A Strategy for Adopting Cloud Computing Services in Small, Medium and Micro Enterprises (SME) in The Nelson Mandela Metropole

by

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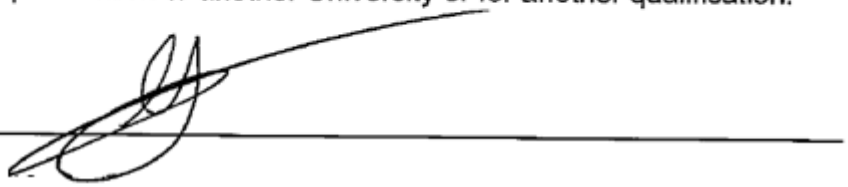
DECLARATION OF ORIGINALITY

I, George Sarpong, (207077211), hereby declare that the treatise for MPhil in IT Governance is my own work and that it has not previously been submitted for assessment or completion of any postgraduate qualification to another University or for another qualification.

SIGNATURE: 

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ABSTRACT

Small, medium and micro enterprises (SMEs) in South Africa continue to form the foundation for growing the economy. Thus, these enterprises have a significant role in to play in helping the country to eliminate poverty and unemployment. In order for these businesses to continue to grow and stay abreast with the changing business landscape, these businesses need to adopt some or other form of technology. One such technology is cloud computing, which is at times referred to as external hosting. Cloud computing is a type of technology that allows any business to operate as if it had a team of dedicated professional information technology (IT) personnel continually checking and monitoring its IT systems. As a result, cloud computing often allows a business to save on costs, improve communication with clients and speed up the transfer of information across the business. Thus, as SMEs often have small or non-existent IT departments, cloud computing offers these business an opportunity to compete with larger corporations without having to compromise on the quality of their service.

However, in spite of these benefits, cloud computing still remains something of a novelty to many small businesses that operate in Nelson Mandela Metropole, as these businesses tend to either adopt a small portion of the technology or not to adopt the technology at all. The reasons for not significantly investing in the technology are usually far ranging but are often linked to these businesses not understanding how the service can be best used to help their business to grow.

This study includes a description of a strategy that SMEs can follow when adopting cloud computing services as part of their business models. In addition to this, this study includes a discussion on the various benefits and disadvantages that await SMEs that make the decision to invest in the service.

Keywords: Cloud Computing, SME, Nelson Mandela Metropole, Information Technology, Strategy, Benefits of Cloud Computing

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LIST OF ABBREVIATIONS AND ACRONYMS

Coherent Actions (CA)

Design Science Research paradigm (DSR)

Diagnostics (D)

Enterprise architecture (EA)

Gross Domestic Product (GDP)

Guiding Principles (GP)

Information communication technology (ICT)

Information systems (IS)

Information technology (IT)

Infrastructure-as-a-Service (IaaS)

National Development Plan (NDP)

National Institute of Standards Technology (NIST)

Platform-as-a-Service (PaaS)

Protection of Personal Information Act (POPIA)

Service level agreement (SLA)

Small medium and micro enterprise (SME)

Software-as-a-Service (SaaS)

CHAPTER 1 INTRODUCTION

1.1 Introduction

As a result of the continual introduction of more complex technologies, various businesses have begun to call for a more structured approach to managing information communication technologies (ICT) (Santos et al., 2017). One suggested approach to effectively managing ICT, is for organisations to begin to adopt information technology (IT) governance as part of their business structures. According to Huygh, Joshi, De Hass and Grembergen (2018), IT governance is a component of corporate governance that is aimed at governing IT-related assets. IT Governance can therefore be defined as the "process of implementing structures, processes, and relational mechanisms that are needed in order to govern IT assets, thereby achieving strong business/IT alignment, and ultimately improving the return on IT-enabled investments" (Huygh et al., 2018, p. 5336). This postulates the idea that organisations should seek to align their use of IT with their strategic plans to reap maximum rewards from their IT systems.

This need to align business operations with IT stems from the understanding that modern day businesses are becoming more and more dependent on the use of IT (Huygh et al., 2018) in order to perform their activities. This increased dependency on IT has resulted in organisations spending more on their IT operations than ever before. According to a research entity, Gartner (2018), South African businesses spend more and more each year on their IT (see Table 1.1). This signifies the important role that IT is starting to play in business development strategies in the country. In other words, any business that wants to remain competitive in the country will need to start making a significant investment in its IT infrastructure.

Table 1.1. IT Spending Forecast, South Africa (Millions of Rand)

	2017 Spending	**2017 Growth (%)**	**2018 Spending**	**2018 Growth (%)**	**2019 Spending**	**2019 Growth (%)**
Data Centre Systems	7,803	-3.6	8,594	10.1	8,456	-1.6
Software	27,908	12.7	31,396	12.5	35,361	12.6
Devices	39,634	3.0	39,995	0.9	44,196	10.5
IT Services	71,942	8.7	77,672	8.0	83,303	7.2
Communications Services	117,777	0.8	118,929	1.0	119,361	0.4
Overall IT	**265,065**	**4.2**	**276,586**	**4.3**	**290,677**	**5.1**

Source: Gartner (August 2018)

1.2 Relevance of Research Problem

As indicated in Table 1.1 this investment in IT is not merely confined to the IT department but is also aimed at integrating the entire business function. Businesses have thus become more digitalised (Brennen, S. & Kreiss, 2014). Brennen and Kreiss (2014, p. 8) define digitalisation as “the adoption or increase in the use of digital or computer technology by an organisation, industry, country, etcetera.” This increased digitalisation of the world has led us to what is termed Industry 4.0, or the fourth industrial revolution. Uzair Younus (2017) writes that the fourth industrial revolution will result in technologies becoming fully embedded in societies and humans. This will result in all aspects of business operations becoming fully connected, which will enable businesses to receive and send data at faster rates than ever before.

Despite these and many more benefits, there exist some drawbacks for organisations that choose to advance with technology. One such drawback is the increase in an entity’s susceptibility to cyber related risks (Kent & Tanner, 2016). A cyber risk is defined as “any

risk of financial loss, disruption or damage to the reputation of an organisation as a result of a failure of the organisation's information technology systems" (Institute of Risk Management, 2018, p. 10). Cyber related risks thus tend to affect the way in which an organisation performs its activities. One of the major cyber risks is the risk over the security of data (Njenga & Jordaan, 2016). This is due to the fact that data forms a critical component for the way in which organisations conduct their activities. Organisations aim to transfer data faster and more accurately across various networks. Technology allows organisations to achieve their data transfer goals with larger amounts of data, thus improving the business's ability to interact with its third parties. The rise in data security risks can be directly linked to the increase in data transfers, as now more relevant and important data is transferred across networks.

