consistent with those of Ramdani et al. (2009) *and* Alshamaila *et al.* (2012) who also found trialability to be a significant factor towards SME adoption.

Regulatory support

We picked up through our interviews that all participants operate in industries that are highly regulated. This is what Cipal Telecoms said,

"*take for example POPI act (protection of personal information) which requires all organizations dealing with customer data to be compliant with this regulation, we've had to adopt a cloud-based application from Google that gave us a certificate on securing and protecting customer data. We get a certificate stating all the steps taken to secure our customer information."*

These findings are also consistent with those of (Zhu & Kraemer 2005) who found regulatory bodies do play a significant role in adoption of new technologies.

The results also suggested that technology awareness and education does play a role in influencing adoption. The perception from our participants is that cloud service providers are focusing more on large organizations and are giving minimum attention to SMEs when it comes to raising awareness.

The SMEs believed that having a single person take care of their IT needs will not only help them save time and focus on business development, but will eliminate the need to deal with different people for IT requirements - trust will be improved which might increase the chances of them adopting cloud computing. Over the Top said,

"Most of us SMEs are not technology savvy, we good at what we do and would rather leave the technology side of things and let someone who is an expert advise me on what technologies to adopt, time is money for me, and I don't want to talk to one person for connectivity, another for LAN support and another one for cloud services, give me one person and let him or her worry about the rest and let me focus on what I do best, getting business"

5.6 Conceptual Framework for cloud computing adoption

The conceptual research framework used in Chapter 3 was reviewed using the findings from the interview process in evaluating which elements were found to be significant and which ones were not. The table below summarizes the significance of these elements. It is worth noting that both competitive pressure and technology readiness were found not to be a significant factor in cloud computing adoption for SMEs. However, three new factors were seen as playing a significant role in adoption. These factors are regulation, culture, awareness and trialability.

Table 4: Summary of findings

Factors	Significance	Company
Technology		
Relative advantage	Significant	All participants
Complexity	Significant	Over the top, Infraset, Alex
Compatibility	Significant	All participants
Trialability	Significant	All Participants
Awareness	Significant	Over the Top, Alex & N&H
Organization		
Size	Significant	All participants
Top management	Significant	All participants
Technology Readiness	Not significant	

Culture	Significant	Alex Rest, Cipal & N&H
Environment		
Competitive Pressure	Not Significant	Over the Top, Alex, Cipal & N&H
Regulation	Significant	Infraset, Cipal, N&H
Trade partner pressure	Significant	All participants

