THE ROLE OF CLOUD COMPUTING IN ADDRESSING SMALL, MEDIUM ENTERPRISE CHALLENGES IN SOUTH AFRICA

by

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Submitted in accordance with the requirements

for the degree of

DOCTORATE IN BUSINESS LEADERSHIP

at the

Graduate School of Business Leadership

UNIVERSITY OF SOUTH AFRICA

Promoter: Professor John Andrew van der Poll

August 2018

I declare that, *The role of Cloud Computing in Addressing Small and Medium Enterprise Challenges in South Africa*, a research dissertation is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

_____   **August 2018**

Nkosi H. Kumalo   Date

PUBLICATION

The following publication has emanated from this research:

[1] Kumalo, N. and van der Poll, J.A. (2015).The Role of Cloud Computing in Addressing SME Challenges in South Africa, *International Conference on Cloud Computing Research and Innovation* (*ICCCRI, 2015*), pp. 139 – 147, 26 – 27 October, Nanyang Technological University, Singapore, DOI: 10 1109/ICCCRI 2015.32, ISBN: 978-1-5090-0144-6/15.

ABSTRACT

This thesis was motivated by Roberts (2010) who found that 63% of SMEs in South Africa do not make it past second year of operation. To expand further on this problem, we reviewed literature to understand key business challenges experienced by SMEs in South Africa which contribute to this high failure rate. The challenges include red tape, labour legislation, lack of skills, lack of innovation, impact of crime, and lack of funds. The research project aimed to answer a key question: "How can information technology, in the form of Cloud Computing be used to address the challenges faced by small and medium businesses in South Africa?"

To answer this question, data was collected from 265 SME companies and quantitatively analysed. It is important to note that the profile of SMEs targeted in this study are those that employed fewer than 200 employees, with a turnover of not less than 26 million rand per annum, and registered with South African Revenue Services (SARS) and also with the Companies and Intellectual Property Commission (CIPC) of South Africa. Over 60% of the firms that responded to the survey were in business for more than 10 years which means we are mainly dealing with data from businesses that have past the survivalist stage and are matured businesses. These are businesses that can share their experiences and challenges they faced throughout their journey. The profile of SMEs in this study should not be confused with that of Very Small Medium Enterprise Businesses.

The questionnaire was designed to address four themes being the Demographic profile, SME Business Environment, Threat of Survival, and lastly Technology Adoption. Key finding in this research is that 60% of the panellists stated that red tape is the overriding challenge that small businesses contend with. 67% of the panellists confirmed that they have not invested in their businesses in the past year; and 53% stated that they have not applied for finance from the bank for fear of being rejected. Only 30% of the SME market were found to use enterprise resource planning (ERP) and 62% do not have their own IT department. Of great concern is that 65% of the panellists have experienced server down time at least once in the past year. Inability to predict the rising IT costs in a firm has been cited as the main concern when running IT on premise. The cost predictability finding was also discovered to be a benefit enjoyed by the SMEs who use Cloud Computing.

The conclusion is that there is a relationship between Cloud Computing, Small and Medium Enterprise businesses and the challenges they face in their business environment. To address the identified business challenges, technology adoption studies by Gumbi & Mnkandla (2015), Carcary, Doherty & Conway (2014), Lacovou et al (1995), Mohlomeane & Ruxwana (2014), Kshetri (2010), BMI Research (2018), Conway & Curry (2012), Li, Zhao & Yu (2015), Wernefeldt (1985), Schindehuitte & Morris (2001), Tornatzy & Flesher (1991) were reviewed. From these publications, the Technology, Organisational and Environmental (TOE) was found to be relevant and of interest for use in answering the main research question.

This study developed the Cloud Adoption Framework which is the anchor of all SME challenges. Key study contribution is that the TOE model, which is predominantly used to understand the determinants of technology adoption like various industry applications, infrastructure innovations etc., are now used to address specific challenges that have contributed in the high failure rate of SME business. This is the first-time TOE model has been used to align with key SME challenges that contribute to firms' failure. Specific technology across Software, Infrastructure and Platform services models are recommended for use by SMEs to ensure challenges are mitigated and improve the chances of survival for SMEs operating in South Africa.

By following the recommended Cloud Adoption Framework, SMEs should be able to navigate the complexities brought about by the tough operating environment and also the technologies available to address those challenges. All six challenges have solutions in Cloud Computing and SMEs are educated on these solutions and also how to access these on a pay as you use model of consumption.

Keywords: SME; Small and Medium Enterprise; Cloud Adoption; Cloud Computing; Cloud; Enterprise Business Challenges; South Africa; Information Technology; IT

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LIST OF ABBREVIATIONS/ACRONYMS

Abbreviation/Acronym	Meaning
BCEA	Basic Conditions Employment Act
BPM	Business Process Management
BPR	Benchmarking and Business Process Reengineering
CCMA	Commission for Conciliation, Mediation and Arbitration
CFA	Confirmatory Factor Analysis
CIPRO	Companies and Intellectual Property Registration Office
CTMM	City of Tshwane Metropolitan Municipality
DTI	Department of Trade and Industry
EDI	Electronic Data Interchange
EE	Employment Equity
EFA	Exploratory Factor Analysis
ERP	Enterprise Resource Planning
EU	European Union
GDP	Gross Domestic Product
GEM	Global Entrepreneurship Report
IaaS	Infrastructure as-a Service
KMO	Kaiser-Meyer-Olkin
LAN	Local Area Network
LRA	Labour Relations Act
ML	Maximum likelihood
NAIC	North American Industry Classification
NCR	National Credit Regulator
NDP	National Development Plan
NIST	National Institute of Standards and Technology
OECD	Organisation for Economic Cooperation and Development
OTE	Organisational, Technological, Environmental
PaaS	Platform as a Service
PAF	Principal Axis factoring

Abbreviation/Acronym	Meaning
PAYE	Pay as you Earn
PCA	Principal Component Analysis
R&D	Research and Development
RBV	Resource Based View
SaaS	Software as a Service
SADTI	South African Department of Trade and Industry
SARS	South African Receiver of Revenue Services
SBA	Small Business Association
SBCI	Strategic Banking Corporation of Ireland
SBP	Small Business Project
SDA	Skills Development Act
SDL	Skills Development Levy
SME	Small and Medium Enterprises
SMME	Small, Medium and Micro Enterprises
UIF	Unemployment Insurance Fund
UNIDO	United Nations Industrial Development Organisation
VAT	Value added Tax
VIP	Very Important People
WCA	Workman's Compensation Act

STATEMENT OF ORIGINAL AUTHORSHIP

STUDENT NUMBER: 70833982

I hereby certify that this thesis:

"The Role of Cloud Computing in Addressing Small, Medium Enterprise Challenges in South Africa" constitutes my own intellectual investigation, the content and work presented in this thesis is a genuine and original work done by me and has not been published or submitted to any institution for the award of any degree programme. Any literature, data, or works done by others and cited in this thesis has been given appropriate acknowledgement and listed in the reference section.

Name: Nkosi Hugh Kumalo

Date: August 2018

ACKNOWLEDGEMENTS

This thesis was carried to gain a Doctor of Business Leadership qualification, a research degree at the University of South Africa. I have selected the topic '*The role of Cloud Computing in addressing Small, Medium Enterprise Challenges in South Africa*" as it is my wish to play a role in the development of socio-economic policies in South Africa via the promotion of adoption of best-in-class technology, Cloud Computing in particular.

During this project, I have gained a good understanding of Cloud Computing technology and have equally improved my research and communication skills. Knowledge they say is power, I am of the same belief that business decision makers within the SMEs subsector who read this work would be better informed to make the correct and appropriate technology selection regarding outsourcing their business IT infrastructure services.

I want to specifically start by saying a big thank you to Professor van der Poll, J.A. and other faculty members of the Graduate School of Business Leadership (SBL). Prof van der Poll, J.A. was my supervisor during the writing of this dissertation. Prof van der Poll's contribution is significant in that he has been guiding and encouraging my academic development throughout the process.

The contribution made by Mr. Hennie Gerber who is the statistician for University of South Africa has added immense value at the most critical stage of the research which is research tool design; statistical interpretation; and analysis. Mr Gerber's services can never go unnoticed and I want to thank the University for ensuring that we have access to such critical resources as we work towards completion of our research projects. Of importance, I acknowledge various organisations who participated in interviews and survey processes for data collection.

Finally, I would like to thank my family members and friends who challenged me to complete the research. Thank you for allowing me to sacrifice family time to ensure successful completion of my study.

CHAPTER 1 - INTRODUCTION

1.1   Background

In this chapter, we are conducting a high-level introduction of the research problem regarding high failure rate of Small and Medium Enterprise (SME) organisations in South Africa. Research shows that Small and Medium Enterprise (SME) businesses within South Africa do not make it past the second year of trading (Roberts, 2010). As explained by Roberts (2010) the failure rate is as high as 63%. To understand this, we looked at the reasons why these businesses experience such high failure and what role can information technology (Oliveira & Martins, 2014) in the form of Cloud Computing play in addressing the challenges faced by Small and Medium Enterprise businesses.

The National Small Business Act of 1996, defines a 'small business' as follows:

… a separate and distinct business entity, including co-operative enterprises and nongovernmental organisations, managed by one owner or more which, including its branches or subsidiaries, if any, is predominantly carried on in any sector or sub sector of the economy i.e. Agriculture, Mining, Manufacturing, Electricity, Construction, Retail Motor Trade, Wholesale, Tourism, Finance, and Community Services.

Small Medium Enterprise businesses can be categorised into four site classes being *micro*, *very small*, *small* or *medium enterprises*, following a complex set of thresholds. The National Small Business Act, as revised by the National Small Business Amendment Act of 2003 and 2004, defined the site classes according to a number of employees and annual turnover. Micro enterprise site class employs a maximum of 5 employees with a turnover of twenty million rands per annum. The top end of the site classes is a medium enterprise which employs between fifty-one and two hundred employees with a revenue threshold of between thirteen million and twenty six million.

The main interest in this thesis is those SMEs that have made it past the second year of operation as there is no point in targeting businesses that have already collapsed or are

on the verge of collapsing. To be specific, we are interested in the medium business category of companies that are registered with the receiver of revenue and also with the Companies Intellectual Property Commission of South Africa. The key is to extract learnings from those that have survived and share broadly how they managed to overcome challenges facing this market.

The strategic role of SMEs across different countries was researched to understand why it is important to ensure success of Small and Medium Enterprise businesses. For example, in South Africa, 91% of formal entities operating in the country are Small and Medium Enterprises contributing 51% to 57% gross domestic product (GDP) which provides 61% employment in South Africa (Abor & Quartey, 2010).

Different failure models have been developed over the years due to high failure levels (Lussier & Halabi, 2010; Lin, Wang, Wu & Chuang, 2009) covering various aspects of these models ranging from poor management skills, lack of business knowledge, and lack of funding. From a South African perspective, as summarised in the SME (Small and Medium Enterprise) Index; (2013), key SME challenges include lack of skill, labour regulation, economic conditions, lack of finance and cost of labour.

This chapter also introduces the relevance of Cloud Computing in addressing SME challenges in South Africa. Cloud Computing is introduced as technology consumed as a service; and requires minimal skill and expertise for technology integration, support, and upgrades (Mell & Grance, 2011). We argue that there is a role to be played by Cloud Computing in addressing SME challenges and this is a unique contribution to the body of knowledge since literature is limited on the coverage of both Cloud Computing and SME challenges. Extensive research is available on SME and its challenges; and on Cloud Computing, but not in how the two can be used together to create solutions to the research problem under investigation.

Through a literature review, we summarize SME challenges into six categories being government red tape, labour legislation, lack of skill, lack of innovation, impact of crime, and lack of funding. All these challenges are explained in detail and discussions on what potential benefits can be derived from could computing in addressing these challenges is

also covered. This background sets the scene as to what approach we should take in designing a research instrument to uncover the truth on whether Cloud can address SME challenges.

1.2   Problem statement

As indicated earlier, the problem is that many small businesses within South Africa do not make it past the second year of trading. Failure rates are as high as 63% (Roberts, 2010). Six factors that inhibited the growth of Small and Medium Enterprises in South Africa have been identified as government red-tape, lack of skill, labour regulations, lack of innovation, crime, and access to funding (SBP Growth Index 2013). Cloud Computing is an area that could address most, if not all these challenges as it provides Information technology resources that are scalable (Smith, 2009; Hayes, 2008), on demand, on a pay-per-use (Smith, 2009), convenient, independent of location and cost effective (Mell & Grance, 2011).

If so many Small and Medium businesses in South Africa do not succeed and the challenges are well documented as was referred to in the problem statement above, then the key question this thesis is looking to answer is:

- **How can information technology, in the form of Cloud Computing be used to address the challenges faced by Small and Medium businesses in South Africa?**

1.3   Context of the problem

1.3.1   Role of SMEs in an economy

SMEs have gained recognition in the field of management because of the strategic role they play in promoting a nation's economy in terms of reducing poverty by providing employment opportunities (Okpara & Wynn, 2007; Quinn, 1978). Their contribution to the growth and development of any economy is undeniable in both the developed and developing countries (Tshabalala, 2011) SMEs provide about 77% of employment and 40% of total investments in Turkey (Seker & Correa, 2010). In Nigeria, they account for about 75% of employment in spite of the fact that 60% of the population lives below the

poverty line (Mukaila Ayanda & Sidikat Laraba, 2011). This significant role played by SMEs can be attributed to the level of their innovativeness and flexibility (Odedairo & Bell, 2010). But then their ability to innovate depends on the competence of management, their size and the availability of resources (Hamilton, 2009). Innovation is very important to business growth and the more SMEs innovate, the more their performance improves within the industry (Akinade, 2007).

SMEs play a crucial role in almost all economies but particularly in developing countries with major employment and income distribution challenges, such as South Africa. The creation and sustainability of new SMEs are vital to the economic prosperity of a country or else a country risks an economic stagnation (Fatoki & Garwe, 2010). It is estimated that small businesses (SMEs) employ 22% of the adult population in developing countries (Fatoki & Garwe, 2010). United Nations Industrial Development Organisation (UNIDO) estimates that SMEs represent over 90% of private business and contribute to more than 50% of employment and of gross domestic product (GDP) in most African countries (UNIDO, 1999). A recent study conducted by Abor & Quartey (2010) estimates that 91% of formal business entities in South Africa are SMEs, and that these SMEs contribute between 52 to 57% to GDP and about 61% to employment. However, many small businesses within South Africa do not make it past the second year of trading with failure rates as high as 63% (Roberts, 2010).

1.3.2 Why do SMEs fail?

Seven out of every ten new SMEs in the United States are failing within their first year in operation (Headd & Kirchhoff, 2009). The failure rate remained relatively unchanged for the last three decades irrespective of the economy or the wealth of research on the subject (Balcaen & Ooghe, 2006; Gepp, Kumar, & Bhattacharya, 2009; Kim, 2007; Yip, 2006). The high rate of failure leads to the issue of why small businesses fail at such an alarming rate, which consequently has a substantial negative impact on the economy (Mahembe, 2011).

There are three levels of SME business failure causes. This first one is the inherent or generic problems of smallness, in most cases the key is the dependence of the firm on

only one owner-manager. The second one, specifically to individual firms is a lack of finance or poor management. Lastly, there are symptoms of problems or failure which proprietors tend to confuse with root causes. Some symptoms may not present themselves to the proprietor because of a lack of expertise or the right type of information according to Jennings & Beaver (2007)

In addition to the business failure causes identified above, entrepreneur is recognised in the literature as the most critical factor in the failure of small businesses. First of all, management motivation, skills, and abilities have an impact on how business is managed. Research into the causes of bankruptcies of small businesses in the United States confirms this (Bradley & Moore 2000). These authors identified that the two most prevalent causes of failures of small businesses were: (1) inadequate management skills or poor knowledge of the business and (2) insufficient capital. Studies have shown a lack of planning and excessive optimism about the return of funds invested.

Okpara, Wynn, Pamela (2007), conducted structured interviews as well as a survey and gathered data from about 400 small businesses in Nigeria to find the principal constraints to success. Their findings showed that among other causes, poor management, lack of capital, corruption, weak infrastructure, poor recordkeeping were found to be key causes of business failure. Franco & Haase (2009), attempted to identify factors for poor performance and failure faced by Small and Medium-sized enterprises. Research findings from Franco & Haase's (2009) study revealed that the most important factors are limited access to finance, poor market conditions, inadequate staff, and lack of institutional support, co-operation and networking.

A study of 37 well-run firms conducted by McKinsey Consulting found that seven policy areas affect long-term organisational success. These areas are strategy, structure, systems, staff, style, skills and shared values and goals (Pascale & Athog, 1987). Barsley & Kleiner (1990) on the other hand identified what they call the major causes of small business failure. These include: poor managerial expertise, an inadequate business plan, unclear goals, bad sales strategies, overdependence on one customer, undercapitalization, lack of teamwork, and failure to get good advice.

In a study on the critical factors for consulting to small business, Pech & Mathew (2003) highlighted what they call the most commonly cited causes of small business failure. These include lack of financial planning, absence of business records, no understanding or use of business records, poor cash-flow management, poor debtor management, poor inventory management, poor costing-pricing, poor market research and over-borrowing.

Small Business Project (SBP), a not for profit organisation registered in 1987 is driving SME Growth Index, which is a project geared towards establishing a solid, evidence based understanding of South Africa's SMEs (SBP Growth Index, 2013). A longitudinal study conducted in 2013 across 500 SMEs in business services, manufacturing and tourism shows that while turnover continues, a moderate upward track, employment growth remains disappointing (SBP Growth Index, 2013). Interestingly, the challenges of the overall environment appear to be driven mainly by domestic factors, rather than global conditions. Top three factors that inhibited the growth of SME firms between 2012 and 2013 are *lack of skills* in first place, followed by *burdensome regulations*, local *economic conditions*, *lack of finance* and the *cost of labour* (SBP Growth Index 2013). This is consistent with the literature reviewed during the research proposal stage of the thesis, and the main question not addressed by the literature is how Cloud Computing can be used to address these challenges.

1.4   Relevance of Cloud Computing to SME challenges

Cloud Computing is technology consumed as a service just like utility based services such as electricity. It requires minimal skill and expertise for technology integration, management, support and upgrades, as all of these functions are performed on behalf of the user by a Cloud service provider (Mell & Grance, 2011). The user would subscribe to a service and pay for exactly what was used on a day or month. This is across the whole technology stack with options of how it should be deployed i.e. privately, community, public or hybrid clouds. Private cloud refers to all deployments that happen in-house within the company datacenter, and public cloud is where technology is consumed from another location on a pay as you use basis. Community Cloud is dedicated to a group of users who have similar requirements and the deployment models can follow both public or private or hybrid. Lastly, hybrid deployment model refers to the IT workloads deployed

in both public and private clouds where both would be accessed seamlessly without service provider interference (Mell & Grance, 2011).

Our argument is that there should be a role played by technology in the form of Cloud Computing that can help businesses minimize negative impact of poor management, lack of skill, lack of funding, and other impediments to the success of a small business. Using literature on SME challenges with specific focus on the Small Business Projects (SBP), SME Growth index 2013 report, and a publication on the role of Cloud Computing in addressing SME business challenges in South Africa (Kumalo; Van Der Poll, 2015), this study looks at the potential role Cloud Computing can play in helping SMEs with their business challenges which are Red Tape, Labour Legislation, Lack of Skills, Lack of Innovation, Impact of Crime and Lack of Funds.

1.4.1 Red Tape

The concept of "red tape" is used today as a noun to describe excess bureaucracy and regulation that serves as cost on business (Mazzarol & Choo, 2003). The Western Cape Department of Economic Development and Tourism, 2011 explains, red tape as:

- Non-essential procedures, forms, licenses, and regulations that add to the cost of dealing with government, or

- Anything obsolete, redundant, wasteful or confusing that diminishes the competitiveness of the Province, which stands in the way of economic growth and job creation or wastes taxpayers' time and money.

Red Tape more specifically refers to those aspects of regulation that take up more time than they are worth, require reports and forms just for the sake of it, replace common sense, are so complex and hard to understand that businesses must pay expert consultants or are restrictive to business innovation and growth.

Using tax compliance as an example, the current tax system creates an unnecessary burden for small businesses (Brown, 2013). Entrepreneurs must deal with multiple tax structures including VAT, PAYE, Skills Development Levy, UIF, income tax and

workplace compensation. These are all important but it can be hugely cumbersome and complex for a new business (Brown, 2013).

There are three service models for Cloud Computing and these are Software as a Service (SaaS), Infrastructure as a Service (IaaS) and Platform as a Services (PaaS) (Mell and Grance, 2011). Tax Compliance Software technology which requires compute, memory, networking, database, hypervisor, operating system, tax application, support and management does not have to be built and managed by the SME in his own datacenter. These services can be rented from a Cloud Services Provider and consumed *on demand* by the SME (Mell and Grance, 2011).

The benefit of using Cloud Computing is that the SME does not have to commit to a three-year software licensing agreement with the software provider and also there is no commitment to hardware procurement which can lead to high capital investment for a small business. Support and maintenance is all catered for by the Cloud Service provider giving the SME time to focus on growing the business. Examples of products in market today are Sage One, VIP Payroll and a few others.

1.4.2 Labour Legislation

Small and Medium Enterprises (SMEs) are not, generally, founded by legal experts. Even if they were, it is highly unlikely that compliance with legislation would be top of mind for the entrepreneur (Benjamin, 2010; Bhorat, 2010; Halton, 2010). SME businesses are and should be driven by getting new business and ensure that their business is stable in terms of revenue and customer additions. However, if legislation is ignored, it can hamper business growth and even lead to destroying the business in its entirety (Benjamin, 2010; Bhorat, 2010; Halton, 2010).

In order to redress the imbalances of the past regime where black people were excluded in participating economically, the South African government introduced the Labour Relations Act (Act No. 66 of 1995) which deals with legal and constitutional matters of collective bargaining and unfair dismissal, which for the first time created a single legal framework for labour relations applicable to all sectors of the economy including SMEs (Benjamin, 2010; Bhorat, 2010; Halton, 2010). By the second democratic elections in

1999, more laws were introduced including Basic Conditions Employment Act (Act No. 75 of 1997), Employment Equity Act (Act No. 55 of 1998), and Skills Development Act (Act No. 97 of 1998).

These laws are continuously updated. To keep up with the legislation change is a challenge for a small business (or any business for that matter). Workflow processes and Software from Companies like Lexus Nexis where Cloud Computing Software can be acquired on a pay as you use model to ensure business compliance without help of a consultant could be valuable for a business in terms of knowledge, costs and convenience.

1.4.3 Lack of Skill

Access to labour markets is a key factor of production crucial for Small and Medium Enterprises (Shane & Venkatarman, 2000; Thornhill & Amit, 2003), as it allows for appropriate expertise that enable ventures to explore identified opportunities (Nasser et al, 2003; Markman & Baron, 2003). In South Africa labour is mainly unskilled and informal (Luiz, 2002) while available semi-skilled labour is expensive (Ahwireng-Obeng & Piaray, 1999; Viviers et al, 2001).

Competent management skills are a prerequisite for the success of SMEs (OECD, 2002). Management competence (or know how, capacity, abilities and skills) are a set of factors associated with successful businesses as they give the entrepreneur the ability to perform their role successfully. Management competence and skills also provide the power to act effectively in a range of possible future circumstance (Ibrahim & Soufani, 2002; Markham & Baron, 2003; Wasilczuck, 2000; Mughan et al, 2004; Lange et al, 2000 Man et al, 2002; Bird, 1998). These skills include being able to identify and evaluate market opportunities, set up realistic and measurable goals, develop business plans, secure resources required to setup a new venture, produce and service the market, manage conflict effectively; and achieve overall industrial efficiency as well as effectiveness that lead to the growing of the business (Gundry & Welsh 2001; Miller et al, 2003; Dreisler et al, 2003). Basically, skills assist the entrepreneur to act and steer the business in the right direction.

On the other hand, one of the major reasons for the failure of SMEs seems to be insufficient management capacity; lack of expertise; low levels of skills; and managerial incompetence (Mughan et al, 2004; Viviers et al, 2001; Ligthelm & Cant, 2002; Clover & Darroch, 2005; Strydom & Tustin, 2003; Rwigema & Karungu, 1999; Freeman, 2000; Thornhill & Amit, 2003). Surveys of business failure suggest that SME often have a good idea, but because they have no idea of business fundamentals or do not know how to run a business, they forgo, under-exploit or delay the identified opportunity (Ladzani & van Vuuren, 2002; Tustin, 2003; Rwigema & Venter, 2004).

Originally, management was considered from the perspective of the "general manager" of a business and it specifically addressed the tasks he / she had to discharge to ensure success of the business. In the beginning, these tasks were classified into five broad categories, namely planning, organizing, command, coordination and control - with each comprising a host of activities (Fayol, 1916). These tasks were deemed to constitute the primary tasks of management, with communication, motivation and decision making as secondary management tasks.

In the case of supporting management capability on the tasks above, Cloud Computing facilitates formulation of a process and automate it to an extent that all management activities and tasks can be visible and given the right focus by management. Benchmarking and Business Process Reengineering (BPR), popular in the 1990s, were essentially taken over in the early 2000s by Business Process Management (BPM), a leading technology for pursuing the agility and efficiency required for competitiveness (Dumas et al. 2005; Smith & Fingar 2006; van der Aalst et al. 2003), and this can be delivered through Cloud Computing from Service Providers such as Comdiware. Cost of technology is exorbitant and most SMEs cannot afford to deploy this technology due to cost, skill, time and other reasons, but Cloud Computing is a well-positioned solution to allow small businesses to compete at the same level as big businesses without spending a lot on technology.

1.4.4 Lack of Innovation

As an economy moves beyond its factor endowments, it and its firms will inevitably need to strive to produce more efficiently and to identify new economic opportunities. Innovation is a high-yield means of growth and a non-negotiable for international competitiveness (SBP, SME Growth Index; 2013). Companies typically envision being successful through innovation at the international level. Some of the major factors influencing the success and innovation of companies include R&D and commercialisation based on internal resources (Chesbrough & Crowther, 2006; Lichtenthaler, 2008). Resources developed through internal R&D can act as a formidable barrier preventing potential competitors from entering the same market (Chesbrough, 2003; Schilling, 2008). However, companies face various problems such as, lack of investment in technology, limited amounts of time available for R&D and rapid market changes arising from fluctuating customer needs (Chan, Kensinger, Keown & Martin, 1997). Internal R&D efforts can be inefficient and wasteful in that such efforts require the use of many resources and substantial amounts of time, making it obstinately difficult to capture growth opportunities and manage the company's innovation activity (Kuemmerle, 1997; Lane & Lubatkin, 1998; von Hippel, 1988).

Consequently, the company's organisation and R&D strategies must be designed such that they can satisfy diverse global needs. Further, its R&D process must increase the likelihood of R&D outputs from other companies for the growth and success of their business and Cloud Computing technology can assist with the required collaboration and integration between companies. The expansion of boundaries between companies has contributed to this phenomenon.

Because of the abundance of external ideas in the global market and increasing collaboration among companies, an increasingly large number of multinational companies have been pursuing innovation activity in partnership with other companies (Dodgson, Gann, & Salter, 2006). Noteworthy is the use of both internal and external ideas through collaboration for coping with rapid market changes and for developing new growth engines, for example, Apple and Sony records made music available through

internet enabled devices via iTunes. Such initiatives have sparked growing interest in new R&D paradigms for exploring how companies manage their collaborative efforts.

In the wake of these changes, the concept of open innovation has been highlighted with collaborative activities such as technology acquisition, R&D collaboration, and joint venture activity for example Microsoft collaborated with Nokia with the integration of Nokia Online assets and Windows Phone operating System.

The concept of open innovation embraces the strategic intent behind the use of both internal and external resources and is defined as the dynamic capability to manage technology both within and outside companies. Collaborative activities for the use of external resources reflect the core role of open innovation, that is, technical and commercial enhancement of the performance, productivity, and sales of companies (Lichtenthaler, 2008). For example, Cloud Computing Platform as a Service solution in the form of Electronic Data Interchange (EDI) which allows forward and backward integration of supply chain processes between supplier and its vendors running different technology platforms. Vendors/partners do not have to implement the same Enterprise Resource Planning Platforms (ERP) as the supplier to have visibility on the status of their purchase orders, invoices released after payments, inventory status in the order process and so forth, as these can be done via a Cloud Service provider portal on a pay-per-use model, instead of hardware deployment on site.

1.4.5 Impact of Crime

Businesses, already susceptible to a wide variety of crimes, need to be on their guard to prevent the impact of criminal activity from impacting profitability to the point that the viability of their business comes into question. Crimes against companies range from shoplifting and vandalism to piracy and counterfeiting. In some instances, crimes committed against businesses are committed by outsiders while in many other situations employees at all levels commit crimes against their employers. In some cases, companies become unwitting accomplices of money-laundering crimes. (SBP, SME Growth Index, 2013).

Crimes committed against business are nothing new. The literature records numerous examples throughout history. By 1995, the Small Business Confidence Chamber (SBCI) survey found 35% of retailers reporting customer theft with similar percentages for manufacturing and wholesaling industries. In all, 75% of surveyed businesses reported one or more incidents of crime, with 3.5 incidents on average (Burrows & Hopkins, 2005).

Crime is imposing substantial direct and opportunity costs on business, and detracting from growth. Firms face significant risks of financial loss, and potential violence and emotional damage associated with crime. This degrades owner and staff morale, and productivity. The additional costs of security degrade firms' competitiveness, and by extension the competitiveness of the country. Indeed, the Global Competitiveness Report ranks South Africa at position 141 of 148 countries surveyed for the business costs of crime and violence (SBP, SME Growth Index, 2013).

Small businesses may be particularly vulnerable to crime as small businesses often do not have safeguards in place to prevent and detect criminal activity. As early as 1996, (prior to prevalence of internet crime) a survey of 400 firms conducted by the U.S. Small Business Administration found nearly 13% of surveyed businesses became crime victims. Further, less than half (48%) employed security measures, and many incidents, especially employee thefts, went unreported (Small Business Research Summary, 1997).

Since the development of the internet, cybercrime activity is increasing at an alarming rate. The 1995 National Computer Crime Survey reported 67% of the 7,818 businesses surveyed fell victim to at least one cyber-attack (Bureau of Justice Statistics, 2008). Many of the cyber-attacks involved theft (60%) while other incidents included viruses uploaded to the business computer system. 68% of the cyber-attack thefts resulted in a monetary loss of $10,000 or more (Bureau of Justice Statistics, 2008).

The best strategy to defend against business crime should focus on preventive measures. For many businesses, simple actions such as improving security lighting or requiring employee identification may reduce crime (Bressler, 2009). Crime preventive actions can be categorized into external measures, to include security lighting, surveillance cameras, locks, key control, employment policies that include background checks, drug testing,

employee identification and separation of duties; computer defenses that include secure websites, access authorisations through secure passwords, computer firewalls, and secure internet payments (Bressler, 2009). Finally, everyday work practices such as keeping minimal amounts of cash on hand, requiring employee identification, paying everything by cheque and not delegating cheque signing provide basic defenses against internal and external crime (Larimer, 2006). All these recommendations can be embedded in a technology that is automated and help a small business owner to have visibility on measures taken in reducing crime. For example, video cameras placed in business require storage and archiving capability infrastructure. A paid service can assist in securing this data at a minimal cost and with less skills required from the small business owner. Stock management system can also be on-boarded on Cloud infrastructure to ensure integration with mobile devices, and to give visibility to the owner on how much stock is sold and how much cash is in the till. Recent retail management systems can provide this service. Cloud security infrastructure to assist with Cyber Crime can be deployed to minimise cyber-attacks for small business.

1.4.6 Lack of Funds

Much has been documented about the lack of financing for SMEs, not just in South Africa (Herrington et al., 2010), but in many other parts of the world as well (Turner et al., 2008; OECD, 2006; Kauffmann, 2005). Difficulty in accessing finance has remained one of the top three constraints mentioned by the national expert panel in several surveys and SME studies in South Africa. Mahembe, (2011) and the National Credit Regulator (NCR) report showed that a significant number of entrepreneurs from disadvantaged communities did not keep financial records and that cash constraints were widespread amongst entrepreneurs from disadvantaged communities with registered businesses. Cash flow difficulties were significantly reduced in firms that implemented the following management practices: (1) kept a cash book, (2) kept a record of debtors, (3) practiced active debtor management and (4) controlled inventory. Implementing any of these practices was associated with a minimum of 33% reduction in the probability of an exhausted overdraft and doing all four appeared to reduce this probability by as much as 61%. Implementing these practices also significantly increased the probability that a firm would succeed in an

application for term loan finance (SBP, SME Growth Index, 2013). The high costs and technical know-how of implementing a record keeping system can be mitigated by embracing Cloud Computing Software as a Service. Such services are inexpensive, for example Sage Accounting software costs between R30 and R120 per month per user.

Despite the lack of financing being cited as a constraint in other publications, there are a variety of funding programmes and financing schemes using guarantees that are available, in addition to other support programmes. Awareness and the uptake of these schemes, however, have been very low (DTI, 2008). Clearly, the lack of awareness of the existence of these programmes will affect access. For example, even if the financing is available, it will not be accessed by those who might need it. A study by Chimucheka & Rungani (2011) found that 28% of SMMEs surveyed had never applied for financing from a bank. The main reasons given were not knowing the procedures for applying for a loan (53%), not knowing about the sources of finance available from the banks (23%) and the high interest rate regime of banks (7%). 17% indicated that they had enough capital to start and run their own businesses. Using internet applications powered by Cloud Computing, SMEs can subscribe to newsletters from the Department of Trade and Industry at no cost to SME.

1.5 Research Question

The main research question (RQ) addressed in this thesis is:

- **How can information technology, in the form of Cloud Computing be used to address the challenges faced by Small and Medium businesses in South Africa?**

Specific questions this thesis seeks to address are:

1. What are Small and Medium Enterprise (SME) business challenges?
2. What are SME Cloud Computing inhibitors?
3. How should Cloud technology be used to meet information technology challenges of the SME market?
4. To what extent can Cloud technology be used to address SME challenges?

5.   What are the technology gaps in addressing SME business challenges?

1.6   Research purpose and objectives

1.6.1   Purpose and aim of the research:

This is an exploratory research on the impact of Cloud Computing to the Small and Medium Enterprise market in South Africa. Cloud Computing topic is new and has not been written about extensively especially in the context of how it can be used to resolve business complexities in the Small and Medium Enterprise market. The purpose of this study is to understand the SME market and investigate solutions that can be delivered through Cloud Computing services to enable SMEs to unlock the potential value in the economy of South Africa. The focus is to extract technology experiences (if any) from the Small Medium Enterprises and provide insight to cloud service providers in how they can improve or optimise cloud solutions to fit the requirements of Small medium business in line with their top business challenges. This research does not lead with Cloud Computing solutions but more with the challenges faced by SMEs and start to identify solutions or gaps in the solutions available today to address these challenges.

This thesis looks at three key issues: the economic situation in South Africa, the promise of Small and Medium Enterprise in delivering growth and job creation, and also how technology can remove complexities found in the Small and Medium Enterprise operating environment. The question of whether Cloud Computing is relevant in supporting SME to deliver economic growth is what this thesis is addressing.

This is not a theoretical research but a form of applied research where an attempt will be made to solve problems for the SME market using Cloud Computing services. The study will contribute to National Development Plan (NDP) policies that can be supported leveraging Cloud Computing services.

Research Aim

The aim of this research is to:

- **Understand business challenges faced by SMEs in South Africa, and investigate how Cloud Computing can be used to address them.**

1.6.2   Research objectives

Specific objectives of the research are to:

1.   Determine why SMEs are not embracing Cloud Computing.
2.   Determine functionality limitations of Cloud Computing in addressing SME business challenges
3.   Identify technology development opportunities on Cloud Computing for SMEs.
4.   Develop a Cloud Adoption Framework for SMEs.

1.7   Limitations and delimitations of the Study

1.7.1   Limitations

Cloud Computing has potential impact on all sectors of the economy beyond just Small and Medium Enterprise (SME) organisations. Other areas impacted upon are significant and include local government, personal use at home, corporate enterprise organisations and IT developer community. An understanding of the impact that goes beyond SME sector can help to build a complete picture of the impact of the Cloud model on all users in South Africa. The fact that this study is limited to the SME channel only constitute a limitation that is beyond the scope of this study.

Key SME business challenges in South Africa have been categorized into six areas including regulation, skills, labour issues, innovation, funding and crime (SBP, SME Growth Index; 2013). The study is focusing on how Cloud Computing can assist SMEs to resolve business challenges only on these categories. This limitation means the study is narrowly focused to these six elements and excludes other potentially important and significant challenges that might not be addressable through Cloud Computing.

The doctoral level of study requires drilling in on the detail and unravel underlying complexities identified by the research. A comprehensive analysis of all six (6) categories is beyond the scope of this thesis, as these elements are too broad to address for the level of depth required for research at this level of study.

SME business owner / decision maker targeted with this study has demonstrated views and understandings of the Cloud phenomenon and their interpretations, depending on their technical savvy. Language, education and technical expertise barriers have contributed in the limited access to information contained in the recommendations herein.

To our knowledge, there is insufficient information in the research archives on the impact of Cloud Computing on the SME market and, thus, most of the information contained in this study is based on feedback from the panellists and on our experience of the topic.

1.7.2 Delimitations

We are fortunate to have an existing business relationship with SME database owners, that is, National Small Business Chamber and iFeedback. Thus, the ease of access to the SME database is not a limitation but an enabler of the research study. The issues being researched in this study are topical issues that will provide insights to senior executive responsible for driving Cloud Computing solutions in South Africa. This work will also be useful to other interested people within and outside of the ICT industry on ways in which to operate and manage Small and Medium Enterprise organisations so as to enable a smooth transition to the Cloud Computing business model. The research topic relates to a problem which we are confronted with every day and it is anticipated that a deeper understanding of the issues relating to the SME market will allow for recommendations that may be tested and implemented to minimise the negative impact of Cloud Computing in the SME sector.

1.8 Summary

This chapter introduced the research problem building on Roberts' (2010) work that showed that 63% of SMEs in South Africa do not make it past second year of operation. Study background issues captured in the SME Index (2013) research regarding key business challenges which contribute to high failure rate of SMEs were described and summarised into six areas: red tape, labour legislation, lack of skills, lack of innovation, crime, and lack of funds.

We explained what Cloud Computing is and how SME challenges can be addressed using Cloud Computing technology. Our experience and published research papers helped in identifying the research problem. Research question framed for the study were used to formulate the research tool explained comprehensively in the methodology chapter. The key study question is "*How can information technology, in the form of Cloud Computing be used to address the challenges faced by Small and Medium businesses in South Africa*?" The next chapter looks at literature reviewed to establish what other writers have expressed about this topic and identifies what is the unique contribution to the body of knowledge in this regard.

It is also noted that there are limitations to the study since Cloud Computing is a new phenomenon and most writers have showed differing interpretations and understanding. The level of complexity of the concept of Cloud Computing is noted as a potential limitation to some SME business owners who have limited knowledge and exposure to information technology.

Limitations and delimitation of the study were also covered to inform avenues for further research. The literature review chapter which follows next will look at different aspects of Cloud Computing. The chapter will also consider different parameters that define the SME sector.

CHAPTER 2 – LITERATURE REVIEW

2.1 Introduction

Chapter one introduced the research problem and covered extensively the context of the research referencing published theory. Definitive parameters of Cloud Computing and Small and Medium Enterprise definitions were also covered. Cloud Computing and Small and Medium enterprises are broad topics, looked at by different authors in many different angles. This chapter seeks to capture these diverse views in relation to the research questions this study seeks to address.

Literature review section of the thesis takes into consideration published theory on the role of Cloud Computing in addressing Small and Medium Enterprise challenges in and around South Africa. Literature delves into how technology in the form of Cloud Computing impacts growth of a firm. Various models are reviewed specifically the resource based view of a firm, strategic adaptation of a firm, as well as technology, organisational and environmental (TOE) models. It became clear that a Cloud Adoption framework that considers Cloud Computing and SME business challenges had never been developed nor researched and a research space was created to develop such after reviewing these different growth models. In most cases, Cloud Adoption is studied on its own or if SME challenges are included, they are never in the form of external factors as covered in this thesis.

To understand and create clarity for the thesis, it was necessary to align the definition of Cloud Computing with the Small and Medium Enterprise market as there are differing interpretations on the meaning of these in literature.

The National Institute of Standards and Technology definition of Cloud Computing is adopted in this thesis which defines Cloud Computing as "a model for enabling convenient, on demand network access to a pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service provider intervention" (Mell & Grance, 2011:1). This definition also expands further to cover the characteristics, service models, deployment models of Cloud Computing which

makes the definition comprehensive. The definition is also aligned with the objectives of the study.

The National Small Business Act of 1996 covered the definition of Small and Medium Enterprise business in manner that resonates with our intentions. It defines Small Business as "a separate and distinct business entity, including cooperative enterprise and governmental organisation, managed by one owner or more including branches or subsidiaries, if any, is predominantly carried in a sector or sub sector of the economy …". It further classifies SME into micro, very small, small or medium enterprises using a set of thresholds including number of employees and annual income. This study adopts this definition and targets site class "Medium" which employs not more than 200 people and revenues of not more twenty-six million rand per annum. It is important to emphasise that the interest is on the businesses that have gone past the survival stage as we are interested to understand how they navigated the challenges faced by SMEs and whether technology has managed to assist in ensuring their sustainability.

2.2   Theoretical considerations

To understand the gap in literature regarding the role played by Cloud Computing in addressing challenges of Small and Medium Enterprise customers in South Africa, a variety of research publications are reviewed. The publications reviewed are in line with the objectives of this study and the main purpose is to understand what other writers have said about what we are trying to achieve with this study.

2.2.1   Embracing Cloud Computing by SMEs in South Africa

The developing world's cloud computing sector has received considerable attention from global and local IT players, national governments, and international agencies according to Kshetri (2010). For example, IBM has implemented cloud computing centers in China, India, Vietnam, Brazil, and South Korea. Other global cloud service providers such as Microsoft, VMware, Salesforce, Dell, and Odin are actively searching for opportunities in the developing world. Even more impressive is that firms operating in the developing world countries have jumped on the cloud bandwagon (Kshetri, 2010). Cloud-related venture capital and other investments are also flowing into developing economies. It is

probably fair to say that in no other major technological innovations has the developing world received this level of interest. However, findings and conclusions about the potential and impact of cloud computing in the developing world drawn from surveys, studies, and experiences of companies are confusing and remarkably inconsistent. Some analysts suggest that developing countries will be attractive markets for cloud services and predict that this technology will soon make "healthcare 2.0," "banking 2.0," and "education 2.0" realities in these countries, according to Kshetri, 2010.