This rise in data transfers has led to the term "big data" being used to define the large amounts of information being transferred across business operations. Big data is the term used to describe "data that is generated from online transactions, emails, videos, audios, images, click streams, logs, posts, search queries, health records, social networking interactions, science data, sensors and mobile phones and applications" (Sagiroglu & Sinanc, 2013, p. 42). In time this data begins to grow at escalating rates resulting in it becoming difficult to capture, form, store, manage, share, analyse and visualise using typical database software tools. As a result, organisations have begun to seek ways to manage and control this incoming data and information effectively (Sagiroglu & Sinanc, 2013).

1.3 Research Rationale and Significance

One suggested way of managing big data is to make use of on-demand services. In the technological world, on-demand services are services that are offered to consumers on a pay-as-you-use basis. This allows users to access a wider range of technological services which they may not have been able to access due to a limitation on their resources (Chen, Wu, & Chen, 2018). An example of an on-demand service is cloud computing. Voorsluys, Broberg and Buyya (2011) refer to cloud computing as an umbrella term that is used to describe a type of on-demand service.

Cloud computing offers many different solutions to organisations such as allowing companies to analyse big data. This is done by offering organisations a lower cost and a more powerful and timely means of data processing (Wang, Kung, & Anthony, 2018).

Marston, Li, Bandyopadhyay, Zhang & Ghalsasi (2011) list three key advantages to implementing cloud computing, and these are: (1) its ability to lower costs, (2) its ability to provide immediate access to hardware resources with no upfront capital investment required, and (3) its ability to lower barriers to innovation and deliver services that were not possible. Cloud computing also offers the benefits of virtualisation (Gupta & Milojicic, 2011). Virtualisation is where a single computer is given the ability to operate as if it were multiple computers. Furthermore the impending legislation around the Protection of Personal Information Act (POPIA) may potentially offer another benefit for cloud services users, as cloud services are potentially more secure than traditional methods of protecting digital data (Skolmen & Gerber, 2015).

Based on this discussion, it can be seen that cloud computing can be of real benefit to most businesses, as it allows them to save on the cost of transferring information across networks. Cloud computing may also potentially be of more significance to SMEs than larger corporations. This is because cloud computing allows these businesses to perform similar activities to that of larger businesses, without them needing to invest in any major IT infrastructure. Thus, cloud computing may allow SMEs to invest most of their financial resources in other activities without having to compromise on their IT operations. However, despite these advantages of cloud computing, SMEs still continue to be slow to adopt this service (Mavimbela & Dube, 2016). As a result, a gap begins to exist between SMEs' abilities to keep pace with larger businesses that are able to rapidly evaluate and quickly adopt new technologies in an effort to realise certain economies of scale offered by these technological advancements. By being slow to adopt this and other technologies, SMEs can be said to have reduced competitiveness in the sectors in which they operate.

1.4 Definition of Cloud Computing

There are multiple definitions for what constitutes a cloud computing model. According to the National Institute of Standards Technology (NIST), cloud computing is “a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g. networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction” (NIST, 2011, p. 2). This definition is widely agreed upon by various authors including Phaphoom, Wang, Samuel, Helmer and Abrahamsson (2015); Doherty, Carcary and Conway, (2016); Johnston, Loot and Esterhuyse, (2016); Hassan,(2017).

Although this definition is widely used, other authors have proposed alternative definitions for this term. Rajaraman (2014, p. 245) describes cloud computing as “a method for availing computing resources from a provider, on demand, by a customer using a computer connected to a network.” Kushaia, Murray and Zysman (2015) refer to cloud computing as a computing resources management model, used for pooling and sharing hardware infrastructure resources on a large scale. Erdogmus (2009) defines cloud computing as a pool of highly scalable, abstracted infrastructure that is capable of hosting end-customer applications that are billed by consumption. Put another way, cloud computing is a method of delivering fast reliable and convenient IT resources to users that are connected to the internet.

All of these definitions of cloud computing provide an excellent contribution to aid in helping one to understand what cloud computing is. However, in conducting this research project it was decided that cloud computing will be defined according to the NIST definition (see above), since, it is submitted, this definition provides the most complete description for what cloud computing is, which is in line with the purpose of this research study.

1.5 Definition of a Small Business

According to Cloete and Courtney (2002), various methods can be applied to determine whether a business can be classified as an SME. To date, most academic literature tends to either classify businesses as SMEs by their turnover or by their type of organisational structure (Scheers, 2018). For example, businesses with turnovers between R0 and

R8 000 000 are often classified as SMEs; consequently business with turnovers in excess of R8 000 000 fall outside this scope.

Alternatively South African legislation has chosen to adopt different characteristics for defining small businesses; for example, s1 (viii) of the National Small Business Act (102, 1996) defines a small business:

> "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 mentioned in column I of the Schedule and which can be classified as a micro-, a very small, a small or a medium enterprise by satisfying the criteria mentioned in columns 3, 4 and 5 of the Schedule opposite the smallest relevant size or class as mentioned in column 2 of the Schedule."

Alternatively, section 12(E) (4) of the Income Tax Act(58,1962), defines a small business as "any close corporation or co-operative or any private company as defined in section 1 of the Companies Act if at all times during the year of assessment all the holders of shares in that company, cooperative or close corporation are natural persons." Certain other requirements are prescribed. *Inter alia* gross income may not exceed R20 million in terms of section 12E(4)(*a*)(i) of that act.

These various definitions of what constitutes an SME helped to form the basis for constructing the definition of an SME for the purposes of this research project. It is therefore proposed that for the purposes of this research project, an SME shall be defined as *any registered corporation being managed by a single or group of individuals with a turnover between R15 000 and R40 million per annum.*

1.5.1 **The need for small business**

The need for SMEs stems from the understanding that these businesses enable low income earners in South Africa to gain access to economic opportunities (Chimucheka, 2013). The National Development Plan (NDP) is of the view that South African SMEs have the ability to contribute 90% of the country's new employment requirements by 2030.

This will result in SMEs becoming the real driving force behind Gross Domestic Product (GDP) in the county (BIZNIS Africa, 2017).

Despite the view of the NDP, it is submitted that SMEs have an above average failure rate. According to Global Entrepreneurship Monitor in 2016, 67% of businesses were forced to close down due to financial implications. This over-expenditure could partially be caused by SMEs not realising opportunities available to them to reduce costs through the use of new technological advancements.

1.6 Research Aim, Question and Objectives

One possible reason for SMEs not making use of different technologies like cloud computing may be due to the fact that they fail to identify the value which these technologies can bring to their business (Kevin, Muzaffar & Esterhuyse, 2016: 16). According to research conducted by World Wide Worx in conjunction with accounting research firm Xero, approximately 52% of SMEs battle to keep up with technological advancements while 45% of firms indicate that they could be doing more in the technological space. This results in an ever increasing technological gap between entities that are able to continually and quickly adopt new technologies versus those that are slow to react.

The King IV report on Corporate Governance requires entities to take steps to evaluate, direct and monitor their use of technology resources as a means to help support their strategic resources. This therefore places an onus on firms to find ways to stay abreast of technological advancements to ensure that their business models do not collapse. However, some small businesses still do not see good corporate governance as enough of an incentive to adopt cloud computing. They still view the drawbacks of adoption as being greater than the benefits (Kevin, Muzaffar & Esterhuyse, 2016: 18). These drawbacks create barriers that are likely to cause these SMEs to continue to operate the same way in which they always have, which, given the technological advancements, will likely cause stagnation in their operations.