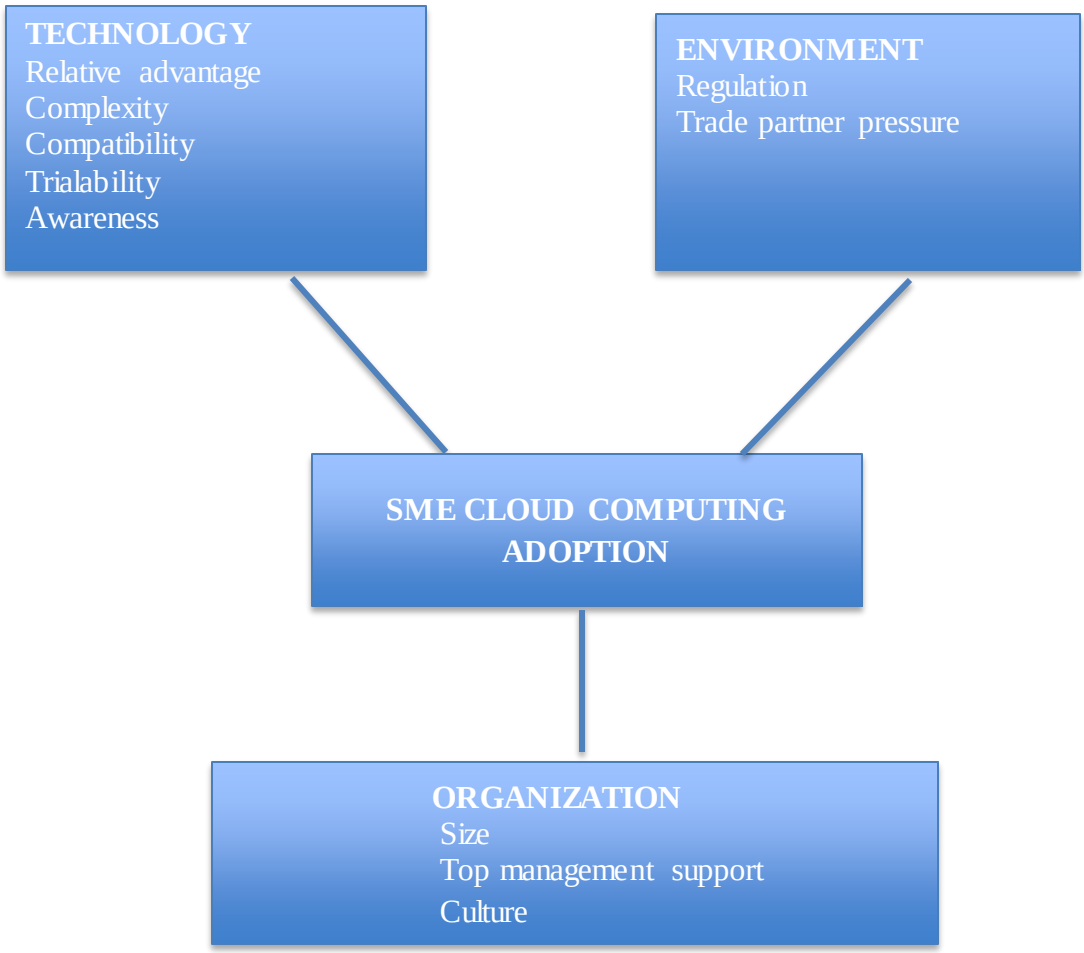


Figure 5: Conceptual Framework based on findings: SME Cloud Computing Adoption

The literature and findings from the study were used to come up with recommendations used in SME cloud computing adoption framework. These elements can be seen in Table 8 above.

Literature and findings from the study were used in putting together the following recommendations in determining the determinants influencing cloud computing

adoption by SME's in South Africa. The framework above depicts all the elements that influences adoption being relative advantage, complexity, compatibility, trialability, awareness, regulation, trade partner pressure, size, top management support and culture.

The study revealed that technology, organization and environmental factors they do influence adoption of cloud computing amongst SME's with the elements highlighted above as playing a significant role in the adoption process.

5.6.1 Technological: Relative advantage

SME's operate in a competitive environment often with limited resources in order to stay in business. The study revealed that choosing the right technologies should be based on the perceived advantage and benefit that this innovation will bring to the business, hence relative advantage is a significant factor in adoption process of cloud computing adoption by SME's.

Awareness: it was evident from the study and interview results from all participants that they aren't prepared to invest in cloud computing if they are not aware of what this technology can do. Therefore this means that cloud service providers to invest more resources and exploiting all avenues in raising awareness and customer education on cloud computing. The awareness element is new and was found in our study as playing a significant role in adoption process hence it is recommended to be included in the conceptual framework.

5.6.2 Compatibility

Most organizations' way of doings things is influenced and based on the values adopted by the business, some businesses refer to these values as the fiber or the DNA of the business. It is therefore recommended and crucial that when an organization decides to adopt new innovation, that this innovation is compatible with the existing values of the business in order to extract value from the technological investment made.

5.6.3 Complexity

It is also worth noting that if this technology is perceived to be complex and difficult to understand, there are few chances that it will be adopted easily by the users. Therefore, choosing an innovation that is easy to use and understand is critical when making technology adoption decisions.

Getting businesses to invest in a new technology might be challenging especially for SME's with limited resources. It is recommended that cloud providers should give businesses an opportunity to test cloud products for a period of time in order to experience the highlighted benefits. They can do this by offering proof of concepts also referred to as trial in promoting cloud computing adoption by SME's without upfront investment. This trial period will not only reduce risks associated with this technology, but will give opportunity for the business to test compatibility. This is a new element found to be significant in cloud adoption process, hence the recommendation to include it in the conceptual research framework.