IT-intensive areas such as offshoring and software development are enthusiastically embracing clouds according to Kshetri, 2010. In India, cloud demand is high in the offshoring industry and technology hubs. In South Africa, the call center industry has been the fastest growing area for the cloud (Kshetri, 2010). Likewise, the IBM Cloud Center in China's Wuxi City targets software developers. The market for the cloud in developing countries is small but expanding rapidly. An IDC study suggested that emerging markets such as Brazil, Russia, India, and China will likely be important forces driving the global shift toward the cloud (Smith, 2008) with China and India having the greatest mid- to long-term potential for the cloud. The report also revealed that South Africa is a leader in using the cloud to support telecommuting. Call center agents and software developers can log in from anywhere using IP lines or a virtual private network (VPN).

The perspective covered by Kshetri helps to understand the rate in which developing countries are embracing Cloud Computing and usage patterns across different areas i.e. Telecommuting, Health vertical etc. The limitation in this research is that it does not cover Cloud Computing in relation to the business environment challenges faced by SMEs. Our study is bringing clarity on what challenges are facing SMEs and also how Cloud Computing can be used to address these challenges. There is precision in the desired outcome of this research as we look into the specific challenges and bring them closer to Cloud Computing to see if these can be minimized to ensure SMEs have a better experience in running their businesses.

The BMI Research Technology Report for 2018 forecasts that the South African cloud computing market will reach a value of almost ZAR9.4bn in 2022, corresponding to a

CAGR of 11.7% over the 2018-2022 period. Underlying this growth will be demand from South African companies looking to cloud solutions as potential means for cutting costs associated with ICT infrastructure, as well as the increased flexibility offered both in terms of pricing (subscription versus upfront costs) and in rolling out and managing enterprise applications. In the short-term, larger SME businesses are most likely to put IT applications such as mail, phone systems and document management into the cloud. Meanwhile, enterprise applications that require a high level of customisation, or which are subject to regulatory or data-sensitivity constraints, are more likely to stay on-premises.

This finding supports the need to delve deeper in understanding Cloud Computing and how SMEs will use it specifically to address the SME business challenges. What is not coming through from BMI research report for 2018 is the compelling reason as to why businesses are looking to cut ICT infrastructure costs and looking to Cloud Computing for rescue. Our research put much more context to the SME challenges and also brings solution that addresses those challenges.

Findings from a study conducted by Mohlameane & Ruxwana, (2014) on larger SMEs in South Africa, revealed that most participants have limited knowledge and understanding of cloud computing concepts. Some did mention that they have used SaaS applications such as Google Apps. Cloud computing is perceived to be cost effective as there is no additional costs such as software licenses, hardware, ICT infrastructure support and maintenance. Secondly, cloud computing services are accessed over the Internet providing SMEs with the flexibility of accessing cloud computing services anywhere and anytime. However, there were challenges found with cloud computing, such as bandwidth cost and quality and data security. Participants were concerned about the cost and quality of bandwidth as they perceive it to be expensive, according to Mohlameane & Ruxwana (2014).

Bandwidth quality is very important as cloud computing services are accessed over the Internet. Cloud computing services require quality and reliable internet connectivity. Although some participants in the study conducted by Mohlameane & Ruxwana (2014) mentioned that they have used cloud computing applications such as Google Mail and online e-mail archiving, and showed greater interest on the solution, the lacking

awareness of cloud computing inhibits the SMEs the opportunity to experiment and explore cloud computing benefits (Mohlameane & Ruxwana, 2014).

It is interesting to note that Cloud Computing is being used by SMEs especially larger ones without knowledge that this is actually Cloud Computing. Mohlemeane & Ruxwana (2014) discovered that security is the main concern for Cloud Computing usage and this finding has been common throughout the publications reviewed during this study.

2.2.2 Cloud Computing Adoption Framework

To address the second objective of our study, being the development of a cloud adoption framework, we review a variety of publications starting with the research work done by Gumbi & Mnkandla (2015). They studied several SMEs within the city of Tshwane Metropolitan Municipality (CTMM) in South Africa to establish the extent to which Cloud Computing basic concepts and key terms are understood, and to identify applications/services that are most valuable and critical to their growth and development. This basic understanding of Cloud Computing is important to ensure SME readiness in starting the adoption journey towards Cloud Computing. Gumbi & Mnkandla's study identified the main concerns influencing SMEs not to adopt Cloud Computing.

Gumbi & Mnkandla's (2015) publication states that SMEs are the most pragmatic solution to the two most pressing problems South Africa is facing today namely, severely declining economic growth and a high rate of unemployment. However, SMEs are finding it difficult to remain sustainable and to survive today's market environment, which is highly competitive and characterised by a declining economic growth, according to Gumbi & Mnkandla (2015). Cloud Computing has recently emerged as a viable solution and an excellent value proposition to SMEs, as it promises cost efficiencies for SMEs through its unique business model that is based on outsourcing of physical IT assets. Cloud Computing is changing the entire ICT environment. It presents opportunities for SMEs to reduce their ICT infrastructure costs through adoption of high-end information and communication systems.

Even though there is a plethora of significant benefits presented by Cloud Computing to SMEs, the current adoption rate is significantly low, according to Gumbi & Mnkandla

(2015). The findings of Gumbi & Mnkandla's (2015) study reveal that SMEs do not understand the basic key terms and concept of Cloud Computing. They do not understand the fundamental building blocks of Cloud Computing such as the applicable service models (SaaS, IaaS and PaaS) and deployment models (Public Cloud, Private Cloud, Community Cloud and Hybrid Cloud). The findings of the study also revealed that SMEs do not understand or are not clear about the benefits of Cloud Computing. This led to the conclusion that it would be challenging to realise the benefits of Cloud Computing without comprehending the basic tenet and or building blocks upon which Cloud Computing is fundamentally based.

To start the journey to Cloud Computing, it is evident that an adoption framework anchored by the three pillars of Cloud Computing being Infrastructure as a service, Applications as a service and Platform as a service is needed. This is where our research will bring in a significant contribution in the development of the Cloud Adoption framework anchored by the three pillars of cloud computing. Our main research question which is to understand how can IT in the form of Cloud Computing address challenges faced by SMEs in South Africa is partially attended to by Gumbi & Mnkandla's (2015) study. Gumbi & Mnkandla's (2015) are merely highlighting the need to understand Cloud Computing to realise the benefits, but ignores the deeper understanding of the challenges faced by SMEs and position Cloud Computing as the solution rather than position Cloud as a phenomenon that needs to be understood. We agree that understanding of Cloud Computing is required but not at the expense of comprehending and appreciating SME business challenges. It also provides us with an opportunity to develop a model to embrace Cloud Computing using its core elements as a foundation and mitigate the gap in understanding this phenomenon. The framework need to bring closer the value of Cloud Computing and how it can assist in addressing SME challenges, which is a gap not covered in Gumbi & Mnkandla's (2015) research.

We also review work done by Carcary, Doherty, & Conway, (2014) who examined the depth of preparation SMEs undertook prior to migrating to the Cloud environment suggesting there is a substantial gap between what is published in the literature regarding steps to support Cloud Computing adoption and what is implemented in practice by the

SME community. Carcary, Doherty, & Conway, (2014) found that more than half of the survey panellists determined the strategic intent and objectives of Cloud adoption; established a process for determining the services most suitable for the Cloud environment; and involved key stakeholders throughout the process of assessing service readiness for the Cloud. The depth of effort in for example the process applied to determine suitability for the Cloud is somewhat questionable, as only the minority of SMEs developed criteria for assessing Cloud service readiness and used those criteria to assess actual Cloud readiness. Other important preparation steps were poorly followed with only a small number of SMEs establishing a strategic plan for roll-out of the selected services to the Cloud, and documenting a strategy for selecting the Cloud Service Provider(s) and managing relationship(s) with them. The low levels of in-depth preparation correspond to some findings in the literature. For example, Iacovou et al (1995), state that many small organisations lack a required level of organisational readiness for adopting high-impact systems. However, the survey findings also suggest that approximately half of the SMEs in Iacovou et al, (1995) study who adopted Cloud Computing did not engage in any preparation for migration to the Cloud.

The gaps that Carcary, Doherty, & Conway's (2014) exploratory study highlighted between what is currently published in the literature regarding Cloud Computing adoption and how SMEs are engaging in the Cloud adoption process, point towards a need to understand the relevance of Cloud Computing to the SME context. Carcary, Doherty, & Conway, (2014) state that it is commonly acknowledged that SMEs are inherently different from larger enterprises, and the lack of focus placed in the existing literature on the SME context could result in SMEs being disadvantaged in terms of relevant SME specific models and support/guidance for Cloud migration. Although establishing a process to identify potentially suitable services/processes for Cloud migration was an activity many SMEs engaged in, it appears that this process was high-level in nature as per Carcary, Doherty, & Conway (2014). As outlined previously, this finding is supportive of the nature of SMEs and their tendency to be characterised by lower levels of formality in processes and procedures.

Carcary, Doherty, & Conway (2014) introduced a nine-step Cloud life cycle depicted in figure 2.1., which can be used for both the migration and the ongoing management of public, cloud-based services. A consortium of organisations using an open-innovation approach developed the life cycle.

Figure 2.1: Cloud Lifecycle Management Framework (Conway & Curry, 2012)

Carcary, Doherty, & Conway (2014) emphasise the need to put in place the Cloud Adoption model relevant for SMEs after a detailed review of two models – Cloud Readiness Model (Loebbecke et al., 2012) and Cloud Lifecycle Management Framework (Conway & Curry, 2012).

This study is more internally focused as the emphasis is placed on establishing an implementation strategy and project team for rolling out and managing the transition of specific services to the Cloud, designing the future state of services, including interfaces

to other systems, selecting and managing relationships with the CSP, and regularly reviewing Cloud service requirements. We have identified the gap in this thesis and started by understanding the challenges facing the SME market and base the Cloud Adoption framework on the key challenges facing this sector. Cloud Computing has to be relevant to the needs in which it wants to address and failure to focus on the business and market challenges faced by SMEs can lead to failed implementation of good technology.

2.2.3 Functionality limitations of Cloud Computing

Our third research objective is to determine functionality limitations of Cloud Computing in addressing the challenges faced by SMEs in South Africa. Amongst other publications, we reviewed LI, Zhao, & Yu's (2015) who focused their efforts in 'explaining Cloud service transformation in Small and Medium Enterprises (SMEs) based on technology-environment-organisation paradigm and understand the role of Cloud service trust in transformation process' has found that Cloud service trust has a significant positive effect on the SMEs' Cloud service transformation intention. LI, Zhao, & Yu's (2015) finding is about significant influences of technological drivers (reliability and information security), environmental drivers (institutional pressure, structure assurance, and vendor scarcity) and SMEs' Cloud service trust. Further, the authors found mediating effects of trust on relationships between external drivers and Cloud service transformation.

According to LI, Zhao & Yu (2015), the practical implications of these findings is that vendors should build Cloud service trust by distinguishing advantages of their Cloud service and by establishing strategic alliances with existing users in marketing to attract potential clients. Vendors should target entrepreneurial organisations as initial customers and then expand to other types of organisations. The implication for users is that there is a need for cultivating entrepreneurship, if they have innovative IT initiatives and need to speed up the IT innovation absorption. Market regulators can provide adequate structural assurances and survival-of-the-fittest market mechanism to stimulate Cloud service market.

The TOE Drivers for Cloud Transformation model in figure 2.2 links the technological and environmental drivers to Cloud service trust, and further links Cloud service trust and organisational drivers to SMEs' Cloud service transformation intention.

Figure: 2.2. TOE Drivers for Cloud Transformation (Li, Zhao & Yu; 2015)
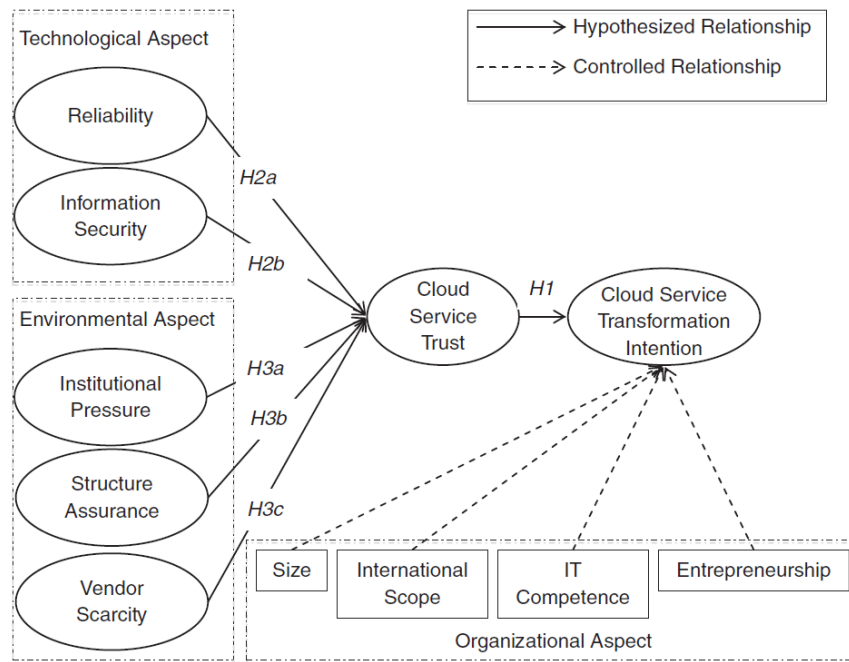
Source: Li, Zhao & Yu (2015). TOE drivers for cloud transformation: direct or trust mediated?, *Asia Pacific Journal of Marketing and Logistics*, 27(2), pp. 226-248.

The model presented above places an emphasis on trust to enable Cloud Service transformation in Small and Medium businesses. The key gap identified in the model is that all elements of the model do not focus on the business challenges faced by SME. Trust is a core premise of a positive relationship in various contexts (McKnight & Chervany, 1996), which could help to facilitate win-win cooperation strategies, thus improving transaction efficiency. As a multi-faceted concept, trust has been studied in various contexts (Mayer et al., 1995; McKnight et al., 2002). Mayer et al. (1995:1), define trust as "the willingness of a party to be vulnerable to the actions of another party based on the expectation that others will perform a particular action important to trustors, irrespective of the ability to monitor or control that other party". Much trust research in the

IT innovation acceptance and diffusion field has been done in the context of interpersonal relationships (Gefen et al., 2003; Goo et al., 2009; Jarvenpaa et al., 1999; McKnight et al., 2002; Stewart, 2003), such as between clients and service providers or partners. Jarvenpaa et al. (1999) examined trust in an online store and found that trust is positively related to purchasing behavior. Stewart (2003) showed that trust transfers from a physical shopping channel to a related web site channel. Additionally, Goo et al. (2009) discovered the role of trust in partner relationship. Recently, trust in technology innovation or IT artifacts has been studied in various contexts (Corritore et al., 2003; Komiak & Benbasat, 2006; Li et al., 2008; McKnight et al., 2011; Wang & Benbasat, 2005; Wang & Benbasat, 2008).

Wang & Benbasat (2008) studied the trust in recommendation agents in the context of e-commerce and elaborated in several determinants of trust formation. McKnight et al. (2011) suggested that trust in the IT itself also shapes IT-related beliefs and behavior. These studies suggest that trust in technology innovation is also a primary predictor of innovative technology usage and should be taken as a fundamental construct. Thus, trust in Cloud service should be included in studying Cloud service transformation in organisations.

We are of the view that studying Cloud Computing should be in the context of how it addresses the challenges of Small and Medium Enterprise businesses. In the context of SMEs, the intention should not be to convert these businesses to experts in Cloud Computing but to understand the role Cloud Computing can play in addressing their challenges. When SMEs do not have a choice and alternatives to address their business challenges but to look to Cloud Computing, trust does not become the determining factor of Cloud Adoption but hope takes the lead in this regard. Our view is that Trust comes when the user has other alternatives and can chose which solution is best positioned to address his/her challenges. It is therefore our view that emphasis should be placed on understanding key business challenges of SME business and then recommend Cloud solutions to address these challenges. The TOE models should be relevant in determining the way in which SMEs can embrace Cloud Computing but integral to this is the environmental aspect of the business in leveraging technology to address its challenges.

2.2.4 SME Business Environment: Growth

One of the main reasons we are undertaking this research is to understand how IT, in the form of Cloud Computing, can address the challenges faced by SMEs in South Africa. This should be able our small contribution in mitigating the reasons why many small businesses within South Africa do not make it past the second year of trading with failure rates as high as 63% (Roberts, 2010). Growth signifies that firms are confident, able and eager to seize opportunities (SBP Growth Index. 2014). Growing firms generate employment and support the expansion of a country's economy. Indeed, the National Development Plan of South Africa foresees that jobs will emerge from "small and expanding firms". South Africa needs not just more SMEs, but more sustainable, growing SMEs according to SBP Growth Index (2014). Firm growth does not happen in isolation. Information and technology have fundamentally changed how business is done, and national borders are increasingly obsolete as economic boundaries. South Africa needs to be competitive in a fast-paced global market. The creation and growth of business have been studied from as early as the 1960s. Spanning the divergent subject areas of economics, psychology and organisational development, the three dominants theories of firm growth are:

- Resource Based View of the firm (see figure 2.3)

- Strategic adaptation view of the firm (see figure 2.4)

- OTE Theory (see figure 2.5)

The first two aspects focus primarily on the specific variables contributing to the numeric growth of firms but with differing methods used to measure this firm growth (Hakkert, Kemp & Zoetermeer, 2001).

Figure 2.3: Resource based view of the firm
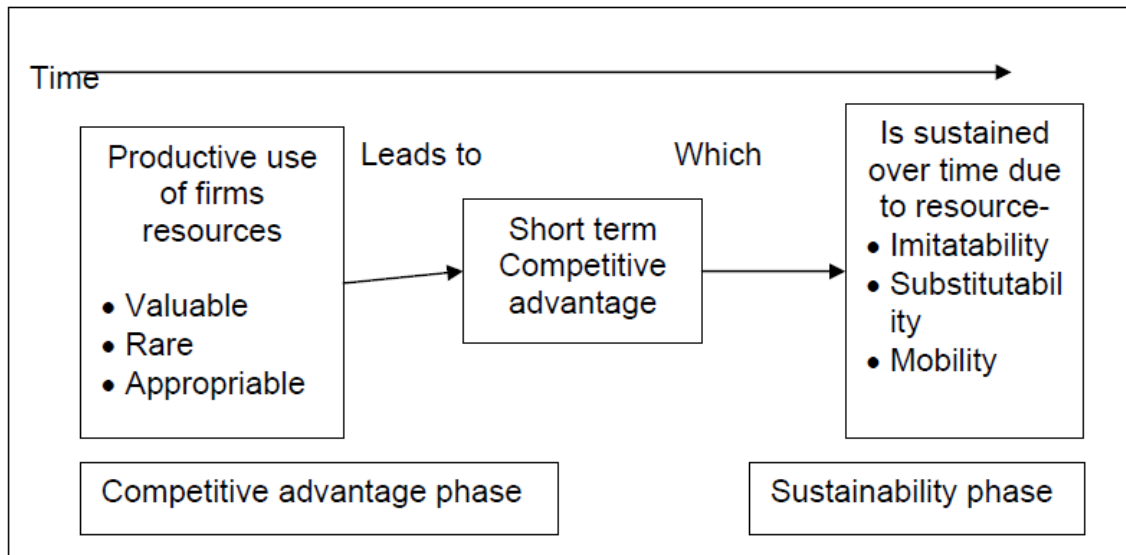
Source: Wernerfeldt (1985)

Source: Wernerfelt, B. (1985). From critical resources to corporate strategy, Strategic Management Journal, 5(2), pp. 171-80.

Resource based view is an approach to achieving competitive advantage that emerged in 1980s and 1990s, after the major works published by Wernerfelt (1985) on the resource-based view of the firm, by Prahalad & Hamel (1990) on the core competence of the corporation, Barney, (1995) on firm resources and sustained competitive advantage amongst others. The supporters of this view argue that organisations should look inside the company to find the sources of competitive advantage instead of looking at competitive environment for it.

Resource based view has been criticised in two areas. The first area has come from Porter (1985) who although agreeing that resources are an essential element to competitive strategy, found that the configuration of resources, the impact of external forces and the use of above average returns, in the long run, as a measure of sustainable growth were most important. This supports our view that emphasis should be placed on business environment when looking at how technology can be used to address business challenges of a firm. Priem & Butler (2001) found the Resource Based View to be self-verifying in that securing a valuable resource generally will lead to some form of growth.

They emphasize that in general, different resource configurations tend to generate same value and therefore must be additional factors that produce competitive advantage.

Figure 2.4 shows the Strategic Adaption of a firm model which focuses on changing the posture to achieve a better fit between the organisation and its environment. This adaption, as per Schindehutte & Morris (2001), can refer to changes to products or services offer, customer profile, marketing, distribution channels, personnel, financial system and physical plant requirements.

Figure 2.4: *Strategic Adaption of the Firm*
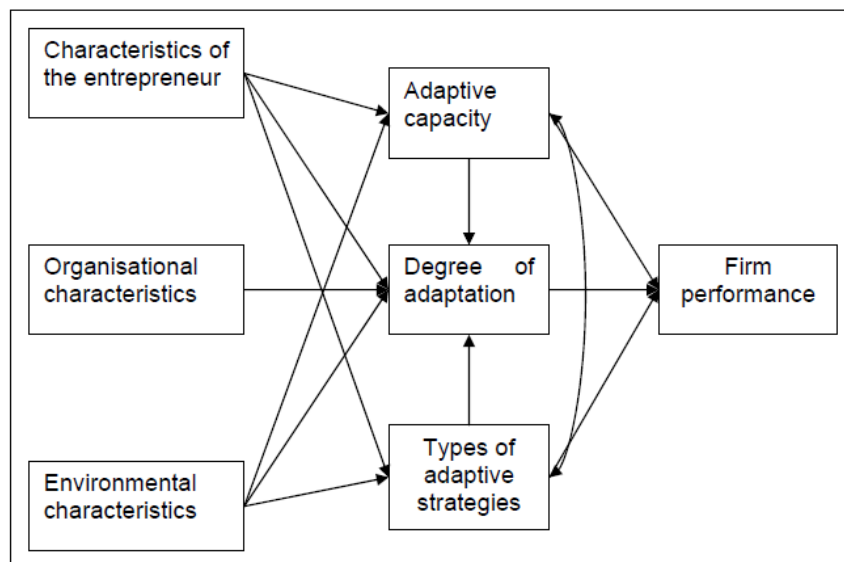
Source: Schindehutte and Morris (2001)

Source: Schindehutte, M., Morris, M.H. & Kocak, A. (2008), Understanding market-driving behavior: the role of entrepreneurship, Journal of Small Business Management, 46(1), pp. 4-26.

Critics of this theory such as a Hrebiniak & Joyce (1985) found that goal-driven behavior is much less of a predictor of organisational growth than environmental selection. The ability to dominate market share in this manner would possibly only be facilitated by a dominant market share, vertical alignment up the value chain, and or a form of market collusion. The second view which cannot be called a criticism but rather a challenge is that the abilities of a firm are essential to facilitate an adaptive strategy, it is this view that led to research on the learning organisation as termed by Vankataram & Van de Ven

(1998) where the growth outcome of firms relies on an intimate understanding of both the firm and the competitive forces in the external environment.

2.2.5 Technology Adoption (TOE Model)

The essence of technology in modern times is that it is not stationary. Technological change has become self-driven and cannot be ignored, in which change feeds on change. The period that followed the Industrial Revolution was one in which innovation intensified. There were reclines and tides, in which major breakthroughs occurred and macro inventions were followed by waves of micro inventions with secondary applications (Mokyr, 2005). The dynamics of technology are that the present and the future are nothing like the past, in the same way Cloud Computing is disrupting the industry by changing how IT is consumed.

Cloud Computing services are being touted as a major enabler for small businesses lately. This new paradigm is seen to offer unique opportunities to small and medium enterprises (SMEs) worldwide and developing economies are no exception (Yeboah-Boateng & Essandoh, 2013). It presents SMEs access to similar technologies available to their larger counterparts and those in the developed world which inherently creates innovativeness, increases competitive advantage and impacts their operations and processes. The results of the study indicated that a slight majority of the respondents were familiar with cloud computing on the individual level but the level of awareness amongst the larger SME industry was low to medium (Yeboah-Boateng & Essandoh, 2013). The finding therefore recommends education and sensitization on cloud computing in order to increase awareness and knowledge about this emerging technology and its prospects. This is seen as one sure way of enhancing its uptake in developing and emerging markets.

Abor & Quartey (2010) state that Small and Medium Enterprises (SMEs) contribute significantly to the socio-economic development globally. SMEs employ an estimated 85% of persons in the manufacturing sector and contribute around 70% of Gross Domestic Product. Therefore, developing systems and innovations that can boost SMEs efficiently and productively cannot be overemphasised. However, there is a slow

response of small businesses towards the adoption of ICT (Houghton, Winklhofer, 2004). This is largely due to the high costs and risks associated with investing in systems and innovations. Cloud computing is therefore seen as the best alternative for addressing the challenge faced by SMEs in adopting technological innovations (Rio-Belver, Cilleruelo, Garechana, Gavilanes, & Zabalza, 2012).

There are many theories used in information technology research. We are interested only in theories about technology adoption. The most used theories are the Technology Acceptance Model (Davis et al. 1989), Theory of Planned Behavior (Ajzen 1991), Unified Theory of Acceptance and Use of Technology (Venkatesh et al. 2003), and the Technology, Organisational and Environmental (TOE) framework (Tornatzky and Fleischer 1990). We will develop only the TOE framework because it is the only one that is at the firm level. The Technology Acceptance Model, Theory of Planned Behavior, and Unified Theory and Use of Technology are at the individual level.

Technology, Organisational and Environmental (TOE) theories are a lens in which the Technology Adoption is looked at in this study. We reviewed multiple publications on this topic as referenced above and the ones covered in this section are most relevant to answering our main research question. Figure 2.5 is the TOE framework which was originally developed by Tornatzky & Fleischer in 1990. The framework focuses on three aspects of an organisation's context that influence the process of technological innovation adoption such as Cloud Computing. These three aspects are technological context, organisational context, and environmental context (Tornatzky & Fleischer 1990).

Figure 2.5: TOE Model (Tornatzky & Fleischer, 1990)
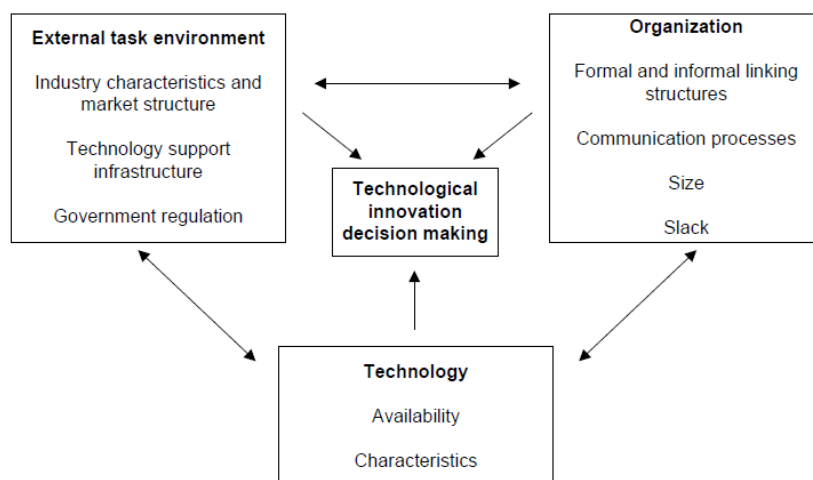
Source: Tornatzky, L.G. & Fleischer, M. (1990). The Processes of Technological Innovation, Lexington books, Lexington, MA.

Technological context describes both the internal and external technologies applicable to the organisation. This includes existing practices in use and equipment which are internal to the organisation as well as available technologies external to the organisation (Thompson 1967, Khandwalla 1970). Before any technology adoption process takes place it is critical that internal technologies that form most of the existing operational work are considered (Collins et al. 1988; Lacovou et al. 1995; Kuan & Chow, 2000). The chances that the organisation will allocate more technological resources to the adoption project depend on the perceived benefits. Technology opportunism which according to Srinivasan et al. (2002) is the organisation's ability to sense and react to new technologies has also been observed in the adoption processes. Organisational context is an element that deals with the characteristics and resources of an organisation. This forms a linkage between employee structures, intra-organisation communication processes, and organisational size including the extent of slack resources.

The *organisational context* affects adoption and implementation of decisions in many ways. These include stimulating innovation through internal mechanisms that link subunits within an organisation (Galbraith 1973). Organisational factors such as IT expertise are some of major concerns in the adoption project as observed by Lacovou et al. (1995) in their study of Electronic data interchange (EDI) in small companies.

Environmental context forms the environment in which the organisation ventures its business such as the industry where it belongs. It also includes competitors, presence or lack of technology service provision and regulatory framework (Tornatzky & Fleischer 1990). Thong (1999) found out that competition within the environment stimulates the likelihood of technology adoption. Smaller companies are usually affected by such factors (Iacovou et al., 1995).

The Technological, Environmental and Organisational elements present "*both constraints and opportunities for technological innovation*" (DePietro, Wiarda, & Fleischer, 1990, p. 154). Thus, these three elements influence the way a firm sees the need for, searches for, and onboards new technology.

Understanding the *business environment* and potential *impact of technology* to the firm and *its environme*nt is considered when looking for unique contribution in how challenges are an opportunity for technology adoption in the form of Cloud Computing - Figure 2.6 shows this.

Figure 2.6: Determinants of Cloud Adoption (Low, Chen, Wu, 2011)

Technological Context
• Relative advantage
• Complexity (insignificant determinant)
• Compatibility (insignificant determinant)

Organizational Context
• Top management support
• Firm size
• Technology readiness (Insignificant determinant)

Environmental Context
• Competitive pressure
• Trading partner pressure (the most influential determinant)
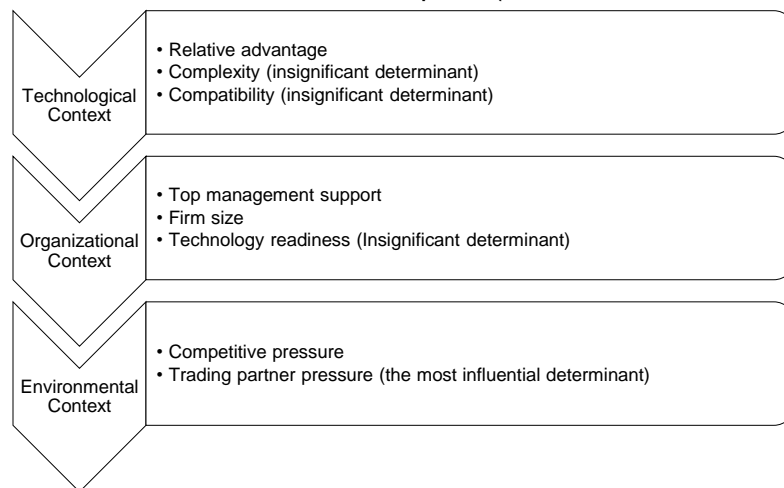
Source: Low, Chen, & Wu (2011). Understanding the determinants of Cloud Computing Adoption. Industrial Management & Data Systems, 111(7), pp. 1006-1023.

Whether a firm implements Cloud Computing in the high-tech industry depends on the firm's technological, organisational, and environmental contexts. Five (5) variables were

found to be significant determinants of Cloud Computing adoption and these are *relative advantage*, *firm size*, *top management support*, *competitive pressure*, and *trading partner pressure*. Three variables were also identified as insignificant determinant of Cloud Computing adoption: *complexity*, *compatibility*, and *technology readiness*. These variables were considered when we explored the appropriate model in how Cloud Computing can be used to address the challenges of Small and Medium Enterprises in South Africa.

Among the determinants, *trading partner pressure* was observed to be the most influential factor affecting a firm's Cloud Computing adoption. *Relative advantage* was the barrier to Cloud Computing adoption (Low, Chen, Wu, 2011).

Cloud Computing has spread out through the main areas related to information systems (IS) and technologies, such as operating systems, application software, and technological solutions for firms (Armbrust et al., 2010). Pyke (2009); Mell & Grance (2011). The authors found key benefits of Cloud Computing to be scalability, ease of implementation, use of the skilled practitioners, freeing up of internal resources, and quality of service.

2.2.6 Technology Development Opportunity on Cloud Computing

Our view is that literature on TOE Model is not expanded to understand the link between the business environment and the challenges it presents the SME sector with; and how technology can be used to address these. Environmental assessment is limited to competitive pressure and trading partner pressure but not on specific challenges, such as red tape, skill shortages, labour regulations, lack of innovation, limited access to funding and crime. *Relative advantage* was identified as a barrier to Cloud Computing adoption and the proponent of this model assumes that the barrier is due to the high cost of Cloud Computing. Our view is that Cloud costing model cannot be a deterrent without looking at the cost of connectivity especially when servers are hosted outside the country in the form of Public Cloud Computing Service model. We are of the view that *relative advantage* is a barrier when looking at the difficulty in relinquishing control of the IT environment and entrusting it to someone for management and support on a day to day. To access this information, one needs to follow the Cloud provider business rules and

this has direct impact on *relative advantage* (when compared to internally hosted infrastructure). Data sovereignty, regulation, cost of bandwidth, network quality issues are all ignored in this study and these are all contributing factors to the adoption of Cloud. In this thesis, we have constructed a research tool to test these theories and also discussed the application of TOE in this regard.

Li, Zhao & Yu's (2015) views on how TOE model should be used is closely aligned to this thesis and we place emphasis on the challenges of Small and Medium Enterprise business to enhance the model. Core pillars of this model should be anchored by Cloud Computing service models, such as Infrastructure as a Service, Software as a Service and Platform as a Service.

To set the correct base to work from when looking at the role played by Cloud Computing in addressing Small and Medium business challenges, we look at the definition of Cloud Computing and Small and Medium businesses to ensure the right parameters are set and avoid generalisation. Various authors have different understanding of Cloud and SME market, and we have clearly articulated the parameters applied to this study so as to manage the generalisation of views and findings from other studies. Now that this is established, an initial view of the Cloud Adoption Framework has been proposed taking into account SME business challenges as was covered in Chapter one. Cloud Computing service models and underlying technology by service tower and how all stages of the framework are interrelated to deliver the solution for the Small and Medium business in South Africa are looked at. Figure 2.7, below is an initial view of how business challenges stack on top of Cloud Computing Service Towers including Application as a Service, Infrastructure as a Service and Platform as a service. The aim is to apply TOE model to the diagram below and extract value of the model in how the SME business challenges can be addressed using technology and thus providing a framework for SME on how to embrace Cloud Computing in their business to address specific challenges.

Figure 2.7: Preliminary Cloud Adoption Framework (Synthesized by the writer)
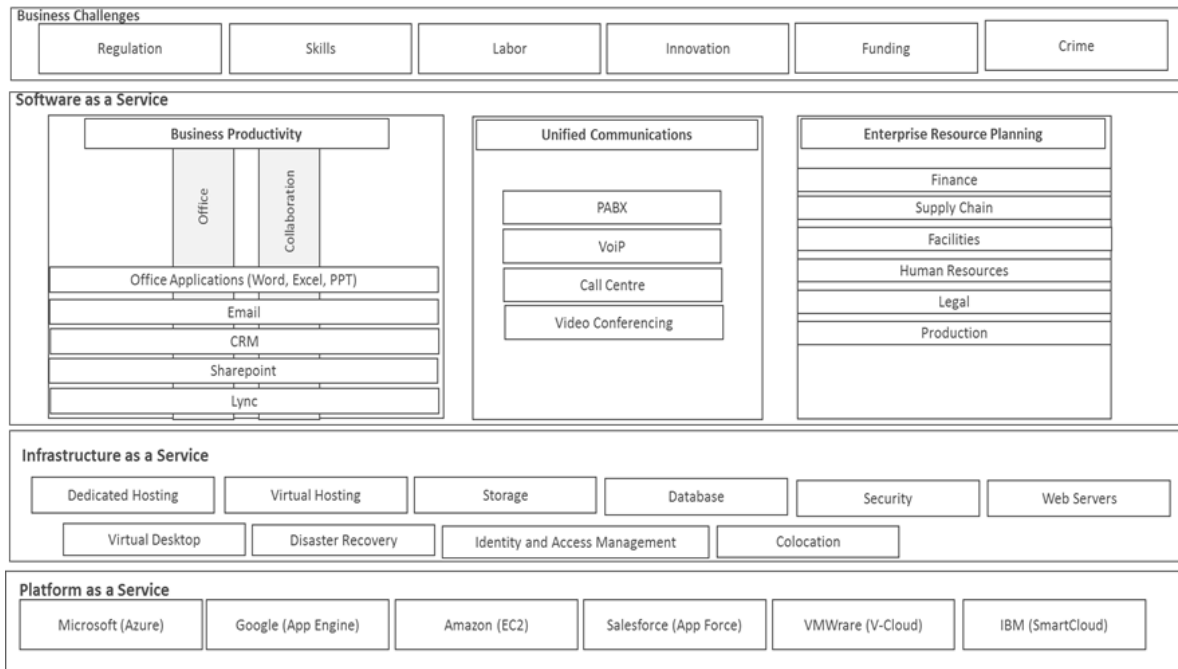
2.3   Cloud Computing Defined

Cloud Computing is a new phrase which is profiled as the next disruptive technology. Many organisations are spending significant amount of time with research companies, online information gathering and with the technology service providers to understand how Cloud can be leveraged in the future from an IT strategy perspective. Cloud Computing has created the same paradigm shift as what was compared to the replacement of individual generators by the centralized electricity grid (Etro, 2011; Li, Wang, Wu, Li, & Wang, 2011). Although there is little or no consensus on a single definition of Cloud Computing, Cloud Computing is understood in various ways by different authors and the section below considers how different authors define and describe Cloud Computing.

2.3.1   Cloud Computing definitions offered in literature

The following definitions of Cloud Computing (CC) are offered in the literature:

- *"a large distributed computing paradigm driven by economies of scale in which a pool of abstracted, virtualized, dramatically-scalable, managed computer power, storage,*

*platforms and services are delivered **on demand** to external customers over the internet*" (Forster, Zhao, Raicu & Lu, 2008).

- The National Institute of Standards and Technology in USA describes it as "*a model for enabling convenient, on demand network access to a shared pool of configurable computing resources (e.g. networks, servers, storage, applications, and services) that can be rapidly provisioned and released with **minimal management effort** or service provider interaction*" (Mell & Grance 2011:1).

- Vaquero et al (2009) on page 236 takes an elementary approach: "*Clouds are a large pool of easily usable and accessible virtualized resources (such as hardware, development platforms, and/or services). These resources can be dynamically reconfigured to adjust to a variable load (scale), allowing also for an optimum resource utilization. This pool of resources is typically exploited by **a pay-per-use** model in which guarantees are offered by the infrastructure provider by means of customized SLAs*" (Service Level Agreements).

- Cloud Computing has also been defined as an on-demand access model of delivering hardware and software as services over the Internet in different ways of deployment models and service models (Srinivasan, Lilien, & Rangaswamy, 2002).

- Another definition by Mansukhani & Zia (2011) describes Cloud Computing as a method for delivering information services that provides flexible use of servers, scalability, and management services, along with a unique combination of capabilities that include **scalable and dynamic** infrastructure, global/remote access, precision usage controls and pricing, and standard platform and support services, IT, and management.

- The 451 Group research company, describes Cloud Computing as simple and easy to understand, and offers the following definition *"IT as a Service delivered by IT resources that are independent of location".* This definition is not making specific mention of any resources but encompasses everything within the IT environment and emphasizes delivery of resources independent of location.

What is common amongst these definitions is that they all refer to Cloud Computing in the perspective of Information Technology and not the usual Clouds in the sky that we are all familiar with. It is also noticed that they emphasize access to information technology resources in a dynamic fashion; but the critical question that needs to be asked is whether the information technology resources referred to in all the definitions above, are limited to only computing, network, and storage. The National Institute of Standards and Technology definition extends the resource beyond just computer server, storage and memory but also includes applications. This is critical because information technology usage is meaningful to users when applications are running on top of information technology infrastructure and the ability to access these applications in the form of Cloud Computing can be valuable; and can make a difference to the users. An example would be access to G-mail account which is an email application sitting on top of an operating system, hypervisor, database server, email software, security server for identity management and backup infrastructure. The users do not get to see the underlying technology and it does not matter where the location of this technology is, as long as it is easily accessible from internet.

Figure 2.8 depicts the National Institute of Standards and Technology's (NIST) definition of Cloud Computing which further classifies it as having five essential characteristics, three service models, and four deployment models.

- essential characteristics: on-demand self-service, broad network access, resource pooling, rapid elasticity, and measured service

- service models: Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS)

- deployment models: private, community, public, and hybrid Cloud

Figure 2.8: Definition of Cloud Computing (Mell & Grance, 2011)
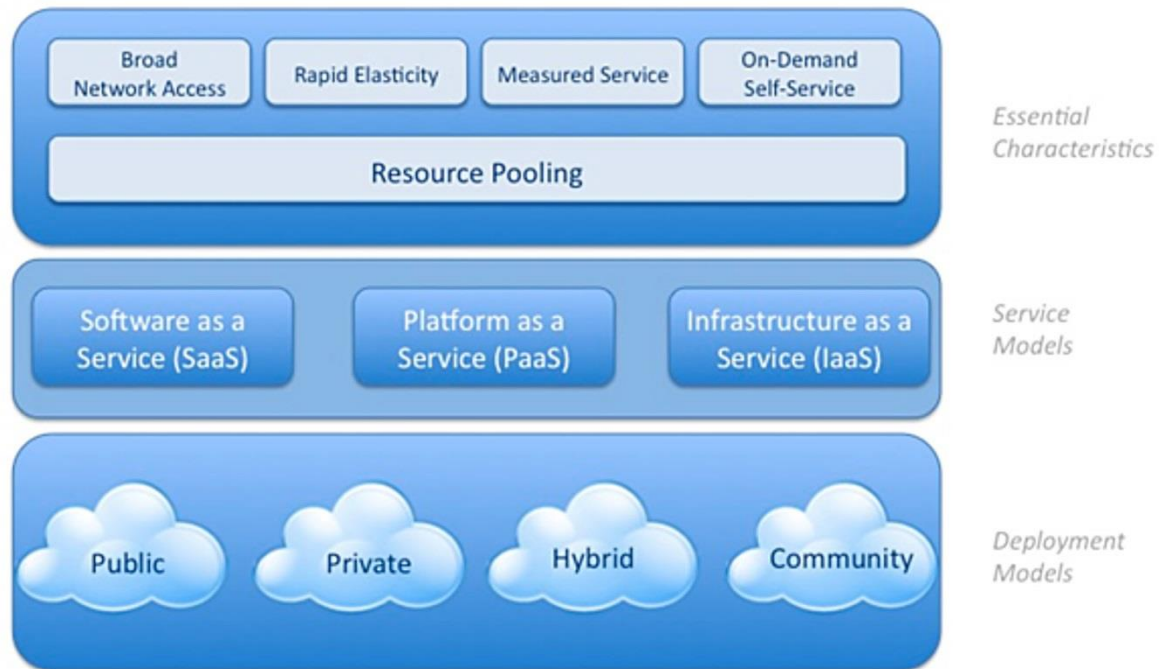
Source: Mell, P. and Grance, T. (2011). The NIST definition of Cloud Computing, NIST Special Publication No. 800-145, pp. 2-3, available at: http://nvlpubs.nist.gov/nistpubs/Legacy/SP/nistspecialpublication800-145.pdf. Accessed on 1 February 2017.