With the above in mind, the research problem statement (question) on which this study has been based, can be stated as follows:

"Despite the benefits of cloud computing, SMEs in The Nelson Mandela Metropole are still reluctant to adopt cloud computing services as part of their business model."

1.6.1 Thesis statement

In supporting the problem statement above, the thesis statement addressed in this study is;

Cloud computing has the potential to offer SMEs operating in The Nelson Mandela Metropole the ability to perform their activities in a manner to be able to compete with larger corporations. Therefore, in adopting and harnessing the benefits of cloud computing services, these enterprises are more likely to survive and grow their operations.

1.6.2 Research objectives

The primary objective of this research project is to devise a strategy to assist SMEs in Nelson Mandela Metropole in adopting cloud computing services.

Secondary Objectives

To achieve the primary objective of this study the following secondary objectives are formulated as follows:

- To conceptualise cloud computing in the context of this study's research problem.
- To outline the advantages, disadvantages and barriers to businesses that choose to adopt cloud computing services.
- To outline a methodological process for developing a strategy, for adopting cloud computing services.
- To understand the role that cloud computing currently plays, or the role that it could play in helping SMEs to achieve their objectives.
- To discuss the research findings and conclusions of the study and to provide recommendations.

1.7 Scope and Delineation

To facilitate an effective research project, it was decided to narrow the scope for this research assignment in three areas. These areas were identified as being (1) the type of organisations to be included in the study, (2) the geographical area where the organisations to be included in the study would be selected from and (3) the number of entities to be examined by the study. In making the decision to narrow these areas two important factors were considered, namely the availability of time and financial resources.

After considering these factors the following three research areas were scoped as follows:

- Firstly this study only focuses on SMEs that fit the definition as noted above; that is registered corporations that are managed by a single or group of individuals with turnovers between R15 000 and R40 million per annum.
- Secondly the geographical boundaries where the research took place, were limited to the Nelson Mandela Metropole as this presented the closest available area that houses numerous SMEs that fall in line with the definition above.
- Thirdly in determining the number of SMEs to be included in the study, this research project focused on only examining five SMEs operating in the area.

1.8 Research Approach

At this stage it can be seen that a real-world problem exists within the SME environment. To address this real-world problem this study composed an artefact. This artefact was in the form of a strategy, which detailed a process which can be followed by SMEs in adopting cloud computing services. A design orientated information systems (IS) approach was selected as the research paradigm. The design orientated IS research approach will be discussed at length in chapter 3 of this study.

1.9 Treatise Structure

With the objectives of this study firmly in mind this section will briefly provide a synopses of how each chapter will relate to this research study.

Chapter 1 introduces and outlines the purpose of this research study. This chapter provides a background and describes the research question and the purpose of this research study. Chapter 1 also provides clarity on the research question, the thesis statement and the scope of the study.

Chapter 2 explains the current technological landscape in which SMEs operate. It also outlines the advantages, disadvantages and barriers that prevent SMEs from adopting cloud computing services.

Chapter 3 outlines the strategy for adopting cloud computing services by SMEs. The chapter also discusses the methodology and tools that are used to conduct this research study.

Chapter 4 presents the findings and summarises some of the results from the data collection. The chapter also develops a strategy for cloud computing adoption based on the data collected, and methodology that was established in chapter 3.

Chapter 5 concludes the study and summarises the research findings and conclusions reached.

CHAPTER 2 LITERAURE REVIEW

2.1 Introduction

Chapter 1 of this research project outlined and defined the problem statement, the thesis statement and the research objectives.

The aim of this chapter is to conceptualise cloud computing in the context of this study's research problem (question) and its associated research objectives. To properly conceptualise cloud computing this chapter reviews published literature related to cloud computing. In doing this, this chapter seeks to provide a better understanding of the concept of cloud computing. Moreover, the literature assists in providing an understanding of some of the advantages and disadvantages of adopting cloud computing services, in order to make a case for SMEs adopting cloud services as part of their business models. Finally, this chapter looks to identify and review the barriers that have prevented companies from implementing cloud computing services.

2.2 SME Information Technology Landscape

There are a significant number of SMEs operating in South Africa. According to a 2017 engineering news report (Odendaal, 2017), there are over 5.6 million SMEs operating in the country alone. Each of these organisations can be said to have a set of similar traits or characteristics that identify them as SMEs. One such characteristic can be found in the way in which SMEs make decisions.

According to Ayandibu & Houghton (2017), in an SME environment the process of making a decision is often not structured or formalised. As a result, important decisions tend to be made haphazardly (Okello-Obura & Matovu, 2011). This haphazard approach to decision making often causes SMEs to make uninformed decisions, due to the lack of necessary information required to make informed decisions. This is especially the case when it comes to SME'S IT investment decisions (Alhassan & Van Belle, 2017).

Mohamed, A., Eman S, N., & Geith, M (2016), state that the majority of IT investment decisions are complex activities that have significant and strategic implications for

organisations. Therefore, these decisions should be given careful and meaningful thought before they are undertaken. In spite of this, SMEs are still reluctant to spend the necessary time and resources in order to properly consider IT investment strategies (Hasheela-Mufeti & Smolander, 2017). This is due to the fact that most SMEs, excluding SMEs that specialise in the provision of IT services, lack necessary IT skills to make appropriate IT investment decisions. As a result these businesses tend to rely on their owners intuition when making such decisions (Alhassan & Van Belle, 2017). These owners are usually not experts in the field of IT and therefore make uninformed decisions that are based on their personal intuition. Furthermore, IT investment decisions in SMEs are at times based on short term informal and ad hoc practices, with no identifiable IT strategy in mind (Rantapuska & Ihanainen, 2007). Such a process of decision making can have negative implications on SMEs' ability to adopt new technologies (Rantapuska & Ihanainen, 2007).

Therefore, in order for these businesses to begin to adopt new technologies the owners of the business will need to become more educated about the relative importance of making proper IT investment decisions.

One suggested way of achieving this is for organisations to introduce enterprise architecture (EA), as a way to guide their process for IT decision making (Mohamed, Eman & Geith, 2016). EA is an approach to managing the complexity of an organisation's structures, business environments, and different information systems, and for facilitating the integration of strategy, personnel, business, data, and IT (Goethals, Snoeck, Lemahieu & Vandenbulcke, 2006). EA provides an organisation with a holistic view of the enterprise and its different components and structures (Dang & Pekkola, 2017). This allows the organisation to identity the key areas of the business that require IT investment. EA can result in numerous benefits to organisations such as improved decision making, reduced IT costs, bettering business-IT alignment, re-use of resources, and regulatory compliance (Dang & Pekkola, 2017). Although these benefits can be said to be significant to these organisations, without the business owners being properly invested in trying to understand how these technologies can be of benefit to their business, this approach will still not yield the desired outcome (Shimba, 2010). It is therefore suggested that SMEs

explore different technologies in order to assess their benefits. One such technology is cloud computing. In chapter 1 cloud computing was defined as a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (NIST, 2011).