5.6.4 Environmental

All participants acknowledged that systems influenced by regulation are difficult to avoid and in most cases form part of doing business and complying with authorities. This is a new element that influences cloud computing adopting process, and which should be included in the SME cloud computing adoption process.

5.6.5 Trade Partner pressure

All participants felt that in order to maintain a healthy relationship with your suppliers, it is often advisable to adopt all the systems recommended by your trade partners. Being on the same system with suppliers can potentially provide benefits for both customer and supplier like improved turnaround times, enhanced productivity, access to information, hence it is advisable for SME's to adopt recommended cloud solutions used by their partners.

5.6.6 Organizational

Top Management support:

None of our participants had dedicated IT departments in house, as such all investment decisions are made by the owner of the business. All of them agreed in using a top down

approach when it comes to ensuring that all employees use adopted systems. Cloud providers should ensure that they engage top management when selling cloud solutions. This can be done through trials, raising awareness and educating their existing and potential clients.

Taking this approach especially in the SME segment will have positive results because if the top management buys into the value of investment, then it is easier to implement across the organization because of size. SME's by virtue of size tend to be less beaurocratic than large organizations with multiple approval levels. However, size alone is not enough if the culture of the organization is not conducive to accepting and trialing new technologies. It is therefore recommended that SME's should create a culture that encourages its employees to accept new technologies and encourage trial. They can do this by putting in place rewards system in place towards trial and usage of new innovation. Culture is a new element in the framework and it was found to playing a significant role in cloud computing adoption process by SME's.

5.7 SUMMARY OF CHAPTER FIVE

Five SME's were identified and selected to participate in the interview process that assisted in gathering empirical data. Findings from these interviews were revealed, presented and interpreted in this chapter. These findings from the interviews were then used to construct a new conceptual model proposed in this study. The next chapter reviews and evaluates whether the research objectives of this study were met.

CHAPTER 6
EVALUATION OF THE RESEARCH

6 INTRODUCTION

This chapter is presented in the form of a reflection on the research process thus far, also to ascertain whether the research objectives were met and whether both primary and secondary research questions have been answered through this process. This research was an early attempt at exploring and describing the factors influencing SME cloud computing adoption in South Africa. The chapter also discusses the limitations of the study and makes recommendations for further research.

6.1 OVERVIEW OF CHAPTERS

6.1.1 Chapter 1

The first chapter highlighted an introduction to the field of study by providing the background to the research problem. The study location and study context were explained, research problem, research goals and objectives, followed by research questions (both primary and secondary) were also discussed. Lastly, this chapter also touched on the theoretical and practical implications of the study including its delimitations.

6.1.2 Chapter 2

This chapter surveyed the scholarship used in the study by using different forms of scholar databases. This was achieved by shortlisting over 187 journal articles for review. All these journal articles focused on cloud computing adoption by SMEs. The research process took on a systematic literature review process where all shortlisted articles were grouped into subtitles to create search strings:

- Cloud computing and adoption
- South African SMEs
- IT adoption framework
- Benefits and challenges of cloud computing

6.1.3 Chapter 3

This chapter covered the theoretical underpinnings and its elements on which this study was based. A conceptual research framework was developed using Technology, Organization and Environment (TOE) as a theoretical base to help us explore and describe the factors influencing cloud computing adoption by SMEs. This chapter also reviewed and highlighted the different studies that previously used the TOE framework.

6.1.4 Chapter 4

Chapter 4 discussed the research process undertaken in the study, including research methodology used. These included the research paradigm, approach, strategy, design, instrument, data collection, sampling method, limitations and ethical considerations. The study also justified why a case study strategy was used for this research. A total of five SME participants were interviewed.

6.1.5 Chapter 5

The data gathered through the interview process and its findings were then analyzed and reviewed in this chapter. The findings indicated which elements significantly influence SME cloud adoption and also how these elements influence cloud adoption. The elements which were found to have significant influence in SME cloud computing adoption were used to develop a new conceptual model.