2.3.2   Essential characteristics

The following are some characteristics of cloud computing:

On-demand self-service: A consumer can unilaterally provision computing capabilities, such as server time and network storage, as needed automatically without requiring human interaction with each service provider (Mell & Grance, 2011).

Broad network access: Capabilities are available over the network and accessed through standard mechanisms that promote use by heterogeneous thin or thick client platforms for example, mobile phones, tablets, laptops, and workstations, (Mell & Grance, 2011).

Resource pooling: The provider's computing resources are pooled to serve multiple consumers using a multi-tenant model, with different physical and virtual resources dynamically assigned and reassigned according to consumer demand. There is a sense of location independence in that the customer generally has no control or knowledge over the exact location of the provided resources but may be able to specify location at a higher level of abstraction (e.g., country, state, or datacenter). Examples of resources include storage, processing, memory, and network bandwidth (Mell & Grance, 2011).

Rapid elasticity: Capabilities can be elastically provisioned and released, in some cases automatically, to scale rapidly outward and inward commensurate with demand. To the consumer, the capabilities available for provisioning often appear to be unlimited and can be appropriated in any quantity at any time. (Mell & Grance, 2011)

Measured service: Cloud systems automatically control and optimize resource use by leveraging a metering capability at some level of abstraction appropriate to the type of service (e.g., storage, processing, bandwidth, and active user accounts). Resource usage can be monitored, controlled, and reported, providing transparency for both the provider and consumer of the utilized service (Mell & Grance, 2011).

According to characteristics mentioned above, Cloud Computing should provide any user with the ability to use technology as much and as less as they wish without the intervention of a service administrator. For example, if the user feels that he/she wants to extend the technology consumed to more than one user within the same company or in the same family, the user should not require technical assistance but should be able to scale up and down; and the costs should follow this model. The network used to access this technology should not be constrained to one type of network service such as mobile, local area network (LAN), or satellite network. It should be accessible through broad connectivity. Resources referred to in the characteristics are processing power, memory, storage and network and all these resources should be shared across multiple users and that is what is meant by resource pooling. This limits the need to have dedicated deployment of resources by each user which can be costly and time consuming in terms of support. To be able to support this, the service provider needs to build access to the

technology through a website that will allow users to have control and less requirements to have a technical administrator to enable this service request.

2.3.3   Service models

Mell & Grance (2011) from the National Institute of Standard and Technology define the three Cloud Computing service models in figure 2.9:

Figure 2.9: *Cloud Computing Service Models (Mell & Grance, 2011)*
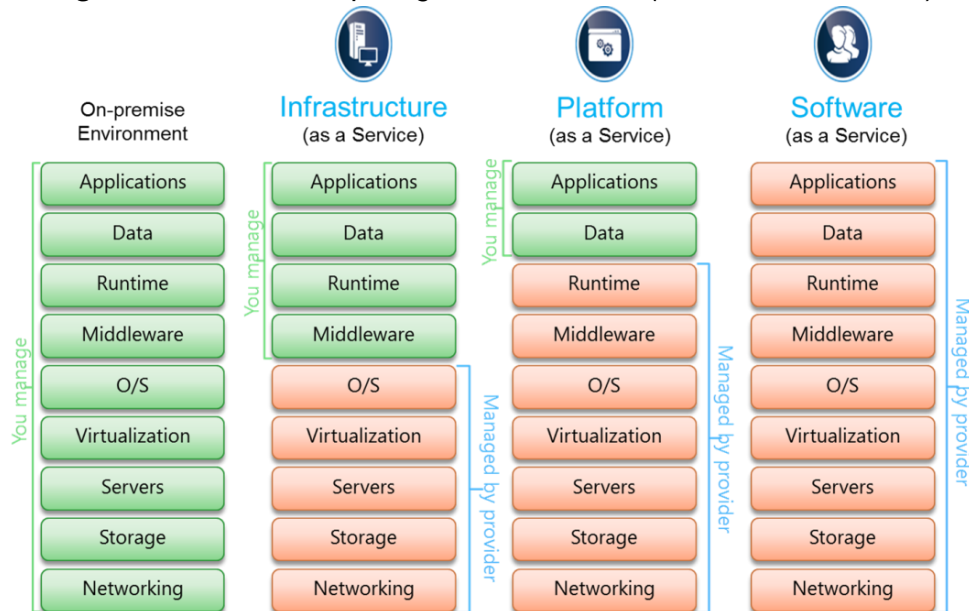
Source: Mell & Grance (2011). The NIST definition of Cloud Computing, NIST Special Publication No. 800-145, pp. 2-3, available at: http://nvlpubs.nist.gov/nistpubs/Legacy/SP/nistspecialpublication800-145.pdf. Accessed on 1 February 2017.

The above service models are discussed next.

- **Software as a Service (SaaS)** The capability provided to the consumer is to use the provider's applications running on a Cloud infrastructure as demonstrated in figure 2.10. The applications are accessible from various client devices through either a thin client interface, such as a web browser (e.g., web-based email), or a program interface. The consumer does not manage or control the underlying Cloud infrastructure including network, servers, operating systems, storage, or even individual application capabilities, with the

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possible exception of limited user-specific application configuration settings (Mell & Grance, 2011). SalesForce.com is an example of **Software as a Service** company.

Figure 2.10: Software as a Service Offerings (Synthesized by the writer)

- **Platform as a Service (PaaS)** – The capability provided to the consumer is to deploy onto the Cloud infrastructure consumer-created or acquired applications created using programming languages, libraries, services, and tools supported by the provider. The consumer does not manage or control the underlying Cloud infrastructure including network, servers, operating systems, or storage, but has control over the deployed applications and possibly configuration settings for the application-hosting environment (Mell & Grance, 2011). Google App Engine is an example of **PaaS**.

- **Infrastructure as a Service (IaaS)** – The capability provided to the consumer is to provision processing, storage, networks, and other fundamental computing resources where the consumer is able to deploy and run arbitrary software, which can include operating systems and applications as shown in figure 2.11. The consumer does not manage or control the underlying Cloud infrastructure but has control over operating systems, storage, and deployed applications; and possibly limited control of select networking components. (Mell & Grance, 2011). Examples of **IaaS** include Amazon Elastic Cloud (EC2), and Simple Storage System (S3) and host firewalls.

Figure 2.11: Infrastructure as a Service Offerings (Synthesized by the writer)

	COMPUTE		STORAGE		
	IaaS	PaaS	Relational	Scale-out	Blobs
amazon.com	Elastic Compute Cloud (EC2)	Elastic Beanstalk	Relational Database Service	Simple Database	Simple Storage Sevice (S3)
Microsoft	Hyper V Cloud (for partners)	Windows Azure	SQL Azure	Tables	Blobs
Google		App Engine	Cloud SQL	Datastore	Blob Store
salesforce		AppForce, VMForce		Database.com	
vmware	vCloud for Partners				
IBM	SmartCloud Enterprise				Object Storage
ORACLE		Java Cloud Service	Database Cloud Service		

Cloud Computing and its components, Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS), are terms that represent new developments in the software industry that are completely changing the way software is manufactured, consumed, and disseminated. Infrastructure such as computing resources and storage are bundled, shared, and provided as a service. Previously highly protected software platforms were opened and are further developed in emerging ecosystems of independent, third-party developers and platform owners. Functionality of software is consumed over the browser. Consumers do not buy licenses of software products anymore, but pay for its usage on a pay as you use basis. Due to all these changes, information technology is transforming into a general-purpose technology that can provide a fundamental contribution that promotes growth and competition and is opening new opportunities for users as well as producers of computing technology and software (Etro 2009).

2.3.4   Deployment models

Customers have four options in which they can deploy Cloud services in their organisations; these are shown in figure 2.12.

Figure 2.12: Cloud Deployment Models (Mell & Grance, 2011)
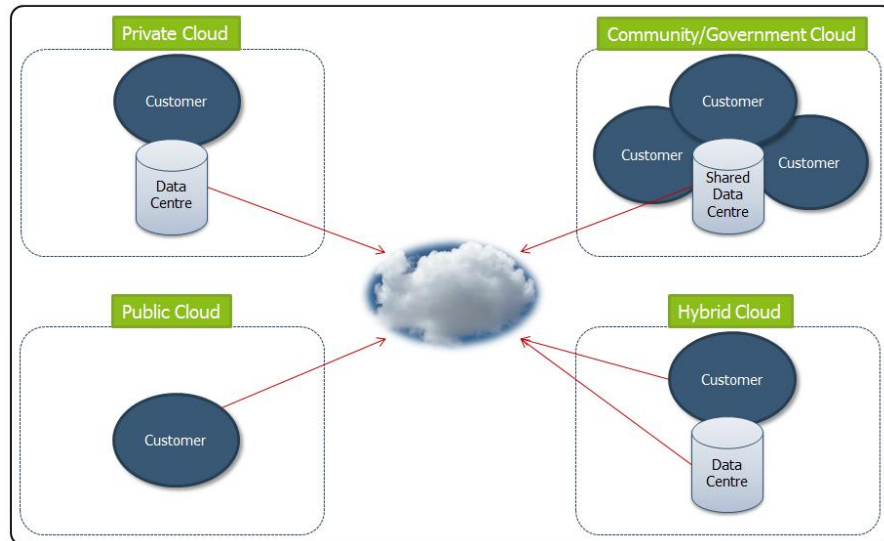
Source: Mell, & Grance (2011). The NIST definition of Cloud Computing, NIST Special Publication No. 800-145, pp. 2-3, available at: http://nvlpubs.nist.gov/nistpubs/Legacy/SP/nistspecialpublication800-145.pdf. Accessed on 1 February, 2017.

The above deployment models are described next.

Private Cloud: The Cloud infrastructure is provisioned for exclusive use by a single organisation comprising multiple consumers, in business units. It may be owned, managed, and operated by the organisation, a third party, or some combination of them, and it may exist on or off premises (Mell & Grance, 2011).

Community Cloud: The Cloud infrastructure is provisioned for exclusive use by a specific community of consumers from organisations that have shared concerns for example as dictated by: the mission of the organisation, security requirements, policy, and compliance considerations. It may be owned, managed, and operated by one or more of the organisations in the community, a third party, or some combination of them, and it may exist on or off premises (Mell & Grance, 2011).

Public Cloud: The Cloud infrastructure is provisioned for open use by the general public. It may be owned, managed, and operated by a business, academic, or government organisation, or some combination of them. It exists on the premises of the Cloud provider (Mell & Grance, 2011).

Hybrid Cloud: The Cloud infrastructure is a composition of two or more distinct Cloud infrastructures (private, community, or public) that remain unique entities, but are bound together by standardised or proprietary technology that enables data and application portability. An example of hybrid cloud is Cloud bursting for load balancing between Clouds (Mell & Grance, 2011).

The four (4) different Cloud models give the user/customer options to choose a model which is suitable to their business needs. This calls for Cloud service providers to understand the target audience for their Cloud Services and ensure that they meet their requirements. For example, Public Sector organisation may be best suited to deploy Cloud under community or private cloud models when SME organisations can comfortably consume Cloud technology in a public cloud model. This study looks at the SME market and establishes which model is best suited to provide the SME market with the best user experience while yielding the required benefits to enhance this market.

2.4 Small and Medium Enterprise Market Defined

Different institutions, countries and governments define Small and Medium Enterprises (SMEs) in different ways. Sovereign governing bodies throughout the world have established unique criteria for designating a firm's size. The U.S. federal government has stipulated a business' size as a function of annual revenues or number of employees based on the North American Industry Classification (NAIC) system (Small Business Act, 1979). The maximum qualifying annual revenue varies from $750 thousand to $50 million and the maximum number of employees ranges from 100 to 1,500 depending on NAIC designation (SBA, 2007).

Although in the United States small businesses typically include firms employing fewer than 500 employees and generating revenues of $50 million or less, small businesses

were reported to comprise nearly all U.S. employers. They also employ most of the private sector workforce and create the greater part of the gross domestic product (SBA, 2009).

The executive arm of the European Union defined Small and Medium size enterprises (SMEs), which were comparable to U.S. small businesses, as independent companies with fewer than 250 employees (Blau, 2009). In Australia, small businesses were designated as firms employing 200 or fewer workers. However, in New Zealand SMEs are considered firms with fewer than 20 employees (Al-Qirim, 2007).

According to the South African Department of Trade and Industry Annual Review of Small Business in South Africa 2005-2007, micro enterprises are described as businesses whose annual turnover is below the compulsory VAT registration limit. A further distinction is the 'survivalist' business, which is generally defined as providing income only below the poverty line. However, all these criteria do not fit exactly with the official definition, as per the small business definition schedule in the National Small Business Act of 1996 as amended in 2003 and 2004.

The National Small Business Act of 1996, defines a 'small business' as follows:

… a separate and distinct business entity, including co-operative enterprises and nongovernmental organisations, managed by one owner or more which, including its branches or subsidiaries, if any, is predominantly carried on in any sector or sub sector of the economy i.e. Agriculture, Mining, Manufacturing, Electricity, Construction, Retail Motor Trade, Wholesale, Tourism, Finance, and Community Services.

Small businesses can be classified as micro, very small, small or medium enterprises, following a complex set of thresholds. The National Small Business Act, as revised by the National Small Business Amendment Act of 2003 and 2004, defined the average thresholds per site class as in table 2.1 below.

Table 2.1: Average Threshold per SME site class in S.A (National Small Business Act)

Site Class	Number of Fulltime or equivalent employees	Total Annual Turnover
Medium	200	R26M
Small	50	R13M
Very Small	20	R3M
Micro	5	R0.20M

Compared to developed-country standards, SA thresholds are low. Many businesses which Americans or Europeans regard as small or medium enterprises would be regarded as large enterprises in South Africa. The terms 'small business' and 'SMME' are used as synonyms, whereas the term 'enterprise' refers specifically to entities (especially close corporations, co-operatives and companies) registered with the Companies and Intellectual Property Registration Office (CIPRO). The owners of these SMMEs are hence referred to as business owners or 'employers and self-employed'. The term 'entrepreneur' is used for those involved in a start-up or a new business activity.

These various definitions illustrate inconsistency throughout literature in the manner in which small businesses are defined. Universally, SMEs have been characterised as catalytic economic agents with relatively limited resources and broad diversity (Forsman, 2008). SMEs have gained recognition in the field of management because of the strategic role they play in promoting a nation's economy in terms of reducing poverty by providing employment opportunities (Okpara & Wynn, 2007). Their contribution to the growth and development of any economy is undeniable in both the developed and developing countries. SMEs provide about 77% of employment and 40% of total investments in Turkey (Seker & Correa, 2010). In Nigeria, they account for about 75% of employment although 60% of the population lives below the poverty line (Mukaila Ayanda & Sidikat Laraba, 2011). This significant role played by SMEs can be attributed to the level of their innovativeness and flexibility (Seker & Correa, 2010). But then their ability to innovate depends on the competence of management, their size and the availability of resources

(Hamilton, 2009). Innovation is very important to business growth and the more SMEs innovate; the more their performance improves within the industry (Akinade, 2007).

SMEs play a crucial role in almost all economies but particularly in developing countries with major employment and income distribution challenges, such as South Africa. The creation and sustainability of new SMEs are vital to the economic prosperity of a country or else, countries risk economic stagnation (Fatoki & Garwe, 2010). It is estimated that small businesses (SMEs) employ 22% of the adult population in developing countries. United Nations Industrial Development Organisation (UNIDO) estimates that SMEs represent over 90% of private business and contribute to more than 50% of employment and of gross domestic product (GDP) in most African countries (UNIDO, 1999). A recent study conducted by Abor & Quartey (2010) estimates that 91% of formal business entities in South Africa are SMEs, and that these SMEs contribute between 52 to 57% to GDP and provide about 61% to employment. However, many small businesses within South Africa do not make it past the second year of trading with failure rates as high as 63% (Roberts, 2010).

The National Development Plan (NDP) sets an ambitious aim: to treble the size of South Africa's economy by 2030. It is a daunting challenge. By the plan's own admission, to achieve this will require sustaining a robust rate of economic growth – at a minimum of 5% a year over 15 years − a feat that few countries have proven capable of. Economic growth signifies that firms are confident, able and eager to seize opportunities. Growing firms generate employment and support the expansion of a country's economy. Indeed, the National Development Plan foresees that jobs will emerge from "small and expanding firms". South Africa needs not just more SMEs, but more sustainable, growing SMEs (SBP Growth Index, Feb 2014). Firm growth does not happen in isolation. Information and technology have fundamentally changed how business is done, and national borders are increasingly obsolete as economic boundaries (SBP Growth Index, Feb 2014).

SMEs like any other business entity are exposed to various macro environmental variables, however, some of the main issues faced by SMEs are highlighted in the SME Growth index 2013 and were critically reviewed in this chapter. Key to getting SME growth on track is reforming South Africa's business environment. Evidence compiled from SME

Growth Index 2013 research, shows that South African SMEs are confronted with tough, often hostile, operating conditions. Along with standard commercial pressures – which in the prevailing economic climate are themselves daunting – SMEs in South Africa operate in an environment in which governance and social failings impose numerous additional burdens. This holds back their growth, and undermines their competitiveness.

2.5 Summary

This chapter reviewed literature published on Technology Adoption in the context of Cloud Computing and its relevance to Small and Medium businesses. There are many theories used in information technology research and our review placed emphasis only in theories about technology adoption. In the literature, we discovered that most used theories are the Technology Acceptance Model (Davis et al. 1989), Theory of Planned Behavior (Ajzen 1991), Unified Theory of Acceptance and Use of Technology (Venkatesh et al. 2003), and the Technology, Organisational and Environmental (TOE) framework (Tornatzky and Fleischer 1990). The TOE framework was developed because it is the only one that is at the firm level. The Technology Acceptance Model, Theory of Planned Behaviour, and Unified Theory and Use of Technology are at the individual level.

Some of the publications that used TOE model were reviewed starting a study by Gumbi & Mnkandla (2015) who studied several SMEs within the City of Tshwane Metro Municipality in RSA to establish the extent to which they comprehend Cloud Computing concepts. This finding revealed that SME do not understand Cloud Computing. The gap in this study is that Cloud Computing was studied as a standalone phenomenon and challenges faced by SMEs in the context of Cloud Computing were not looked at. This study's emphasis is not on Cloud Computing but on SME business challenges and how Cloud Computing can be used to address these. Cloud Computing is an enabling solution and it is important to understand the challenges faced by SME in order to apply Cloud Computing correctly and minimise the need to understand it but rather focus on how to apply it.

Carcary, Doherty, & Conway, (2014) research emphasised the need to put in place Cloud Adoption Model using the Cloud Readiness model and the Cloud Cycle Management

framework. The limitation in Carcary, Doherty, & Conway (2014) research is that, it is more internally focused as it only looks at how SMEs should implement and embrace Cloud Computing in their business. It does not take into account the external factors that hamper growth of SME sector in South Africa.

Li, Zhao, & Yu (2015) suggested that vendors should build Cloud service trust by distinguishing advantages of their Cloud service and by establishing strategic alliances with existing users in marketing, to attract potential clients. The model used is that of TOE for SME and how elements of trust can be used to enhance the model.

We also looked at the growth aspect of Small and Medium Enterprise businesses using resource based view of a firm; strategic adoption of a firm; and TOE models. These models were looked at in the context of how they could be used in parallel with technology to assist with growth of a firm. After critical review of all models, we found that TOE model is appropriate for addressing the challenges of SME when applied correctly. The unique contribution the writer brings into this body of knowledge is to add more emphasis on the SME business challenges and how they can be aligned with the relevant technology.

Resource based view of the firm was criticised on the basis that it is not only the resources of the firm that enhance competitiveness but the external forces, above average returns, and impact of the external forces amongst others. This posed a limitation to this framework in its ability to address the need to succeed in the Small and Medium enterprise market as it ignored external factors that affect growth of firms.

Strategic adaption of the firm was also reviewed. Its focus is to change the posture of the firm to achieve better fit between organisation and its environment. It is criticised for its limitation to drive market share as it is hindered by its dependency on company resource optimisation/changes like products, services, customer profile, marketing, distribution, personnel, finance systems and changing plant requirements, amongst other factors. The critics state that to dominate market share, market share acquisition methods must be pursued aggressively including but not limited to mergers and acquisitions, vertical alignments up the value chain or market collusion. Also, firm abilities are essential to facilities adaptive strategies.

As Cloud Computing is technology innovation, we are of the view that this model is contradicting the definition of Cloud Computing. Relative advantage is not a barrier to Cloud Computing contrary to the TOE model assessment. Trading partner pressure is also not a determinant of Cloud Computing as stated by the TOE model. To support this view, we define Cloud Computing using Mell & Grance's (2011) definition, and service models. This helped in ensuring that there is alignment in interpretation of Cloud Computing parameters and the role it plays in addressing Small and Medium Enterprise market challenges in South Africa.

Small and Medium Enterprise was also defined using the National Small Business Act of 1996 which defines SME as "a separate and distinct business entity including cooperative enterprises and non-governmental organisations, managed by one owner or more which, including its branches or subsidiaries if any is predominantly carried on in any sector or subsector of the economy i.e. Agriculture, Mining, Manufacturing, Electricity, Construction, Retail, Motor Trade, Wholesale, Tourism, Finance and Community Service.

CHAPTER 3 – RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

The foregoing chapter presented a review literature published on the role of Cloud Computing in addressing SME business challenges in South Africa. Core to this chapter was a review of theoretical models. The technological, environmental and organisational (TOE) model was found to be relevant to the research questions of this study; and was found to be the base to expand as it was only limited to SME and Technology scenarios. Our unique contribution is the addition of Cloud Computing and clearly defined SME challenges that can be addressed using Technology including: red tape, regulation, labour, lack of innovation, lack of funding, and crime.

To have a properly thought out approach to the research project, we will in this chapter set the foundation for starting the research process by clearly defining and articulating the research design and methods to be followed when conducting field work.

Cooper & Schindler (2001) argue that although there are differing views on what research design is, there are certain essentials that are common amongst the definition and these are:

- The design is an activity – a time-based plan;
- The design is always based on a research question;
- The design guides the selection of sources and types of information;
- The design is a framework for specifying the relationship among the study variables; and
- The design outlines procedures for every research activity.

Coldwell & Herbst (2004) define research design as the strategy for the study and the plan by which the strategy is to be carried out. This implies that research design specifies methods and procedures for the collection, measurement and analysis of data.

According to Leedy & Ormrod (2005) research is a systematic process of collecting, analysing and interpreting information (data) to increase our understanding of the phenomenon in which we are interested, or about which we are concerned. Leedy &

Ormrod (2005) further advocate that, in view of the fact that data and methodology are interdependent, it is essential that when selecting a methodology, we always consider the nature of the data that will be collected in the resolution of the research problem.

According to Coldwell & Herbst (2004), a research design provides the glue that holds the research project together. Thus, a research design is used to structure the research and to show how all the major aspects of the research project − the samples or groups, measures, treatments or programs, and methods − work together to address the central research question, which in this case is: *how can information technology, in the form of Cloud Computing be used to address the challenges faced by Small and Medium businesses in South Africa*?

The study is exploratory, descriptive and quantitative in nature. The exploratory method is used in the early stages of the research (Literature Review) to gain insights into the research problem and to identify factors that lead to the failure of small businesses. According to Strauss & Corbin (1998), qualitative research "*is the research about persons' lives, lived experiences, behaviors, emotions, and feelings as well as about organisational functioning, social movements, cultural phenomena, and interactions between nations".* This study is not designed to focus on people but mainly to conduct a scientific research to understand the relationship between Cloud Computing and Small Medium Enterprise challenges in South Africa. To answer the key question on how can information technology in the form of Cloud Computing be used to address the challenges faced by Small Medium Enterprise business, a research design needs is done in such a manner that this question is answered.

Table 3.1 shows a research design highlighting important questions to be asked and the methods used to ask these questions. Of utmost importance is the target audience who needs to be provide input in answering these questions and in this case, we are targeting mainly the business owner and not the Cloud service provider. IFeedback is a database company used to provide the target audience to be used in this research and we worked closely with this company to get participation and cooperation for this survey.

Table 3.1: Research Design Chart Example (Source: Synthesized by writer)

RESEARCH QUESTIONS	METHODS	SOURCES	WHO
1. What are SME Business Challenges?	Survey	Online Questionnaire	Business Owner on iFeedback database
2. What are SMEs Cloud Technology inhibitors?	Survey	Online Questionnaire	Business Owner on iFeedback Database
3. How should Cloud Technology be used to meet Information Technology Challenges of the SME market?	Survey	Online Questionnaire and Telephone Interview	Business Owner on iFeedback database
4. To what Extent can Cloud be used to address SME Challenges?	Survey and telephone interview	Online Questionnaire and Telephone Interviews	Business Owner on iFeedback Database
5. What are the technology gaps in addressing SME Business Challenges?	Survey and telephone interview	Online Questionnaire	Business Owner

As outlined in the table above, we use quantitative methods to address all research questions, and very limited qualitative methods in the form of telephone interviews to address question 4 and 5 which are mainly open ended questions.

Qualitative Research implies the research findings are not subjected to formal quantification or quantitative analysis. As a rule, information is considered qualitative in nature if it cannot be analyzed by means of mathematical techniques and in this case our information is subjected to extensive quantitative techniques.

Quantitative Research generally involves the collection of primary data from large numbers of individual units, frequently with high intentions of projecting the result to a wider population (Martins et al, 1996). Managing numbers is an important part of understanding and solving problems. Essentially, quantitative methods solve problems using numbers.

3.2 Research Process

Saunders, Lewis & Thornhill (2007) use an analogy of an "onion" to demonstrate the different layers of the research process. They maintain that an onion is made up of different layers, much like the layers of the earth, starting from the core and moving to the outer layer. Although the different layers of the "onion" vary in intensity, they are all important for making an "onion" the kind of vegetable it is.

When an onion is peeled, one moves from the outside layers to the inside layers and the same holds true for the process of research. This analogy is useful because it provides a simplified and pictorial view of research.

Saunders et al. (2007) provide an example of how the "onion" would, typically, look. However, we have taken their example, simplified, as depicted in the figure 3.1 below, to render it more specific to this thesis. Figure 3.1's contribution is also considered when preparing arguments for the design of this study.

Figure 3.1: Onion Research Approach (Saunders, Lewis & Thornhill, 2007)
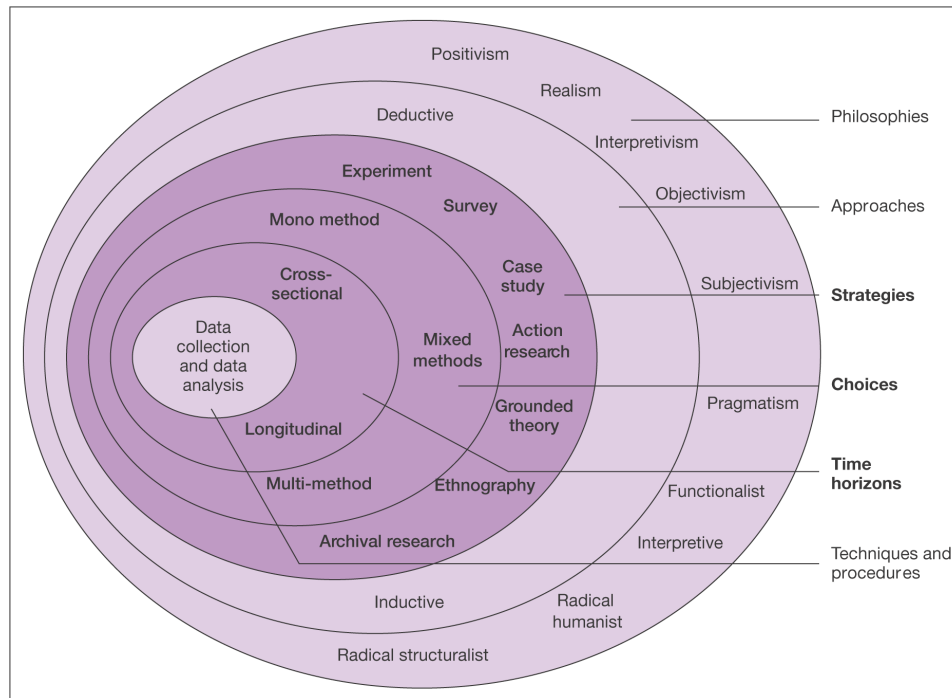
Source: Saunders, M., Lewis, P., & Thornhill, A. (2007). Research methods for business students. Harlow: Pearson Education Ltd.

One of the most difficult things about understanding research design is that scholars disagree about the name, the order and the nature of research stages. Disagreement was very clear between Crotty (1998); and Saunders et al. (2007). Saunders et al. (2007) classified research into six stages: philosophies; approaches; strategies; choices; time horizons; techniques and procedures. On the other hand, Crotty (1998) narrowed them down to be: epistemology; theoretical perspective; methodology; methods.

Another issue was obvious in Saunders et al. (2007). They mixed 'epistemology' and 'theoretical perspectives' since they classified 'positivism' and 'subjectivism' as philosophies. Crotty's (1998) classification of research stages was clearer and distinguished between 'epistemology' and 'theoretical perspective'. Crotty's (1998) classification as shown in figure 3.2 was more helpful in justifying our decision in selecting a philosophy to be applied, a 'theoretical perspectives', methodology and methods since they are related to each other. Crotty's classification is also adopted in this thesis to get to sensible research steps or stages.

Figure 3.2: Research Main Stages (Adapted from Crotty, 1998)
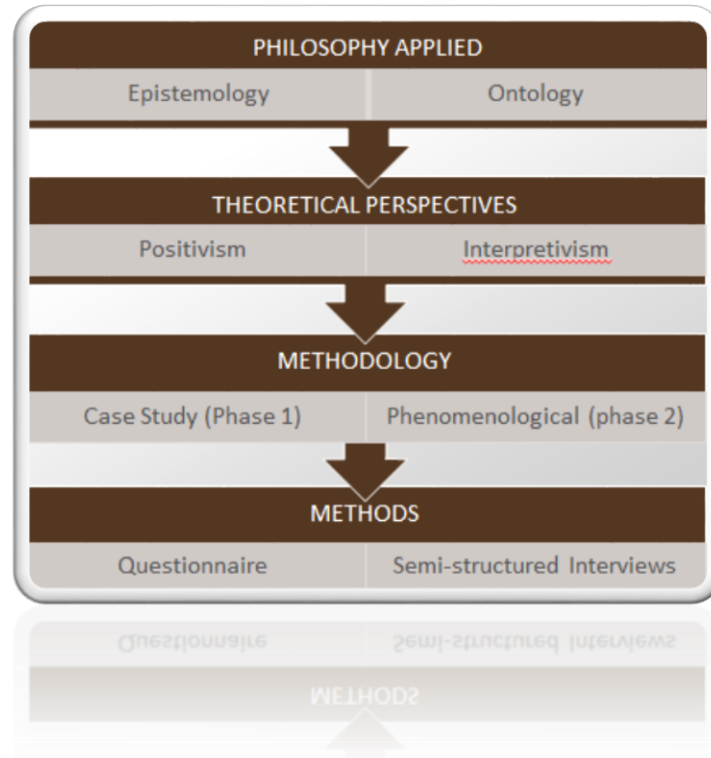
Source: Crotty, M. (1998). The foundations of Social Research: Meaning and Perspective in the research process. London: Sage.

3.3 Research philosophy and theoretical perspectives

Research philosophy is a belief about how data should be gathered, analysed and used. It is a research strategy employed and research instrument used (Galliers, 1991). The term epistemology (what is known to be true) and ontology (what is believed to be true) encompasses the various philosophies of research approach which we are applying in this study.

Aspects of the research onion are discussed next.

Ontology

This is our view point and social reality; and epistemology is how we know and interpret the world (Vilakati, Schurink & Viljoen, 2013). Ontology is concerned with nature of reality

and assumptions about how the world is constituted as well as the nature of things. The aspect of Ontology which we apply to this study is that of **Interpretivist.**

The position of interpretivism in relation to ontology and epistemology is that interpretivists believe the reality is multiple and relative (Hudson & Ozanne, 1988). Lincoln & Guba (1985) explain that these multiple realities also depend on other systems for meanings, which make it even more difficult to interpret in terms of fixed realities (Neuman, 2003). The knowledge acquired in this discipline is socially constructed rather than objectively determined (Carson et al., 2001) and perceived (Hirschman, 1985, Berger & Luckman, 1967, Hudson & Ozanne, 1988).

Interpretivists avoid rigid structural frameworks such as in positivist research and adopt a more personal and flexible research structures (Carson et al., 2001) which are receptive to capturing meanings in human interaction (Black, 2006); and make sense of what is perceived as reality (Carson et al., 2001). Interpretivists believe the researcher and his informants are interdependent and mutually interactive (Hudson & Ozanne, 1988). The interpretivist researcher enters the field with some sort of prior insight of the research context but assumes that this is insufficient in developing a fixed research design due to complex, multiple and unpredictable nature of what is perceived as reality (Hudson & Ozanne, 1988). The researcher remains open to new knowledge throughout the study and lets it develop with the help of informants. The use of such an emergent and collaborative approach is consistent with the interpretivist belief that humans have the ability to adapt, and that no one can gain prior knowledge of time and context bound social realities (Hudson & Ozanne, 1988).

Therefore, the goal of interpretivist research is to understand and interpret the meanings in human behaviour rather than to generalize and predict causes and effects (Neuman, 2000; Hudson & Ozanne, 1988). For an interpretivist researcher, it is important to understand motives, meanings, reasons and other subjective experiences which are time and context bound (Hudson & Ozanne, 1988; Neuman, 2000) which is exactly the purpose of our research project.

Epistemology

Conversely, epistemology is the philosophy of knowledge; its focus is on the origin and nature of knowledge. Hence it addresses the relationship between the researcher and knowledge (Hirschheim, Klein, & Lyytinen, 1995).

Epistemology relates to beliefs about how one might discover knowledge about the world (Creswell, 2013) and refers to the science of knowing (Babbie, 2004). The epistemological position the study has taken looked at what business challenges SMEs are faced with and how Cloud Technology can help address these – this will take the form of a **Positivistic Approach**.

Alternatively, it may be argued that the study may be best classified as more **interpretivistic**, because no theories were found to describe the impact of Cloud Computing to addressing the challenges of SMEs. Studying the Cloud business model as a real, certain and precise phenomenon and collecting data that is factual, truthful and unambiguous, could be a difficult task. Cloud Computing is still a relatively young discipline and there is also a lack of general agreement on software measurement as well as a lack of maturity regarding this software measurement (Bourque et al. 2004). Nevertheless, a few organisations, for example, Gartner, IDC and others have collected quantitative data on the adoption of Cloud Computing. On the other hand, the study aims to collect facts and causes of behavior – characteristics of a **positivistic** research philosophy.

Table 3.2 provides a simple explanation of the differences between Ontology and Epistemology. The two philosophies are further expanded on to explain the difference between positivist and interpretivist approach with the methodologies in which one can apply to conduct research.

Table 3.2: Research Philosophies (Sandberg; Webber, 2004)

Ontology	Positivist	Interpretivist
Nature of 'being'/ nature of the world	Have direct access to real world	No direct access to real world
Reality	Single external reality	No single external reality
Epistemology		
'Grounds' of knowledge / relationship between reality and research	Possible to obtain hard, secure objective knowledge	Understood through 'perceived' knowledge
	Research focus on generalization and abstraction	Research focuses on the specific and concrete
	Thought governed by hypotheses and stated theories	Seeking to understand specific context
Methodology		
Focus of research	Concentrates on description and explanation	Concentrates on understanding and interpretation
Role of the researcher	Detached, external observer	Researchers want to experience what they are studying
	Clear distinction between reason and feeling	Allow feeling and reason to govern actions
	Aim to discover external reality rather than creating the object of study	Partially create what is studied, the meaning of phenomena
	Strive to use rational, consistent, verbal, logical approach	Use of pre-understanding is important

Ontology	Positivist	Interpretivist
Techniques used by researcher	Seek to maintain clear distinction between facts and value judgments	Distinction between facts and value judgments less clear
	Distinction between science and personal experience	Accept influence from both science and personal experience
	Formalized statistical and mathematical methods predominant	Primarily non-quantitative

Source: Sandberg, J. Webber, S. (2004). Competence – the basis for a smart workforce, in Gerber, R. and Lankshear, C. (Eds), Training for a Smart Workforce, Routledge, London, pp. 47 – 72.

3.4   Research approach

Inductive reasoning applies to situations where specific observations or measurements are made with the aim of formulating conclusions, generalisations and theories (Saunders *et al*. 2007, pp. 87–88). In ***deductive reasoning***, the researcher focuses on generalisations, and then proceeds toward the specifics of how to prove or implement these generalisations (Saunders *et al.* 2007, pp.86–87). Deductive reasoning is applicable primarily in disciplines where agreed facts and established theories are available (Remenyi *et al.* 2000).

Table 3.2 lists the main differences between the deductive and inductive research approaches, and helps provide more information on what is an **inductive research** approach which is considered the most appropriate for an interpretivist research philosophy.

Table 3.3: *Inductive versus Deductive Research Approaches* (Rimenyi et al. 2000)

Deduction	Induction
✓ Scientific principles	✓ Gaining an understanding of the meanings humans attach to events
✓ Moving from theory to data	
✓ Need to explain causal relationships between variables	✓ Close understanding of the research context
✓ Collection of quantitative data	✓ Collection of qualitative data
✓ Application of controls to ensure validity of data	✓ More flexible structure to permit changes of research emphasis as the research progresses
✓ Operationalization of concepts to ensure clarity of definition	
✓ Highly structured approach	✓ Realisation that the researcher is part of the research process
✓ Researcher independence as regards what is being researched	✓ Less concern with the need to generalise
✓ Necessity to select samples of sufficient size to generalise conclusions	

Source: Remenyi, D., Willimas, B., Money, A. & Swartz, E. (2000). Doing Research in Business and Management. London: Sage Publications.

Although this study does include some elements of a deductive approach, the study may best be classified as inductive. As is the case with this research, inductive reasoning is applicable to business and management studies where established and accepted theories are likely to be available (Remenyi et al., 2000).

3.5   Research methodology

An important step in the research design is the choice of a research strategy for collecting data. In this thesis, data was collected both during the exploration and the testing phases.

3.5.1   Exploration phase

There is limited information available on the impact of Cloud Computing to the SME market in South Africa. Thus, the first step in the research has been to explore the way in which the Cloud Computing business impacts on the SME market in a practical context so as to supplement the insight gained from the literature review. Most of literature suggests case studies may be used as the appropriate research strategy for discovery or exploration (Benbasat *et al.*, 19991; Hutjes & Buuren, 1992; Lammers *et al.*, 1997). Benbasat *et al.* (1991) offer the following three main reasons for using case studies as the appropriate research strategy for exploration:

- The researcher can study the study phenomenon in a natural setting, learn the highest benchmark and generate theories from practice.
- The researcher can answer those questions that lead to an understanding of the nature and complexity of the processes taking place.
- The case study method is an appropriate way in which to conduct research in an area with limited prior research.

These reasons are all applicable to the exploration phase of this study. A theory (methodology) was constructed during the exploration phase, using the results of the literature review and supplemented by the findings of the case studies. The literature review was used to identify specific questions for the case studies in order to create a better understanding of the nature and complexity of the impact of the Cloud Computing business on the SME market in South Africa.

3.5.2   Testing phase

The objective of the testing phase is to validate whether the research methodology could be used to understand the different aspects regarding the impact of Cloud Computing on the SME market, and whether the research methodology offers the possibility of

assessing an organisation's capability in Cloud Computing, as well as capability of identifying possible areas of improvement. The research strategies relevant include **action research**, **experiments**, **large-scale surveys** and **case studies.**

Action research: The theory route chosen for this study is that of theory development, and not theory application in terms of which action research would have been an appropriate research strategy. The fundamental contention of an action researcher is that complex social processes may best be studied by introducing changes into these processes and observing the effects of these changes (Marsick & Watkins, 1997).

However, as regards to theory development, the focus is on explaining the study phenomenon and not diagnosing a problem and applying a theory to improve the situation. If the route of theory application was also chosen (implementing the designed methodology), applying action research during the testing phase may have been considered. However, possible criticism is that action research may have created a risk regarding the reliability and validity of the study results. When researchers intervene, they become part of the study.

Thus, action research may incorporate interpretive statements that include the observer's values and prior knowledge and this, invariably, intrudes on the observation with the researcher comprehending the 'meaning' of the observation. According to Eden & Huxham (1997) as the researcher attempts to understand what is observed, this personal understanding will invade the recording of the observation and the deductions that may follow. Thus, in view of the fact that the research design is restricted to theory development, action research was not considered as a possible research strategy.

Experiments: Yin (1994) recommends experiments and case studies as the appropriate research strategy when the form of the research question takes the form of either 'how', or 'why', and when the study focuses on a contemporary event. In this study experiments were found inappropriate for several reasons. The objective of the testing phase is to validate the methodology constructed. However, simulating all aspects of a Cloud Computing business model, starting at the project proposal phase (when the project boundaries and, thus, the initial Cloud Computing business opportunities are defined)

until the implementation of the Cloud business model by the SME was assumed to be impractical. It is also assumed that it is not possible to study all relevant issues convincingly, in laboratory settings (Remenyi *et al.*, 2000) for social issues and challenges faced by SMEs. For example, it is difficult in a laboratory setting to simulate the stress that arises in practical action and this may hamper decision-making (Levi & Tetlock, 1980).

Large scale surveys: Surveys are a common approach to research in business and management, offering an opportunity to collect large quantities of data or evidence (Saunders *et al.*, 2007, pp. 56–57). Surveys allow evidence to be gathered concerning either 'who', 'what', 'where', 'how many' or 'how much', but are of less value when the researcher is asking about 'how' or 'why', that is, questions with an open-ended character. Surveys are also less suitable when the questions are more profound and complicated (Leeuw, 2003). In view of the fact that design methodology in this study was aimed at addressing, for example, the initial positions of various SME organisations prior to migration to a Cloud Computing business model and the processes / strategies they would apply in order to realise an outcome of the decision which would be as close as possible to their own position, *surveys*, **as a research strategy, were deemed appropriate**.