According to the NIST (2011), any cloud model should comprise five characteristics, which are used to describe all cloud models offered to customers. Three service or architectural layers are used to outline and define the type of service that a client wants access to. Kushida et al. (2015) note that any service offered that does not delineate between these three architectural layers cannot be considered to be a cloud service. It is therefore proposed that this description represents the foundation for what cloud computing is. Cloud computing models are denoted by four deployment models which dictate how users interact with cloud services. The characteristics, architectural layers as well as the deployment models are explained below:

2.2.1 **Characteristics of cloud computing**

The five characteristics referred to in the definition are:

1) On-demand services users, which allow users to access information as and when needed.
2) Broad network access, which allows users access to the cloud network through standard mechanisms such as laptops and tablets.
3) Resource pooling, where service providers' resources are pooled together to service multiple users, by allocating resources using a "multi-taint" model that assigns and reassigns resources based on user demand.
4) Rapid elasticity, which allows users to request additional services such as storage space. These services are then provisioned and released rapidly.
5) Measured service, which optimises resources and thus allows the user and the provider to identify, monitor and control their usage.

2.2.2 Service delivery/architecture models of cloud computing

1) Software-as-a-service or SaaS: with this type of service, applications are run on the cloud, which removes the need to install and run applications on client computers. Examples include Facebook and Twitter (Marston et al., 2011). With SaaS the need for organisations to run and install applications is removed, thus helping entities to eliminate the expense of software licencing, software and hardware maintenance and compatibility issues that occur with software upgrades (TechTarget, 2018). SaaS also offers numerous other benefits for businesses including enhanced customer service and work flows, allowance for collaboration between business functions, an overall improvement in business efficacy, allowances for flexible payments and scalable usage (TechTarget, 2018). The major difficulties with using a SaaS model include the fact that it is over reliant on the cloud service provider to deliver services, track and report accurate billing of services and facilitate a secure environment for data.

2) Infrastructure-as-a-Service (IaaS): with this service storage and computing capabilities are offered as services. Examples include Terremark and Joyent (Marston et al., 2011) With IaaS the service provider becomes responsible for the hosting of the cloud infrastructure. The service provider will then supply the infrastructure on the client's premises along with a virtualisation layer to improve customer performance (Marston et al., 2011). IaaS benefits include the fact that it offers the complete package to users, which enables them to utilise the cloud model without having to buy, manage and support the infrastructure (TechTarget, 2018). These services are more for businesses that seek to deploy services that have changing or temporary workloads. This allows the business to use the environment for a short period of time and then transfer the information to another environment when the business is ready. Billing is done based on the resources that the business uses (TechTarget, 2017).

   The drawbacks of implementing such a system is that users experience higher prices than first expected, as fees are only calculated at the end of a period which

is agreed upon in the service level agreement (SLA). Another problem that occurs when using IaaS is that this service is very reliant on the operations of service providers. When these service providers experience problems with their systems the problem is almost always transferred to the customer (TechTarget, 2017).

3) Platform-as-a-service (PaaS): with this service a user is offered a computing platform for application development and deployment, including operating systems, web servers and programming language execution environments. Examples include Salesforce and Microsoft Azure. PaaS builds on the services offered by IaaS by allowing service providers to maintain the operating systems and the software used to run the system (Bhardwaj, Jain, & Jain, 2010). This provides convenience for users as this allows them to access the infrastructure and the services from anywhere provided they have some sort of connection to the system. Users are charged on a per use basis which eliminates the capital investment amounts. The biggest risk associated with this type of service relates to its service availability and resource pooling needed to provide services for the customer (Bhardwaj et al., 2010).

2.2.3 **Deployment models or platforms**

1) Private Cloud

With a private cloud model the cloud service is implemented inside a corporate firewall (Nazir, Tiwari, Tiwari, & Mishra, 2015). This allows only individuals, who are authorised by the entity, to have access to this cloud service. This type of model offers a greater level of security than public clouds because only a limited number of users can access the system (Goyal, 2014). Moreover, the infrastructure used for operating private clouds is operated solely by the organisation requesting the service, which provides the company with a greater level of control. Private clouds are however more expensive to operate than public clouds (Goyal, 2014).

2) Community Cloud

Community clouds are in-between private and public clouds. With a community cloud the cloud infrastructure is shared amongst multiple organisations. This infrastructure can either be managed by the organisations themselves or by a third party. These clouds are normally created by organisations with similar interests such as insurance companies (Nazir et al., 2015) Community clouds are cheaper to set up as the costs associated with the setup are split amongst the participants of the cloud service. Management of community clouds can be outsourced to cloud providers (Goyal, 2014). These clouds however cost more than public clouds, and because there is a fixed amount of bandwidth and data storage, they can be slower than other cloud services (Goyal, 2014).

3) Hybrid Cloud

A hybrid cloud is a mixture of two or more distinct cloud infrastructures such as the private cloud and community cloud. For example, an entity's critical data may lie within their private cloud whilst less critical information may lie in a public cloud (Nazir et al., 2015). With hybrid clouds, capital expenses are kept low because most of the cloud infrastructure is outsourced to public cloud providers (Mohamed et al., 2016). Hybrid clouds also improve organisational resource allocation for temporary projects because their use of public clouds removes the need for investments to fulfil these projects (Goyal, 2014). Hybrid clouds also help to improve organisational infrastructure spending as public clouds can be used for development testing and for the retirement of applications, whereas private clouds could be used for production (Subramanian, 2011). Hybrid clouds also offer entities the best of both worlds by providing them with all the control available in private cloud deployment models along with the scalability of public clouds (Goyal, 2014).

The biggest drawback of a hybrid cloud model is that, because this model extends to an IT area that falls outside the organisation, they are more susceptible to cyber related attacks. Goyal (2014) writes that although hybrid clouds make the movement of information between the private clouds and the public clouds easier, there is a greater risk associated with the transfer of information across these types of models because the privacy controls are different in each environment. This is

due to the fact that each model will be operated by a different manager. Thus, the level of controls, privacy and security updates will be different. So where one cloud system may not recognise a malicious code, the other may identify such a code when information is transferred to it. This could lead to information being deleted by a platform or rendered unusable on the one platform. Finally, hybrid clouds offer greater flexibility to businesses between control and security, where organisations wish to push part of their business operations to public clouds for cloud bursting purposes (Goyal, 2014). Cloud bursting occurs when applications are run in private clouds or data centres until the demand for computing capacity spikes or increases and extra resources are required, then the applications are moved to the public cloud (TechTarget, 2017). This allows organisations to only pay for resources consumed in the public cloud when the applications are run in this environment(“TechTarget,” 2017).