6.2 RESEARCH GOALS AND OBJECTIVES

The goal of this study was to develop a conceptual framework using Technology, Organization, and Environment framework (TOE) as a theoretical base.

This goal was achieved through the following objectives:

- To explore general challenges facing SMEs in South Africa
- To explore what cloud computing is and challenges in the context of South African SMEs
- To describe how SMEs can derive value from cloud computing
- To describe how TOE factors influence SME cloud computing adoption

The following questions were derived in order to ensure that the above objectives were met:

6.2.1 Primary Research Question

What determinants influence cloud computing adoption by SMEs in the South African context?

6.2.2 Secondary Research Questions

- What are the challenges facing South African SMEs?
- What is cloud computing in the context of SMEs in South Africa?
- How can South African SMEs derive value out of cloud computing?
- How do Technology, Organization and Environmental factors influence cloud computing adoption?

6.3 Challenges facing SMEs in South Africa

The following were found to be the common challenges that SMEs face in South Africa: Human capital, fear of failure, socio-economic problems, payment terms, cost cutting by big business, business development, finance, technology and product and services.

6.4 Cloud computing and its challenges

The study adopted the National Institute of Standards and Technology definition as the most appropriate for this research which defined: *Cloud computing is a model for enabling ubiquitous, 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 service provider interaction*

6.5 What is the definition of an SME in South Africa?

It is a separate distinct entity including cooperative enterprises and non-governmental organizations managed by one owner or more, including branches or subsidiaries if any is predominately carried out in any sector or sub-sector of the economy mentioned in the schedule of size standards and can be classified as SME by satisfying the criteria mentioned in the schedule of size standards.

6.6 Describe cloud computing value enjoyed by SMEs in South Africa:

These benefits were highlighted by the participants in our interview process together with those mentioned in the literature review: scalability, affordability, cost reduction, leveling the playing field with large corporates, better planning and access to new markets.

6.7 How do Technology, Organization and Environmental factors influence cloud computing adoption?

All of the above sub questions were answered through literature review and also through the findings from the research interview process covered in Chapter 6. The study found the following TOE elements to have a significant influence in SME cloud adoption: relative advantage, compatibility, complexity, awareness, trialability, trade partner pressure, regulation, top management support, size and culture.

6.8 CONTRIBUTIONS OF THE STUDY

6.8.1 Limitations of the study

First limitation: The unit of analysis of the study was the SME segment which means that it excluded the medium size and large companies. The findings from this study are only applicable to SMEs.

Second limitation: Geographical limitation due to the fact that the study was conducted in South Africa, is a developing market. It might well be that some of the challenges that SMEs face in South Africa are only unique to developing countries and not SMEs in the developed world. For example, issues of connectivity tend to be more prevalent in emerging economies. Therefore, these results cannot be generalized to SMEs across the globe.

Third limitation: The participants in the interviews were business owners and it is possible that employees might have a different view of the factors that influence cloud computing adoption for SMEs.

6.8.2 Future Research

There is an opportunity to do the same research in different countries to see if these findings will be consistent. Further, this study revealed three other factors that were found to be significant in cloud computing adoption by SMEs and it will be worth understanding if these factors (culture, single point of contact for IT needs, regulation and awareness) will have the same impact in other markets outside South Africa. The study used five SMEs from five different sectors which means, in essence, one participant from each industry. There is an opportunity to increase the sample size to include more than one participant from each industry to determine whether there will still be a consistency in findings.

6.8.3 Contributions to the Research

Cloud computing adoption by SMEs is still in its infancy when compared to large organizations across the globe. This clearly shows that there are different challenges facing SMEs with regard to cloud adoption than those facing large organizations. There are few studies that used qualitative methods to investigate the cloud phenomenon, yet this method provides a unique opportunity when doing interviews, in deeply understanding the issues that relate to why adoption is slow amongst SMEs. It is the researcher's view that this study will contribute towards the academic pool of research and the research community as a whole to assist in gaining a better understanding of the cloud adoption phenomenon.