Case studies: Adopting case studies as a research strategy (qualitative research) implies that researchers are not able to escape completely their personal influences as a result of the inherent involvement of the researcher in the research domain (Peshkin, 1988; Maxwell, 1992; Robson, 2002). This fact may, then, be a potential source of criticism regarding the reliability and validity of the data collected. However, both Yin (1995) & Zwaan (1999) argue that case studies may be used for validation to check whether certain theories are correct – the precise objective of the testing phase. Thus, it was decided to also embrace the use of case studies as the research strategy during the testing phase. Contrary to statistical study, case study emphasises full contextual analysis of events or conditions and their inter-relations (Coldwell; Herbst. 2004).

Figure 3.3 shows a process we have followed to choose a research method and design for our study. We conducted and disciplined enquiry following the strategies discussed

above. The paradigm of the study which informs research methods and an approach towards analysis will be discussed in this chapter, but the figure below gives a high-level summary of our approach.

Figure 3.3: Summarised Research Methodology and design
(Source: synthesised by writer)
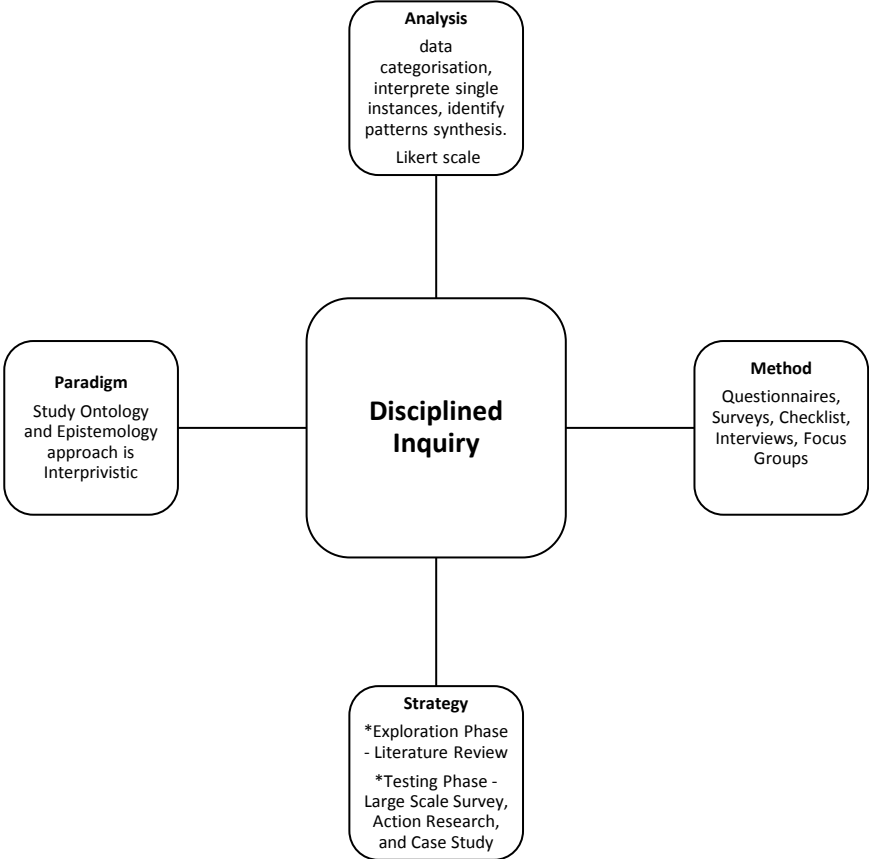
3.6   Time horizons

It may be expected that the decision either to migrate or not to migrate to the Cloud business model because of negative / positive business impacts may take place within a limited time frame. However, case studies during the exploration and testing phases are not aimed at studying change and development. The objective in the exploration phase is to explore the way in which the Cloud Computing business model would impact on the SME organisation in a practical context, whereas the objective in the testing phase is to

validate the design methodology selected for the study. Thus, a cross-sectional time horizon is considered the most appropriate.

3.7   Data collection methods

According to Leedy, Ellis & Ormrod (2005), data collection involves participation of the researcher who poses a series of questions to willing participants; summarises their responses using percentages, frequency counts or more statistical indexes; and then draws inferences about a particular population from the responses of the sample. According to Charlesworth et al. (2001), it is important to note that no data collection method is exclusive to either the qualitative or the quantitative approach.

Both primary and secondary data will be used for this study. According to Neuman (2003) primary data is collected directly from the source of study whilst secondary data is collected from sources other than the primary source.

In this study, the *primary* data was collected as follows:

- Surveys − printed survey questionnaires were sent via E-mail to the participants.
- Interviews − interviews were conducted with key decision makers or business owners in the Small and Medium Enterprise organisations.
- Documentation − documents were collected from research agencies about the research topic.

Secondary data was collected from the following sources:

- iFeedback Small and Medium Enterprise database
- Literature

Table 3.4 shows various methods applied in this research with main emphasis placed on questionnaires, and surveys. Coldwell & Herbst (2004) articulate advantages and challenges for different methods and these were considered when methods of research were applied for this study. The challenges highlighted especially for interviews are experienced during the research hence the study being more weighted towards quantitative methods and very light on qualitative feedback.

Table 3.4*: Methods of Data Collection for this study* (Coldwell & Herbst, 2004)

Method	Purpose	Advantage	Challenges
Questionnaire, Surveys, Checklist	To easily get information in a non-threatening way	• Can be anonymous • Inexpensive • Easy to compare • Many sample questionnaires exists	• Impersonal • May need sampling expert • Wording can be bias
Interviews	To get someone's impressions or experiences	• Get full range of depth of information • Develop relationship with client	• Flexible • Can take time • Hard to analyse • Can be costly
Document Review	To get an impression of how the SMEs operate without disrupting their businesses. Taken from review of application, minutes, finances memos etc.	• Comprehensive and historical information gathered • Information already exists • Few biases	• Takes time • Information may be incomplete or out-dated • Not flexible

Method	Purpose	Advantage	Challenges
Case Studies	To fully understand clients' experiences in a programme and conduct comprehensive examination through cross comparison	• Fully depicts clients experience in programme input and results • Powerful means to portray Cloud Computing to SMEs	• Time consuming • Represent depth rather than breadth of information

Source: Coldwell, D. & Herbst, F. (2004). Business research, 1st edition, Juta and Co Ltd., Cape Town, South Africa.

3.8   Sampling techniques and methods

Neuman (2003) states that a researcher may use two types of sampling techniques, namely, "probability"- or "nonprobability" sampling. The choice between probability and nonprobability sampling depends on whether the study is qualitative or quantitative in nature. Quantitative studies tend to use probability sampling because of the time, cost and accuracy issues that are usually associated with quantitative studies. The goal of a quantitative study is to be able to generalise the research findings to a broader population.

Qualitative research, on the other hand, is less concerned with sampling techniques as it is more concerned with finding cases that will enhance the understanding of a certain social phenomena as well as selecting samples that are relevant to what is being studied. This study is more concerned with understating: *How can Information Technology in the form of Cloud Computing be used to address challenges faced by SMEs in South Africa?*

The nonprobability sampling method as referenced in figure 3.4., is used in this thesis and termed "purposive" or judgemental sampling. Purposive sampling is defined by Neuman (2003) as a nonprobability sampling method that is used to select panellists from a population who will best answer the research question. The word "purposive" is derived

from the word "purpose" which, essentially, indicates that this type of method selects samples that serve a specific purpose.

Figure 3.4: *Non-Random Probability Sampling (Kumar, 1999)*
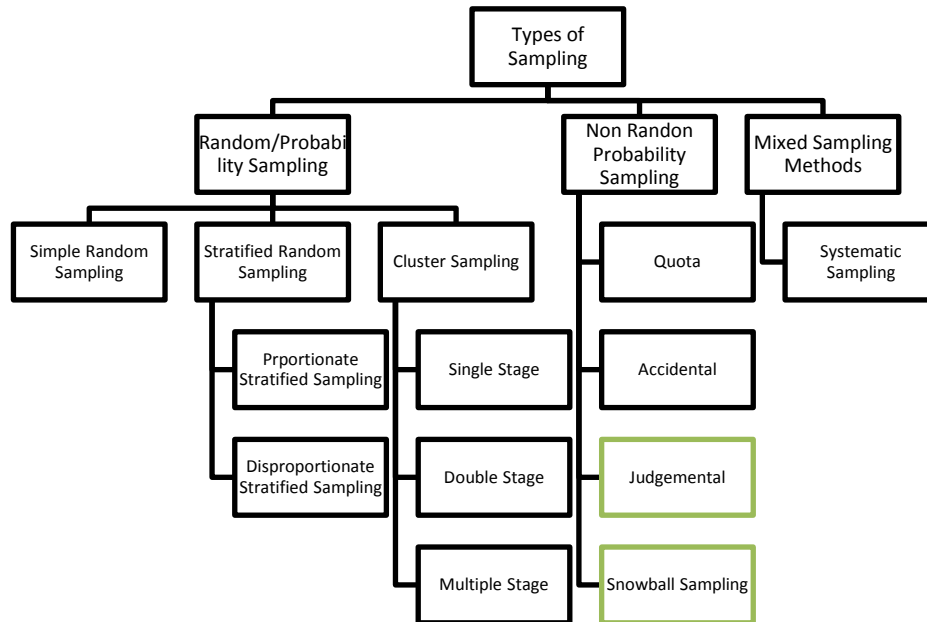
Source: Kumar, K. (1999). Pure versus hybrid: performance implications of Porter's generic strategies, Health Care Management Review, 22(4), pp. 47-60.

A judgemental sampling method is chosen based on some form of predefined characteristic relevant to this thesis. Firms were randomly selected within tourism, manufacturing, business services and other sectors, after controlling for the following key variables: panellists employed fewer than 200 employees; had turnover of less than R26 million per annum and are registered businesses in South Africa in line with SARS and Companies Intellectual Property Commission (CIPC).

Snowball sampling involves identifying subjects for inclusion in the sample by referral from their subjects. This sample design is particularly useful in the study of those social groups whose members tend to hide their identity for moral, legal, ideological or political reasons. The procedure was used to identify potential participants during the very limited qualitative stage of the research project in order to reach the relevant audience who are not easily accessible or immediately available to participate in projects of this nature.

3.8.1 Sample size

We made contact with potential panellists with the use of emails and telephone calls for the participation in this study. The process continued until we had at least 250 panellists willing to participate.

The overall population of 33 000 Small and Medium Enterprise registered members on the iFeedback database were controlled for key variables leading to a qualified sample size of 6500 potential panellists. From this we managed to secure 265 panellists yielding a 4% response rate.

3.9   The qualitative analysis

Maxwell (1998) pointed to three different main strategies in data analysis, namely: categorising strategies (such as coding and thematic analysis); contextualising strategies (such as narrative analysis and individual case studies analysis); and memos and displays. Powell & Renner (2003) listed the following steps in data analysis which were adopted in this thesis: get to know your data; focus the analysis; categorise information; identify patterns and connections within and between categories; interpretation or bringing it all together. Although the method of data analysis for this thesis is that of quantitative methods, the approach taken by Powell & Renner is somewhat relevant for our research and has been applied where relevant to fit with the content analysis covered in figure 3.5. Maxwell (1998) supports these categorisation strategies. To combine the ideas of Powell & Renner (2003), Maxwell (1998), and Kippendorf (2004), the content analysis method, as per figure 3.5 below, was found to be the most appropriate as it covered all considerations made by Maxwell (1998) and Powell & Renner (2003). The conventional content analysis techniques start with an *observation of the information obtained* and *developing insights from the d*ata, which is used to *develop categories and themes*, while in summative content analysis technique, the researcher bulks data gathered from the conventional content analysis to identify key words used to validate categories and themes.

Figure 3.5: Content Analysis Process Flow
(**Source:** Adapted from Kippendorf, 2004)
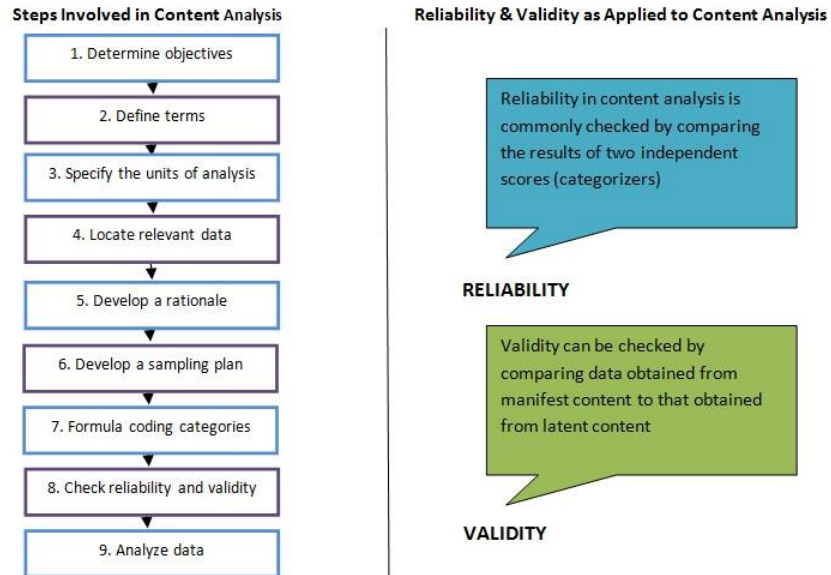
3.10 The quantitative analysis

Firstly, the descriptive statistics were calculated. The importance of reporting descriptive statistics rests in their utility as tools for interpreting and analysing data. Descriptive statistics include statistical procedures used to describe the population one is studying. The results from descriptive statistics help to organise data and describe data. Descriptive statistics can only be used to describe the group that is being studied. That is, the results cannot be generalised to any larger group. Descriptive statistics are useful and serviceable if one does not need to extend results to any larger group (Phillip, 2012).

Examples of descriptive statistics used in this study are frequency distributions, measures of central tendency (mean, median and mode) as well as tables used to describe all the data (Phillip, 2012). Statistical techniques chosen for this thesis focuses on differences of means of variables which include, decision tree; measurement of fit using Chi-square automatic interaction detection (CHAID), and Receiver of Operating Characteristic C curve. To explain the statistical techniques further, examples from the research instrument (refer to questionnaire in appendix A) will be used. This section of the study is by no means the analysis of the results but merely an example of how different methods of analysis were used to reach conclusions made in the data analysis section of the study.

A decision tree is a widely-used data mining technique and will also be used for this thesis. Data mining can be described as the process of collecting, searching through, and analysing a large amount of data in a database, as to discover meaningful patterns or relationships. A decision tree model allows us to develop a classification system that predicts or classify future observations based on a set of decision rules. If we have the data divided into classes of interest (for example Cloud Computing benefits), this data is then used to build rules that can be used to classify Cloud Computing usage profiles. The decision tree helps to provide different profiles of Cloud users for example question 38 of this study's research instrument (refer to Appendix A: Research Instrument/Questionnaire) which requires panellists to list benefits of Cloud Computing categorised on agility, scalability, flexibility, economical, best practice and none of the above. Both groups of panellists who realised and also do not realise the benefits of Cloud Computing are analysed and linked to different sets of questions in order to get a decision. The value of the decision tree is that it accounts for the interaction between the independent variables and the complexity of building a model with a lot of independent variables.

Decision trees offer a decision-making model with high level of interpretability. A decision tree is a special form of a tree structure. The tree consists of nodes where a logical decision has to be made, and connecting branches that are chosen according to the result of this decision. The nodes and branches that are followed constitute a sequential path through a decision tree that reaches a final decision in the end. Each node represents an independent variable in the dataset. In this study, decision trees are generated from the benefits of Cloud Computing in a top-down fashion. The root node of a decision tree is the tree's initial state – the first decision node. Each node in a tree contains some data. On the basis of an algorithm the decision is made to split the node into branches. The most important independent variable is used to create the first split by using certain criteria. The process is repeated until a complete tree is obtained. In some cases, the node cannot be split further, in this case it will be the final decision node.

The tree can be too large with many small nodes that do not contribute much to the fit and are too specific. This is called over-fitting. Stopping rules are used to avoid over-fitting. *The stopping rule - The Square measure of variability is used as a stopping rule.*

3.10.1   CHAID (Chi-squared automatic interaction detection)

Taking an example of Q16 of the research instrument (refer Appendix A) where panellists are asked to state which training methods they use to provide training to their staff and linking this to Q38 (Cloud benefits). Chi-square was used to test the measurement of fit. In this case the decision tree was applied and the outcome was that a measurement of fit was achieved. The proportion of panellists experiencing benefits from the Cloud are 63%. After the model was fitted the measures of fit would be used to assess the model fit. Table 3.5 shows an example of how a measure of fit to assess the model was conducted.

Table 3.5: Measures of Fit: Fit Details (synthesized by researcher)

Measure	Training	Definition
Entropy RSquare	0.0890	1-Loglike(model)/Loglike(0)
Generalized RSquare	0.1513	$(1-(L(0)/L(model))^{(2/n)})/(1-L(0)^{(2/n)})$
Mean -Log p	0.6027	$\sum -Log(\rho[j])/n$
RMSE	0.4552	$\sqrt{\sum(y[j]-\rho[j])^2/n}$
Mean Abs Dev	0.4160	$\sum |y[j]-\rho[j]|/n$
Misclassification Rate	0.3320	$\sum (\rho[j]\neq\rho Max)/n$
N	256	N

The R^2 being 0.089 means that only 9% of variation in Q38 cat is declared for by the tree model. This indicates a weak fit. In human sciences R^2 values are also generally lower, because of the complexity of human nature as well as all the factors influencing human nature. Therefore, these models will be used to assess general patterns statistically which

ought to make sense logically to have some value. The misclassification rate is 33% which is fair.

The confusion matrix shows the correctly classified proportions in the table 3.6 below:

Table 3.6: Confusion Matrix on Benefit of Cloud Computing (from researcher's results)

Actual	Predicted Count	
Q38 category	**Not**	**Benefits**
Not	60	36
Benefits	49	111

3.10.2   Receiver of operating characteristics C curve

Another measure of fit is the Receiver of Operating Characteristic C curve as shown in figure 3.6 – in this case done for data on Q16 where panellists were asked to specify which training method they used to provide training to their staff using the following options to answer the question SETA, Formal Training, on the job training or none of the above. The graph below shows that a majority of panellists who realised benefits in Cloud Computing (67%) do offer training to their staff and the balance shows that those who do not offer training do not realise the benefits of Cloud Computing.

Figure 3.6: Receiver of Operating Characteristic Curve **(from researcher's results)**
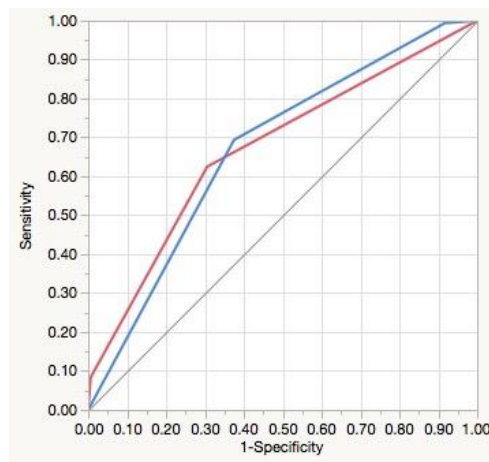
Table 3.4: Answer to Question 38 on Perceived benefits of Cloud Computing

	Q38 category	Area
▬	Not	0.33
▬	Benefits	0.67

Figure 3.6 demonstrates how receiver of characteristics curve works in relation to question 38 of the research instrument. Table 3.7 can be viewed as the legend for figure 3.6 where the grey line moving from the bottom left to top right-hand corner represents those panellists who stated that they do not provide training to their staff (0) and those that do provide training to their staff (1). The measurement of fit is then calculated using the red and the blue line where a fit is determined between those that do / do not provide training to their staff versus those who realise / do not realise the benefits of Cloud Computing.

The area under the curve (AUC) figure varies between 0.5 and 1.0. Near 0.5 indicates random performance while near 1.0 indicates perfect performance of the model. All Receiver of Operating Characteristic (ROC) curves begin in the bottom-left corner and rise to the top-right corner. Moving along the ROC curve represents trading off false positives for false negatives. Generally, random models will run up the diagonal, and the more the ROC curve bulges toward the top-left corner, the better the model separates the panellists who see the benefit and those who do not see the benefits of Cloud Computing. The Area under curve (AUC) figure is 0.67 which indicates a fair fit.

Decision tree is a good tool to use in order to understand how responses to answers relate in order to get to a particular decision. To expand further and test our analysis, we also leveraged off the decision tree model.

3.10.3 Decision tree

Figure 3.7: Application of the Decision Tree (synthesized by researcher)
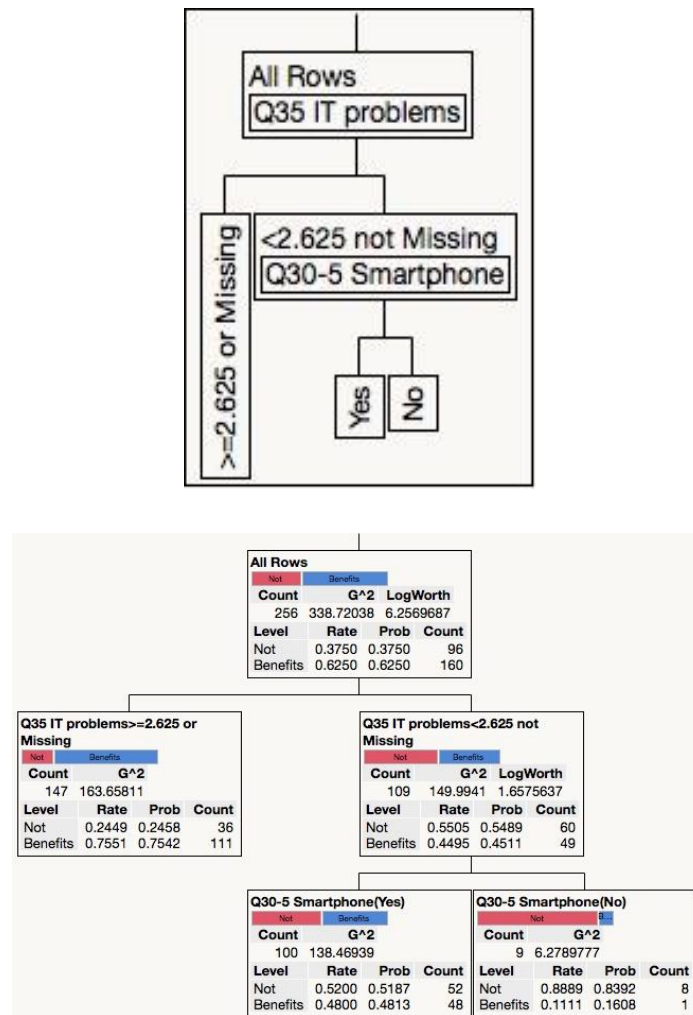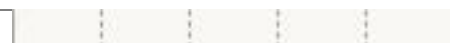
Figure 3.7 is not an analysis but an example of how profiles can be recognized from the tree, thereby setting a platform for our next chapter to demonstrate data analysis method for this thesis. An example of profiles for panellists experiencing Benefits from the Cloud:

Group 1: A group of panellists who Experience IT problems (Q35 IT > 2.6), and those that have responded Agree to question Q2-9. The proportion of panellists for this profile is 76% (compare this to the overall proportion of 63%)

Group 2: A group of panellists who are experiencing NO Benefits from the Cloud. This is depicted from all the panellists who do not experience IT problems (Q35 IT < 2.6) and

those who do not have smartphones as per Table 3.8 below. The proportion of panellists for this profile is 89% (compare this to the overall proportion of 38%)

Table 3.8: Use of Independent Variables in a Decision Tree Model

Term	Number of Splits	G^2		Portion
Q35 IT problems	1	25.068164		0.8270
Q30-5 Smartphone	1	5.2457305		0.1730
1 Industry	0	0		0.0000
2 Time	0	0		0.0000
3 Turnover	0	0		0.0000
4 Employees	0	0		0.0000
5 Change in turnover	0	0		0.0000
6 Location 2	0	0		0.0000
Q7.1 Tax	0	0		0.0000
Q7.2 UIF	0	0		0.0000
Q7.3 BEE	0	0		0.0000
Q7.4 CIPRO	0	0		0.0000
Q30-1 Email	0	0		0.0000
Q30-2 Mobile network	0	0		0.0000

Term	Number of Splits	G^2		Portion
Q30-3 Fixed private network	0	0		0.0000
Q30-4 PC/Laptop	0	0		0.0000
Q30-6 MS Office	0	0		0.0000
Q30-7 HR and Payroll	0	0		0.0000
Q30-8 CRM solutions	0	0		0.0000
Q30-9 Server room	0	0		0.0000
Q30-10 ERP	0	0		0.0000
31 IT department	0	0		0.0000
34 Server room downtime	0	0		0.0000

Qualitative data obtained from the semi structured interviews was subjected to qualitative data analysis techniques. The qualitative data analysis examined the real, rich text of data resulting from transcription of the face to face in-depth interviews (Lancaster, 2005). The collected data was processed by means of statistical and text analysis, and interpreted across various databases (Creswell, 2013), and presented in the form of word-cloud as depicted in figure 4.19 where panellists were asked open ended questions regarding the performance of their businesses.

3.11 Limitations of the study

The database is sourced from iFeedback; and was limited to Small and Medium Enterprises (SMEs) with a site class threshold of 200 employees with between R5M and

R26M annual turnover because of the time, cost and complexity limitations of accessing the information from other sources such as Chambers of Commerce or other registered institutions that make their databases available at a fee.

3.12 Ethical considerations

Participation in the study was voluntary and based on the panellist's ability to give informed consent. All the data and information gathered was treated strictly confidential and will not be accessed by anyone without prior permission. Moreover, the participants had the right to withdraw at any time if the participant was unable to compete the questionnaire.

The principles underlying research ethics are universal and concern issues such as honesty and respect for the rights of individuals. Professional groups such as market researchers have established explicit codes of ethics to which members are obliged to adhere to (Coldwell & Herbst, 2004). We have complied with this through the UNISA School of Business Leadership (SBL) ethical clearance process which was completed in November 2016 before the field work for this thesis could commence. Ethical clearance has intrinsic value in protecting the rights of humans who may become involved in research. Ethical clearance also serves as a professional indemnity if we are not seen to adhere to the appropriate code of ethics as governed by the ethics committee.

As explained by Coldwell & Herbst (2004), ethical considerations come into play at three stages of the research project: (1) when participants are recruited; (2) during the intervention and/or the measurement procedure to which participants are subjected; and (3) in the release of the results obtained.

In developing a template code of conduct, organisations recognise that each agency remains best placed to develop specific sections of their own code of conduct that relate to their business, value and culture. The template will not prevent this, but rather will help research processes to occur in consideration of government requirements (Coldwell & Herbst, 2004). As part of the project the UNISA, SBL Code of Ethics was considered.

We ensured that honesty is displayed at all times. Privacy of panellists was not divulged. We also ensured that confidentiality and fairness were exercised through-out the data collection process.

3.13 Validity: Exploratory factor analysis to test construct validity

To test the validity of all the constructs (dimensions) in the questionnaire, an exploratory factor analysis was performed to determine if the individual questions load (or contribute) onto the constructs as intended in the questionnaire. Factor analysis is a statistical method used to describe variability among observed variables in terms of fewer unobserved variables called factors (the constructs).

There are two types of factor analysis: exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). Only exploratory factor analysis will be considered. In this instance EFA is used as a first step in the validation process. CFA is used as a further step to confirm a factor structure. However, it is important to establish the constructs or factors with EFA, before the factors can be confirmed with CFA.

3.13.1 Determine the number of factors (constructs)

Firstly, the number of factors from the 39 individual statements (questions: 13, 15, 17, 18, 19, 22 and 26) were determined as can be seen in figure 3.8. Exploratory factor analysis yields one or more factors from the items / statements under consideration.

We applied the following criteria to determine the number of factors:

- Cumulative percentage explained by the factors > 60%
- Eigen values > 1 (also called the Kaiser Guttman rule)
- Significant decline in the Scree plot
- Parallel plot

Bartlett's test for Sphericity was also conducted to determine if it is useful to conduct factor analysis. We looked at the correlation structure between the individual variables and if it is found to be too weak, it would not be worthwhile to conduct EFA. The KMO value

provides a measure of the appropriateness of conducting EFA. The KMO value differs between 0 and 1 with 0.5 as a cut-off point to conduct a viable EFA.

Figure 3.8: Bartlett's Test for Sphericity (researcher's results).

Number	Eigenvalue	Percent	20 40 60 80	Cum Percent
1	7.6505	19.617		19.617
2	4.2064	10.786		30.402
3	3.6124	9.263		39.665
4	2.7968	7.171		46.836
5	2.5949	6.653		53.490
6	2.0961	5.375		58.864
7	1.2545	3.217		62.081
8	1.1482	2.944		65.025
9	0.9422	2.416		67.441
10	0.8496	2.179		69.619
11	0.8202	2.103		71.722
12	0.8052	2.065		73.787
13	0.7535	1.932		75.719
14	0.7323	1.878		77.597
15	0.6594	1.691		79.287
16	0.6238	1.600		80.887
17	0.6027	1.545		82.432
18	0.5604	1.437		83.869
19	0.5168	1.325		85.195
20	0.4757	1.220		86.414
21	0.4417	1.133		87.547
22	0.4241	1.087		88.634
23	0.4059	1.041		89.675
24	0.3742	0.959		90.635
25	0.3682	0.944		91.579
26	0.3473	0.891		92.469
27	0.3380	0.867		93.336
28	0.3171	0.813		94.149
29	0.3135	0.804		94.953
30	0.2693	0.691		95.643
31	0.2662	0.683		96.326
32	0.2497	0.640		96.966
33	0.2213	0.567		97.534
34	0.2044	0.524		98.058
35	0.1812	0.465		98.522
36	0.1762	0.452		98.974
37	0.1508	0.387		99.361
38	0.1355	0.347		99.708
39	0.1138	0.292		100.000

The output provided above shows 65% cumulative variance is explained by 8 factors. Eight factors have Eigen values larger than 1. This means that the items/statements may be reduced to 8 factors. Eight factors would then be used for the rotation.

3.13.2 The extraction method

Most common extraction methods are maximum likelihood (ML), principal component Analysis (PCA) and principal axis factoring (PAF). Usually principal component analysis (PCA) is used with orthogonal rotation and principal axis factoring is used with oblique rotation.

3.13.3 Determine the rotation method

Before the factors can be calculated, an extraction and rotation method must be chosen. Two main rotation methods exist, namely orthogonal or oblique. The orthogonal method ensures that the rotated factors are not correlated with each-other. This is the preferred method if further modeling like regression is to be performed. The oblique method allows for correlation between the rotated factors (or constructs), this method is preferred when the correlation between constructs needs to be explored.

The most recommended orthogonal method is the Varimax method and Quartimin is recommended for the Oblique method. Table 3.9 shows the extraction and rotation of the factors, whereby the communalities and factor loadings are produced.

Table 3.9: Factor Analysis Output from the research Questionnaire

Q13 - Value Added Tax	0.89298
Q13 - Unemployment insurance fund	0.51775
Q13 - Income tax	0.61898
Q13 – Pay-as-you-earn	0.60254
Q13 - Skills development levy	0.64728
Q13 - Workplace compensation	0.56083
Q15 - Labour law	0.41772
Q15 – Skills	0.42655
Q15 - Labour relation	0.3995
Q15 - Work ethic	0.44365
Q17 - Work Ethic (improved)	0.5402
Q17 - Skills and education	0.58279
Q17 - Don't stay	0.44865
Q17 - Lack of experience	0.45538
Q17 – Expectations	0.55162
Q18 - Wage subsidies	0.60579
Q18 - Skills and education	0.35184
Q18 - Government funded training	0.65205
Q18 - Labour law and regulatory	0.27765

Q18 - Direct funding	0.58344
Q18 - Improved work ethic	0.3521
Q19 - Theft (Burglary)	0.49798
Q19 - Theft (Internal)	0.59583
Q19 – Fraud	0.60725
Q19 – Cybercrime	0.45974
Q19 - Armed robbery	0.52383
Q22 - Information sharing with firm	0.27875
Q22 - Local suppliers	0.36652
Q22 – Clients	0.35378
Q22 - Enterprises in your sector	0.70469
Q22 - Professional and Industry associates	0.50902
Q26 - Bank overdrafts / credit line	0.77246
Q26 - Retained profits or sales of assets	0.45687
Q26 - Leasing or hire purchase	0.82114
Q26 - Loans from family friends shareholders	0.71317
Q26 - Trade credits	0.70447
Q26 - Bank loans	0.78631
Q26 - Grants/loans from governments	0.448
Q26 - Equity	0.48355

The output shows the commonalities for the 8 extracted factors. Commonality refers to common variance (the variance that is shared with other items) as opposed to unique variance that is unique to that item. Commonality indicates the proportion of an item's variance that is shared with the other items (factor structure). The commonalities therefore indicate the extent to which an individual item 'relates' to the factor structure (the rest of the items). As can be seen in table 3.10, a value near 1 indicates a high proportion of 'common' variance. This item therefore 'relates' to the other items as opposed to a commonality near 0 where the item is 'unique'.

Table 3.10: Items with low commonalities (0.2 or lower) to be considered for removal and the EFA repeated

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8
Q.26 - Leasing or Hire Purchase	**0.89**	0.08	0.03	0.1	0.01	0	0.07	-0.1
Q.26 - Bank Loans	**0.86**	0.01	0.12	0.13	0.02	0.04	0.09	0.08
Q.26 - Bank Overdrafts / credit line	**0.86**	0	0.06	0.14	0.1	0.01	0.07	0.13
Q.26 - Trade Credits	**0.84**	0.01	0.09	0.09	0.03	0	0	-0.1
Q.26 - Loans from family, friends, shareholders	**0.83**	0.04	0	0.15	0.05	0.01	0	-0.1
Q.26 - Retained Profits or sales of assets	**0.65**	0	0.09	0	0.13	0.05	0.06	0.04
Q.26 – Equity	**0.65**	0.16	0.06	0.11	0.12	0	0.07	0
Q.26 - Grants / Loans from Governments	**0.58**	0.06	0.08	-0.1	0.29	0.02	0	0
Q.17 – Expectations	0.05	**0.74**	0.13	0.04	0.13	0.01	0.03	-0.2
Q.17 - Skills and Education	0.01	**0.74**	0.02	0.01	0.13	0.01	0.03	0.07
Q.17 - Work Ethic	0	**0.69**	0.07	0.12	0.15	0	0.05	0.18
Q.17 - Lack of Experience	0.08	**0.67**	0.1	0.04	0.16	0.02	0	-0.2
Q.15 – Skills	0.08	**0.6**	0.06	0.11	0.05	0.08	0.14	0.1
Q.17 - Don't Stay	0.06	**0.58**	0.08	0	0.29	0.04	0.07	-0.3
Q.15 - Work Ethic	0.07	**0.57**	0.13	0.07	0.09	0	0.31	0.25
Q.13 - Pay as You Earn	0.08	0.07	**0.79**	0.08	0.04	0.02	0.03	0
Q.13 - Value Added Tax	0.12	0.15	**0.78**	0.01	0.01	0	-0.1	0.34
Q.13 - Income Tax	0.1	0.19	**0.76**	0.03	0	0.01	0.03	0.16

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8
Q.13 - Unemployment Insurance Fund	0.1	0.03	**0.69**	0.12	0.1	0.03	0.09	0
Q.13 - Skills Development Levy	0.02	0.09	**0.67**	0.09	0.02	0.11	0.25	-0.3
Q.13 - Workplace Compensation	0.04	0	**0.6**	0.06	0	0.06	0.33	-0.2
Q.19 – Fraud	0.15	0.03	0.04	**0.76**	0.03	0.01	0.03	0.01
Q.19 - Theft (Internal)	0.08	0.02	0.05	**0.75**	0.1	0.01	0.16	0.05
Q.19 - Armed Robbery	0.08	0.05	0.06	**0.73**	0.02	0.02	0	-0.1
Q.19 - Theft (Burglary)	0.05	0.08	0.07	**0.69**	0	0	0.09	0.01
Q.19 – Cybercrime	0.1	0.1	0.09	**0.66**	0	0	0.02	0.03
Q.18 - Government funded training	0.13	0.16	0.11	0.08	**0.74**	0.11	-0.1	-0.1
Q.18 - Direct funding	0.17	0.1	0.01	0	**0.74**	0.02	0	0
Q.18 - Wage Subsidies	0.15	0.09	0.1	0.02	**0.72**	-0.1	0	-0.2
Q.18 - Skills and Education	0.06	0.2	-0.1	0	**0.57**	0.06	0.07	0.09
Q.18 - Improved work ethic	0	0.29	-0.1	-0.1	**0.52**	0.04	0.03	0.21
Q.18 - Labour Law and Regulatory	0.13	0.12	0.08	0.19	**0.43**	0.04	0.26	0
Q.22 - Enterprises in your sector	0	0	0.12	0.11	-0.1	**0.81**	0	0.07
Q.22 - Professional and Industry Associates	0.05	0.07	0.06	0.1	0.02	**0.69**	0.02	0.13
Q.22 - Local Suppliers	0.06	-0.1	0.08	0.03	0.11	**0.58**	0	-0.1
Q.22 – Clients	-0.1	0.03	0.01	-0.1	0	**0.58**	0.09	-0.1
Q.22 - Information sharing with firm	0.03	0.05	-0.1	-0.1	0.05	**0.51**	0.01	0.02

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8
Q.15 - Labour Relation	0.15	0.26	0.3	0.18	0.05	0.08	**0.66**	0.04
Q.15 - Labour Law	0.07	0.26	0.33	0.14	0	0	**0.61**	0

Table 3.10 demonstrates that the output shows the factor loadings for the 8 extracted factors. The loading of an item indicates the extent to which an individual item 'loads' onto a factor. A value near 1 indicates that an item loads highly on a specific factor. A loading of 0.40 and larger can be considered as meaningful.

An item was said to load on a given factor if the factor loading was 0.40 or greater for that factor and less than 0.40 for the other factors. If an item has loadings of greater than 0.40 on more than one factor the item is 'cross-loading', closer inspection is warranted and a decision is made to which factor the item belongs. Cross loadings may be the result of ambiguity in the item/statement.

The individual statements (items) can now be allocated to each of the 8 factors according to their individual factor loadings. These 8 factors form the constructs or dimensions in the questionnaire.

These factors/constructs make logical and theoretical sense as they are aligned with literature on the challenges facing Small and Medium Enterprise market in South Africa. The eight factors in this case are named: "government red tape needed (factor 1), lack of skill needed (factor 2), labour regulations needed (factor 3), lack of innovation needed (factor 4), impact of crime needed (factor 5) and access to funding needed (factor 6), labour relations not needed (factor 7), labour law not needed (factor 8).

Please note that question 15 statements are cross-loading. These statements were considered as part of the construct where it loaded the highest as well as where it made sense logically. In future research, these statements would be revised.

3.14 Reliability (Construct reliability)

Cronbach's alpha is a statistic used for quantitative analysis for this project. It is generally used as a measure of internal consistency or reliability of a psychometric instrument. In other words, it measures how well a set of variables or items measure a single, one-dimensional latent aspect of individuals. Generally, many quantities of interest in business, such as impact of red tape to business growth, are impossible to measure explicitly. In such cases, a series of questions are asked; and the answers are combined into a single numerical value. For example, let us consider that we are interested to know the extent of government red tape in hindering growth of SME businesses in South Africa. We would first prepare a table with 6 items recording the likelihood of impact to the day to day operations of the business and its growth plans. Each item is scored from 1 which means "very likely" to 5 which means "very unlikely". The scores on 6 items are summed to give the final score as shown in figure 3.9 (see entire set score).

3.14.1 Cronbach's α

Figure 3.9: Cronbach Alpha values for the construct "Red Tape"

	α	
Entire set	0.8790	

Red Tape Related Items	α	
13 - Value Added Tax	0.8586	
13 - Unemployment Insurance Fund	0.8567	
13 - Income Tax	0.8561	
13 - Pay as You Earn	0.8480	
13 - Skills Development Levy	0.8611	
13 - Workplace Compensation	0.8687	

The overall Cronbach Alpha for the construct "red tape" can be seen on the output next to 'Entire set': 0.879. The individual Cronbach alpha values next to the items (or questions) indicate the change in the overall Cronbach's Alpha value, should the corresponding item be removed from the construct. The corrected item-total correlation indicates the correlation of the specific item (or question) with the total correlation of all the questions. The higher this correlation the 'better' this item or question forms part of the construct. If the individual Cronbach Alpha is higher (usually at least 2-4%) than the overall Cronbach Alpha (entire set) and the corrected item-total correlation is low or negative (below 0.1), then this individual item could be removed. The removal must make sense logically. In this case, no items qualify for removal.

However, when items are used to form a scale they need to have internal consistency. The items should all measure the same thing, so they should be correlated with one another. Cronbach's alpha generally increases when the correlations between the items increase. For this reason, the coefficient is also called the internal consistency or the internal consistency reliability of the test. The value of alpha (α) may lie between negative infinity and 1. However only positive values of α make sense. Generally, alpha coefficient ranges in value from 0 to 1 and may be used to describe the reliability of factors extracted from dichotomous (that is, questions with two possible answers) and/or multi-point formatted questionnaires or scales (i.e., rating scale: 1 = poor, 5 = excellent) as was used in our research instrument.

Although Cronbach's alpha is widely used nowadays, there are certain problems related to it. The first problem is that alpha is dependent not only on the magnitude of the correlations among items, but also on the number of items in the scale. A scale can be made to look more 'homogenous' simply by doubling the number of items, even though the average correlation remains the same. This leads directly to the second problem. If we have two scales which each measure a distinct aspect, and combine them to form one long scale, alpha would probably be high, although the merged scale is obviously tapping two different attributes. Third, if alpha is too high, then it may suggest a high level of item redundancy; that is, a number of items asking the same question in slightly different ways.

Some professionals insist on a reliability score of 0.70 or higher in order to use a psychometric instrument as shown in Table 3.11. This rule should be applied with caution when α has been computed from items that are not correlated.

Table 3.11: Estimate of Internal Consistency as measured by Cronbach Alpha, all exceeded 0.80

Variables	Items	Items left out	Mean	SD	Cronbach Alpha	Reliab ility
Construct 1: Red Tape	11, 12, 13, 14	None	3.0753876	0.9766327	0.7406	Good
Construct 2: Lack of Skill	11, 15, 17, 18	None	3.4926564	0.9070146	0.8380	Good
Construct 3: Labour Regulations	11, 13, 14, 15, 18	None	3.4818475	0.8970209	0.8133	Good
Construct 4: Lack of Innovation	11, 20, 21, 22	None	4.0708651	0.7238674	0.7623	Good
Construct 5: Impact of Crime	11, 19	None	2.5062745	1.0760272	0.8512	Good
Construct 6: Access to Funding	11, 23, 25, 26	None	2.3701234	0.9835436	0.9276	Good

3.15 Summary

This chapter started by explaining the research process followed on this project taking into consideration the different views put forward by Cooper & Schindler (2001); Coldwell & Herbst (2004); and Leedy & Omord (2005). The Onion analogy of explaining the research process as was published by Saunders, Lewis & Thornhill (2009) was also used together with Crotty (2007) to get to a synthesised research process for this project.