4) Public Cloud

With public clouds services are provided by a third party for a specific community of users. With this type of cloud service, companies are potentially freed from being obligated to pay costs of purchasing and managing on-premises hardware and software (Nazir et al., 2015). Public clouds are typically faster but are less secure than private clouds (Nazir et al., 2015). These systems offer organisations data availability, uninterrupted technical expertise, on demand saleability, are easy and inexpensive to set up and offer virtually no wasted resources. This type of model is however, less secure then other models which reduces its appeal to small business practices (Goyal, 2014).

2.3 Why Adopt Cloud Computing?

By understanding what cloud computing is and what opportunities it provides, organisations would be better placed to improve their business through the use of technology (Assante, Castro, Hamburg, & Martin, 2016). Therefore, organisations should

examine and implement strategies to adopt cloud computing in order to enable them to gain access to these benefits.

2.4 The Advantages of Cloud Computing

To date extensive research has been done on the advantages of adopting cloud computing services in an organisation. Based on various research articles the benefits of adopting cloud computing, are that cloud computing offers the following:

2.4.1 Access to a relatively cheap computing environment

Organisations that adopt cloud computing services are able to gain access to a computing environment that offers them availability, scalability and flexibility in computing resources at low running costs (Mohamed et al., 2016).

Cloud computing also allows organisations the ability to save on their capital investment costs by separating computing resources from the enterprise's location. This allows the entity the ability to gain access to and utilise a computing environment without necessarily having to own the computing infrastructure (Mohamed et al., 2016; Nazir et al., 2015).

Doherty et al. (2016) states that cloud computing offers organisations the ability to receive computing services at lower running costs which enables them to maximise their resource utilisation. This could be done through the freeing up of employees, reducing hardware start-up costs or reducing network demand (Doherty et al., 2016). Cloud computing also offers organisations total cost ownership which allows them to focus more on their core business without having to worry about infrastructure (Giuseppe, Alessio, Walter, & Antonio, 2013).

2.4.2 Creates flexibility in resource utilisation

Since organisational resources are managed through software, cloud computing allows organisations the ability to request additional resources such as storage space as and when needed (Avram, 2014), thus providing flexibility.

2.4.3 **Rapid deployment of additional resources**

Cloud computing promotes the rapid deployment of business services and resources, thus allowing organisations the ability to receive changes immediately (Bhardwaj et al., 2010).

2.4.4 **Better resource utilisation**

Johnson (2011) records that cloud computing lowers the demand on organisational network systems by removing the need for applications to be run directly from the business systems. This allows entities to have faster operating systems which enable quicker workflows. Additionally, because cloud services are scalable, users will only consume resources as they use them, which frees up more operating space and lowers the cost of the service. Moreover, with cloud computing, users are able to make use of computing resources without necessarily needing to have the required level of expertise to operate such systems (Sharma & Mann, 2012).

2.4.5 **Integration with business process**

One other major benefit of cloud computing is its integration with enterprise resource planning systems (ERP). ERP systems are used to automate different business processes in order to enhance productivity and improve real-time monitoring of operations (Syspro, 2018). Processes such as payroll and banking are integrated to enable these processes to be updated in real-time without any human intervention. An ERP system will enable the organisation to share and transfer data and information across all functions of the organisation (Hasheela-Mufeti & Smolander, 2017). There are two broad categories of ERP systems; namely (1) on premise ERP systems and (2) hosted ERP systems (Klaus, Rosemann & Gable, 2000).

On premise ERP systems generally run using the enterprise's own IT infrastructure systems. The entity therefore becomes responsible for the management and operation of the system in accordance with the licence which it has received (Hasheela-Mufeti & Smolander, 2017). Alternatively, hosted ERP systems are offered over a direct network connection that may or may not run over the internet (Owen, 2011). With a hosted ERP system an enterprise will be able to receive multiple benefits including rapid

implementation of software systems and rapid updates to software systems (Hasheela-Mufeti & Smolander, 2017). Therefore by making use of cloud based ERP systems enterprises will be able to receive all the benefits offered by having an ERP system, without having to spend large amounts of money on maintaining the system.

2.4.6 **Remote access to information**

Cloud computing offers entities remote access to a computing environment thus enabling users to have access to information regardless of their location (Bhardwaj et al., 2010).

2.4.7 **Adopt new technologies faster**

By utilising cloud computing services organisations are able to access more updated software technologies which enable them to stay abreast of advancing technologies (Mohamed et al., 2016). These advancements include:

(1) Mobile interactive applications, that are location, environment and context-aware, that enable information provided by users in real time to be analysed and utilised for the benefit of the business;
(2) Batch processing which allows entities with large quantities of information to have that information processed and analysed in a short period of time;
(3) Business analytics that can utilise vast amounts of computer resources to understand customers' buying patterns and supply chains and;
(4) Extensions of computer intensive desktop applications that can offload the data crunching to the cloud, leaving only the rendering of the processed data at the front end, with the availability of network bandwidth reducing the latency involved.

2.4.8 **Virtualised resources**

Cloud computing offers organisations virtualised resources, parallel processing security, data integration and scalable data storage (Abaker, Hashem, Yaqoob, Anuar, Mokhtar, Gani & Khan, 2015) these benefits are designed to save the organisation waiting time with regards to processing and analysing of information.

2.4.9 **Resource pooling**

Cloud computing allows organisations to pool their resources in order to save on costs, such as making use of the same community cloud (Apostu, Puican, Ularu, Suciu, & Todoran, 2013).

2.4.10 **Management of big data**

Big data development and analysis are other key features for businesses that are looking to adopt cloud computing. Abaker, et al. (2015) identified big data development as the biggest value offered to users of cloud computing and its ability to manage big data. Cloud computing provides organisations with essential resources that are necessary to perform large scale complex tasks and span a range of IT functions from storage and computation to database and application services. These resources can be used to reduce the time it takes to perform these tasks and generally improve the business's operations.

Business continuity is listed as another potential benefit offered by cloud computing (Armbrust, Fox, Stoica, Zaharia, Griffith, Joseph, Katz, Konwinski, Lee, Patterson & Rabkin, 2010). As a result of information and systems being held off site, should a natural disaster occur, organisational operations and services would unlikely be affected due to the location of information. In addition to this, cloud computing allows for backups to be recovered more easily as most cloud service providers are competent enough to recover backups (Apostu et al., 2013).

2.4.11 **Aids in the protection of information**

One potential benefit offered by cloud computing is its ability to aid organisations' compliance with the Protection of Personal Information Act (POPIA). POPIA is an Act that is designed to give legal effect to section 14 of the Constitution, which allows everyone the right to privacy, by safeguarding personal information when such information is processed by a responsible party. It is important to understand that this Act does not just deal with the processing of personal information, but also with the security, integrity and confidentiality measures to be put in place by the responsible party over any processed personal information (POPIA, 2013). POPIA therefore, sets out to create lawful conditions for the secure processing of personal information with the aim of protecting this personal information. Cloud computing allows for this to be facilitated by allowing companies to

simplify certain compliance related tasks by the Act (Skolmen & Gerber, 2015). Tasks such as the processing of personal information can be run through the cloud in order to minimise the time taken to comply with the legislation.