Cloud service providers can benefit a great deal in understanding why certain SMEs adopt cloud and others do not whilst operating in the same market conditions. Vendors can also understand why certain cloud services (Saas) are more popular than others. The findings from this study can also assist cloud providers to package their services in such a way that they are addressing different needs of SMEs, instead of a one-size-fits-all approach, for instance the single point of contact for all IT needs.

The findings of this study also revealed that managers and especially top management plays a key role in driving cloud computing adoption within organizations. The findings also highlighted that in order to promote high adoption of cloud computing technology, manager's needs to ensure that organizational culture and environment as a whole is conducive for employees to adopt cloud computing technology.

On the other hand, it is also critical for top management to understand the positive impact that cloud computing benefits can have in the overall performance of the business and its bottom line.

6.9 CONCLUSION

Although cloud computing technology is still in its infancy, this study highlighted the potential value that this technology can have in organizations. Even though this study did not focus on large organizations, there clearly is an opportunity to understand whether the value derived by SMEs is the same as that of large organizations. It is clear though that attention needs to be given in increasing the adoption rate of cloud computing for this technology to have a significant impact in the marketplace.

The value of this research report is in contributing to the growing body of academic knowledge in Information Systems, notably on the determinants of SME cloud adoption in the South African context.

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6. APPENDIX I: (INTERVIEW SCHEDULE)

1. **Company Information**

    - Briefly tell us about your company background:
    - Industry?
    - No. of employees?
    - Any regulatory body?
    - Number of years in business?
    - IT Support (In-house or Outsource)?
    - Geographical presence (locally or abroad or both)?

2. **SMEs**

    - What is your understanding of SMEs?
    - In your view, what are the challenges facing SMEs in South Africa?

3. **Understanding of cloud computing**

    - Are you aware of cloud computing technology?
    - If yes, please elaborate, and if no, then please answer the following question
    - Does your organization make use of any of the following cloud computing applications? Dropbox, Salesforce, Facebook, LinkedIn, Gmail, Office 365, Google drive, Google apps?
    - What are your challenges regarding cloud computing?

4. **Please describe the value that you derive from cloud computing?**
5. **Impact of Technology, Organization, Environment factors on cloud computing adoption Technology**
    - Does relative advantage, complexity and compatibility influence cloud adoption? How?

    Organisation

    - In your view, does firm size, management support and technology readiness influence cloud computing adoption? How?

    Environment

    - In your view, what is the impact of competitive pressure, trade/suppliers' pressures have on cloud computing adoption?
6. **Please outline what other factors in your view promote cloud computing overand above the benefits mentioned above and the TOE factors?**

7. APPENDIX II : (PARTICIPATION REQUEST LETTER)

Dear Participant

My name is Wanda Matandela. I am currently registered for a Master of Commerce degree in Information Systems at Wits University.

In completing my degree, I am required to conduct an empirical research on the "determinants influencing cloud computing adoption by SMEs in South Africa". In your capacity as the business owner or someone who is responsible for making technology choices and decisions for your organization, I humbly ask that you please spare me 45 – 60 minutes of your time to participate in this survey. The survey consists of 5 questions with sub questions broken into company demographics, role of technology and how factors like technology, organization and environment pressures affect your technology decisions.

Please note that the responses from the survey are confidential and will only be used for research purposes. These results will have both practical and academic implications in that, they will help cloud service providers to understand the factors that influence adoption of cloud computing amongst SMEs. Also, the study seeks to contribute to the academic literature on the same subject of cloud adoption in South Africa and abroad. This data will be securely stored in a memory stick and you are more than welcome to have access to it should you wish to do so. You are not obliged or forced in any way to participate in this survey, and also you are allowed to stop participating when you feel uncomfortable at any stage of the process. All your responses, personal and company information will be anonymous.

Permission to do the survey has been approved and granted by the Wits University Ethics Committee.

Thank you in advance for your participation and if you have any concerns, please feel free to contact either myself at wanda.matandela@wits.ac.za alternatively send an email to my supervisor: ray.kekwaletswe@wits.ac.za

Kind Regards,

Wanda Matandela
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