The study is quantitative in nature and the method applied is that of large scale survey explained in literature regarding Cloud Computing and SME market in South Africa. Judgmental sampling method was used on iFeedback database targeting the tourism, manufacturing, business services and other sectors of the SME market. A set of criteria to be discussed in the next chapter were used to ensure that the right profile of SME relevant to participate in the survey were reached. The sampling process assisted us to

achieve 4% response rate from a sample of 6500 qualified potential participants in the population.

Data analysis followed the decision tree method to allow for data mining and also to develop data classification in order to predict future observations. This process has helped to account for interactions among the variables being studied. Ethical clearance was successfully completed in November 2016 and we have complied with all UNISA ethical requirements. Validity test of the research instrument followed the exploratory factor analysis approach which assisted in describing variability amongst observed variables in terms of fewer unobserved variables called factors (the constructs). From the exercise, eight factors were identified as opposed to the six factors discovered through a review of literature at the beginning of the research project. Through this analysis the following factors were discovered: government red tape, lack of skill, labour regulations, lack of innovation, impact of crime, lack of access to funding which are consistent with the literature reviewed. Two additional factors were identified: Labour relations and labour regulations which were not accepted since they are loaded in the labour regulation construct.

To measure reliability, we used Cronbach alpha which is used to measure internal consistency of the research tool/instrument used to conduct research of the project. Estimate of internal consistency as measured by Cronbach Alpha exceeded 0.80 and are summarised in a table for ease of reference.

The next chapter presents the findings from the research field work. Synthesis of the large volumes of data collected was conducted using quantitative analysis. Collection of data relevant to the research project and demonstration of the unique contribution of this thesis to knowledge will be discussed in the next chapter.

CHAPTER 4 – EMPIRICAL FINDINGS

4.1 Introduction

Building on the methodology presented in the previous chapter, this chapter outlines the data which we collected in the field. It presents the data which the research acquired from the surveys in response to the research questions as presented in the data gathering tools, namely: online survey based on the research questionnaire, the telephonic follow up interviews, and the document analysis referenced to in the literature review section of this thesis.

This chapter synthesises the large volume of data gathered into comprehensible information grouped and categorised according to the thematic sections of relevance to the research problem and questions. This chapter also synthesises and analyses the data obtained during the research process and scholarly literature played an important part in setting the base on which to start the project. The data is analysed and presented according to sections and categories as obtained from the literature reviewed and according to the research questionnaire. The Technology, Organisations and Environmental (TOE) Model is an anchor of the research instrument and forms the basis in which data has been categorised and presented. This chapter reviews and analyses the data according to the following thematic areas: technology adoption; business threat of survival, change in employment; and lastly the impact of business environment between 2015 and 2016, in no particular order.

Quantitative results include the descriptive statistics pertaining to the questionnaires used. Reliability on key questions is measured using Cronbach's alpha as was discussed in the foregoing chapter.

4.2 Interpretation of results

In this section, the results pertaining to the quantitative study are reported, starting with a report on the demographics of those who completed the question.

4.2.1 Demographic information

Profile of participants by industry

Firms were randomly selected within the study focus sectors, after controlling for key variables including: panellists employed fewer than 200 employees; turnover of less than R26 million per annum; and registered businesses in South Africa in line with SARS and Companies Intellectual Property Commission (CIPC).

Figure 4.1 shows that in total 265 panellists answered the questionnaires. Of the total, 10% generated less than two hundred thousand of revenue per annum, 26% generated less than three million rand per annum and 64% generated between thirteen and twenty-six million rand of annual revenue.

Figure 4.1: Revenue by Responding Firm
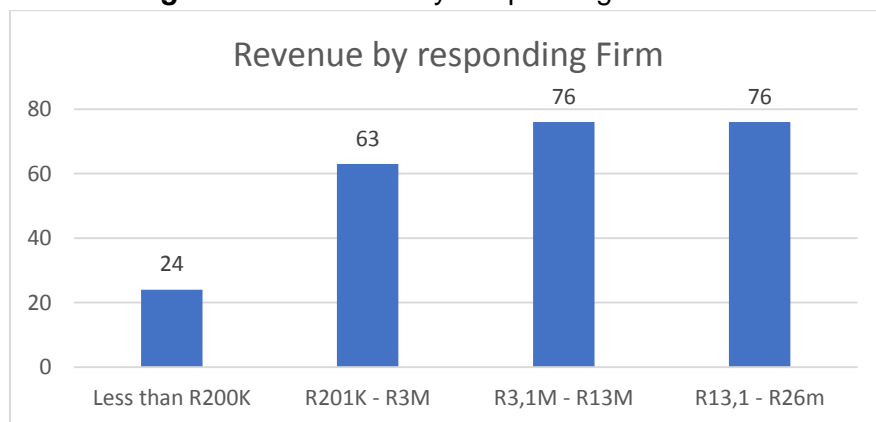
In figure 4.2 we observe that 27% of firms employ less than 5 people and 39% employ between fifty and two hundred people. The highest proportion of firms (61%) were those that employ between six and twenty people.

Figure 4.2: No of Employees by Responding Firm

Over three quarters of the panellists were established firms that had survived the start-up period and were at a phase where upscaling and expansion were possible according to data in figure 4.3. Note should be taken of the age distribution of the firms. 67% of the firms have been operating for more than 10 years, and almost half of these for over twenty years. 10% are between two and five years old and 3% are less than two years in operation, as such, are at the most critical stage of survival.

Figure 4.3: Age Distribution of Firms
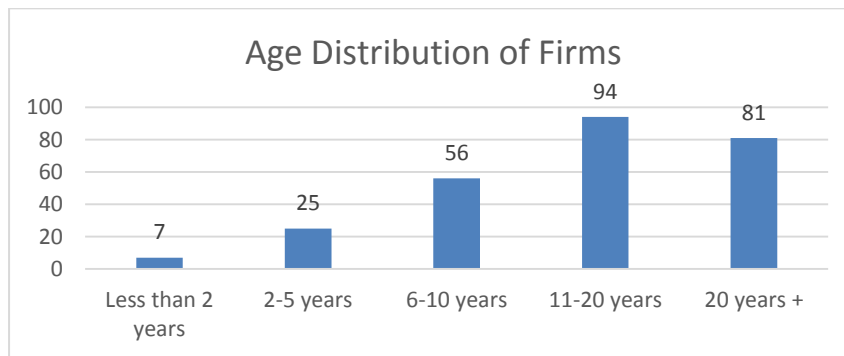
The findings showed that firms that participated in the study are aging – along with their owners, with relatively few new entrants to the market. Since the study panel closely matches the Stats SA data on employers, this suggests that there is an overall aging of the SME cohort. As firm owners approach retirement age, the shrinking of this community and with it the loss of potential opportunities, is a real risk to the economic growth of South Africa.

In table 4.1, we see that 94% of the businesses surveyed were registered for tax, 83% for unemployment insurance fund and 84% with Companies and Intellectual Property Commission (CIPC). Only 53% are registered with Department of Trade and Industry for Black Economic Empowerment (BEE) ratings.

Table 4.1: Regulation the business is registered for.

	Yes		No		All	
	N	% of Total	N	% of Total	N	% of Total
Tax	250	94.34%	15	5.66%	265	100.00%
UIF	220	83.02%	45	16.98%	265	100.00%
BEE	141	53.21%	124	46.79%	265	100.00%
CIPRO	222	83.77%	43	16.23%	265	100.00%

48% of the panellists were from the business service sector with 9% and 6% from manufacturing and tourism sectors respectively as shown in figure 4.4. Industry verticals have been of interest to this study since they have been mentioned in the National Development Plan as sectors with most potential to accelerate growth of the South African economy. However, this does not mean we ignore the results of the 37% who responded under industry name '**other'** as they contribute significantly in addressing the research questions for this project.

Figure 4.4: Panellist by Industry Vertical
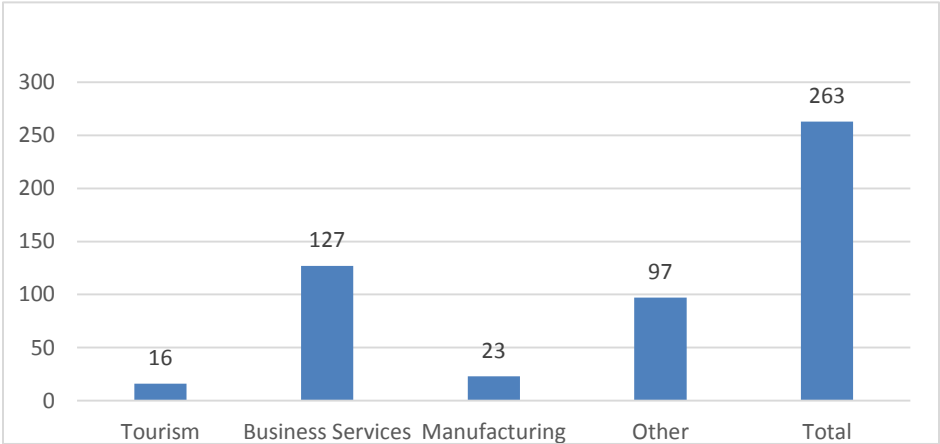
Table 4.2 shows that the geographic spread included 56% of panellists from Gauteng, 27% from Western Cape and 10% from Eastern Cape. Kwa-Zulu Natal, Mpumalanga, Northwest and Free State all constitute less than 3% of panellists.

Table 4.2: Geographic location of business

Location	Count
Gauteng	147
Western Cape	71
Eastern Cape	10
Mpumalanga	6
Kwa-Zulu Natal	8
North West	4
Free State	2
(Please Specify) (all provinces)	1
(Please Specify) (countrywide)	1
(Please Specify) (ETHIOPIA ADDIS ABABA)	1
(Please Specify) (International)	1
(Please Specify) (It is the national umbrella body)	1
(Please Specify) (Lagos)	1
(Please Specify) (Namibia)	1
(Please Specify) (National)	3
(Please Specify) (Nationally – I am online business)	1
(Please Specify) (SADEC)	1
(Please Specify) (Western Cape and Gauteng)	1
(Please Specify) (Zimbabwe)	1
Total	**262**

4.2.1 Growth

Change in turnover is a good measure of progress made against the National Development Plan as businesses are needed to assist in driving economic growth of the country. This study needed to see how these businesses performed between 2015 and 2016, and in figure 4.5 the findings showed that 43% of the panellists did not grow during

this period with 19% shrinking and 24% being stagnant. 58% of the panellists showed growth and of the ones showing growth, 36% are growing moderately and 22% have high growth.

Figure 4.5: Growth Trajectory of Firm
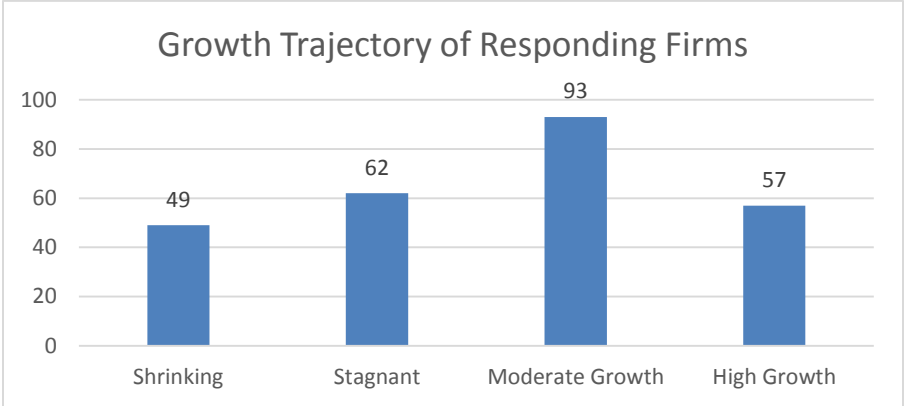
To gauge how difficult 2015 had been, panellists were asked whether they had experienced a threat to their survival. In figure 4.6 we see that some 35% indicated that they had experienced such a threat. This underlines the grave circumstances facing SMEs.

Figure 4.6: Threat of Survival in the past year
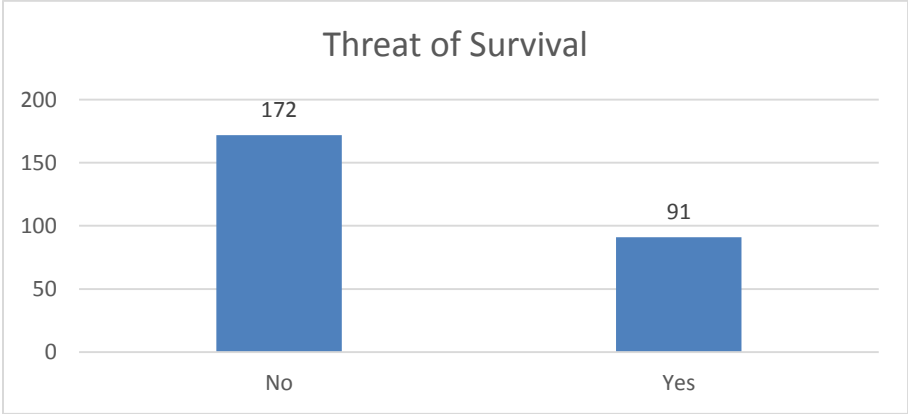
Literature (SME growth index for 2012) showed that, many are struggling to survive. Tourism enterprises, at slightly more than one third, showed the greatest propensity of a survival threat, followed by manufacturing. A sense of a survival threat was lowest among business services, at just over one in five.

It is important to acknowledge that firms at different stages of their development experience differing growth dynamics. This should be of prime importance to policy makers. Understanding the dynamics at work at different points in the age continuum enables policy to be tailored for greatest impact among specifically targeted groups of firms. Figure 4.6, shows that across the panellists, 48% of firms neither increased nor decreased their staff numbers.

Figure 4.7: Change in No of Employees compared to last year
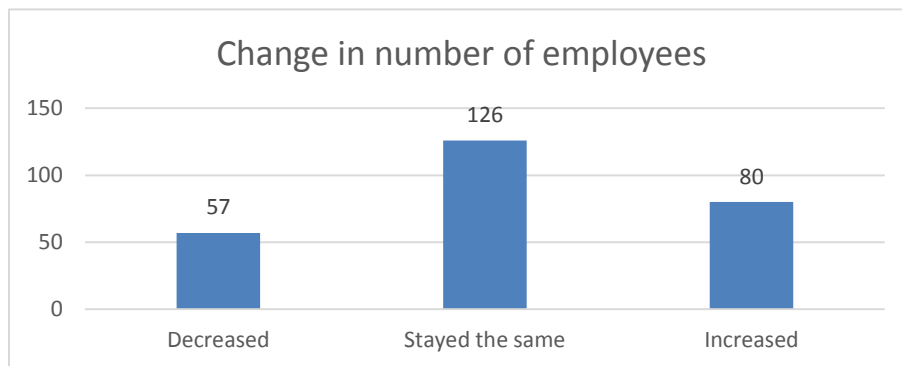
During the synthesis stage of the research, firm age category, reported having taken on employees was analysed. It is expected that the young cohort of firms take on employees and this view will be tested in the later stage of this work.

4.3   Descriptive statistics pertaining to SME business challenges

Descriptive statistics are reported per question. With each question, reliability information in the form of Cronbach's alpha coefficient is presented which is used as a measure of internal consistency or reliability of a psychometric instrument. The study measured how well a set of variables or items measure a single, one-dimensional latent aspect of individuals.

The research problem statement uncovered through extensive review of literature review highlights that many small businesses in South Africa do not make it past the second year of trading with failure rates as high as 63% (Roberts, 2010). In order to understand what is holding growth back – or promoting it – this study interrogates SMEs' views on the business environment. Business does not operate in a vacuum, and the effectiveness

and efficiency of such things as the quality of legislation, markets and institutions can be decisive for firms' performance, and for the performance of the economy.

To test this statistically, panellists were asked whether it was easier to operate business in South Africa compared to the previous year. The broad impression of the business environment held by the panellists was not positive. As shown in figure 4.8, 67% said that it became harder to operate a business in South Africa in 2015. Only 4% said it had become easier. 29% believed it had not changed.

Figure 4.8: Ease of doing business in South Africa compared to last year
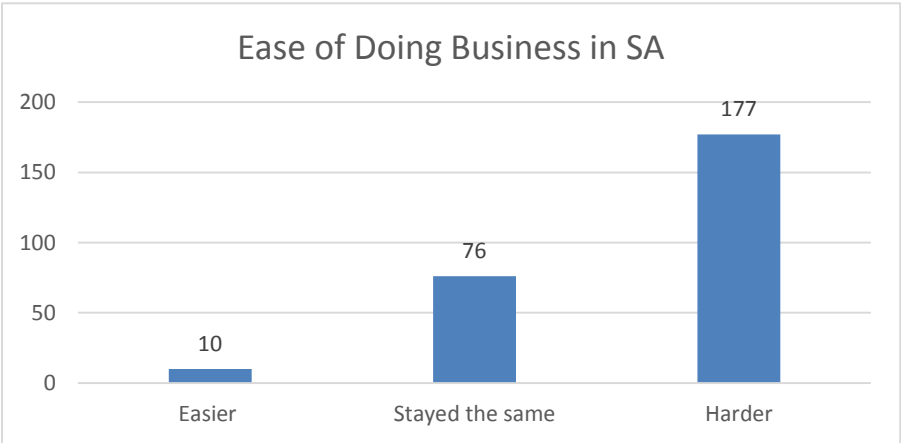
4.4   SME key business challenges

Literature highlighted common factors that contribute to SME business failure which are *government red tape, lack of skill, labour regulations, lack of innovation, impact of crime and access to funding*. The panel was asked to identify chief impediments to their business growth in the last year. 61% of the panellists feel that government red tape/bureaucracy has had big impact in hindering growth for the past year, followed by labour legislation at 54%, and lack of skill at 46% as shown in table 4.3. During the analysis stage, reliability of data was looked at using Cronbach's alpha.

Table 4.3: Chief Impediments to business growth in the past year

	Very Unlikely		Unlikely		Neither		Likely		Very Likely		All	
	N	% of Total	N	% of Total	N	% of Total	N	% of Total	N	% of Total	N	% of Total
Government Red Tape / Bureaucracy (e.g. VAT UIF Income Tax etc)	20	7.66%	38	14.56%	44	16.86%	83	31.80%	76	29.12%	261	100.00%
Labor Legislation (e.g. Labor relations act; Employment Equity Act; Skills Development Act etc)	24	9.23%	40	15.38%	55	21.15%	71	27.31%	70	26.92%	260	100.00%
Lack of Skill (e.g. Managerial Incompetence; Lack of Expertise; Management Capacity etc)	40	15.44%	45	17.37%	53	20.46%	79	30.50%	42	16.22%	259	100.00%
Crime (e.g. Cybercrime; Theft; Damage to Property etc)	37	14.57%	78	30.71%	59	23.23%	60	23.62%	20	7.87%	254	100.00%
Lack of Innovation (Lack of Research and Development; Commercialization etc)	50	19.38%	84	32.56%	57	22.09%	53	20.54%	14	5.43%	258	100.00%
Lack of access to finance (e.g. Poor financial record keeping; Poor debtor Management; Lack of Inventory Control etc)	56	21.46%	79	30.27%	53	20.31%	41	15.71%	32	12.26%	261	100.00%

The picture presented in Table 4.3 is concerning as South African firms are operating under adverse circumstances. These challenges distract firms from their core business, push up the costs of operations and may overwhelm weaker firms entirely. Differences are evident in the impediments identified by firms in different sectors. Government bureaucracy is the dominant concern for firms in manufacturing, business services, and tourism firms.

Regulatory compliance costs have long been recognised internationally as a burden on business, both for individual firms and for the economies within which they operate. Heavy compliance burdens, and ineptly administered regulations, add to the costs of doing business, and constrict firms' ability to grow. Cumulatively, they hinder national economic growth (SBP Growth Index; 2014). The need for regulatory reform to create a simpler, more efficient business environment has been a stated government commitment for decades. The 1995 White Paper on Small Business, for example, put it succinctly: "*Inappropriate or unduly restrictive legislative and regulatory conditions are often viewed as critical constraints on the access of small enterprises into the business sector and as obstacles to their growth.*" More recently, the NDP − and New Growth Path − also recognise the need for an improved regulatory environment.

4.4.1 Impact of Red tape

To understand the direction that the regulatory environment is taking, the panel was asked to assess whether the red tape burden had increased, decreased or stayed the same over the preceding year. The outcome as shown in figure 4.9 is that a clear majority of SMEs (57%) believe that the red tape burden has increased, with 1% saying that it has remained constant.

Figure 4.9: Has Red Tape Burden Increased or Decreased in the past year?
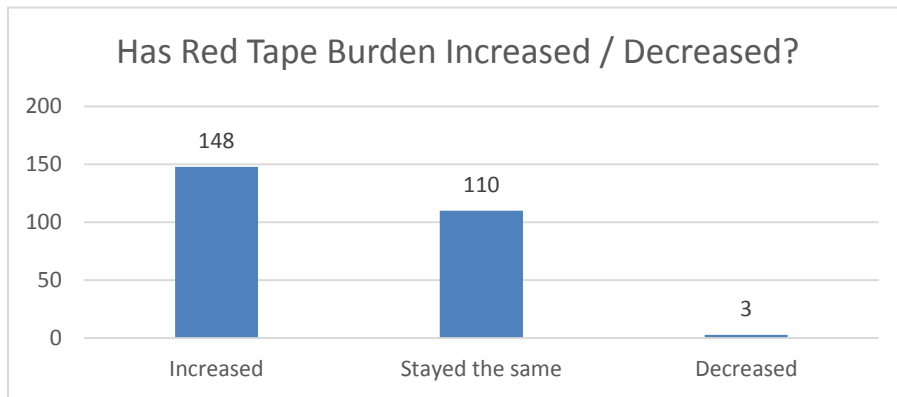
Red tape is a broad term and in order to get more context on the nature of red tape panellists were faced with, panellists were asked to identify the chief sources of red tape burdens in 2016. By a considerable margin, SARS inefficiencies dominated the responses, at around 43% and 47% of panellists saying Value Added Tax and income tax respectively had a likelihood of being the chief sources of red tape in their businesses as seen in table 4.4. Of particular interest is that 39% state that unemployment insurance fund is neither, likely or unlikely to be an impediment to business in the past year.

Table 4.4: Sources of Red Tape

	Very Unlikely		Unlikely		Neither		Likely		Very Likely		All	
	N	% of Total	N	% of Total	N	% of Total	N	% of Total	N	% of Total	N	% of Total
13 - Value Added Tax	39	15.66%	31	12.45%	70	28.11%	74	29.72%	35	14.06%	249	100.00%
13 - Unemployment Insurance Fund	50	21.83%	46	20.09%	90	39.30%	29	12.66%	14	6.11%	229	100.00%
13 - Income Tax	31	12.55%	29	11.74%	70	28.34%	75	30.36%	42	17.00%	247	100.00%
13 - Pay as You Earn	31	12.86%	37	15.35%	90	37.34%	59	24.48%	24	9.96%	241	100.00%
13 - Skills Development Levy	36	15.32%	40	17.02%	83	35.32%	54	22.98%	22	9.36%	235	100.00%

	Very Unlikely		Unlikely		Neither		Likely		Very Likely		All	
	N	% of Total	N	% of Total	N	% of Total	N	% of Total	N	% of Total	N	% of Total
13 - Workplace Compensation	37	15.55%	37	15.55%	88	36.97%	47	19.75%	29	12.18%	238	100.00%

Could this be due to the non-compliance of employees to this regulation or rather lack of enforcement from the government in ensuring compliance with these regulations? This was a problem for manufacturers and business services. Several panellists noted that while SARS can efficiently collect revenue, it is less efficient at paying refunds or resolving problems. Difficulties in obtaining tax clearance certificates remained a source of frustration. Challenges associated with SARS have emerged as a key concern in every round of the annual survey. A common theme is the need for SARS to reorient its approach from one that is punishment-based to one that recognises the specific challenges that it imposes on small businesses, and work constructively with this sector to better business success. Labour – including problems relating to bargaining councils, the CCMA, Workman's Compensation and so on – was also most frequently cited issues.

Business concerns regarding the compliance burden related not only to the volume of regulatory requirements and poor administration, but also to the frequency of regulatory change. Panellists were asked if they believed they knew all the regulations they were expected to comply with. Just under three firms in five were confident that they did. In figure 4.10, we see that 26% of the panellist state that maybe they know all regulations they need to comply with and a disappointing 17% said they do not know what regulations they should comply with in their business.

Do you understand all Regulations in your industry?

Understanding of Regulations in your Industry

	No	Yes	Maybe
	44	146	68
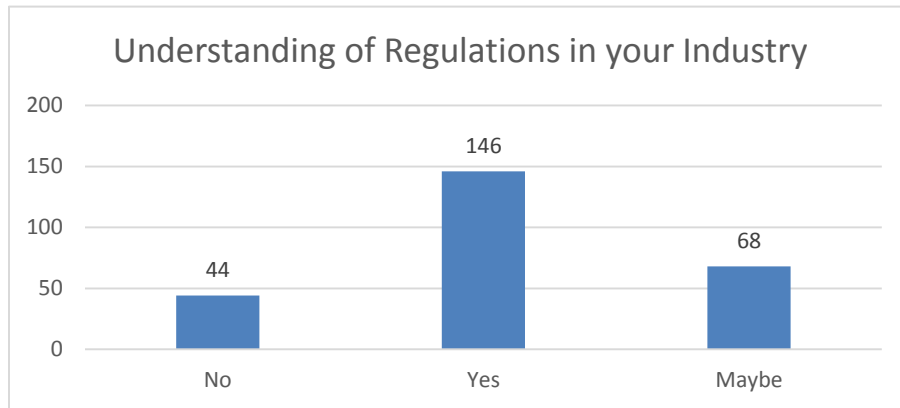
4.4.2 Lack of skills

If SMEs are to grow in a manner that creates jobs, their experience of the labour environment must be clearly understood. Reorienting South Africa's business environment to one that encourages employment should be a key policy objective, and requires a solid evidence-based approach. Panellists were asked to point out impediments to hiring. Table 4.5 shows that overwhelmingly, this came down to two issues: inadequate skills (71%) and labour law (45%).

Table 4.5: Chief Impediments to Hiring in the past year

	Very Unlikely		Unlikely		Neither		Likely		Very Likely		All	
	N	% of Total	N	% of Total	N	% of Total	N	% of Total	N	% of Total	N	% of Total
Labour Law	29	11.79%	35	14.23%	64	26.02%	50	20.33%	68	27.64%	246	100.00%
Skills	15	5.81%	19	7.36%	40	15.50%	114	44.19%	70	27.13%	258	100.00%
Labour Relation	25	10.08%	53	21.37%	86	34.68%	57	22.98%	27	10.89%	248	100.00%
Work Ethic	15	5.86%	29	11.33%	63	24.61%	87	33.98%	62	24.22%	256	100.00%

Labour laws and skills shortages have been repeatedly identified as key challenges in literature; and the results presented above are in line with other studies, which consistently identify labour laws and skills shortages as critical constraints to South Africa's economic growth. Bluntly put, "the poor preparedness of South African school leavers to enter the labour market, and the legislation that governs the labour market, create substantial constraints on employment growth" as per the SBP SME Growth Index (2013).

Panellists were asked to explain how they are responding to the skills shortage? Some indicated that they are spending money on training their staff. As shown in figure 4.11 a majority of panellists indicated that they conduct training of some description, most common being job training, followed by formal training not affiliated to the Sectoral Education and Training Authorities (SETA). A minority use SETA services – as noted in the diagram attached, this is often because some of the SETA offerings are mandatory.

Figure 4.11: Forms of Training used for Employee Development
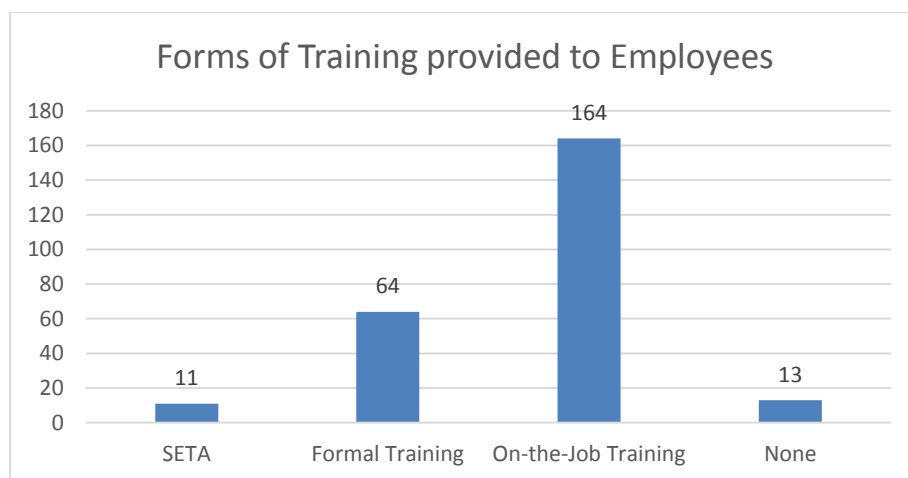
4.4.3   Labour regulations

Youth unemployment is a burning concern around the world. SMEs are recognised as the key drivers of job creation, and provide a natural entry point to the labour market for young job seekers. Indeed, data from Stats SA suggests that young work seekers are more likely to find opportunities in smaller firms than in larger ones. This study sought to understand the panellists' perspectives on employing young people. A question as to the concerns, if any, they would have about hiring new, young entrants to the job market was posed. In table 4.6, key concerns in hiring youth were pointed out as work ethic (65%), skills and education (69%), lack of experience (67%) and misaligned expectations (65%).

Table 4.6: Concerns in hiring Youth in your business

Concerns in hiring Youth	Very Unlikely		Unlikely		Neither		Likely		Very Likely		All	
	N	% of Total	N	% of Total	N	% of Total	N	% of Total	N	% of Total	N	% of Total
Work Ethic	12	4.76%	37	14.68%	60	23.81%	83	32.94%	60	23.81%	252	100.00%
Skills and Education	10	3.94%	24	9.45%	43	16.93%	98	38.58%	79	31.10%	254	100.00%
Don't Stay	14	5.88%	34	14.29%	70	29.41%	69	28.99%	51	21.43%	238	100.00%
Lack of Experience	14	5.47%	28	10.94%	47	18.36%	95	37.11%	72	28.13%	256	100.00%
Expectations	10	3.95%	16	6.32%	57	22.53%	89	35.18%	81	32.02%	253	100.00%

Young people who are unable to secure entry-level jobs are likely to find themselves frozen out of employment in the long-term. With few skills and limited experience, they will become not only unemployed but unemployable.

Government has made available compelling propositions to motivate business in South Africa to support hiring of youth. Hiring is also a very key element in assessing whether SMEs are delivering on their mandate to bridge unemployment levels of South Africa and with the feedback above that shows high level of concern in hiring youth, we had to investigate what would motivate SMEs to hire youth. A key question was asked as to what extent do the panellists see Wage Subsidies, Skills and Education, Government funded training, Labour Law and Regulatory, Direct Funding and lastly Improved work ethic as motivation to hiring youth? One would have expected that Wage and Subsidy would come out tops as a motivator but interestingly table 4.7 shows that Skills and Education came at 77% of the panellists agreeing that this is a motivator, followed by Improved Work Ethic at 67% and lastly Wage and Subsidy at 56% of panellists in favour of a youth wage subsidy.

Table 4.7: Motivation for hiring Youth

	Very Unlikely		Unlikely		Neither		Likely		Very Likely		All	
	N	% of Total	N	% of Total	N	% of Total	N	% of Total	N	% of Total	N	% of Total
Wage Subsidies	33	13.20%	36	14.40%	42	16.80%	95	38.00%	44	17.60%	250	100.00%
Skills and Education	12	4.78%	22	8.76%	25	9.96%	114	45.42%	78	31.08%	251	100.00%
Government funded training	29	11.69%	43	17.34%	53	21.37%	69	27.82%	54	21.77%	248	100.00%
Labour Law and Regulatory	36	15.00%	41	17.08%	69	28.75%	53	22.08%	41	17.08%	240	100.00%
Direct funding	20	8.16%	42	17.14%	61	24.90%	74	30.20%	48	19.59%	245	100.00%
Improved work ethic	13	5.20%	22	8.80%	48	19.20%	95	38.00%	72	28.80%	250	100.00%

4.4.4 Impact of crime in business

Crime remains a critical challenge in South Africa, touching every facet of life. We asked our panellists about their experiences of crime, and the impact it was having on their firms. One in every four businesses surveyed had been victims of crime in the past year. In table 4.4, we see that Armed Robbery came least as a common crime experienced over the past year where 5% of the panellists stating that it was likely or very likely to have affected their business in 2016. Theft, Fraud and Cybercrime were real experiences and have affected an average 25% of our panellist base for 2016.

Table 4.8: Crime Experienced in the past year

	Very Unlikely		Unlikely		Neither		Likely		Very Likely		All	
Impact of Crime in the past year	N	% of Total	N	% of Total	N	% of Total	N	% of Total	N	% of Total	N	% of Total
Theft (Burglary)	85	34.14%	22	8.84%	75	30.12%	34	13.65%	33	13.25%	249	100.00%

	Very Unlikely		Unlikely		Neither		Likely		Very Likely		All	
Impact of Crime in the past year	N	% of Total	N	% of Total	N	% of Total	N	% of Total	N	% of Total	N	% of Total
Theft (Internal)	84	33.47%	35	13.94%	65	25.90%	38	15.14%	29	11.55%	251	100.00%
Fraud	89	35.32%	36	14.29%	69	27.38%	37	14.68%	21	8.33%	252	100.00%
Cybercrime	78	31.58%	31	12.55%	77	31.17%	41	16.60%	20	8.10%	247	100.00%
Armed Robbery	108	44.44%	29	11.93%	93	38.27%	7	2.88%	6	2.47%	243	100.00%

Many firms are spending additional funds on security. But crime also appears to be constraining growth more indirectly. One panellist thus remarked: "The effect of crime on South Africa has resulted in no forward planning because the buyers and suppliers do not want to commit to the long-term relationship. It is having a negative effect on the mind-set of the entire country because everyone you talk to daily is affected, be it friends, family, suppliers, customers etc. It inflates prices because of having to guard, protect yourself and your company and keep up with technology in order to do so. I drive around with a gun – this is a negative mind-set. Insurance increases. It has a negative impact on life, on the manufacturing industry etc. It changes the focus from trying to have a good business to worrying about crime − terrible to live in a threatening environment. Delivery times increase as people carry less stock."

4.4.5 Lack of innovation

As an economy moves beyond its factor endowments, it and its firms will inevitably need to strive to produce more efficiently and to identify new economic opportunities. Innovation is a high-yield means of growth and a non-negotiable for continuous improvement of businesses and the economy in which they operate in. In figure 4.12, we see that our panellists felt generally positive about the prospects for innovation in South Africa: 58% of the panel agreed that the environment was conducive to innovation.

Figure 4.12: Is South Africa Innovation Conducive?

Is South Africa Innovation Conducive?

	No	Yes
Value	109	151
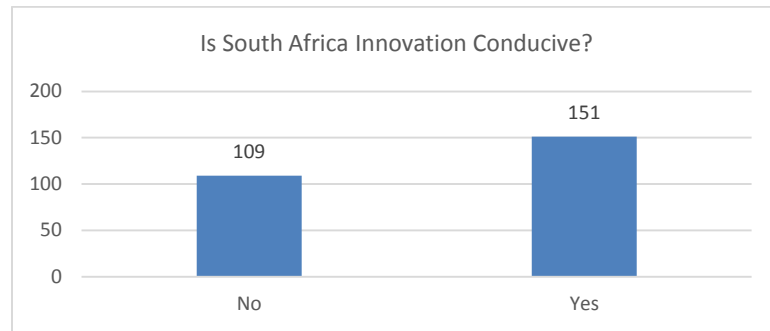
In 4.13, we see that 67% had introduced new products or services in the past year, and 16% had come up with new production processes or distribution methods.

Figure 4.13: Types of Innovation Introduced in the past year

Types of Innovation Introduced in 2015

Product /Service Innovation	Process / Distribution Innovation	No Innovation
175	41	44
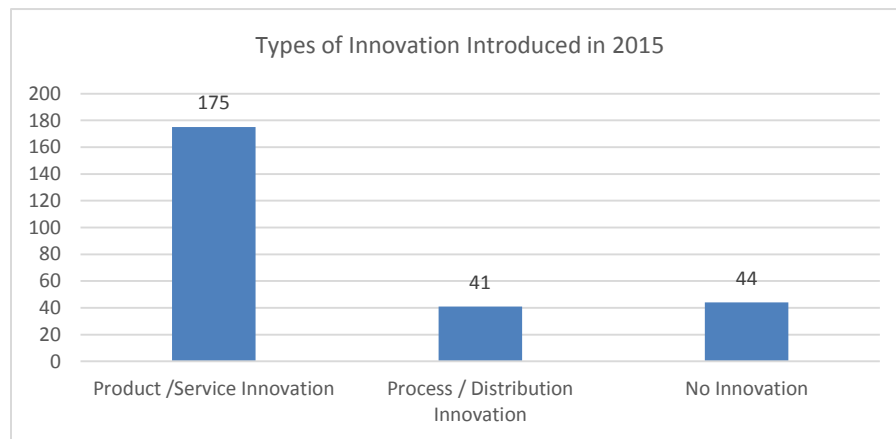
Global competitive Index report shows that South Africa performs quite creditably on innovation, ranking 37th of the 148 countries in the sample. The Competitiveness Index however raises concerns about South Africa's availability of scientists and engineers – reflecting broader concerns regarding the country's access to skills.

4.4.6 Access to funding

Companies must be able to invest in the assets and resources they need. This is critical for growth and economical sustainability of the country. Figure 4.14 shows that 67% of our panellists are not investing in their businesses. Just over a third of our panellists had acquired new major assets in 2016.

Figure 4.14: Investment in major assets in the past year

Did your firm acquire major assets last year?

	No	Yes
Value	176	85
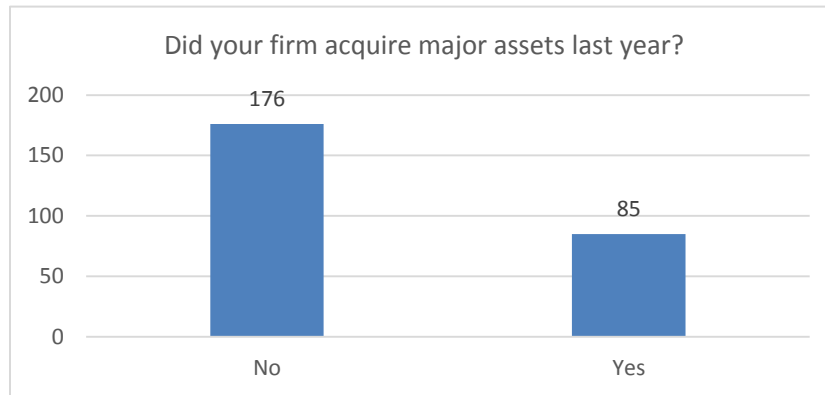
In our analysis, we will dig deeper on which firms are actually investing and which ones are not in line with their maturity and growth trajectory. It is also noted from the panellists that 22% of our panellists have made no investments when 43% of the panellists have invested between 1-10% of the resources back into the business in 2015 as seen in figure 4.15. This could possibly be due to the slow growth and level of maturity of our base since most of them have made it past the two years' life cycle. Investment is fairly slow as 13% of the firms have invested between 21-30% of their resources back into the business.

Figure 4.15: Proportion of Investment made in the past year

Level of Investment made in the past year

None	1-5%	6-10%	11-15%	16-20%	21-25%	26-30%
57	48	63	33	27	14	17
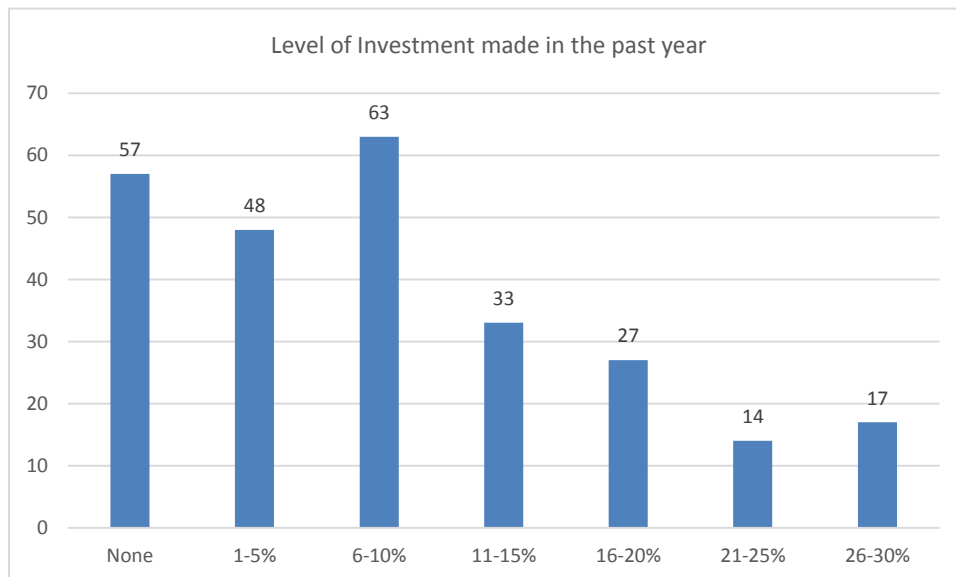
We asked our panellists to identify the sorts of financing that their firms had used (though not necessarily applied for a new) over the past year. The outcome shown in figure 4.16

is that 30% of the panellists stated that they applied for finance, most of them indicated that they use a variety of funding mechanisms including and excluding finance from the banks.

Figure 4.16: Did your Firm Apply for Funding in the past year?
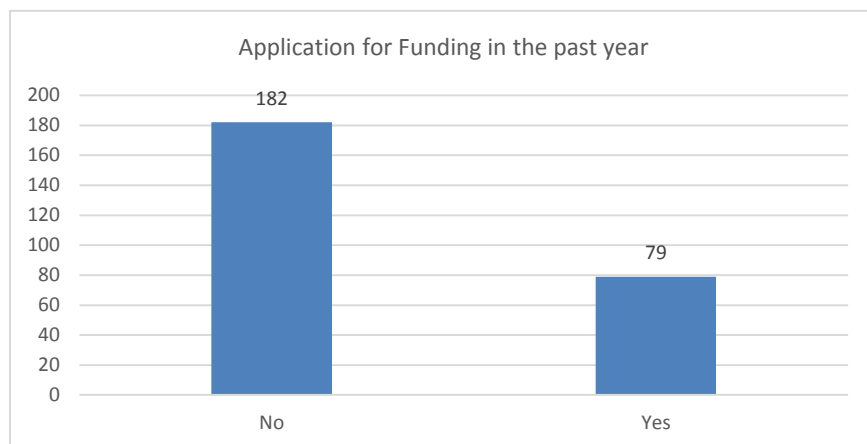
When looking at the type of funding used, table 4.9 showed that it appeared there was a diverse mix. Topping the list at 64% of panellists were use of Grants/Loans from the Government – suggesting that established SMEs are not able to access bank finance, confirming the perception that banks are reluctant to extend credit to SMEs. Substantial numbers of our panellists reported having bank loans or lease agreements with financial institutions already especially the more matured business who have been in operation for more than 20 years. Bank overdraft was the least used source of funding with 40% of those who invested in their business stating that they have used this form of financing. Loans from family, friends and shareholders (arrangements based heavily on trust and personal relationships) were used by around 42% of SMEs who invested in their business in the past year.