2.4.12 **Improves storage of information**

According to Marston et al. (2011), most enterprises tend to make use of cloud services due to their offer of enhanced storage capabilities. As a result, Marston et al. (2011) looked to identify the most cost-effective cloud storage plan by analysing and reviewing the cost per unit for each cloud storage service provided by a major cloud service provider. The research also looked to identify whether or not implementing cloud computing would be financially beneficial to organisations. The results of the research found that the cost for implementing cloud storage services remains relatively high for larger organisations because their large-scale data centres can offer services at lower costs then cloud services providers. The implementation of such services for SMEs, however, becomes imperative, as these entities usually lack the infrastructure to effectively run such solutions at lower costs.

Cloud storage systems typically allow businesses to share files and folders using different mediums across remote locations. Access to these operating systems can be gained through the use of mobile devices, remote management tools and online file syncing, thus allowing businesses to operate regardless of time or place.

2.5 Summary of advantages

Therefore, in summary based on the above discussion, the most important benefits identified by these publications relate to cloud computing's ability to reduce costs, allow flexibility and scalability, lower the barriers to innovation, allow for remote access to systems and allow for rapid deployment of resources. Moreover, the majority of the identified advantages of cloud computing can be said to have a positive effect on the enterprise regardless of the type of entity.

Most entities should understand that the biggest benefit of cloud computing can be found in its overall perceived benefit to the organisation (Stieninger, Nedbal, Wetzlinger, Wagner, & Erskine, 2014). This means that should management, and its employees not

perceive cloud computing to be positively improving the way in which the business performs its operations, users are more likely to see its addition as a needless one. Users should see multiple benefits arising from its continued use such as, improvements in the speed of operations, reductions in system downtime, reduced system maintenance and increased growth in each function (Stieninger et al., 2014). It is therefore critical that organisations obtain the buy-in of users in order to bring the most out of the implementation of cloud computing.

As a result of these advantages a number of applications have been developed to leverage cloud platforms in an effort to draw in additional users (Abaker et al., 2015).

Finally it is important to understand that although the above examines the overall benefits of cloud computing, each individual deployment model and service layer provides users with its own unique benefits (Branco, De Sá-Soares, & Rivero, 2017) because each service and deployment model has its own features and characteristics. These disadvantages to adopting cloud computing are discussed below:

2.6 The Disadvantages of Cloud Computing

Despite many of the benefits offered by cloud computing, different entities have been very quick to dismiss it as a viable business technology (Sultan, 2011), because for all the advantages offered by cloud computing there are disadvantages or reasons not to adopt such a service. It is for this reason that Apostu et al.(2013) writes that businesses, especially smaller ones, need to fully comprehend these disadvantages before deciding to adopt these services.

2.6.1 Inadequate security over information stored on the system

The majority of these limitations stem from cloud computing being a wireless network (Abaker et al., 2015), and as a result the majority of these limitations are inherent. According to Avram (2014); Mohamed, Eman & Geith (2016); Abaker et al., (2015); Apostu et al.,(2013); Stieninger et al., (2014), these inherent limitations are centred on cloud computing's inability to successfully provide security over information that is stored in the cloud. These concerns arise because wireless networks can be accessed remotely

by unauthorised individuals (Doherty et al., 2016) and there are usually no ways of identifying the individuals who gain access the network.

Phaphoom et al. (2015) write that security presents the most significant inhibitor which prevents entities from adopting cloud services, since the adoption of cloud computing services requires organisations to entrust their business information to external parties (Doherty et al., 2016). Many organisations consider their business information to be private and critical which means they require extra levels of security (Mohamed et al., 2016), which they do not believe is offered by cloud services. Organisations are therefore hesitant to accept that external companies have the means necessary to protect this information.

Velumadhava Rao and Selvamani (2015) add to this concern by stating that cloud services are more prone to an external “cyber” attack due to it being a wireless network. This is due to the sheer volume of data that is stored on the cloud servers. Moreover, this risk is increased because organisations share resources, which could likely cause data misuse.

Abaker et al. (2015) write that should an organisation’s critical information be released, this could lead to reputational damage to an organisation.

2.6.2 **Inability to process and store big data**

Despite the rapid and significant increase in the amount of data stored in the cloud, the processing improvement mechanisms for this data have remained slow (Abaker et al., 2015). This tardiness in responding to changes results in data staging. Data staging can occur when data is gathered from different sources that do not have a structured format for this data. Examples include data gathered from social networking sites. This data then needs to be scrubbed and transformed into usable information. To date only a limited number of technological applications are able to offer such services (Abaker et al., 2015).

2.6.3 Limited control and flexibility

Cloud users may at times experience limited flexibility and control over the functionality and execution of their hosting infrastructure, as customers are often locked into long term contracts for services which they may not require (Apostu et al., 2013).

2.6.4 Inability to perform worthwhile data analytics

In order to draw meaningful information from large amounts of data, scalable analysis algorithms are required (Talia, 2013). As more data is transferred onto the cloud this data must be processed and compared with existing data that could have been processed differently which creates a back log in the changing of data processing techniques (Abaker et al., 2015).

2.6.5 Continuous availability of services

Organisations have become largely dependent on the use of their IT in order to deliver their services (Rajaraman, 2014). Without IT functioning at optimum levels companies become unable to properly access and deliver their services to customers. One major selling point of cloud services is in its ability to deliver high speed access to computing resources (Avram, 2014). However should the cloud service providers have downtime for the use of their IT system, users will be unable to access information which could cause considerable losses in time and money (Mohamed et al., 2016).

According to Phaphoom et al. (2015), entities require continuous uninterrupted access to internet and IT services in order to utilise cloud services. However, with the lack of availability, or the failure of the provider to provide one with the required level of availability, this has resulted in the unwillingness of entities to adopt services.

2.6.6 Possible deterioration of services

Rajarman (2014) identifies the possible deterioration of the quality of service offered by cloud service providers as a potential disadvantage. This is primarily due to the lack of standardisation of cloud services provided. Therefore, organisations are likely to find varying levels of quality in services offered, which could be to their detriment.

2.6.7 Service Level Agreements (SLA) fail to address the service required

Cloud services are secured through the signing of SLAs, which dictate the relationship between the cloud service provider and the service user. Should the user not understand the SLA or the SLA not account for a particular service which the users require as critical, the user will be left having an inadequate service (Abaker et al., 2015).

Apostu et al (2013), describe the lack of support received by users as another disadvantage of cloud services. It is noted that although service providers advertise call centres and quick response times, this is very rarely the case. It is noted that cloud service providers are often difficult to get hold of when required.

2.6.8 Potential cost of implementing such services

Although one of the major benefits of cloud computing is its ability to reduce company costs, not enough research has been done on cost comparisons between cloud and existing services (Johnston et al., 2016). It is important to note that cloud computing merely converts capital costs into operating costs (Kushida et al., 2015). Hidden costs exist within cloud computing SLAs including support, disaster recovery, application modification and data loss insurance (Avram, 2014).