Table 4.9: Types of Funding Used in the past year

	Very Unlikely		Unlikely		Likely		Very Likely		All	
Type of Funding Used	N	% of Total	N	% of Total	N	% of Total	N	% of Total	N	% of Total
Bank Overdrafts / credit line	83	34.58%	60	25.00%	78	32.50%	19	7.92%	240	100.00%
Retained Profits or sales of assets	63	26.36%	37	15.48%	114	47.70%	25	10.46%	239	100.00%

	Very Unlikely		Unlikely		Likely		Very Likely		All	
Type of Funding Used	N	% of Total	N	% of Total	N	% of Total	N	% of Total	N	% of Total
Leasing or Hire Purchase	84	35.29%	56	23.53%	87	36.55%	11	4.62%	238	100.00%
Loans from family, friends shareholders	88	37.29%	48	20.34%	88	37.29%	12	5.08%	236	100.00%
Trade Credits	80	34.04%	52	22.13%	92	39.15%	11	4.68%	235	100.00%
Bank Loans	77	32.63%	50	21.19%	87	36.86%	22	9.32%	236	100.00%
Grants / Loans from Governments	53	22.08%	34	14.17%	112	46.67%	41	17.08%	240	100.00%
Equity	68	28.69%	41	17.30%	113	47.68%	15	6.33%	237	100.00%
Other	55	27.78%	22	11.11%	106	53.54%	15	7.58%	198	100.00%

The use of bank finance was far more common among manufacturers and business services than among tourism firms. This may be accounted for by the generally larger size, greater sophistication and more advanced age of manufacturing and business services firms on the panel. Many tourism firms on the panel do not hold assets in the name of the firm, but rather in the name of the owner. This makes manufacturing and business services firms better credit prospects. Tourism firms were substantially more likely to have used retained earnings to fund themselves. About one in five firms used trade credit, this being most prominent among manufacturing firms. In summary, financing from government is popular and much effort must be placed in usage of Bank Finance.

Lack of finance was identified as a concern for firm growth, particularly among tourism firms, but overall, other barriers appear far more important. Finance constraints seem to be a problem for younger firms, while more established and more sophisticated firms seemed able to satisfy their needs through a mix of funding sources. Around half of the firms that had invested had financed their investments using cash; bank finance was used by about a third. Although cash featured more prominently in firms' investment financing strategies than bank finance, little evidence was found that access to the latter was indeed a widespread problem.

We posed a question to our panellists on whether there was a time when they needed finance and were reluctant to apply. Figure 4.17 shows that 53% of the panellists said

they had not applied for a bank loan or overdraft or any form of credit, because they expected to be rejected or felt they lacked the collateral.

Figure 4.17: Did you apply for funding in the past year?
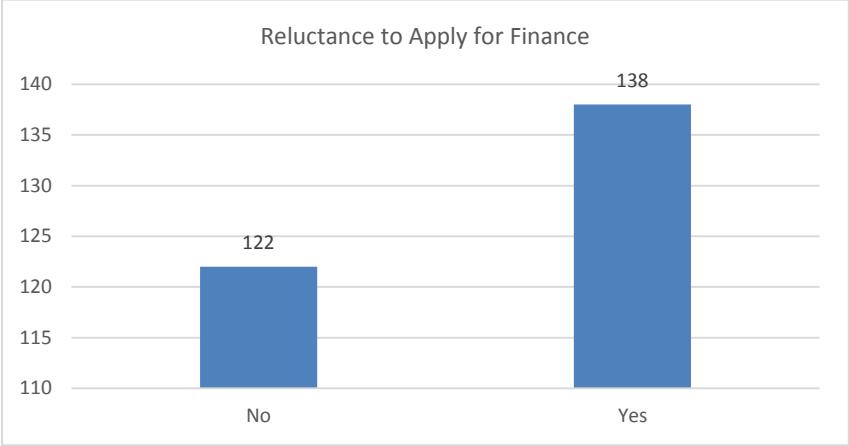
While access to finance is undoubtedly an important enabler, a lack of access does not seem to be a crippling problem. Our results suggest that South Africa's established SMEs are in general finding the funding they need. This finding is in line with the Global Entrepreneurship Monitor's most recent report on South Africa, which indicated that sufficient funding is available, although difficulties exist in gaining access to it. Ease of access differs significantly across sectors and firm ages. Any attempt to stimulate the SME community by offering finance must take into careful account the differentiated nature, needs and objectives of SMEs.

Predictable throughput of funds is essential for business operations. We see in figure 4.18 that 48% of our panellists reported that they had experienced significant cash flow problems in 2015.

Figure 4.18: Did your firm experience Cash flow Problems in the past year?
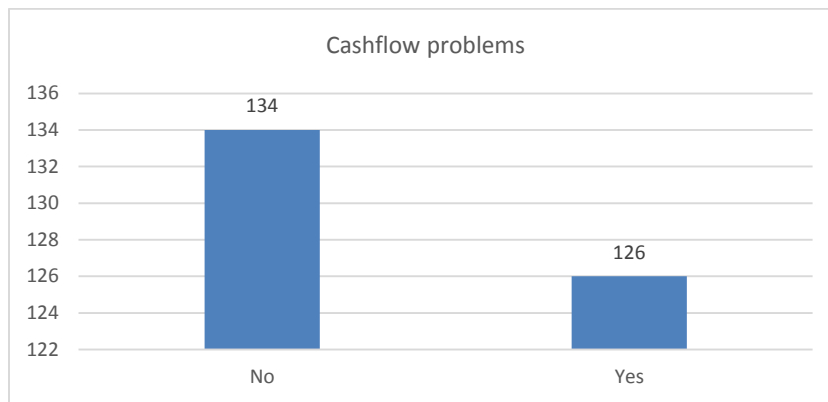
From the face to face interview, it was evident that there is a need for funding which is exacerbated by pervasive cashflow problems within the Small and Medium businesses in South Africa. Cash flow problems tended to stem from firm-specific issues, such as a lack of business or seasonal changes, which were particularly problematic for tourism firms. A large proportion of panellists with cash flow problems reported that their clients paid late. One panellist summed up the problem thus: "Customers are dragging their feet; those that usually paid in 30 days are now only paying in 60 to 90 days. It has put a lot of pressure on the business." Nearly half the who dealt with government rated it as a bad payer. This is linked to red tape burdens discussed earlier.

The complex processes intended to prevent corruption require a level of competence that the civil service frequently does not possess. According to one panellist, government "is bogged down in their own red tape and bureaucracy". Related to this is the levying of VAT on invoices rather than on receipts. Firms may become liable for large bills to SARS before they have actually received any actual funds for a particular sale. When a debtor is tardy in meeting his or her obligations, and SARS demands the applicable VAT, this can seriously compromise a company's cash flow.

An open ended question during the interview stage of our research was asked as to the reasons why businesses experienced cashflow problems and figure 4.9 below is an aggregate of all responses. Words in bold and bigger font size reflect the most common words used to respond to this question. As per figure 4.9, predominantly, businesses state that lack of finance, stringent bank requirements in accessing funding, lack of proper

record keeping which ultimately lead to banks not having sufficient information to assess credit risk, came up as very pervasive to the plight of the Small and Medium Enterprise market in South Africa.

Figure 4.19: Reasons why business had cash-flow problems in the past year

4.6 Technology adoption

To understand the potential of Cloud Computing in the SME market, businesses had to be in use of some sort of technology in order to appreciate the challenges that come with Information Technology. If panellists did not have any technology at all, we removed their input from this part of the questionnaire as their results would dilute our need to understand technology challenges faced by SME market in South Africa. It is very interesting to note that peripheral technology in the form of Mobile Devices, PC/Laptop, Email, Smartphone are widely used by the panellists. What is clear is that a small number of businesses use core IT technology in the form of HR and Payroll, CRM and ERP (Enterprise Resource Planning) application, that is, Finance Automation, Supply Chain Applications, to mention a few. In table 4.10 we see that only 30% of the panellists use ERP and this technology is designed to address some if not most of the challenges identified in the literature review.

Table 4.10: Types of Technology Used in your business

	Yes		No		All	
Type of Technology Used in your business	N	% of Total	N	% of Total	N	% of Total
Email	261	98.49%	4	1.51%	265	100.00%
Mobile network	214	80.75%	51	19.25%	265	100.00%
Fixed private network	157	59.25%	108	40.75%	265	100.00%
PC/Laptop	256	96.60%	9	3.40%	265	100.00%
Smartphone	239	90.19%	26	9.81%	265	100.00%
MS Office	255	96.23%	10	3.77%	265	100.00%
HR and Payroll	179	67.55%	86	32.45%	265	100.00%
CRM solutions	107	40.38%	158	59.62%	265	100.00%
Server room	143	53.96%	122	46.04%	265	100.00%
ERP	81	30.57%	184	69.43%	265	100.00%

62% of the panellists did not have their own IT department and this means technology in use does not require on premise deployments and are potentially using Cloud Computing as all of them have some form of technology. This question was to determine how big is the problem for those who are using technology on premise and we were interested in getting their input on the challenges they are facing with running their own IT department. Figure 4.20 shows that 38% of the panellists who have own IT department will still help us uncover these challenges and build towards understanding whether Cloud can assist in addressing key SME challenges.

Figure 4.20: Do you own IT department in your Firm?
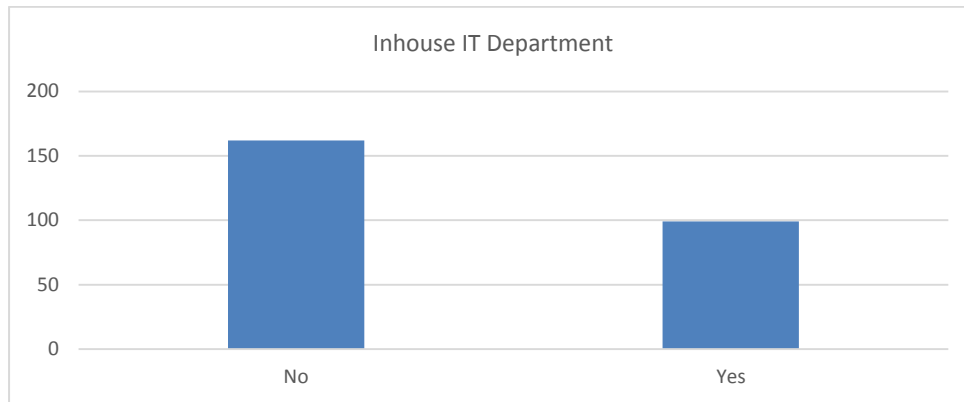
30% of our panellists stated that they have on average 2 employees in their IT department and those that have 70 employees which is the highest number contribute 1% of the panellists base. A huge percentage of panellists are outsourcing the IT function which is completetly different from Cloud Computing. Outsourcing of the IT service means they are running the IT environment as either on-premise or in the datacentre of the service provider but all functions related to this funtion are handled by other persons other than their own employees. The difference with Cloud Computing is that it is run from an independent location and the user cannot point exactly where the service is hosted from. Of importance is the payment method as Cloud Computing is paid for as a service just like a utility bill and outsource is a contract over a long term without flexible payment method.

Figure 4.21 shows that server down time is a very common experience amongst panellists since 65% have experienced it and 28% have seen this happen more than twice in the past year. There are multiple reasons why this happens and the real opportunity to address this is when the business handover IT function to service provider running in the Cloud. Very minimal cases are reported for server down time in Cloud Computing world and this is an observation to be explored further when we discuss findings analysis in detail.

Figure 4.21: Have you ever experience server downtime in the past year?
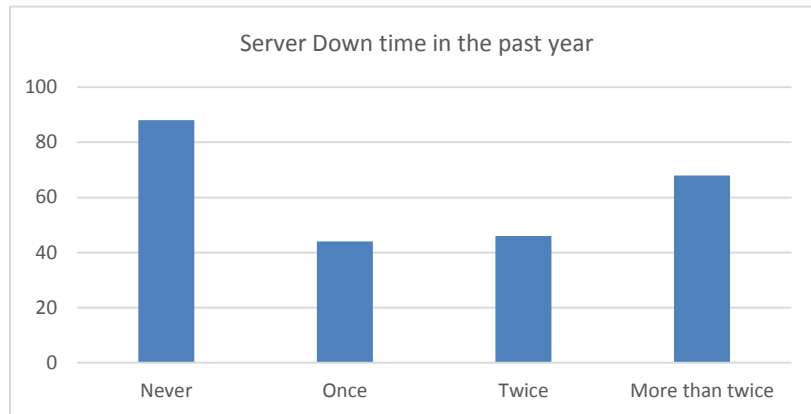
Information technology environment is one of the areas that attract high operational and capital investments costs for the company. The pressure put on the Head of IT to manage these costs is phenomenal considering the exponential growth of data and the need to have infrastructure to support this environment. A question posed to the panellists was what are the main challenges experienced with their IT environment and 68% of the panellists agree that an ability to predict running costs of IT is a key and predominant challenge as seen in table 4.11.

Table 4.11: Main Challenges facing IT Department

Main Information Technology Department Challenges	Very Unlikely		Unlikely		Likely		Very Likely		All	
	N	% of Total	N	% of Total	N	% of Total	N	% of Total	N	% of Total
Cost Predictability	39	15.92%	39	15.92%	144	58.78%	23	9.39%	245	100.00%
Inconsistent Availability	48	20.00%	49	20.42%	117	48.75%	26	10.83%	240	100.00%
Poor Support	46	18.85%	53	21.72%	128	52.46%	17	6.97%	244	100.00%
Uncontrollable Growth in Capacity	48	20.00%	60	25.00%	119	49.58%	13	5.42%	240	100.00%
Security and Compliance	35	14.40%	46	18.93%	136	55.97%	26	10.70%	243	100.00%
Non-scalable and Inflexible Investment	42	17.50%	60	25.00%	128	53.33%	10	4.17%	240	100.00%
Outdated and Incompatible with latest technology	47	19.58%	55	22.92%	121	50.42%	17	7.08%	240	100.00%

	Very Unlikely		Unlikely		Likely		Very Likely		All	
Main Information Technology Department Challenges	N	% of Total	N	% of Total	N	% of Total	N	% of Total	N	% of Total
Lack of Skill	43	17.84%	56	23.24%	116	48.13%	26	10.79%	241	100.00%

89% of the panellists say they know of Cloud Computing as can be seen in figure 4.22, and this creates an opportunity to investigate how this phenomenon can be used to address these challenges highlighted in the table above. There are still concerns regarding the costs and lack of skill or understanding. Although this is not a response from most panellists but it still comes up as a concern and needs to be taken into consideration if we want to investigate how Cloud Computing can be used to address the challenges faced by SME in South Africa.

Figure 4.22: Do you know of Cloud Computing?
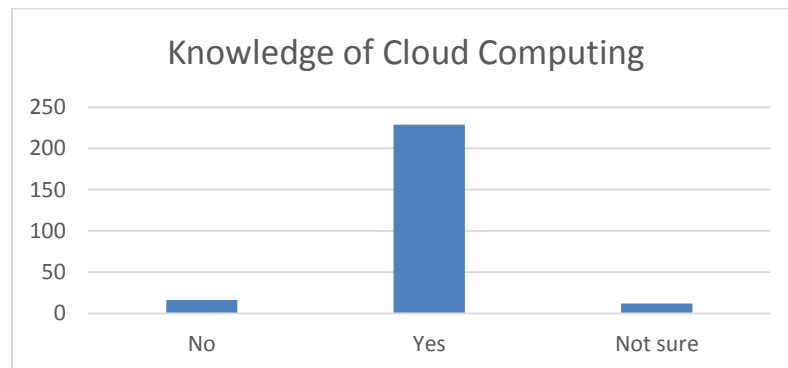
74% of our panellists state that Business Risk and Compliance are a major concern and potentially an inhibitor to embracing Cloud Computing according to our analysis of the results in table 4.12. This challenge is highlighting the technology gap we have in using Cloud Computing as the only solution to address Small and Medium Enterprise challenges in South Africa. If Cloud is to be embraced, a well thought out plan needs to be put in place to mitigate this challenge.

Table 4.12: Concerns regarding usage of Cloud Computing

Concerns about Cloud Computing	Very Unlikely		Unlikely		Likely		Very Likely		All	
	N	% of Total	N	% of Total	N	% of Total	N	% of Total	N	% of Total
Security and Control	37	14.92%	31	12.50%	121	48.79%	59	23.79%	248	100.00%
Latency and Performance	32	13.45%	40	16.81%	123	51.68%	43	18.07%	238	100.00%
Costs	27	11.07%	44	18.03%	121	49.59%	52	21.31%	244	100.00%
Data Sovereignty (Hosting data outside of South Africa)	33	13.58%	40	16.46%	123	50.62%	47	19.34%	243	100.00%
Lack of Skill and Understanding	30	12.10%	41	16.53%	143	57.66%	34	13.71%	248	100.00%
Business Risk and Compliance	30	12.30%	34	13.93%	133	54.51%	47	19.26%	244	100.00%
None of the above	41	30.37%	10	7.41%	71	52.59%	13	9.63%	135	100.00%

We deemed it fair to also ask the panellists on what they perceive to be the benefits of Cloud Computing, and what came out in table 4.13, supports the feedback received in one of the questions above where 89% of our panellists knew about Cloud Computing. 93% of the panellists agree that Cloud Computing is "Like and very likely" to provide Scalability on demand. This would be expected since a vast number of panellists who run their own datacentres stated that uncontrollable growth in capacity is the most pervasive challenge they experienced in the past year from the IT environment.

Table 4.13: Perceived Benefits of Cloud Computing

	Very Unlikely		Unlikely		Likely		Very Likely		All	
	N	% of Total	N	% of Total	N	% of Total	N	% of Total	N	% of Total
Agility (Speed to Market)	15	6.33%	14	5.91%	125	52.74%	83	35.02%	237	100.00%
Scalability (On Demand Availability)	9	3.83%	7	2.98%	119	50.64%	100	42.55%	235	100.00%
Flexibility (Pay as you use)	11	4.64%	11	4.64%	125	52.74%	90	37.97%	237	100.00%
Economical (Maximum return for Investment)	13	5.53%	23	9.79%	119	50.64%	80	34.04%	235	100.00%
Best Practice (Leverage Cloud Service Provider Expertise)	9	3.83%	20	8.51%	130	55.32%	76	32.34%	235	100.00%
None of the above	34	31.48%	2	1.85%	63	58.33%	9	8.33%	108	100.00%

4.7   Presenting the findings

This study's findings were organized by presenting conclusions addressing each research question. These conclusions were derived from the interpretation of the outcomes of the data analysis performed based on the survey data collected. To address the research questions, Cronbach Alpha Coefficient, Factor analysis and Bartlett's test for Sphericity procedures were applied separately to the identified constructs.

In this thesis, we are interested in key constructs being Government red tape, Growth in Employment, Crime, Access to Finance, and Information Technology. According to the Literature review, it is said that 63% of SMEs fail in the 1st year of operation and these constructs have been researched as major contributors to the SME environment and also the reasons why such a high failure rate is experienced. The relationship between Information Technology and its ability to address red tape, Employment, crime and access to finance is tested using quantitative research methods.

From the constructs above, a 38 questions survey was developed to assess whether these constructs apply to the South African SME environment and also if they can be accepted. The intention is to answer the key research questions specific for this project and our analysis will be guided by these questions.

THE FIRST RESEARCH QUESTION: What are Small and Medium Enterprise (SME) business challenges?

We can confirm that that SME key business challenges as were identified during the literature review were tested with the research instrument and were confirmed using factor analysis to ensure that we do not only limit our findings on the literature review. As was covered in the descriptive statistics, all key challenges achieved good reliability and will be accepted as we proceed to make recommendations on how to address them using Cloud Computing Technology.

Figure 4.23 confirms that red tape is a key and highest-ranking business challenge and further broken down into Value Added Tax, Unemployment Insurance Fund, Income Tax, Pay-as-you earn, Skills Development Levy and Workman's compensation to be more specific. Value Added Tax and Pay as you Earn which are both from the Receiver of Revenue scored high in terms of top red tape issues that affect small businesses. Several panellists noted that while SARS can efficiently collect revenue, it is less efficient at paying refunds or resolving problems. Difficulties in obtaining tax clearance certificates remained a source of frustration. Challenges associated with SARS have emerged as a key concern in every round of the annual survey. A common theme is the need for SARS to reorient its approach from one that is punishment-based to one that recognises the specific challenges that it imposes on small businesses, and works constructively with this sector to better business success.
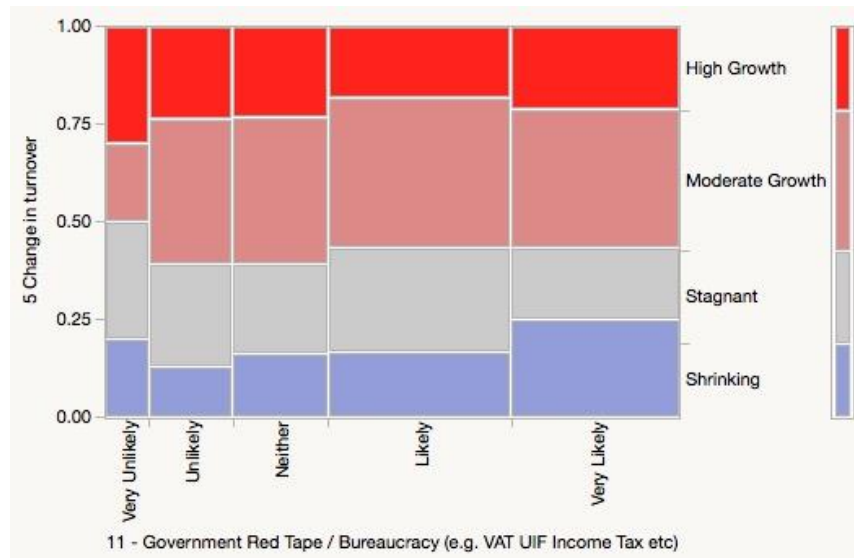
A panellist in the tourism sector, who had established his guest house because of a passion for the sector, remarked: "When I started, I wanted to be a host. Now I am an admin manager."

According to the Mosaic Plot diagram in figure 4.23, shrinking and stagnant firms were more likely than growing firms to say that red tape had increased, whereas high growth firms were more likely to report that the level of red tape had stayed the same.

In figure 4.24, we see that red tape Issues achieved Alpha Coefficient of 0.879 which is a good reliability score and the findings will be accepted for further recommendation.

Figure 4.24: Alpha Coefficient for Red Tape Issues

		α			
Entire set	0.879				
Excluded Col	α				
13 - Value Added Tax	0.8586				
13 - Unemployment Insurance Fund	0.8567				
13 - Income Tax	0.8561				
13 - Pay as You Earn	0.848				
13 - Skills Development Levy	0.8611				
13 - Workplace Compensation	0.8687				

To understand the direction that the Government red tape/bureaucracy is taking, we asked the panellists to assess whether red tape burden had increased, decreased or

stayed the same over the preceding year. A clear majority of SMEs (57%) believe that the red tape burden has increased, with 1% saying that it has remained constant.

Since Red tape is a broad term we wanted to get more context on the nature of red tape panellists are experiencing. Consequently we asked them to identify the chief sources of red tape burdens in 2016 by rating the statements on a 5-point Likert scale (1=Very Unlikely 2=Unlikely, 3=Neither, 4=Likely and 5=Very Likely) as can be seen in table 4.14.

Table 4.14 below shows the specific issues/challenges experienced on red tape.

Table 4.14: Issues experienced on Red Tape

	Very Unlikely		Unlikely		Neither		Likely		Very Likely		All	
	N	% of Total	N	% of Total	N	% of Total	N	% of Total	N	% of Total	N	% of Total
13 - Value Added Tax	39	15.66%	31	12.45%	70	28.11%	74	29.72%	35	14.06%	249	100.00%
13 - Unemployment Insurance Fund	50	21.83%	46	20.09%	90	39.30%	29	12.66%	14	6.11%	229	100.00%
13 - Income Tax	31	12.55%	29	11.74%	70	28.34%	75	30.36%	42	17.00%	247	100.00%
13 - Pay as You Earn	31	12.86%	37	15.35%	90	37.34%	59	24.48%	24	9.96%	241	100.00%
13 - Skills Development Levy	36	15.32%	40	17.02%	83	35.32%	54	22.98%	22	9.36%	235	100.00%
13 - Workplace Compensation	37	15.55%	37	15.55%	88	36.97%	47	19.75%	29	12.18%	238	100.00%

Considering the findings in table 4.14, we note that 47% and 43% of panellists feel that Income Tax and Value Added Tax respectively, are likely and very likely to be the chief sources of red tape in their businesses.

Of interest is those who reported Unemployment Insurance Fund (UIF) as very unlikely or unlikely to be a source of red tape to their business in the past year. The composite score for the construct red tape was calculated by taking the average of the 6 statements. A score between 1 and 5 is determined, where a score near 1 indicating very unlikely and a score near 5 indicating very likely. The histogram in figure 4.25 shows the distribution of the calculated red tape score.

Figure 4.25: Distribution of Red Tape Responses
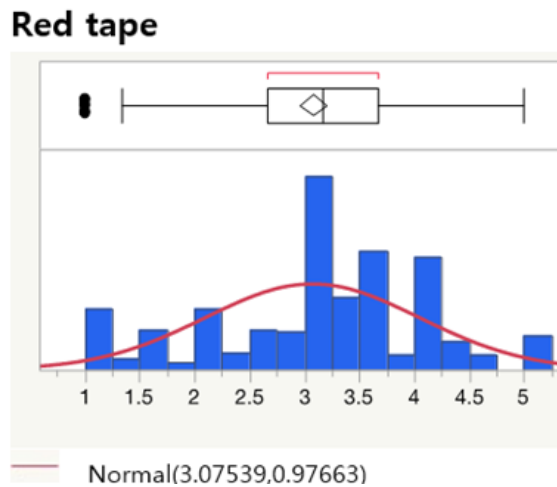
A mean score of 3.07 showing that most panellists score reside in the middle of the scale. Therefore, panellists are mostly undecided on red tape being a business challenge with Income tax and VAT seen as more likely and very likely to be a source of red tape.

To narrow down red tape issues, this finding shows that the first place to work on, in order to address the challenges faced by SMEs in South Africa is SARS specifically on Value Added Tax and Income Tax. Several panellists noted that while SARS can efficiently collect revenue, it is less efficient at paying refunds or resolving problems. Difficulties in obtaining tax clearance certificates remained a source of frustration. A common theme is the need for SARS to reorient its approach from one that is punishment-based to one that recognises the specific challenges that it imposes on small businesses, and works constructively with this sector to better business success.

The Cloud Adoption framework being developed through this thesis will delve deeply in identifying relevant applications Small and Medium Enterprise businesses can use to minimise the pain that comes with Value Added Tax and Income Tax.

THE SECOND RESEARCH QUESTION: What are SME Cloud Computing inhibitors?

This question is addressed during the Technology Adoption stage of our research tool/questionnaire. We are comfortable that our panellists understand Cloud Computing since 89% have answered yes when asked if they know Cloud Computing. 73% of the panellists stated that Business Risk and Compliance requirements are major concerns

when looking to embrace Cloud Computing. Secondly, 73% of our panellist's state that they are concerned about the Security and Control that comes with Cloud Computing. This is not surprising since Cloud Computing is built using the parameters identified by the Cloud Computing Service Provider and this does not take into account the risks and compliance factors a business has to comply with, or take into consideration when deploying Information Technology Infrastructure. Luckily our Cloud Adoption Framework will show different infrastructure deployment options being Public Cloud or Private Cloud deployments. Public Cloud is highly restricted and supports the concerns our SMEs have when looking at Cloud Computing but Private Cloud Computing Deployment model is more accommodating in that it can be deployed in the customer environment therefore mitigating the security and control concern business have about this phenomenon.

Figure 4.26 shows that Alpha Coefficient score achieved across the data set is 0.874 which is a good reliability score and we are comfortable that we can proceed to use this feedback to proceed further into our research. Security and Control can break the whole Cloud Adoption model as businesses will never take the risk of ignoring the regulator and much care should be taken to ensure a right balance is reached between business and compliance required. Lack of Skill and Understanding ranked very high within Moderate Growth and High Growth firms as to the reasons why they do not embrace Cloud Computing and this presents a great opportunity for Cloud Service Providers to engage and ensure interventions are put in place to address the concerns we see in the Small and Medium Enterprise Market segment.

Figure 4.26: Alpha Coefficient on Cloud Computing Inhibitors

	α	
Entire set	0.8746	

Excluded Col	α	
37 - Security and Control	0.8457	
37 - Latency and Performance	0.8496	
37 - Costs	0.8794	
37 - Data Sovereignty (Hosting data outside of South Africa)	0.8363	
37 - Lack of Skill and Understanding	0.8642	
37 - Business Risk and Compliance	0.8396	

The usage of Software as a Service remains a big opportunity since 30% of panellists agree to using ERP in addressing some of their business application requirements and herein lies a solution to address identified challenges. For example, ERP applications have the ability to automate tax compliance and minimise audit issues which will in turn address the challenges highlighted in the first research questions discussed above. SAP, Oracle, Sage and other application providers already have applications in place both running on premise and in the Cloud and immediately available for consumption. 90% of the panellists stated that they like the cost flexibility brought about by Cloud Computing payment model and this must be explored further to assist in mitigating the Cloud Fear.

> **THE THIRD RESEARCH QUESTION:** How should Cloud technology be used to meet information technology challenges of the SME market?

During Literature review stage of this thesis, Cloud Computing was defined as "a large distributed computing paradigm driven by economies of scale in which a pool of abstracted, virtualized, dramatically-scalable, managed computer power, storage, platforms and services are delivered on demand to external customers over the internet" (Forster, Zhao, Raicu, and Lu, 2008).

Our research analysis stated clearly that business challenges in this thesis revolve around Government red tape predominantly within SARS. This issue is interlinked with other challenges highlighted by this thesis being Labour Legislation, Lack of Skills, Crime, Lack of Innovation and Lack of Access to funds. All these challenges can be addressed by

Technology applications which are readily available from Global Service Providers like SAP, Oracle and Sage to mention a few. Since 62% of our panellists do not have own IT department and have experienced server down time in the past year, Cloud Computing become an attractive option to consider when addressing these challenges. Cloud Computing by its definition has the ability to deliver IT services on demand thereby taking away the potential to have server downtime and also the sense of comfort that IT capacity forecasting issue will not be a problem going forward.

The profile our Small and Medium Enterprise businesses show that only 58% of them have yielded a positive growth between 2015 and 2016 and 67% have also stated that it is becoming harder to operate businesses in South Africa. 89% of these panellists know of Cloud Computing but 30% of them use ERP. Our Cloud Adoption Framework should assist Small and Medium Enterprise businesses with a way in which technology can be used to address for example, SARS Tax Compliance issue by leveraging technology like SAP Business One which is a Cloud Computing based product targeting Small and Medium Enterprise businesses. Sage Accounting Package solution is also another option a small business can use to automate Tax Compliance processes and remove the poor experiences when dealing with SARS red tape.

Figure 4.27 derived from our research instrument, shows that our panellists reported what they perceived to be the benefits of Cloud Computing and the results came out with good reliability recording Alpha Coefficient score of 0.9163. Scalability (on demand availability) came out strong and this supports the challenge faced by IT department who reported that they have experienced Datacentre outage more than once in the past year.

Figure 4.27: Alpha Coefficient of Cloud Computing Benefit

	α	
Entire set	0.9163	

Excluded Col	α	
38 - Agility (Speed to Market)	0.8955	
38 - Scalability (On Demand Availability)	0.8923	
38 - Flexibility (Pay as you use)	0.8911	
38 - Economical (Maximum return for Investment)	0.9046	
38 - Best Practice (Leverage Cloud Service Provider Expertise)	0.9041	

Solutions to address other challenges like lack of skill, training, crime, innovation and the rest, are all available in the Cloud Computing world but this issue is addressing the basic requirements of infrastructure needed to address business challenges. In our Cloud Adoption Framework, we will highlight specific applications available in Cloud Computing to meet these challenges and why we believe these should be relevant for the SME business.

> **THE FOURTH RESEARCH QUESTION:** To what extent can Cloud technology be used to address SME challenges?

As can be seen from above, Cloud Computing has benefits for business but there are glaring limitations which could impact on achieving full benefits by the Small and Medium Business Market. Our panellists show that cost is a major issue regarding Cloud Computing. Although Cloud Computing costs are on a pay and use basis, it does have impact on other adjacent technologies like Network Bandwidth costs, Training and Development costs (as this is a new skill), new security features to be added as a result of Cloud utilisation, and so forth. These are all included in the cost of running IT department and Cloud Computing pay as you use model does not take these into account. This feedback shows good reliability as the Alpha coefficient score is 0.87 and we accept this feedback and will use it going forward on the recommendations.

For businesses that have sensitive data that should not be stored outside the country or even outside of the business premises, Data Sovereignty is a real issue and has impact on the extent in which Cloud Computing can be used. Panellist's alpha coefficient score is 0.863 on Data Sovereignty and showing good reliability of this feedback. We need to take these into account when suggesting a way forward to ensure usage of Cloud with caution and also mitigating any risk that may be associated with Cloud Computing. Figure 4.28 show that it is predominantly businesses with Moderate and High Growth that reported Data Sovereignty as a limitation in using Cloud Computing and innovation is required to ensure this is mitigated by either using Private Cloud capability or accepting that Cloud Computing is not feasible at all for these businesses.

Figure 4.28: Data Sovereignty Growth Trajectory
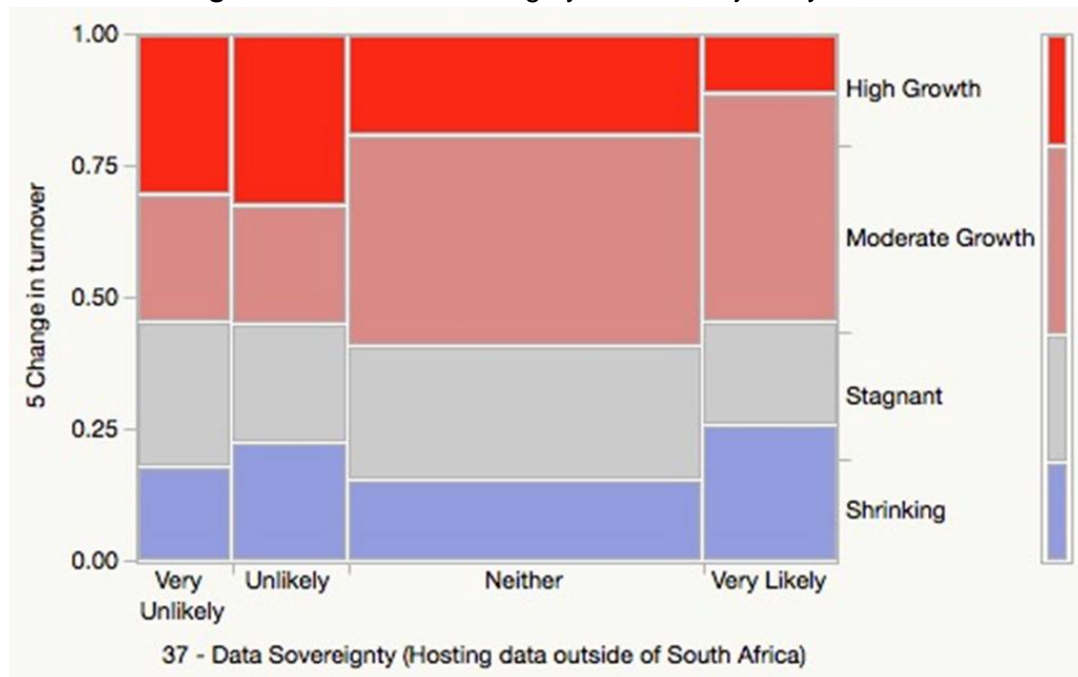
There is limited extent in which Cloud Computing can be used and SMEs can never look to Cloud Computing in order to address all their business challenges. A consideration must be given to the environment in which the SME operates in, starting from the business environment which have its own compliance and governance requirement. These will differ from business to business depending on the industry and type of business we are looking at. If the business is operating in the financial sector the need for compliance with data protection will be higher than when the business is operating in a less regulated environment.

THE FIFTH RESEARCH QUESTION: What are the technology gaps in addressing SME business challenges?

To understand the technology gaps and the experiences of panellists from using technology in the workplace, we asked them to identify key challenges facing their Information Technology environment. In figure 4.29, it is evident from the distribution curve that a majority of panellists are sitting in the middle of the distribution curve showing they are likely or very likely to have experienced IT challenges ranging from inconsistent

availability, unpredictable costs due to exponential growth in data storage, lack of support from service providers, security issues to mention a few.

Figure 4.29: Response Distribution Curve on IT Challenges
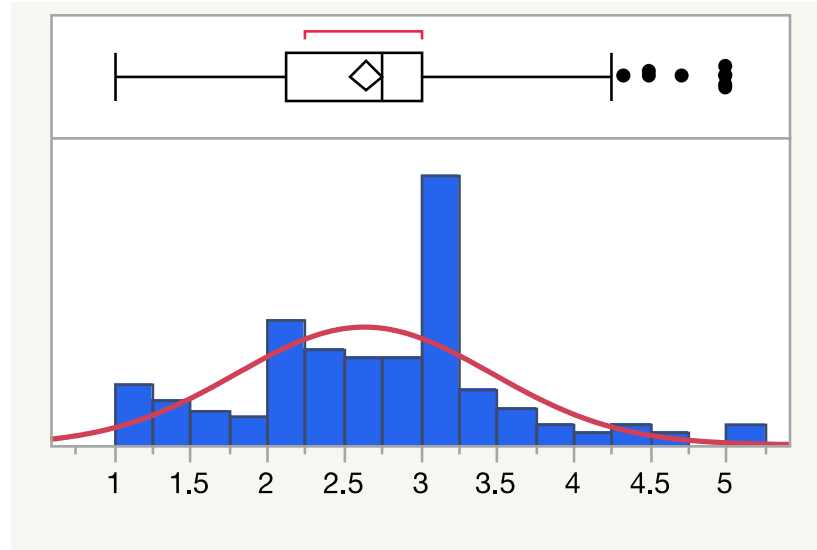
In Table 4.15, we are drilling deeper on the feedback from this question, and a clear majority (68%) are finding IT cost predictability to be a challenge followed by security and compliance challenge at 66%.

Table 4.15: Challenges with IT Department

	Very Unlikely		Unlikely		Likely		Very Likely		All	
	N	% of Total	N	% of Total	N	% of Total	N	% of Total	N	% of Total
Cost Predictability	39	15.92%	39	15.92%	144	58.78%	23	9.39%	245	100.00%
Inconsistent Availability	48	20.00%	49	20.42%	117	48.75%	26	10.83%	240	100.00%
Poor Support	46	18.85%	53	21.72%	128	52.46%	17	6.97%	244	100.00%
Uncontrollable Growth in Capacity	48	20.00%	60	25.00%	119	49.58%	13	5.42%	240	100.00%
Security and Compliance	35	14.40%	46	18.93%	136	55.97%	26	10.70%	243	100.00%
Non scalable and Inflexible Investment	42	17.50%	60	25.00%	128	53.33%	10	4.17%	240	100.00%
Outdated and Incompatible with latest technology	47	19.58%	55	22.92%	121	50.42%	17	7.08%	240	100.00%
Lack of Skill	43	17.84%	56	23.24%	116	48.13%	26	10.79%	241	100.00%

In table 4.16, it is also interesting to see that when panellists were asked to share their concerns on Cloud Computing usage, 73% stated that Security and Control were major concerns as Cloud Computing does require that control be relinquished to the service provider hence positing a potential risk to the business. The majority of the panellists also

mentioned costs (71%) and also Business risk and compliance (74%) as can be seen in the table below.

<div align="center">Table 4.16: Cloud Computing Inhibitors</div>

	Very Unlikely		Unlikely		Likely		Very Likely		All	
	N	% of Total	N	% of Total	N	% of Total	N	% of Total	N	% of Total
Security and Control	37	14.92%	31	12.50%	121	48.79%	59	23.79%	248	100.00%
Latency and Performance	32	13.45%	40	16.81%	123	51.68%	43	18.07%	238	100.00%
Costs	27	11.07%	44	18.03%	121	49.59%	52	21.31%	244	100.00%
Data Sovereignty (Hosting data outside of South Africa)	33	13.58%	40	16.46%	123	50.62%	47	19.34%	243	100.00%
Lack of Skill and Understanding	30	12.10%	41	16.53%	143	57.66%	34	13.71%	248	100.00%
Business Risk and Compliance	30	12.30%	34	13.93%	133	54.51%	47	19.26%	244	100.00%
None of the above	41	30.37%	10	7.41%	71	52.59%	13	9.63%	135	100.00%

The findings above show that Information Technology can never be architected in a manner that meets the specific requirements of business risk and compliance standards unless deployment happens within the business' own IT environment. The risk with deploying IT in own environment has also been highlighted since 47% of all panellists who have own datacenters experienced server downtime more than twice in the past year.

Cloud Computing is a shared infrastructure built on standard specifications to allow for economies of scale and any effort to custom make it in a manner that meets all business requirements will render this model unprofitable and ineffective.

To be specific, the identified technology gaps for Cloud Computing are lack of customization, inability to provide full control rights to the business user in terms of access to their data, lack of transparency on application and operating system deployment and most importantly, inability to predict usage capacity due to high bandwidth consumption of this technology.

4.8   Resulting framework from the analysis

A preliminary framework is shared in chapter two after the review of published literature on "The role of Cloud Computing in Addressing SME Business Challenges in South Africa". The results from the research are used to enhance the resultant framework. Figure 4.30 below represents the resulting Cloud Adoption Framework from quantitative analysis findings. It also includes the information technology building blocks structure to support an approach to be followed in addressing challenges faced by Small and Medium Enterprise business in dealing with their daily challenges within their operating environment. When looking at the Cloud Adoption framework starting from the base infrastructure being platform as a service at the bottom of the diagram, infrastructure as a service, software as a service and ultimately SME business challenges at the top of the diagram, the study will answer the critical question:

- **How can IT in the form of Cloud Computing address the challenges faced by SMEs in South Africa?**

The following research questions needed to be answered in our study to address the main research question, and a questionnaire was designed to answer the following questions which assisted in the formulation of the resultant Cloud Adoption Framework.