2.6.9 Loss of technical knowledge of staff members

Mohamed et al. (2016) highlight the loss of technical knowledge as a possible disadvantage to utilising cloud service providers. This is due to IT departmental employees becoming complacent with their duties due to the services offered by the service provider. This may cause them to lose their technical understanding of the service over time.

2.6.10 Ease of transferring services

Phaphoom et al. (2015) list portability as another disadvantage to adopting cloud services. With portability certain service models for cloud services, such as software-as-a-service and platform-as-a-service, potentially create customer over-dependency on services offered. This reduces the ability of clients to transfer cloud data from one system to the other and this becomes critical to customers when deciding to cancel a contract. This problem is likely to continue until a standardised service API, architectural component and data structures (Armbrust, Stoica, et al., 2010) are implemented.

2.7 Addressing the Disadvantages

Whilst the disadvantages of adopting cloud computing may cause some businesses to reconsider their decision to adopt this technology, most of the notable disadvantages can be addressed by some of the advantages offered by this technology. For example, the most commonly identified disadvantage of cloud computing is that it lacks the ability to secure information that is stored on the platform (Abaker et al., 2015; Apostu et al., 2013; Avram, 2014; Mohamed et al., 2016; Stieninger et al., 2014). This is because information that is stored in the cloud is often stored in a space that the entity has no control over. As a result, multiple classes of information from different enterprises are likely to be stored in the same location. This renders this information at greater risk to being stolen, as hackers are now able to focus their attention on a single storage location. However, because cloud computing allows for multiple concurrent updates to be run to security software, information is more likely to be secure (Phaphoom et al., 2015) as it is continually receiving the latest updated security details. Furthermore, these updates are more likely to be more accurate and more comprehensive as their primary focus will be on securing data that is stored on the platform.

Another notable concern when it comes to cloud computing relates to the role of service providers in providing cloud services. Cloud service providers are often accused of not providing uninterrupted services, or allowing their services to rapidly deteriorate after the contract is signed (Apostu et al., 2013; Mohamed et al., 2016; Rajaraman, 2014). Additionally these service providers tend to lock enterprises into long expensive contracts for services which they do not need (Apostu et al., 2013).

These concerns can be addressed by a number of key advantages and lessons learnt from dealings with other service providers. Firstly, each aspect of the SLA should be reviewed by suitably qualified personnel in order to ensure that it complies with the entities service requirements (Avram, 2014). This will help to protect the enterprise from a service provider who provides a service which is unwanted by the company. Secondly, it should be understood that because cloud computing offers users a variety of service architecture models to choose from (Marston et al., 2011), users have greater flexibility and control

over choosing the service that suits their operations. Thirdly, due to the continued popularity of cloud computing services, cloud computing service providers are more common and therefore users have multiple choices when it comes to who will provide them with the service. Users should therefore compare and properly evaluate a service provider before selecting the service provider. Fourthly, because cloud computing is an advancing technology, the improvements in service offerings to clients are likely to increase. Fifthly, because cloud computing service providers are bound to the SLA (Bhardwaj et al., 2010), users are able to address system downtime upfront. Entities may even create clauses for service providers who fail to meet expectations.

Finally, most disadvantages of cloud computing can be addressed by entities being relentlessly committed to maintaining good governance structures after cloud computing implementation. Governance will always be key in continually maintaining and improving the services received by the enterprise.

2.8 Summary of disadvantages

Based on the above, the most important hindrance to the adoption of cloud computing still remains the security which it offers to entities for information stored (Lim, Grönlund, & Andersson, 2015). It is therefore submitted that security, along with the other disadvantages of cloud computing, is largely mitigated by the advantages offered to enterprises that make use of its services.

2.9 Barriers to the Adoption of Cloud Computing

The barriers that prevent entities from migrating to cloud computing play an important role in influencing entity decisions on whether or not to adopt these services (Assante et al., 2016). Certain unique barriers to adopting cloud computing create multiple and extensive challenges, which at times are not easily overcome (Zhang, Cheng, & Boutaba, 2010). Therefore it is necessary for one to understand and fully comprehend the barriers that prevent the adoption of this technology (Yeboah-Boateng & Essandoh, 2014).

Most of the literature regarding barriers to the adoption of cloud computing focuses on the disadvantages; that is, the reasons for not adopting cloud computing as opposed to

the factors that prevent entities from adopting cloud computing. It is therefore necessary to review the literature to identify the barriers preventing adoption.

According to Yeboah & Essandoh (2014) there are four main barriers that prevent SMEs from adopting cloud computing services. These are:

- The lack of internal expertise and knowledge regarding cloud services;
- Poor internet access and connectivity;
- Security of the cloud services and data privacy;
- Resistance to adopting new technologies.

Lian, Yen and Wang (2014) concur with this view by identifying security, the lack of technical competence in most organisations, lack of top management support and the complexity of cloud computing as the important factors that hinder the adoption of cloud computing services.

Mohamed (2016), notes that clients are normally afraid and unwilling to adopt new technologies. As a result, entities become uninformed regarding the services offered by cloud computing and it becomes more difficult for them to accept these changes.

Low, Chen and Wu (2011) identify three main barriers to the adoption of these services. One is organisational readiness, which represents top managements support, or buy-in towards changing the way in which the organisation is run. Next is technological readiness, which represents relative advantage and simplicity: it was argued that most entities believe that they need extensive training before adopting such services. Last is environmental readiness, which relates to whether or not competitors in the market place were using such services.

Alternatively Lian (2015) found that social influence creates a significant barrier that causes entities not to adopt these services. Lian (2015) defines social influence as the degree to which individuals believe that they should be doing something, as a result of what other people believe. In this study social influence resulted in people between the ages of 19 to 30 being more intent than any other age group on adopting new technologies such as cloud computing. The conclusion here was that people within one's

own age group or social group potentially create a barrier to adopting new technologies, if they do not believe in the technology.

Shin (2014) found that user intentions regarding the adoption of cloud computing are influenced by the perceived usefulness and ease of use of the service. This perceived usefulness is influenced by the availability, security, reliability and access to this service. This theme was seconded by Park and Kim (2014) who regard usefulness as being a major deterrent for adopting cloud computing. Consequently, users still continue to remain skeptical about these technologies, which in turn creates another barrier to the adoption of these services.

Gupta, Seetharaman and Raj (2013) found that security, privacy and cost were major hindrances to the adoption of cloud computing services. Marston (2011) identifies multiple barriers to adopting cloud computing including technology, reliability and security.

Hassan (2017) looked to identify the most important organisational factor that affects SMEs' ability to adopt cloud computing services. The study identified that although employee knowledge and managerial support play a role in cloud computing adoption, IT resources play the most significant role in the adoption of such services. It concluded that the more sophisticated an entity's IT resources are, including hardware, software, the more likely the entity will be to adopt such a technology.