1. What are the small medium enterprise business challenges?
2. What are SME Cloud Computing inhibitors?
3. How should Cloud technology be used to meet IT challenges of the SME market?
4. To what extent can Cloud technology be used to address SME challenges?
5. What are the technology gaps in addressing SME business challenges?

To answer the main research question, the proposed Cloud Adoption Framework focus is on the circles that represent the pillars of the TOE Model. The three pillars being Technology, Organisational, and Environmental areas of the business are forming the most important glue to the framework.

Technology Context

In our research, 65% of the panellists have experienced server down time. This finding is an important motivator to consider Cloud Computing and give the responsibility of your IT environment to the experts that can also provide the required service level agreements based on your affordability. The SME has a choice on whether they use only the Platform as a service, Infrastructure as a service or Software as a service from the likes of Google, SAP, Netsuite etc. to meet their needs. For example, in order to address the Lack of skills issue, where 71% of SMEs say there is inadequate skills and this prevents them from hiring, an SME can employ Cloud Collaboration applications for training and information sharing from leading vendors like Microsoft. This will help mitigate the lack of skill, as one example.

One can hardly look at addressing IT challenges without taking a deeper look into the three pillars and assess whether the organization is fit to start the journey to the cloud. Once the SME understand the business challenge they need to address, a good place to start is to investigate what technologies are available to address this particular challenge. The *Technology context* clearly demonstrates the link to all SME business challenges and the emphasis is whether technology can be used to gain relative advantage when dealing with the identified challenges. All these business challenges have technology solutions and Cloud Migration Model processes as was proposed by Carcary, Doherty, and Conway 2014, need to be applied in conjunction with this adoption framework to get the best experience for small firms. Research question 1, 2 and 3 are addressing the relationship between Environmental elements of the SME business.

Environmental Context

60% of the panelists say that Red Tape hinder growth of their business. 47% state that SARS is the biggest source of Red Tape. This business environment is not conducive as it is a deterrent for SME to conduct business and can also be time consuming. The main pain point areas discovered from the research is that 43% and 47% of respondents say that VAT and Income Tax respectively hamper growth. These finding are clearly answering question 1 and 2 and 4 and in order to answer question 5 of the research, we recommend Cloud Solutions by Business Design ERP solution from SAP. This solution

is able to provide a single cloud ERP solution for fast-growing, mid-market businesses to scale and compete without the complexity and cost. Connect every function across SME business environment to time-tested best practices and in-depth analytics. Some of the key features of this solution is, shared hardware, quarterly releases, upgrade dates determined by SAP, minimum tenants: 1 and most importantly for SMEs it can accommodate a minimum of 20 users. This solution can address SME challenges to the extent which is confined within the parameters of the defined features depending on the size of the SME.

Organisational Context

The key finding here is that 3% of SMEs surveyed have been operating for less than 2 years. This shows that we are dealing mainly with matured businesses that have gone past the survivalist's stage and have experience in running a SME business. 48% of them have experienced cash flow problems in 2015. This context is important to understand in order to answer question 4 and 5 of our research study. Not all organization are the same nor governed by the same regulations and internal risks and compliance procedures. Cloud Computing has risks and this need to be considered when looking to resolve business challenges.

Organisational context is addressing the decisions taken by the firm in how to deploy Cloud technology leveraging off Software as a Service, Infrastructure as a Service and also Platform as a Service. Many dependencies determine the way in which businesses go to Cloud Computing and as per our research finding some are Cost, Compliance, Business Risk, Security, Control and so forth. Mission critical solution like ERP are not easy to give away to a Cloud Service provider but the decision needs to be made as to whether emphasis is based on addressing the business challenges or to limit exposure and risk as stated when reviewing the dependencies mentioned above.

It is critical for the business to understand and operate within their own parameters of Cloud Computing so that they don't fall in the trap of consuming Cloud Computing using service provider definitions that do not comply with their internal and industry requirements.

SME Business Challenges

Since all six main constructs are highly correlated among themselves, it implies that all the factors must be taken into consideration when embracing Cloud Computing technology in addressing key SME challenges. These factors cannot operate in isolation. The Cloud Adoption Framework has inputs from the Cloud Computing Architecture which basically splits information technology services into three; being Infrastructure as a Service, Software as a Service and Platform as a Service. Software as a service is key in ensuring that the user interface gives a good experience in addressing SME challenges. Based on the analysis, it was clear that businesses need the service to be flexible in terms of IT deployments to meet their compliance requirements, hence it was necessary to build in Infrastructure as a service options into the model. Customers can choose a private Cloud or a Public Cloud deployment model depending on the level of customization required by the industry regulator or the business policies themselves.

Our Cloud Adoption Framework synthesised from the research reported on in this work is depicted in figure 4.30.

Figure 4.30: Cloud Adoption Framework (synthesised by the writer)
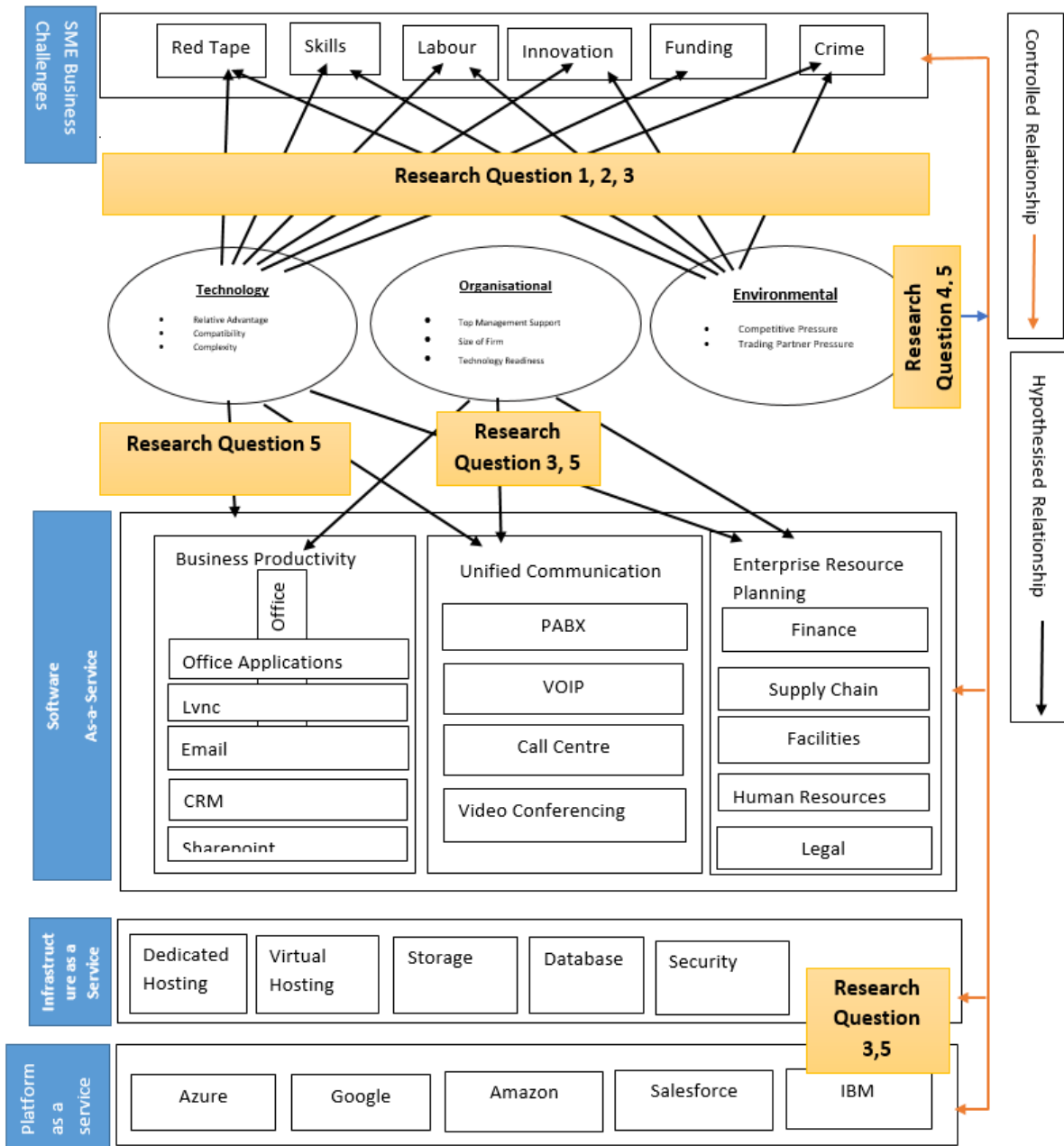
Through the black arrows in the diagram, our hypothesis is that Cloud Computing can address SME business challenges and this relationship was tested using the research instruments and hence the development of the framework. The relationship does exist with all the hypothesis identified, however; careful consideration should be taken when embracing Cloud Computing as there are dependencies that businesses must take into

account when making Cloud and Technology decisions in an effort to address their business challenges.

4.9 Discussion of the Cloud adoption framework

There exist very strong correlations among all 6 SME Business challenges, namely; Regulation, Lack of Skill, Labour Legislation, Lack of Innovation, Lack of Access to Funding, and Crime.

Red Tape

The model above shows that in order to address Government red tape that forms a strong part of Regulation, Software as a Service in the form of Enterprise Resource Planning (ERP) is available to Small and Medium businesses. Within ERP and specifically looking at the finance component of the model, suppliers like Oracle have Budgeting, Planning and Forecasting automation solutions which can be consumed from the internet without any customization required on the local PC. This is like consuming services like Facebook and LinkedIn but this is specifically for businesses. All users in the business will be provisioned to this service and have access to tools that can help with record keeping and most importantly configured to aligned with SARS requirements in relation to Tax Compliance. The manual capturing of transactions and desperate need to balance the booked so a business can claim for VAT (Value Added Tax) will be a thing of the past when these solutions are rolled out.

Lack of Skill

71% of SMEs surveyed state that inadequate skill prevent them from hiring employees. Lack of tools and technology therefore creates a need to invest in people capable to deliver requirements of the business. Technology companies can bridge the gap for skill. For example, in the efforts to meet the Tax requirements, the business would have to employ a chartered accountant to assist in managing the affairs of the business but in the case where processes are automated, reliance on human intervention becomes minimal and Cloud Computing is relevant in addressing these.

Labour Regulations

Labour issues that came out of this study revolved specifically around the speed in which labour laws are changing and the need to keep up and comply will the laws introduced by the government. 54% of our panellists stated that Labour Legislation is a challenge in their business. 17% of the panellist's state that they don't know if they comply with all the regulations and 26% said they are not sure. This makes it difficult for business to manage people hence the Commission for Conciliation, Mediation and Arbitration (CCMA) is bombarded with employer/employee relation issues and the requirement for mediation is high due to lack of understanding and interpretation of the law. People management is an administration intensive exercise if there are no processes and record keeping for staff training and development, equality in salary in line with the law, diversity at work, Unemployment Insurance fund and so forth.

When referring to the Cloud Adoption Framework under Enterprise Resource Planning (ERP) we see Human Resources offering available to businesses in order to address some of the issues that came out of this study. Oracle and SAP to mention a few, have Human Capital Management Solutions that integrate very well with Finance to manage payroll, staff attendance, recruitment automation, incentive bonuses, performance management and dismissals. All these capabilities can be mapped out to the exact requirements of the business and in line with the regulatory requirements. The pain of manual interventions and need to keep up with regulatory changes are minimized since the service providers are responsible for software upgrades anytime there is a change in regulation and this happens at no cost or knowledge of the user.

Lack of Innovation

58% of our panellists feel that the South Africa environment is conducive for innovation. When asked, what is most important to the innovation efforts of your firm, 91% stated that clients are the most important followed by information sharing within firm at 82%. In the Cloud Adoption Framework model, we have covered the need for Unified Communications with main emphasis on VoIP (Voice over IP). This capability is linked with the business productivity tower which offered collaboration capability in the form of

Email, SharePoint and Lync. SharePoint collaboration capability is built into office documents like PowerPoint and word where users working on a document can update and edit the same document hosted on SharePoint on a real-time basis. This capability is not only limited to the business internal users but can also be extended to clients who interface with the business daily. The ability to collaborate is a perfect environment for innovation, and technology can make this possible.

When asked on what innovation was made in the past year, 17% of the panellists state that no innovation was made at all and 16% only did process and distribution innovation. This is concerning considering that more than half of the panellists agree that South Africa is conducive for innovation. CRM is also mentioned in the Business Productivity tower of the model under Software as a Service and this capability is very good in ensuring that customer experience is enhanced to benefit the business. The ability to capture birthday information and interest for your customers can help in ensuring that important days are acknowledged. Most importantly, the ability to deliver relevant solutions/products to your customers due to access to customer insights on their behavior, preferences, profiles and so on, is made available by robust Customer Relations Management (CRM) solutions made possible by IT service providers like Sage, Saleforce.com to mention a few.

Crime

The risk with Cloud Computing is cybercrime and this has come up as one of the concerns users have about this phenomenon. Crime and Security of information highlight the challenge businesses continue to have about theft of information and potential hacking of the network by competitors or enemies of the company. The model has embedded Cybercrime as part of the considerations when moving to Cloud Computing. The level of security should not be at the network level only but should cut across all service levels of the Cloud (Software and Infrastructure). Application security, Desktop/Device security, Website security, Mobile and fixed network security should all form part of the consideration when looking at the framework.

4.10 Chapter summary

Six categories were used to present this chapter starting with the profile of the panellists, business growth of the panellists, descriptive statistics on the key challenges for Small and Medium businesses, presentation of the findings focusing mainly on the research questions, analysis of the framework developed, and finally, the discussions on the framework.

The chapter started with highlighting the profile of panellists who were selected using three categories being those that employee not more than 200 employees, generate not more than R26M in revenue per annum, and must be registered with South Africa Receiver of Revenue Services (SARS) and also Companies Intellectual Properties Commission (CIPC). The database was pulled from iFeedback base of Small and Medium Enterprise customers and 265 companies responded to this survey. 56% were from Gauteng, and we also noted that 48% are in Business Services sector of the SME base.

From the survey, we confirmed that SME challenges are Government red tape, labour legislation, lack of skill, access to funding, lack of innovation and crime - all in order of magnitude. 60% of the panellists state that red tape is the most prominent challenge faced by SMEs and more specific to this is the difficulty of dealing with SARS on Income Tax and Value Added Tax issues. 54% state that Labour Legislation is a second most challenging area in their business due to lack of understanding of the regulatory requirements. This issue is closely connected to the other challenge being lack of skill, since businesses struggle to hire people because there is a lack of skill in South Africa in order to address some of the challenges faced by this business environment.

67% of the panellists confirmed that they have not invested in their business in the last year with 53% stating that they have not applied for finance at a bank for fear of being rejected. Again, the lack of skill issue cannot be removed from this hence the emphasis throughout the chapter on the interconnectedness of the challenges facing the SME market.

Enterprise Resource Planning (ERP) is a key technology that can help businesses mitigate the lack of skills by automating processes and minimising the pain for SME

businesses. Only 30% of the SME market use ERP AND 62% do not have own IT department. Of great concern is that 65% of the panellists have experienced server down time at least once in the past year. Cost predictability of the IT environment has been shared as the main concern when running IT on premise and also as a benefit when looking at Cloud Computing.

The Cloud Adoption Framework has been developed to include all SME challenges which can be addressed by using the three pillars of technology, namely; Business Productivity Pillar, Unified Communications Pillar and the Enterprise Resource Planning pillar. All these pillars are dependent on each other to address these challenges and the model has been explained thoroughly as to how each challenge can be attended to using these pillars.

Chapter 5 which follows next, presents the conclusion to the thesis.

CHAPTER 5 – CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

Chapter four covered research findings and went deeper in articulating challenges faced by the SME market in South Africa. Clear and precise presentation of challenges based on information from the surveyed panellists was shared. A correlation between Cloud Computing and SME business challenges was tested using the research survey and face to face interviews.

This is the last chapter of the research project and a very important chapter as it provides a much needed end to the research journey. We begin with a reflection on the research problem and cover research questions as was discussed in chapter one. A high-level discussion on the reasons why SMEs fail is covered to set the scene for the recommendation and conclusions of this study.

We could never conclude this study without an appreciation of the role other researchers played on the Cloud Computing and SME business challenges topic, hence a reflection on literature review and determining the contribution made by this study to the body of knowledge. Research methodology and summary of research findings are also covered in this chapter to ensure enough context is provided before suggestions can be made on future research opportunities emanating from this project.

Key learnings are also shared on the challenges that faced us during this project. The aim is to ensure that other publishers are aware of possible hindrances to research projects and suggestions are also made on how to mitigate them. Finally, the chapter is concluded on clear guidance regarding future research opportunities that could come from this project.

5.2 Background

This thesis was motivated by Roberts (2010) who found that 63% of SMEs in South Africa do not make it past second year of operation. To expand further on this problem, we reviewed literature to understand key business challenges experienced by SMEs in South Africa which contributed to this high failure rate; and these were red tape, labour

legislation, lack of skills, lack of innovation, impact of crime, and lack of funds. The research project aimed to answer a key question being "How can Information Technology, in the form of Cloud Computing be used to address the challenges faced by Small and Medium Businesses in South Africa?"

To ensure that this question has been addressed by prior research practitioners and look for an opportunity to make a unique contribution to the published knowledge, we reviewed published research work by amongst others Gumbi & Mnkandla, (2015); Carcary, Doherty & Conway (2014); and Li, Zhao & Yu (2015). We referenced the TOE model and added SME key business challenges with emphasis on the use of case scenarios instead of Cloud Computing technology from a technical perspective, like all other publishers have done. This is the unique contribution we have brought into the study as was demonstrated through a model which would be covered in the body of the text.

The definition of Cloud Computing was clarified to ensure it meets the requirements of SME segment in their efforts to address business challenges identified. For this, we leveraged on Mell & Grance's (2011) definition, characteristics and service models. SME definition was also key in reaching our conclusions and recommendations since there are diverse views of what makes up a Small and Medium business in South Africa.

National Small Business act of 1996 defines SME as "a separate and distinct business entity including cooperative enterprises and non-governmental organisations, managed by one owner or more which, including its branches or subsidiaries if any is predominantly carried on in any sector or subsector of the economy i.e. Agriculture, Mining, Manufacturing, Electricity, Construction, Retail, Motor Trade, Wholesale, Tourism, Finance and Community Service. This definition was suitable to start with setting panellist profile parameters for the research project. Through judgmental sampling method, 265 panellists were reached. 56% were from Gauteng. 60% of the panellist's state that red tape is the most prominent.

67% of the panellists confirmed that they have not invested in their business in the last year with 53% stating that they have not applied for finance at a bank for fear of being rejected. Only 30% of the SME market use ERP and 62% do not have own IT department.

Of great concern is that 65% of the panellists have experienced server down time at least once in the past year. Cost predictability of the IT environment has been shared as the main concern when running IT on premise and as a benefit when looking at Cloud Computing.

Panellists profile, key business challenges, Cloud Computing and SME definitions, were all used to make recommendation on how key business challenges could be addressed.

5.3   Contributions to theory

Various literature publications were reviewed to understand the role our research will be playing in contribution to the body of knowledge. Amongst all literature reviewed, we looked at a few recent publications on Cloud Computing and used these to qualify our unique contribution to the knowledge base of this topic. We started off by reviewing work published by Gumbi, Mnkandla (2015) who studied several SMEs within the City of Tshwane Metro Municipality in RSA to establish the extent to which they comprehend Cloud Computing concepts and key terms.

The findings of this study reveal that SMEs do not understand the basic key terms and concept of Cloud Computing. They do not understand the fundamental building blocks of Cloud Computing such as the applicable service models (SaaS, IaaS and PaaS) and deployment models (Public Cloud, Private Cloud, Community Cloud and Hybrid Cloud). The findings of the study also revealed that SMEs do not understand or are not clear about the benefits of Cloud Computing. This led to the conclusion that it would be challenging to realise the benefits of Cloud Computing without comprehending the basic tenet and or building blocks upon which Cloud Computing is fundamentally based.

The key difference between Gumbi, Mnkandla, (2015) and our research is that 93% of our panellists agree that Cloud Computing is beneficial and the main attraction is that it can scale. Our panellists are knowledgeable on Cloud Computing and understand the difference between Cloud Computing and owning IT infrastructure in-house. The reason here could be the profile of panellists targeted as our project seemed to attract mainly those that have been in business for more than ten years and employing between 6 to 20 people within South Africa. This difference is a new perspective we bring into the body of

knowledge published recently. The unique contribution here is what do Small and Medium businesses say about Cloud Computing and how it is positioned in addressing their clearly defined business challenges.

Carcary, Doherty, & Conway (2014) emphasized the need to put in place Cloud Adoption Model using the Cloud Readiness model and the Cloud Cycle Management framework as the basis for their research project. They examined the depth of preparation SMEs undertook prior to migrating to the Cloud environment suggesting there is a substantial gap between what is published in literature regarding steps to support Cloud Computing adoption and what is implemented in practice by the SME community. Carcary, Doherty, and Conway, (2014) argue that SMEs don't do any preparations and it is in their nature to be less formal and organised when it comes to embracing Cloud Computing.

The limitation in this study is that it is more internally focused as it only looks at how SMEs' should implement and embrace Cloud in their business. It does not consider the external factors that hamper growth of SME sector in South Africa. This thesis's contribution is at a much higher level in approach that seeks to understand what the challenges are for SMEs in order to motivate for Cloud Computing as a solution. We are uniquely contributing much needed context as to the reasons why SMEs will find Cloud Computing attractive. It is not about offering technology as a stand-alone but to put more emphasis on the challenges faced by SMEs and recommending relevant solutions made available through Cloud Computing to ensure Cloud Adoption.

Li, Zhao & Yu, (2015) imply that vendors should build Cloud service trust by distinguishing advantages of their Cloud service and by establishing strategic alliances with existing users in the market to attract potential clients. The model used is that of TOE for SME and how elements of trust can be used to enhance the model. Their publication attempts to 'explain Cloud service transformation in Small and Medium Enterprises (SMEs) based on technology-environment-organisation paradigm and understand the role of Cloud service trust in transformation process' has found that Cloud service trust has a significant positive effect on the SMEs' Cloud service transformation intention. The second finding is about significant influences of technological drivers (reliability and information security), environmental drivers (institutional pressure, structure assurance, and vendor scarcity)

and entrepreneurship on SMEs' Cloud service trust. Further, the authors found mediating effects of trust on relationships between external drivers and Cloud service transformation.

It is understandable that trust will play a key part in embracing Cloud Computing since this phenomenon is new in the market and enough content is available on the positives and the negatives. We agree that trust is important in this aspect but of most importance is how relevant Cloud is in addressing a pain point. It is our belief that there is a relationship between SME key challenges and Cloud Computing and to position Cloud Computing, one has to lead with a business challenge that needs to be addressed instead of leading with Cloud Computing as a solution.

The unique contribution on this study is to add the need to review each business challenge and recommend relevant solutions for these particular challenges facing SME market. The research work published by Li, Zhao, Yu, (2015) is necessary and needed but the missing aspect is the pain in which it is meant to address i.e. red tape, Lack of Funding, Lack of Innovation, and so forth. Our belief is that this approach will add more credibility and improve the level of trust higher than it would if Cloud Computing was addressed in isolation excluding its relevance to the business challenges.

We also looked at the growth aspect of Small and Medium Enterprise businesses using resource based view of a firm; Strategic Adaption of a firm; and TOE models. These models were looked at in the context of how they could be used in parallel with technology to assist with growth of a firm. After critical review of all models, we found that TOE model is closer to addressing the challenges of SME when applied correctly.

The unique contribution the writer brings into this body of knowledge is to add more emphasis on the SME business challenges and how they can be made relevant in the Technology, Organisational, and Environmental context.

The resource-based view of the firm was criticized on the basis that it is not only the resources of the firm that enhance competitiveness but the external forces, above average returns, and impact of the external forces amongst others. This posed a limitation

to this business model in its ability to address the need to succeed in the Small and Medium Enterprise market as it ignored external factors that affect growth of firms.

Strategic adaption of the firm was also reviewed. Its focus is to change the posture of the firm to achieve better fit between organisation and its environment. It is criticized for its limitation to drive market share as it is hindered by its dependency on company resource optimization/changes like products, services, customer profile, marketing, distribution, personnel, finance systems, changing plant requirements and so on. The critics state that to dominate share, market share acquisition methods must be pursued aggressively including but not limited to mergers and acquisitions, vertical alignments up the value chain or market collusion. Also, firm abilities are essential to facilitate adaptive strategies.

Contrary to research work conducted by Li, Zhao, Yu, (2015), relative advantage is not a barrier to Cloud Computing. Trading partner pressure is also not a determinant of Cloud Computing as stated by Li, Zhao, Yu, (2015) when reviewing the TOE model. In our research instrument, panellists were asked to share their concerns with Cloud Computing and 73% stated that business risk and compliance are a major concern and potentially an inhibitor to embracing Cloud Computing. On the other hand, 93% stated that Cloud Computing is likely or very likely to provide scalability on demand which is a strong determinant of Cloud Computing in our view.

5.4   Conclusions of the study

Because many Small and Medium businesses in South Africa do not make it past the second year of trading with failure rates as a high as 63% (Roberts, 2010); the aim of the study was to investigate how Information Technology in the form of Cloud Computing can be used to address the challenges faced by Small and Medium businesses in South Africa. Six factors were identified from this study which inhibited the growth of Small and Medium businesses in South Africa and these are Government red tape, lack of skill, labour regulations, lack of innovation, impact of crime and access to funding.

Since Cloud Computing is a technology offering, we reviewed published literature and amongst others looked at the TOE Model (Technology, Organisational, and

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Environmental Contexts) to understand and test the determinants and also barriers to Cloud Computing usage by the SME businesses in South Africa.

The research conclusion is that there is a relationship between Cloud Computing, Small and Medium Enterprise businesses and the environment in which they operate which makes it difficult for SMEs to conduct business in a manner that will enable growth. The type of SMEs in our panellist base contributed immensely in reaching this conclusion and the results could have been different if the parameters used to select the SME profile were to change, hence this thesis does not infer that these results can be used exclusively while ignoring other views from the literature.

Figure 5.1 below is an attempt to summarise the position of this thesis when looking at the TOE model, Cloud Computing, SME market and the Key Business Challenges faced by these businesses.

Figure 5.1: Integrating Business Challenges to TOE and Cloud Computing (synthesised by the writer)
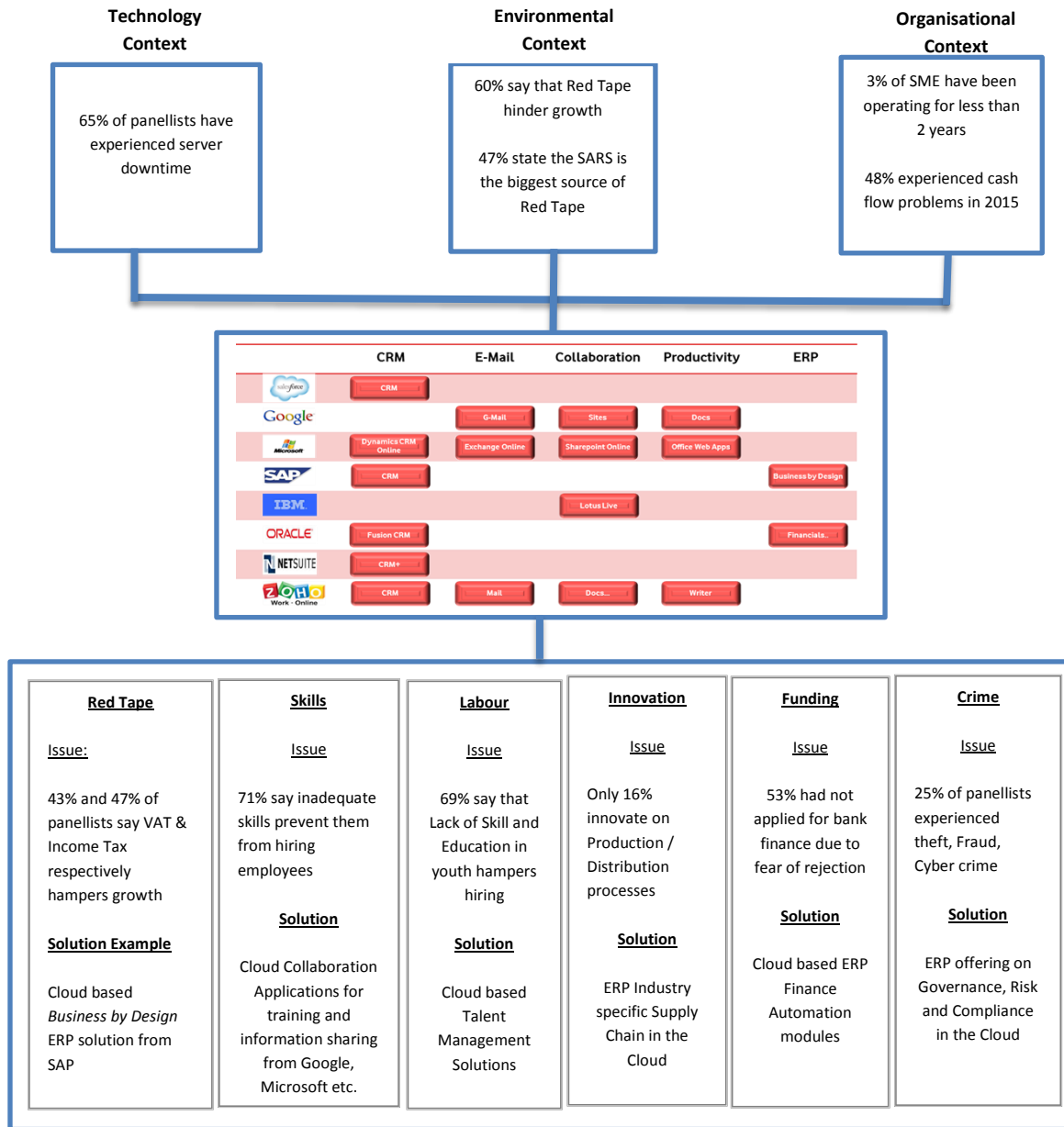
The TOE model guided our research and created pillars which this thesis is anchored on regarding Technology, Organisational, and Environmental Context. The existing relationship on these pillars and how challenges can be approached leveraging off Cloud Computing is the core message of figure 5.1 and the purpose of this thesis.

In the middle of the figure 5.1, we see Cloud Computing Software as a Service creating the glue to the business context and the specific challenges faced by the organisation. Referring to the research questions and the findings, this diagram puts a summarised version of the findings chapter and emphasizes that there is a role that can be played by Cloud Computing in addressing the challenges faced by the Small and Medium Enterprise market in South Africa.

5.5   Recommendations of the study

Cloud Computing is defined as "a model for enabling convenient, on demand network access to a shared pool of configurable computing resources (e.g. networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal effort or service provider interaction" (Mell & Grance 2011:1).

This capability is suitable for the challenges faced by the SME market since it provides access to technology in a manner that does not require technical skill on the part of the SME. The convenience and on demand capability supports the findings of this study since 71% of the Small and Medium Enterprise business state that lack of skill prevents them from hiring people in their business. The Cloud Service provider mitigates this finding by taking over the IT environment and run it on behalf of the Small and Medium Enterprise user on-demand and in a convenient manner. Because 65% of our panellists stated that they have experienced server outages in the past year, it is recommended that the IT environment be given to the Cloud Service provider with better skill and economies of scale that benefit Small and Medium businesses from a cost perspective.

68% of the SME panellists surveyed stated that cost predictions in running own IT department is a challenge since growth in data is difficult to forecast and in most cases IT resourcing is under provisioned and not in line with the demand. Cloud Computing on-demand capability addresses this challenge and we make a link between these two variables as part of the research findings. The SME can provision resources as and when they are needed and decommission resources when the demand is low. This is the benefit that comes with Cloud Computing and something we recommend that it is leveraged by SME market.

43% of the SMEs are either stagnant or declining in revenue growth when compared to the previous years which is confirmation that business is not easy. The resource requirements for the business must be managed to a point where the same budget can be extended in getting more for the business instead of asking for more investments. Cloud Computing creates a platform where the business can scale accordingly and most importantly cost flexibility falls in line with the business performance. If the business is not growing and need to cut on resources, Cloud Computing allows the business to do this due to the flexible payment options built into the costing model. Essential characteristics of Cloud Computing are On-Demand, Self Service, Broad Network Access, Resource Pooling, Rapid Elasticity and Measured Service (Mell & Grance; 2011).

We recommend that the Cloud Adoption Framework be used to understand what services need to be provisioned to extract the best value from Cloud Computing. It can be argued that the definition of Cloud Computing fits with the requirements of the Small and Medium Enterprise business but we can and should never generalize and assume that all SME challenges can be addressed by Cloud Computing. This is the reason why this thesis placed emphasis on the challenges faced by Small and Medium Enterprise market and how to position Cloud Computing as a solution to address these challenges.

During the literature review, various publications on Cloud Computing have been reviewed and we recommend that the Cloud Adoption Model from Carcary, Doherty, & Conway, (2014) which puts emphasis on the preparation for migrating to Cloud Computing should be used as the basic step in planning the journey to Cloud Computing. It is important to first understand what challenges can be addressed through Cloud Computing and once these are qualified, the Cloud Adoption Model can be utilised to assist with the technical know-how of what processes should be put in place to embrace Cloud Computing.

Cloud Computing is by no means an answer to all questions and challenges faced by SMEs, and study has revealed a few concerns as was raised by our panellists. These concerns should be taken into account and strategies to be put in place on how these will be managed when embarking on a journey to the Clouds.

When looking at the definition of Cloud Computing, it is expected that the service provider takes over the Technology environment which means the user will entrust all security and control to the service provider. 72% of our panellists were concerned about this and mentioned it to be one reason they would find it difficult to migrate to the Clouds. We recommend that users define service level agreements with service providers and ensure that penalties are put in place in the event that the service offered by the Service Provider gets compromised.

This will ensure that the service provider treats the responsibility afforded to his/her company with utmost priority as the penalty serves as a way to protect the Small and Medium Enterprise business when consuming Cloud Computing. It is also advisable to conduct Security vulnerability assessments when considering Cloud Computing and take into account what gaps should be closed from a security point of view if the user will be migrating to the Clouds. This is the point where the Small and Medium Enterprise organisation makes a GO/NO GO decision depending on the risk versus the benefit of Cloud Computing.

Although Cloud Computing costing model allows for pay as you use for information technology, 70% of the users are concerned about the cost of Cloud Computing. The panellists state that cost of application and infrastructure proposition makes sense but additional costs like bandwidth, data migration, potential change in culture and ways of doing business are not included in the proposal of Cloud Computing. These are costs borne after the user has migrated to Cloud Computing and could be surprisingly high if proper assessments are not done. For example, when a user adopts ERP application located in a server overseas, network assessments should be done to understand the capacity needed to consume this application in a satisfactory manner. Failing to do this will lead to poor experience for the users as some applications are latency intolerant i.e. Voice Over Internet, Video Conferencing, and so forth.

We recommend that due diligence is conducted to understand what are the business challenges faced by the SME sector and also what the business value is versus the risk exposure, and decisions must be made on what makes sense to the business. Cloud Computing has risks that could impact the business severely and these should never be

taken lightly when making a decision to leverage off Cloud Computing to address business challenges.

5.6 Limitations of research

The National Small Business Act of 1996, defines a 'small business' as:

> a separate and distinct business entity, including co-operative enterprises and nongovernmental organisations, managed by one owner or more which, including its branches or subsidiaries, if any, is predominantly carried on in any sector or sub sector of the economy i.e. Agriculture, Mining, Manufacturing, Electricity, Construction, Retail Motor Trade, Wholesale, Tourism, Finance, and Community Services.

Small businesses can be classified as micro, very small, small or medium enterprises, following a complex set of thresholds. The terms 'small business' and 'SMME' are used as synonyms, whereas the term 'enterprise' refers specifically to entities (especially close corporations, co-operatives and companies) registered with Companies and Intellectual Property Commission (CIPC). The owners of these SMMEs are hence referred to as business owners or 'employers and self-employed', while we have tried to keep the term 'entrepreneur' for those involved in a start-up or a new business activity.

This definition clearly demonstrates that this thesis excluded micro and very small businesses (SMMEs) and therefore is only limited to the Small and Medium Enterprise sector registered with (CIPC). The research findings can, therefore, not be generalised to the broader small business market as the challenges and experiences faced by different categories of SMEs are different. The parameters we are looking for are businesses that are registered with CIPC and this eliminated a lot of potential panellists from our database.

There is insufficient information in the research archives on the role played by Cloud Computing in addressing challenges faced by the SME market and, thus, most of the information contained in this study is based on feedback from the panellists and also on our experience of the topic.

5.7 Challenges faced during the study

Several challenges have been encountered in conducting this study. The degree of challenges varied in severity and we have chosen to share top seven challenges encountered and how they were overcome with the hope that this can assist future research work in case they go through the same issues.

Choosing the right topic

The research topic was changed four times during this study which posed a major challenge as the project work could not proceed until the topic was locked. The discussions between myself and my supervisor took many turns as the outcome of expectations of the research project were not aligned. My supervisor expected that this project would have pockets of cloud-computing technicalities, while the researcher's approach was more from a business level and not at a technical level. Increased frequency of meetings and discussions between the supervisor and myself was necessary to ensure free flowing communication on the expected outcome of this study.

Choosing the right methodology

The decision on whether to conduct quantitative or qualitative research was also a challenge as we attempted to do this part before the research questionnaire was completed. The learning here is that the research methodology was determined by the type of questions in the questionnaire and the answers to these questions provided guidance as to whether this will be a mixed method or not. Leveraging off Unisa resources for example, statisticians, aided in clarifying the research methodology appropriate for this study. Thus, it is advisable to consult extensively on this so that a balanced view/approach can be taken.

Assembling a research team

The research team involved Information Technology industry experts who were both participants and also formed part of the committee we used to brainstorm ideas off. National Small Business Chamber and iFeedback Database was used to form a database of panellists but the main challenge was to know and understand the extent to which you

can use these resources without negatively impacting on the ethical compliance requirements of Unisa SBL committee. The participants and the people we relied on for use in completing this project came with an understanding that this is a business opportunity, however when they realised there is no opportunity to make money, most of them lost interest and their participation was not optimal towards this project. As such, clear and precise communication and most importantly, alignment of expectations was a key learning. It is thus recommended that this part has to be done right at the beginning of the engagement with the research team.

Finding study participants

This study required that Small and Medium Enterprise organisations provide sensitive information about their business performance both in hiring employees and revenue growth. The major concern from the participants was that this information could impact on their businesses if it lands in the competitors' hands or even in the hands of authorities like SARS who could use this information for their own intentions. Many potential participants chose not to participate for this reason and we had to be patient and convincing to the participants in how the data will used. Ethical clearance requirements also made provision in the consent form that data will not be used for any other purposes except for this study. The need to adhere to ethical compliance and ensure consent forms are signed by the participants helped a lot in securing confidence of the participants for this study. This stage of the research was time consuming and took the most part of the project from a time perspective.

Participants trust

The Small and Medium Enterprise industry is very fluid and the database for this market is never rigid due to lack of sustainability of these businesses because of the challenges they face. The participant profile parameters put in place to attract a certain type of Small and Medium Enterprise panellist made it difficult to reach the critical masses. As we looked for participants who are registered with SARS and also meet a certain threshold in terms of revenue generated per annum, the fear and risk factors came into play when

the participant's first impressions were that we were from South African Receiver of Revenue Services.

The mention of SARS during the survey made a lot of participants uncomfortable and this had an impact on the average time it took to complete a survey. The key to overcoming this challenge was to stay committed and persevere all the way until the mission is accomplished. Our approach was never to give up on the first rejection and the most important aspect was continuous improvement in how to sell ourselves during the questioning sessions.

Staying motivated and working the plan

Our motivation and attitude towards Cloud Computing has been instrumental in carrying through the project to completion. It was discovered early in the project that the topic should be aligned with our passion and if possible must be linked to the type of job we are doing on a daily basis. The feeling of contribution towards a practical/real problem in the work environment contributes a lot in staying motivated and seeing the project through. We used the love of fun and beer as a motivation to complete this thesis! Halfway through the project though, I made a decision to stop any alcohol consumption and save gratification for a time when the project would have been complete. This contributed amongst other things in ensuring that this project was closed.

Dealing with data

The data collected came in big volumes and to start making sense of the data was also one of the major challenges. The first submission of the finding was scrapped by the supervisor and the critical reviewers' due to the fact that we come across as overwhelmed by the data and no logical flow came from the presentation of the data. The key lesson at the stage of the research was that we had to be grounded and become immersed in the data. When reviewing the data, it comes cold and our bias should be eliminated and look at what the data is saying.

5.8   Directions of future research

Cloud Computing is a young concept and businesses are asking themselves numerous questions regarding the risk exposure brought about by giving control of their IT department to a Service provider; and, Data Sovereignty issues as a result of regulation on what type of data is allowed to leave your premises and which country do they get hosted at.

There is an opportunity for the next phase of research to take each of the six identified challenges faced by Small and Medium Enterprise market and go deeper on each one in separate papers. To be specific, red tape on its own is a broad topic and can be researched extensively to understand what the literature says about red tape and how this challenge can be addressed potentially using Cloud Computing. We highlighted high level challenges and positioned Cloud Computing as a likely solution to address this challenge. We anticipates that six papers can be written on the six challenges i.e. red tape, lack of funding, lack of innovation, lack of skill, labour regulations and impact of crime.

From the factor analysis conducted during the research analysis stage of the project, it is evident that there are more than six challenges faced by Small and Medium businesses in South Africa and the next phase of research can also cover extensively the 9 challenges discussed during the analysis.

It would also be interesting in the next phase of the research to focus on the survivalist category of the Small and Medium Enterprise users as our project did not have enough representation of the small SME market. This is the market that has deeper challenges and they are the ones that are not making it past the second year of operation. Had we only focused on this category, the result of the research would have been completely different as we expect that these are the users who do know about Cloud Computing and have limited usage of technology.

5.9   Summary

In this chapter, we covered the unique contribution this thesis has made in the literature regarding the role played by Cloud Computing in addressing SME challenges in South Africa. A wide variety of models has been reviewed with specific interest to Li, Zhao & Yu, (2015) who made a significant contribution to the topic researched in this project.

Li, Zhao & Yu, (2015) implied that vendors should build Cloud Computing service trust to attract potential clients to use and embrace this service. The TOE model was leveraged to build the framework for this study and we also used the same model to expand on the work done by Li, Zhao & Yu, (2015). The key contribution on this publication was the introduction of Small and Medium Enterprise business challenges and how these can be addressed by Cloud Computing looking at the Technology, Organisational and Environmental Context.

A Cloud Adoption Model was created taking into account all three these contexts and placing emphasis on Cloud Computing Software as a Service as a key solution for SMEs and the environment in which they operate. Cloud Computing benefits much through use cases and we have found use cases for Cloud Computing to ensure relevance and context as to why Cloud Computing is relevant for SMEs, and in the opinion of the researcher this is what has been lacking in all research done for Cloud Computing and SMEs.

The conclusion is that there is a relationship between Cloud Computing and all identified SME challenges within the South African business environment and indeed the use case is strong for Cloud in this market. Each business challenge was researched and potential pain points for SMEs were highlighted together with relevant technology application running in Cloud Computing recommended to address this pain point.

A key recommendation was that Cloud Computing definition needs to be articulated clearly to avoid confusion on what solution should be put forward to address SME challenges. There are a few definitions of Cloud Computing in the literature and we put forward the National Institute of Standards and Technology definition by Mell & Grance (2011) as the guidance to a way in which users can use Cloud Computing. The emphasis

was that Cloud Computing should be a convenient, on demand and easily accessible service and if it does not comply with this it will be difficult to position as a solution for SME challenges identified.

We also acknowledged that Cloud Computing is not always the best solution for SME challenges and careful consideration to issues like data sovereignty, need for customisation, security and control and the like, should be considered when implementing Cloud Computing.

Reasons why users are not embracing Cloud Computing were also attended to in the research project and recommendations were covered extensively as to how these hindrances can be mitigated.

Limitations of the research were also covered in this chapter and the main one was the focused way in which the database was used to extract the findings. SME database is broad and in this study, the main focus was on SMEs registered with the CIPC and SARS, which excluded a large number of unregistered SMMEs, also referred to as survivalists according to the Department of Trade and Industry definition. These are SMEs that are perceived to be most challenged and it would be interesting to expand on this study and further explore this base in future research.

Amongst other challenges we faced in completing this thesis, the main ones were difficulty in choosing the topic; choosing the right research methodology; assembling the research team; finding the right study participants; gaining trust of the participants; staying motivated throughout the project, and lastly dealing with own data.

Direction for future research was also discussed where we believe that each SME business challenge should be researched deeper. It is recommended that future research should be undertaken, for example, the Role of Cloud Computing in addressing red tape issues for SMEs in South Africa or the Role of Cloud Computing in addressing Lack of Funding Issues for SMEs in South Africa and so forth.

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7. APPENDICES

APPENDIX A: RESEARCH INSTRUMENT / QUESTIONNAIRE

Demographics questionnaire

Please tick the appropriate box by placing X on the right one:

1. Which industry sector do you operate in? (Please place X in appropriate box)

Tourism	
Business Services	
Manufacturing	
Other	

2. How long have you been operating your business? (Please place X in appropriate box)

Less than 2 years	2-5 years	6-10 years	11-20 years	20 years +

3. What is your annual Turnover?

Less than R26m	
Less than R13M	
Less than R3M	
Less than R200K	

4. How Many Employess do you have?

Less than 200	
Less than 50	
Less than 20	
Less than 5	

5. What is a level of change in your turnover between 2014 and 2015? (Please place X in appropriate box)

Shrinking (Negative growth)	Stagnant (Flat growth)	Moderate Growth (not more than 10% growth)	High Growth (more than 10% growth)

6. What is your location?

Gauteng	
Western Cape	
Eastern Cape	
Mpumalanga	
Kwa-Zulu Natal	
North West	
Free State	
Limpopo	
Other	

7. Which regulation is your business registered for?

Tax	
Unemployment Insurance Fund	
Black Employment Equity	
Cipro (Company Registration)	

Threat of Survival

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8. Did your firm face a threat of survival in 2015? (Please place X in appropriate box)

Yes	No

This questionnaire is testing 3 key areas. 1. Whether SME in various growth trajectories are hiring. 2. Assess which sectors are hiring. 3. Which firm age category is hiring?

9. What is the change in your staff numbers in 2014 compared to 2015?

Increased	Stayed the same	Decreased

This questionnaire will assess the difficulty in which SMEs across age distribution, growth trajectory and various sectors find in operating their business within South Africa.

Impact of Business Environment Questionnaire

10. Has it become easier to operate a business over the past year?

Easier	Harder	Stayed the same

11. What are the chief impediments to your business growth in 2015?

Statements for Impediments to business Growth	Very Unlikely	Unlikely	Neither	Likely	Very Likely
Government Red Tape / Bureaucracy (e.g. VAT, UIF, Income Tax etc.)					
Labour Legislation (e.g. Labour relations act; Employment Equity Act; Skills Development Act etc.)					
Lack of Skill (e.g. Managerial Incompetence; Lack of Expertise; Management Capacity etc.)					

Crime (e.g. Cybercrime; Theft; Damage to Property etc.)					
Lack of Innovation (Lack of Research and Development; Commercialization etc.)					
Lack of access to finance (e.g. Poor financial record keeping; Poor debtor Management; Lack of Inventory Control etc.)					

12. Has Red Tape increased or decreased or stayed the same in 2015?

Increased	Stayed the same	Decreased

13. What are the top three sources of red tape issues in 2015 for your business?

Statements for Sources of Government Red Tape	Very Unlikely	Unlikely	Neither	Likely	Very Likely
Value Added Tax					
Unemployment Insurance Fund					
Income Tax					
Pay as You Earn					
Skills Development Levy					
Workplace Compensation					

14. Do you feel you know all the regulations your business needs to comply with?

Yes	No	Maybe

15. What were the main barriers to hiring in 2015?

Statements for barriers to hiring	Very Unlikely	Unlikely	Neither	Likely	Very Likely
Labour Law					
Skills					
Labour Relation					
Work Ethic					

16. What form of training did you provide your employees in 2015?

SETA (Sector Education and Training)	Formal Training	On-the-Job Training	None

17. What were the main barriers to hiring youth in 2015?

Statements for main barriers to hiring youth in 2015	Very Unlikely	Unlikely	Neither	Likely	Very Likely
Work Ethic					
Skills and Education					
Don't Stay					
Lack of Experience					
Expectations					

18. To what extent to do you see below as motivation to hire young work seekers?

Statements for motivation to hire young work seekers	Very Unlikely	Unlikely	Neither	Likely	Very Likely
Wage Subsidies					
Skills and Education					
Government funded training					
Labour Law and Regulatory?					
Direct funding					
Improved work ethic?					

19. What crime have you and your business experienced in 2015?

Statements for crimes experienced by your business in 2015	Very Unlikely	Unlikely	Neither	Likely	Very Likely
Theft (Burglary)					
Theft (Internal)					
Fraud					
Cybercrime					
Armed Robbery					

20. Is the South Africa environment conducive for Innovation? (Please place X in the appropriate box)

YES	NO

21. What innovation did you make in your business in 2015? (Please place X in the appropriate box).

Product / Service Innovation	Process / Distribution Innovation	No Innovation

22. How important are each of these to your firms innovation efforts?

Statements for firm's innovation efforts	Very Important	Important	Neither	Less Important	Not Important
Information sharing with firm					
Local Suppliers					
Clients					
Enterprises in your sector					
Professional and Industry Associates					

23. Did you acquire new major assets in 2015? (Please place X in one box)

YES	NO

24. What is the level of investment your firm has made in 2015?

None	1-5%	6-10%	11-15%	16-20%	21-25%	26-30%

25. Did you apply for finance in 2015?

YES	NO

26. What are the forms of finance have you used in 2015?

Statements for forms of finance used in 2015	Very Unlikely	Unlikely	Neither	Likely	Very Likely
Bank Overdrafts / credit line					
Retained Profits or sales of assets					
Leasing or Hire Purchase					
Loans from family, friends, shareholders					
Trade Credits					
Bank Loans					
Grants / Loans from Governments					
Equity					
Other					

27. Is there a time where you needed finance and were reluctant to apply for it?

YES	NO

28. Have you been rejected for any finance application and why?

YES	NO

If yes, state reasons

_____

_____

_____

_____

29. Have you experienced cash-flow problems in 2015? (if YES, state reasons)

YES	NO

_____

_____

_____

_____

This Section of the questionnaire is aimed at understanding the level of technology usage and understanding of Cloud based technology across the age distribution, business sector and also by growth trajectory.

Technology Adoption

30. What Technology do you use in your business? (Please place X in relevant boxes)

Email	
Mobile Network	
Fixed Private Network	
PC / Laptop	
Smartphone	
MS Office (excel, power-point, word)	
HR and Payroll Solutions	
CRM Solutions (Sales, Marketing, etc.)	

Server Room	
ERP for Procurement, Finance, etc.)	
None of the above	

If none of the above, please specify:

_____

31. Do you have IT department? (Please place X in one box)

YES	NO

32. If Yes, state how many staff members do you have in your IT department

_____

33. How do you support your IT environment? (e.g. Outsourced to support partner)

_____

_____

34. How often do you experience server room down time in the past year? (Please place X in appropriate box)

Never	Once	Twice	More than twice

35. What challenges are you experiencing regarding your Information Technology environment?

Statements for challenges you have regarding your IT environment	Very Unlikely	Unlikely	Neither	Likely	Very Likely
Cost Predictability					
Inconsistent Availability					
Poor Support					
Uncontrollable Growth in Capacity					
Security and Compliance					
Non-scalable and Inflexible Investment					
Outdated and Incompatible with latest technology					
Lack of Skill					

36. Do you know of Cloud Computing? (Please place X in appropriate box)

Yes	No	Not Sure

37. What are your concerns with the usage of Cloud Computing?

Statements on your concerns with Cloud Computing Usage	Very Unlikely	Unlikely	Neither	Likely	Very Likely
Security and Control					
Latency and Performance					
Costs					
Data Sovereignty (Hosting data outside of South Africa)					
Lack of Skill and Understanding					
Business Risk and Compliance					
None of the above					

38. List your perceived benefits of Cloud Computing

Statements on your perceived benefits of Cloud Computing	Very Unlikely	Unlikely	Neither	Likely	Very Likely
Agility (Speed to Market)					
Scalability (On Demand Availability)					
Flexibility (Pay as you use)					
Economical (Maximum return for Investment)					
Best Practice (Leverage Cloud Service Provider Expertise)					
None of the above					

39. General comments on your views about the role Cloud Technology has in addressing your business challenges.

Interview Questionnaire

40. What are the main challenges in navigating the regulatory requirements for your business?

41. Which Regulation threatened the survival of your business and why?

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42. Where do you believe, technology can help remove the business challenges of your organisation?

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43. What are the inhibitors of Cloud Computing in your business and why?

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Thank you for participating in our survey.

Best Regards,

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APPENDIX B: PEER REVIEWED PUBLISHED PAPER

The paper that follows appeared as:

- Kumalo, Nkosi and van der Poll, John Andrew (2015). The Role of Cloud Computing in Addressing SME Challenges in South Africa, *International Conference on Cloud Computing Research and Innovation* (*ICCCRI, 2015*), pp. 139 – 147, 26 – 27 October, Nanyang Technological University, Singapore, DOI: 10 1109/ICCCRI 2015.32, ISBN: 978-1-5090-0144-6/15.

The Role of Cloud Computing in Addressing SME Challenges in South Africa

How can Information Technology, in the form of Cloud Computing be used to address the challenges faced by Small Medium Businesses in South Africa?

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Abstract— **Cloud Computing may be viewed as a utility-based service, similar to the use of (e.g.) electricity. The setting up of the service, management thereof, support and subsequent upgrades are performed by the CSP (Cloud Service Provider) on behalf of the user. The user subscribes to the service and pays for the computing resources that were used during the specified period. Service subscription may be across the whole technology stack from Applications, Infrastructure and Platform; and with options of how it should be deployed i.e. Privately (in-house), Community (for limited number of users), Public (consumed via internet with no dedicated firewalls) or hybrid (with both in-house and public deployments). In this paper the researchers argue that Cloud Computing can alleviate the negative impact of poor management, lack of skill, lack of funding, etc. on the success of a small or medium business. Following a literature survey on the challenges experienced by Small and Medium-sized Enterprises (SMEs), with specific focus on the most recent South African SBP, SME Growth index, 2013, we suggest how Cloud Computing may facilitate SME business growth.**

Keywords—SME, Small and Medium-sized Enteprise, Cloud Computing.

I. INTRODUCTION

Cloud Computing (CC) is a model in which computer processing, storage, software and other services are utility-supplied as a pool of virtualized resources over a network, primarily the Internet [1]. Access to information technology resources over the cloud is provided for in a dynamic fashion and it is important to note that the information technology resources referred to in the CC definitions, are not limited to only computation, networking, and storage aspects. In agreement with [1], the National Institute of Standards and Technology in the USA describes Cloud Computing as "a model for enabling convenient, on demand network access to a shared pool of configurable computing resources (e.g. networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction" [2]. The National Institute of Standards and Technology (NIST) definition extends the resource beyond just computer server, storage and memory but also includes applications. This is critical because information technology usage is meaningful

to users when applications are running on top of information technology infrastructure and the ability to access these applications in the form of Cloud Computing can be really valuable and make a difference to the users. An example would be access to a G-mail account which is an email application sitting on top of an operating system, hypervisor, database server, email software, security server for identity management and backup infrastructure.

Assuming a proficient CSP (Cloud Service Provider), the use of CC by a subscriber requires minimal skill and expertise for technology integration, management, support and upgrades as all of these are performed on behalf of the user by the CSP. The user subscribes to a service and pays just for what was used during the specific period. This applies across the whole technology stack from Applications, Infrastructure and Platform; and with options of how it should be deployed, e.g. privately (in-house), community (for limited number of users), public (consumed via internet with no dedicated firewalls) or hybrid (with both in-house and public deployments where both are accessed seamlessly without service provider interference. The users need not be concerned with the underlying technology, neither as to the location of such technology, so long as such technology is easily accessible from the Internet.

It is the opinion of the researchers that cloud computing may facilitate the operations of Small and Medium-sized Enterprises (SMEs), subsequently in this paper we consider various challenges that SMEs experience and suggest how the use of cloud technology may enhance these businesses.

The layout of the paper follows: The research questions (RQs) are given in Section II. Section III presents three familiar models of cloud computing, while Section IV considers the role of SMEs in an economy. The definition of SMEs follows in Section V and reasons why SMEs fail are discussed in Section VI. Section VII presents the contribution of this paper in considering how cloud computing may address the SME challenges highlighted earlier. A summary and conclusions, in which directions for future work in this

area are considered, appear in sections VIII and 0 respectively.

II. RESEARCH QUESTIONS

This papers aims to answer the following:

RQ1: What challenges are experienced by SMEs in the South African context?

RQ2: How may Cloud Computing alleviate the challenges experienced by SMEs?

III. CLOUD MODELS

Cloud Computing is generally described by three (3) service models, namely IaaS (Infrastructure as a Service), PaaS (Platform as a Service) and SaaS (Software as a Service). **Figure 1** from [4] illustrates the differences and similarities among these approaches. As is evident from the diagram less controlled is exercised by the subscriber moving from a IaaS option to PaaS to SaaS. Following a move from IaaS through to SaaS, more information security concerns arise for both the user and the service provider.
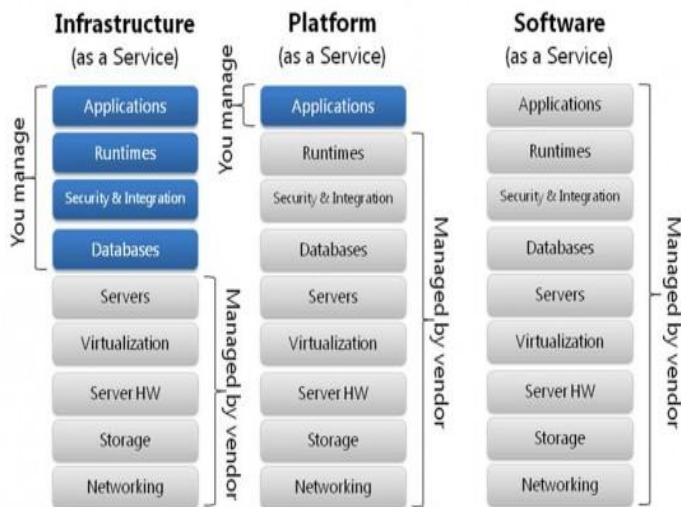

Figure 1: Cloud Computing models [4].

The National Institute of Standards and Technology's (NIST) definition of Cloud Computing further classifies it as having five essential characteristics, three service models, and four deployment models, viz [3].

- *Essential Characteristics*: On-demand, self-service, broad network access, resource pooling, rapid elasticity, and measured service.
- *Service Models*: Software as a service (SaaS), platform as a service (PaaS), and infrastructure as a service (IaaS).
- *Deployment Models*: Public, private, hybrid and community cloud (refer **Figure 2**).
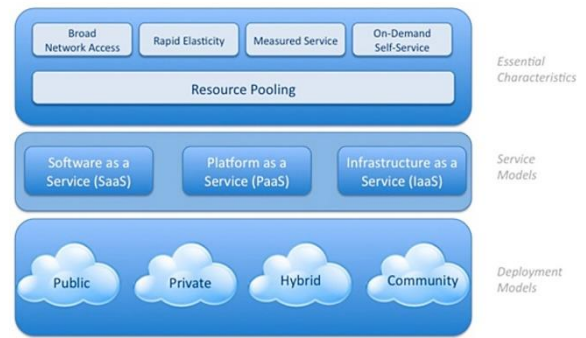

Figure 2: NIST working definition model of Cloud Computing Error! eference source not found.

Next we discuss a number of aspects around SMEs (Small and Medium-sized Enterprises).

IV. THE ROLE OF SMEs IN THE ECONOMY

SMEs have gained recognition in the field of management because of the strategic role they play in promoting a nation's economy in terms of reducing poverty by providing employment opportunities [32]. Their contribution to the growth and development of any economy is undeniable in both the developed and developing countries [70]. SMEs provide about 77 percent of employment and 40 percent of total investments in Turkey [14]. In Nigeria, they account for about 75 percent of employment in spite of the fact that 60 percent of the population lives below the poverty line [13]. This significant role played by SMEs can be attributed to the level of their innovativeness and flexibility [15]. But then their ability to innovate depends on the competence of management, their size and the availability of resources [16]. Innovation is very important to business growth and the more SMEs innovate; the more their performance improves within the industry [17].

SMEs play a crucial role in almost all economies but particularly in developing countries with major employment and income distribution challenges, such as South Africa. The creation and sustainability of new SMEs are vital to the economic prosperity of a country or else it risks an economic stagnation [18]. It is estimated that small businesses (SMEs) employ 22% of the adult population in developing countries. United Nations Industrial Development Organization (UNIDO) estimates that SMEs represent over 90% of private business and contribute to more than 50% of employment and of gross domestic product (GDP) in most African countries [19]. A study conducted by [20] estimates that 91% of formal business entities in South Africa are SMEs, and that these SMEs contribute between 52 to 57% to GDP and provide about 61% to employment. However, many small businesses within South Africa do not make it past the second year of trading with failure rates as high as 63% [21].

V. DEFINITION OF SMALL MEDIUM ENTERPRISE

According to the South African Department of Trade and Industry (DTI) Annual Review of Small Business in South Africa 2005-2007 [5], micro enterprises are described as

businesses whose annual turnover is below the compulsory VAT (value-added tax) registration limit. A further distinction is the 'survivalist' business, which is generally defined as only providing income below the poverty line. However, all these criteria do not fit exactly with the official definition, as per the small business definition schedule in the National Small Business Act of 1996 as amended in 2003 and 2004.

The National Small Business Act of 1996 [7] defines a 'small business' as "*a separate and distinct business entity, including co-operative enterprises and nongovernmental organizations, managed by one owner or more which, including its branches or subsidiaries, if any, is predominantly carried on in any sector or sub sector of the economy i.e. Agriculture, Mining, Manufacturing, Electricity, Construction , Retail Motor Trade, Wholesale, Tourism, Finance, and Community Services*."

Small businesses can be classified as micro, very small, small or medium enterprises, following a complex set of thresholds. The National Small Business Act, as revised by the National Small Business Amendment Act of 2003 and 2004 [7] , defined the average thresholds per site class as in the Table 1 below.

Table 1: Small business classification [7]

Sectors or sub-sectors in accordance with the Standard Industrial Classification (SIC)	Site or Class	Total full-time equivalent of paid employees (Less than)	Total annual turnover (Rm) (Less than)	Total gross asset value (fixed property excluded) (Rm) (Less than)
Agriculture	Medium	100	5.00	5.00
	Small	50	3.00	3.00
	Very small	10	0.50	0.50
	Micro	5	0.20	0.10
Mining and Quarrying	Medium	200	39.00	23.00
	Small	50	10.00	6.00
	Very small	20	4.00	2.00
	Micro	5	0.20	0.10
Manufacturing	Medium	200	51.00	19.00
	Small	50	13.00	5.00
	Very small	20	52.00	2.00
	Micro	5	0.20	0.10
Electricity, Gas and Water	Medium	200	51.00	19.00
	Small	50	13.00	5.00
	Very small	20	5.10	1.90
	Micro	5	0.20	0.10
Construction	Medium	200	26.00	5.00
	Small	50	6.00	1.00
	Very small	20	3.00	0.50
	Micro	5	0.20	0.10
Retail and Motor Trade and Repair Services	Medium	200	39.00	6.00
	Small	50	19.00	3.00
	Very small	20	4.00	0.60
	Micro	5	0.20	0.10
Wholesale Trade, Commercial Agents and Allied services	Medium	200	64.00	10.00
	Small	50	32.00	5.00
	Very small	20	6.00	0.60
	Micro	5	0.20	0.10
Catering, Accommodation and Other Trade	Medium	200	13.00	3.00
	Small	50	6.00	1.00
	Very small	20	5.10	1.90
	Micro	5	0.20	0.10
Transport, Storage and Communications	Medium	200	26.00	6.00
	Small	50	13.00	3.00
	Very small	20	3.00	0.60
	Micro	5	0.20	0.10
Finance and Business Services	Medium	200	26.00	5.00
	Small	50	13.00	3.00
	Very small	20	3.00	0.50
	Micro	5	0.20	0.10
Community, Social and Personal Services	Medium	200	13.00	6.00
	Small	50	6.00	3.00
	Very small	20	1.00	0.60
	Micro	5	0.20	0.10

Note that the attribute values for similar classifications in Table 1 differ from one industry to the next. For example, for *Agriculture* the maximum medium employee size is 100, with a turnover of 5 million ZAR, while for a medium-sized *Construction* the corresponding values are 200 employees and 26 million ZAR respectively.

The White Paper (1995:10) [7] sub-divides small business as follows:

Survivalist enterprises – These are defined as enterprises that engage in activities carried out by people who are unable to find employment or step into an economic sector of their choice. These activities generate income that falls far short of even minimum standards. Little capital is invested and there is very little skills training available in the particular field. Only limited opportunities are available for growth into a viable business.

Micro-enterprises – These refer to a very small business, often involving only the owner, some family member(s) and at the most one or two paid employees. These enterprises usually lack "formality" in terms of business licenses, value-added tax (VAT) registration, formal business premises, operating permits and accounting procedures. Most of these enterprises have a limited capital base. The operators of micro-enterprises only have rudimentary technical or business skills. However, many micro-enterprises advance into a viable small business, discussed below.

Small enterprises – These are regarded as the majority of the established SMES, with employment figures ranging between five and fifty people. The enterprises are usually owned by a manager or are directly controlled by the owner-community. These enterprises are likely to operate from business or industrial premises, be tax-registered and meet other formal registration requirements.

Medium enterprises – These are still viewed as essentially owner/manager controlled, though the shareholding or community control base could be made more complex. They employ a maximum of 200 employees and have about R5 million worth of capital assets (excluding property sector). These medium-size enterprises face obstacles and constraints that plausibly cannot be solved through normal market forces and private-sector actions.

For the purpose of this research, the researchers will focus on Small and Medium enterprises within the site class of fifty to two hundred employees with a turnover of more than thirteen million rands (R3000 000) to not more than twenty six million ZAR per annum. The researchers concerned mainly with Small or Medium Businesses that meet the minimum requirements for VAT registration through the South African Receiver of Revenue (SARS) and also the Companies and Intellectual Property Commission (CIPC) which is a member of the Department of Trade and Industry (DTI) group.

The researchers will not distinguish between industry specific businesses but will take a generic approach towards SMES to understand the basic essentials to support the growth of such SMEs. These may include basic network connectivity, access to email, computer/server requirements, office applications, etc. Therefore, this research does not aim to unravel the complexity faced by e.g. the Mining, Retail, Professional Service or any such vertical segment. Notwithstanding that the researchers acknowledge opportunities exist to conduct further research to analyze the role of Cloud Computing in addressing the challenges faced by businesses within *specific* sectors and how sector relevant technology can be applied to address those challenges. Examples of these industries are live-stock tracking in Agriculture or supply chain automation in Retailing.

VI.   WHY SMEs FAIL

Seven out of every ten new SMEs in the United States are failing within their first year in operation [24]. The failure rate remained relatively unchanged for the last three decades irrespective of the economy or the wealth of research on the subject [25], [26], [27], [28]. The high rate of failure leads to the issue of why small businesses fail at such an alarming rate, which consequently has a substantial negative impact on the economy [29]. Attempts to reverse the failure rate have yielded numerous predictive failure models [30], [31].

Four hundred (400) small businesses in Nigeria were surveyed through structured interviews to determine the principal constraints to success. These were found to be (amongst others) poor management, lack of capital, corruption, weak infrastructure and poor recordkeeping [32], while [33], attempted to identify factors for poor performance and failure faced by small and medium-sized enterprises. Research reveals that the most important factors are limited access to finance; poor market conditions; inadequate staff; lack of institutional support; and lack of co-operation and networking.

The Small Business Project (SBP), a section 21 South African company registered in 1987 is driving SME Growth Index, which is a project geared towards establishing a comprehensive, evidence-based understanding of South Africa's SMEs (SBP Growth Index, 2013). A longitudinal study conducted in 2013 across 500 SMEs in Business Services, Manufacturing and Tourism shows that while turnover displays a continued upward trend, employment growth is lacking. Interestingly, the challenges of the overall environment appear to be driven mainly by domestic factors, rather than global conditions. The top five (5) factors that inhibited the growth of firms over the past year are (1) lack of skills, (2) burdensome regulations, (3) local economic conditions, (4) lack of finance and (5) the cost of labor [23]. These are consistent with the literature reviewed; hence the main gap in the body of knowledge is how Cloud Computing can be used to address these SME challenges.

VII.   CLOUD COMPUTING FOR ADDRESSING SME CHALLENGES

The researchers postulate that technology in the form of Cloud Computing may assist businesses in mitigating the negative impact of a number of challenges addressed below. These are: *red tape*, *labor legislation*, *impact of crime*, *lack of skill*, *lack of innovation*, and *lack of funds*. Using the literature on SME challenges with specific reference to the most recently published document on this topic, namely, in the [23], we investigate how the use of Cloud Computing may alleviate these challenges for South African SMEs.

A.   *Red Tape*

The phrase "red tape" is used to describe excess bureaucracy and regulation that serves as cost on businesses [34]. The Western Cape Department of Economic Development and Tourism [35] explains, red tape as:

- Non-essential procedures, forms, licenses, and regulations that add to the cost of dealing with government, or
- Anything obsolete, redundant, wasteful or confusing that diminishes the competitiveness of the Province, which stands in the way of economic growth and job creation or wastes taxpayers' time and money.

In particular, Red Tape refers to those regulatory aspects that take up more time than they are worth; and require reports and forms just for the sake of producing these. It replaces 'common sense' and are often so complex and hard to understand that businesses have to pay expert consultants. Red tape tends to be restrictive to business innovation and growth.

Using tax compliance as an example, the current South African tax system is viewed upon as creating an unnecessary burden for small businesses. Entrepreneurs have to deal with multiple tax structures including VAT, PAYE (Pay as You Earn), Skills Development Levy, UIF, income tax and workplace compensation. While these are all important, they tend to be hugely cumbersome and complex for a new business [36].

The three service models for Cloud Computing, namely, Software-as-a-Service (SaaS), Infrastructure-as-a-Service (IaaS) and Platform as-a-Services (PaaS) were introduced in Section I. Tax Compliance Software technology which requires computations; memory; networking; databases; hypervisor technology; an operating system; tax applications; and support and management does not have to be developed and managed by an SME in their own datacenter. Instead, these services can be rented from the CSP (Cloud Services Provider) and utilized on demand by the SME.

The benefit of using Cloud Computing is that the SME does not have to commit to a 3 year software licensing agreement with the software provider, neither any commitment with respect to hardware procurement which can lead to high capital investments for a small business. Support and maintenance are catered for by the Cloud Service Provider allowing the SME to instead focus on growing the business. Examples of products in market today are Sage One, VIP Payroll etc. [9].

Considering Figure 1, the **SaaS service model** may therefore assist an SME in alleviating the challenges associated with red tape.

B. Labor Legislation

Small and medium enterprises (SMEs) are not, generally, founded by legal experts. Even if they were, it's highly unlikely that compliance with legislation would be at the top of the list for an entrepreneur [37]. SME businesses are and should be driven by acquiring new business and ensuring that their business is stable in terms of revenue and new customers. However, if legislation is ignored, it can hamper business growth and even lead to destroying the business in its entirety [37].

In order to redress the imbalances of the past regime where certain race groups were excluded from participating economically, the South African government introduced the Labor Relations Act [37] which dealt with legal and constitutional matters of collective bargaining and unfair dismissal law, which for the first time created a single legal framework for labor relations applicable to all sectors of the economy including SMEs [37]. By the second democratic elections in 1999, more laws were introduced, namely, the Basic Conditions Employment Act (Act No. 75of 1997), the Employment Equity Act (Act No. 55of 1998), and the Skills Development Act (Act No. 97 of 1998).

The above laws are continuously updated and to keep up with all the changes in legislation is a challenge for a small business (or any business for that matter). Workflow processes and Software from Companies like Lexus Nexis where Cloud Computing Software can be acquired on a pay as you use model to ensuring business compliance without help from a consultant could be valuable for a business in terms of knowledge, costs and convenience.

As before, the **SaaS model** may assist an SME in successfully dealing with changing labor legislations in a developing country like South Africa.

C. Lack of Skill

Access to labor markets is a key factor of production crucial for SMEs [38], as it allows for appropriate expertise that enable ventures to explore identified opportunities. In South Africa as a developing country, labor is mainly unskilled and informal [39] while available semi-skilled labor is expensive [40].

Competent management skills are a prerequisite for the success of SMEs [41]. Management Competence (or know how, capacity, abilities and skills) are a set of factors associated with successful businesses as these equip an entrepreneur to perform a role successfully and empower him or her to act effectively in a particular range of possible future circumstances [42].

Important management skills include being able to identify and evaluate market opportunities, to set up realistic and measurable goals, to develop business plans, to secure resources required and setup a new venture; to produce and service the market, to manage conflict effectively; and achieve overall industrial efficiency as well as effectiveness that lead

to the growing of the business [43]. Naturally, good skills assist the entrepreneur to take action and steer the business in the right direction.

Coupled with the above competencies, one of the major reasons for the failure of SMEs seems to be insufficient management capacity; lack of expertise; low levels of skills; and managerial incompetence [44]. Surveys of business failure suggest that SMEs often have a good business venture in mind, but have little knowledge of business fundamentals or how to run a business. They often under-exploit or delay the identified opportunity [45].

Originally, management was considered from the perspective of the "general manager" of a business and it specifically addressed the tasks they had to execute to facilitate business success. Initially, these tasks were classified into five broad categories, namely planning, organizing, command, coordination, and control – each comprising a host of activities [46]. These tasks were deemed to constitute the primary tasks of management, with communication, motivation and decision making viewed as secondary management tasks.

In the case of supporting management capabilities on the above tasks, Cloud Computing technology could play a deciding role in designing a process and automating it, to an extent that all management activities and tasks may be visible and given the correct focus by management. Benchmarking and Business Process Reengineering (BPR), popular in the 1990s, were essentially replaced in the early 2000s by Business Process Management (BPM), a leading technology for pursuing the agility and efficiency required for competitiveness [47].

The cost of procuring BPM technology is rather high; hence most SMEs cannot afford to deploy such technology using traditional avenues. However, such technology may affordably be delivered by Cloud Computing service providers.

Considering the required skill of sound management and the automation of BPM identified in this section, we conclude that the **PaaS service model** of Cloud Computing may assist an SME to alleviate the above lack-of-skill challenges.

D. Lack of Innovation

As an economy moves beyond its factor endowments, it and its firms will inevitably need to strive to operate more efficiently and to identify new economic opportunities. Innovation is a high-yield means of growth and a non-negotiable for international competitiveness [23].

Firms typically envision being successful through innovation at an international level. Some of the major factors influencing the success and innovation of firms include R&D and commercialization based on internal resources [48]. Resources developed through internal R&D can act as a formidable barrier preventing potential competitors from entering the same market [49]. However, firms face various problems such as, lack of investment in technology, limited amounts of time available for R&D and rapid market changes arising from fluctuating customer needs [50]. To this end the

researchers believe the use of cloud-based *enterprise systems* may facilitate these activities a great deal. In particular, a user subscribes to only that part of an enterprise system actually needed [1].

Internal R&D efforts can be inefficient and wasteful in that such efforts require the use of many resources and substantial amounts of time, making it prohibitively difficult to capture growth opportunities and manage the firm's innovation activity [51]; [52]; [53].

Consequently, the firm's organizational and R&D strategies have to be designed such that they can satisfy diverse global needs. Further, its R&D process must increase the likelihood of R&D outputs from other firms for the growth and success of their business and a *Knowledge Management* [9] component of a Cloud Computing technology can assist with the required collaboration and integration between firms. In particular, the expansion of boundaries between firms has contributed to this phenomenon. Because of the abundance of external ideas in the global market and increasing collaboration among firms, an increasingly large number of multinational firms have been pursuing innovation activity in partnership with other firms [54].

Noteworthy is the use of both internal and external ideas through collaboration for coping with rapid market changes and developing new growth engines e.g. Apple and Sony records in making music available through internet enabled devices via iTunes. Such initiatives have sparked growing interest in new R&D paradigms for exploring how firms manage their collaborative efforts. In the wake of these changes, the concept of *open innovation* [8] has been highlighted with collaborative activities such as technology acquisition, R&D collaboration, and joint venture activity for example Microsoft and Nokia Inc. with the integration of Nokia Online assets and Windows Phone operating System. The concept of open innovation [8] embraces the strategic intent behind the use of both internal and external resources and is defined as the dynamic capability to manage technology both within and outside firms. Collaborative activities for the use of external resources reflect the core role of open innovation, that is, the enhancement of the performance, productivity, and sales of firms [55] becoming both technically and commercially successful.

As illustration of the above, a Cloud Computing *Platform as a Service* (PaaS) solution in the form of EDI (Electronic Data Interchange), may allow for forward and backward integration of supply chain processes between supplier and its vendors all running different technology platforms. Vendors and Partners need not implement the same Enterprise Resource Platforms [1] or Knowledge Management systems [9] for the supplier to have visibility on the status of their purchase orders, inventory status in the order process, invoices released after payments etc. as these can be done via a Cloud Service provider portal on a pay-per-use model, instead of hardware deployment on site of the SME.

E. Impact of Crime

Businesses, already susceptible to a wide variety of crimes, need to be alert to prevent the impact of criminal activity from impacting profitability to the point that the viability of their business is compromised. Crimes against companies range from shoplifting and vandalism to piracy and counterfeiting [56]. In some instances, crimes committed against businesses are committed by outsiders while in many other cases; employees at all levels commit crimes against their employers. In some cases, companies become unwitting accomplices of money-laundering crimes [57].

Crimes committed against business are nothing new. The literature records numerous examples throughout history. By 1995, the SBCI survey found 35% of retailers reporting customer theft with similar percentages for manufacturing and wholesaling industries. In all, 75% of surveyed businesses reported one or more incidents of crime, with 3.5 incidents on average [58].

Crime imposes substantial direct and opportunity costs on business, and limiting growth. Firms face significant risks of financial loss, and potential violence and emotional damage associated with crime, subsequently degrading owner- and staff morale, and productivity. The additional costs of security lessen a firm's competitiveness, and by extension the competitiveness of a country as a whole. Indeed, the Global Competitiveness Report ranks South Africa at position 141 of 148 countries surveyed for the business costs of crime and violence [23].

Small businesses may be particularly vulnerable to crime as small businesses often do not have measures in place to detect and prevent criminal activity. As early on as 1996, (prior to Internet crime) a survey of 400 firms conducted by the U.S. Small Business Administration found nearly 13% of surveyed businesses to have been victims of crime. Also, fewer than half (48%) employed any security measures and many incidents, especially employee thefts, went unreported [59].

Since the development of the Internet, cybercrime activity has been on a rapid increase. The 1995 National Computer Crime Survey in the USA reported 67 percent of the 7,818 businesses surveyed fell victim to at least one cyber-attack [61]. Many of the cyber-attacks involved theft (60%) while other incidents included viruses uploaded to the business computer system. Sixty-eight percent of the cyber-attack thefts resulted in a monetary loss of $10,000 or more [60].

Arguably, the best strategy against business crime is to focus on preventive measures. For many businesses, at a physical level, simple actions such as improving security lighting or requiring employee identification may reduce crime [62]. Crime preventive actions can be categorized into external measures, to include security lighting, surveillance cameras, locks, and key control; employment policies that include background checks, drug testing, employee identification, and separation of duties; computer defenses that include secure websites, access authorizations through secure passwords, computer firewalls, and secure Internet payments [62].

Everyday work practices such as keeping minimal amounts of cash on hand, requiring employee identification, payments by internet transfer and limiting the delegation of

authority to staff could provide basic defenses against internal and external crime [63]. All these recommendations can be embedded in a technology that is automated and help a small business owner to have visibility on measures taken in reducing crime e.g. placing video cameras on the business premises requires storage and archiving capabilities and *Infrastructure as a Service* (IaaS) can assist in securing such data at a minimal costs and with reduced skills required from the small business owner. Stock management systems could likewise be run from the Cloud Infrastructure and facilitate an integration with *mobile devices* to give visibility to the owner on (e.g.) how much stock are in the stores, or how much cash is in the till. Recent Retail Management systems are able to provide this service and Cloud Security *Infrastructure as a Service* (IaaS) may be employed to combat cyber-attacks on an SME.

F. Lack of Funds

Much has been written about the lack of financing for SMEs, not just in South Africa, but in many other parts of the world as well [65]. Difficulty in accessing finance has remained one of the top three constraints mentioned by the national expert panel in several surveys and SME studies in South Africa. The GEM 2002 and 2003 reports [66] showed that a significant number of entrepreneurs from disadvantaged communities did not keep financial records and that cash constraints were widespread amongst entrepreneurs with registered businesses from such communities. Cash flow difficulties were significantly reduced in firms that kept a cash book and a record of debtors and; who practiced active debtor management and inventory control. Implementing any of these practices was associated with a minimum of 33% reduction in the probability of an exhausted overdraft and embracing these practices appeared to reduce the probability of cash flow problems by as much as 61%. Implementing these practices also significantly increased the probability that a firm would succeed in an application for term loan finance [23].

The high costs and lack of technical know-how of implementing this system can be mitigated by embracing Cloud Computing *Software as a Service* (SaaS) services using products like Sage Accounting software which is costs at between R30 and R120 per month per user [67].

Despite the lack of financing being cited as a constraint in the literature, there are a variety of funding programs and financing schemes through the use of guarantees that are available, in addition to other support programs. Awareness and the uptake of these schemes, however, have been very low [68]. Clearly, the lack of awareness of the existence of these programs will affect access to sufficient funding. Note, however, that even if financial assistance is available, it may well not be accessed by those who need it. A study by [69] found that 28% of SMEs surveyed had never applied for financial assistance from a bank. The main reasons given were not knowing the procedures for applying for a loan (53%), not knowing about the sources of finance available from the banks (23%) and the high interest rates (7%). 17% of SME owners indicated that they had enough capital to start and run their own businesses. Using internet applications powered by

Cloud Computing, SMEs can subscribe to newsletters from the department of trade and industry at no cost.

The discussions in this section answer our **RQ1** above.

VIII. SUMMARY OF CLOUD SOLUTIONS

Our cloud solutions for SMEs are synthesized in Table 2.

Table 2: SME cloud solutions

CLOUD COMPUTING	
ENTERPRISE SYSTEMS	KNOWLEDGE MANAGEMENT
SME Challenge	**Cloud Solution**
Red Tape	**SaaS** - Tax compliance - VAT, PAYE, UIF, etc. Software
Labor Legislation	**SaaS** - Acts: Labor Relations Employment - - Equity, Skills Development, etc.
Lack of Skills	**PaaS** - Management skill development - BPM automation
Lack of Innovation	**PaaS** - No hardware on site - Pay-per-use (utility) computing
Impact of Crime	**IaaS** - Improved data security - Mobile technology - Site visibility for owner
Lack of Funds	**SaaS** - Access to Accounting software - Online funding opportunities

The discussion in the preceding section as well as the synthesis in Table 2 provide an answer to our **RQ2**.

IX. CONCLUSION

This paper investigated the extent to which Cloud Computing may assist in alleviating some of the challenges experienced by SMEs in the South African context. Cloud Computing is generally defined as a model for enabling convenient, on demand network access to a shared pool of configurable computing resources (e.g. networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction [2].

The Small Medium-sized Enterprise market has the potential to play a significant role in the economy and the challenges faced by this market is impeding such potential. A study conducted by [20] estimates that 91% of formal business entities in South Africa are SMEs, and such SMEs contribute between 52 to 57% to GDP and provide about 61% of the employment in South Africa. However, many small businesses within South Africa do not survive their second year of business, with failure rates as high as 63% (Roberts, 2010).

Having reviewed the literature on the reasons why SMEs fail, it was discovered that many such reasons stem from way back as far as the literature is concerned and many of these reasons are still relevant today. The most recent publication

review for South Africa is the SBP growth index 2013 report [23] which summarized the reasons for failure as: impact of red tape, labor legislation, impact of crime, lack of skill, lack of innovation, and lastly lack of funds. These challenged were addressed in the relevant sections above.

This research indicated for each of the six (6) challenges experienced by SMEs the extent to which the service models of Cloud Computing may alleviate each of these and mitigate the risk of SME business failure. A brief synthesis of these findings appears in Table 2. This research furthermore positions Cloud Computing technology as being a convenient and cost effective method for an "on demand", pay- per-use service.

Further research is required to drill down into more detail about the cloud computing frameworks that may be developed for each of the six challenges experienced by SMEs.

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APPENDIX C: EDITORIAL CERTIFICATE

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EDITORIAL CERTIFICATE

This certifies that the manuscript listed below was edited for English language, grammar, punctuation, spelling and overall style by one or more editors at Green Publications

MANUSCRIPT TITLE

The role of cloud computing in addressing small, medium enterprise challenges in South Africa

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12 February 2018

DATE

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