Al-Ruithe and Benkhelifa (2017) explored the effects that data governance had on the adoption of cloud computing. This study identified that although security was the major reason for entities' non adoption of cloud computing, 41% of these security issues are in fact related to data governance.

2.10 Addressing the Barriers to Cloud Computing Adoption

Although there are multiple barriers which prevent entities from adopting these services, the majority of these barriers are described as being more sociological than real barriers (Rajaraman, 2014). Thus, the majority of these barriers can be addressed though organisational process changes.

Al-Ruithe and Benkhelifa (2017) recommend that entities introduce cloud governance programmes. These programmes should focus on educating senior management within an enterprise on how to implement cloud governance strategies successfully.

Mohamed et al. (2016) noted that one way to deal with this is for cloud services providers to start creating measures to properly educate entities on the benefits of adopting cloud services, thereby increasing the awareness of cloud computing amongst business (Mohamed et al., 2016; Yeboah-Boateng & Essandoh, 2014).

2.11 Conclusion

This chapter has reviewed the literature that identified the advantages, disadvantages as well as the barriers to the adoption of cloud computing and briefly looked at some of the measures which can be taken to address the barriers to the adoption of cloud computing services. The aim of this review was to evaluate whether or not it was in the best interests of SMEs to adopt cloud technology as part of their business practices. In order to evaluate this decision, the chapter identified and summarised from different forms of literature the different advantages and disadvantages of adopting cloud computing as part of a business strategy. The purpose of this secondary data collection was to contextualise what businesses could expect to encounter, should they make the decision to adopt cloud computing as part of their operations. The chapter also examined possible challenges that entities may face when they decide to adopt cloud computing. Although these challenges may potentially hinder an SME's decision to invest in cloud technologies, it would be possible for these enterprises to implement certain measures to overcome such challenges.

Overall it is submitted that entities are better off implementing cloud computing services, as the technology will likely make it easier for smaller organisations to access significant computing resources in order to compete with larger organisations.

The following chapter introduces the research methodology followed in this study in order to develop a strategy for adopting cloud computing services in SME's in the Nelson Mandela Metropole.

CHAPTER 3 RESEARCH METHODOLOGY

3.1 Introduction

The previous chapter reviewed and analysed various sources of literature in an effort to define, conceptualise and ultimately understand cloud computing as a discipline.

The purpose of this chapter is to detail the research methodology that is most appropriate to address this study's research problem which is: *"Despite the benefits of cloud computing, SMEs in The Nelson Mandela Metropole are still reluctant to adopt cloud computing services as part of their business model."* This will be done by discussing the research design and methodology as well as the sample design. The chapter concludes by discussing the research instruments used to gather the data for the study.

3.2 Research Approach

A paradigm is described as being a generally accepted world view of how to breakdown a complex real world problem (Kuhn, 1970). A research paradigm can therefore be described as a research approach that is aimed at addressing a real world problem. Information systems (IS) research represents one of the most common research paradigms that is used to conduct information technology research. IS research is a type of research paradigm, which makes use of theory from other disciplines, such as natural science and social sciences (Peffers, Tuunanen, Rothenberger, Chatterjee, & Taylor, 2008). However, whilst both natural and social sciences research aim to understand reality, information systems research aims to create artefacts that are designed to serve a human purpose (Peffers et al., 2018) The aim of information systems research is thus to create an artefact that is capable of addressing a real word problem. There are different ways to conduct information systems research, and one such way is to make use of a design science research approach.

In information systems research, a design science approach is regarded as a systematic approach to design through the use of scientific knowledge (Cross, 2001). It then follows that design science research is a systematic approach to conduct research that utilises scientific knowledge. A design science research paradigm (DSR) is a highly relevant method to utilise when conducting IS research (Cross, 2001). This approach examines the idea that should a researcher produce an innovative design that results in a clear

contribution to knowledge, that this researcher has in fact been involved in conducting research (Antonelli et al., 2010). The aim of DSR is therefore to create scientific artefacts that are utilised to solve real world problems (Antonelli et al., 2010). An artefact is an object that is intentionally made or produced for a certain purpose. Examples of artefacts include constructs, models and methods (Österle et al., 2011). These developed artefacts are then evolved to produce frameworks, guidelines, norms, business start-ups and much more for the benefit of the real world problem identified (Österle et al., 2011).

In order to conduct this research a design science research approach has been used to create this study's scientific artefact. The proposed artefact created by this study has been that of a strategy to adopt cloud computing by SME's in The Nelson Mandela Metropole.

3.3 Research Process

The aim of this research project was therefore to utilise a design science research approach in order to address a real world problem. The research problem area was identified as being the reluctance of SMEs (any registered corporation being managed by a single or group of individuals with a turnover between R12 000 and R40 million p.a.), situated in The Nelson Mandela Metropole to utilise cloud computing services as part of their business model. In order to address this problem this research study developed a scientific artefact in the form of a strategy which SMEs can potentially use to adopt cloud computing services in their businesses.

3.4 Importance of Strategy Development

A strategy is defined as a plan or a technique that is used to achieve an objective (Dymock & Nicholson, 2010). This objective is then used to address a problem which currently exists or one which will exist in the foreseeable future. Strategies are thus used by organisations as ways of identifying how their resources can best be used in an effort to meet their objectives (Gcaza & Von Solms, 2016). Gcaza and von Solms (2016) define a strategy as being the way in which a business utilises its resources to address different internal and external challenges that exist within the environment in which the business operates. Porter (1986) noted that a strategy should be the main distinguishing characteristic that separates one organisation from another. Strategies

are therefore key enablers to any organisation that wishes to achieve a desired outcome. Strategies must thus be purposefully engineered in such a way as to permit an organisation to easily identify the direction in which it is going.

A business strategy is a documented plan which sets out how an organisation plans to achieve its goals (Evolve, 2017). A business strategy will typically contain key principles that outline how a company will go about attaining its goals. For example, a business strategy may explain how to deal with competitors, or it may look at ways to address customer needs and expectations or even examine the long term growth and sustainability of the organisation (Evolve, 2017).

Based on this discussion, it is submitted that any strategy that depicts how cloud computing could be implemented would be highly beneficial to an SME. Such a strategy will provide the enity with a systematic way to address its technological deficiencies in a manner that will not negatively impact on the entities goal achievement.

Any such strategy would however need to be embedded in the mission and vision of the organisation with the goal of addressing the organisation's purpose (Tsokota, von Solms, & van Greunen, 2017). This would enable the strategy to help lead the organisation to its envisaged position (Tsokota et al., 2017). In summary, a strategy can be seen as an integral part to reaching a desired outcome.

In order to develop an effective strategy for the adoption of cloud computing services by SMEs in The Nelson Mandela Metropole, this study based its strategy on the approach defined by Gcaza and von Solms (2016). This approach has been selected as it presents the most appropriate approach to the development of an ideal strategy. This strategy development approach has been depicted in figure 3.1.

Figure 3.1: Strategy Development Approach (Source: Gcaza & von Solms, 2016)

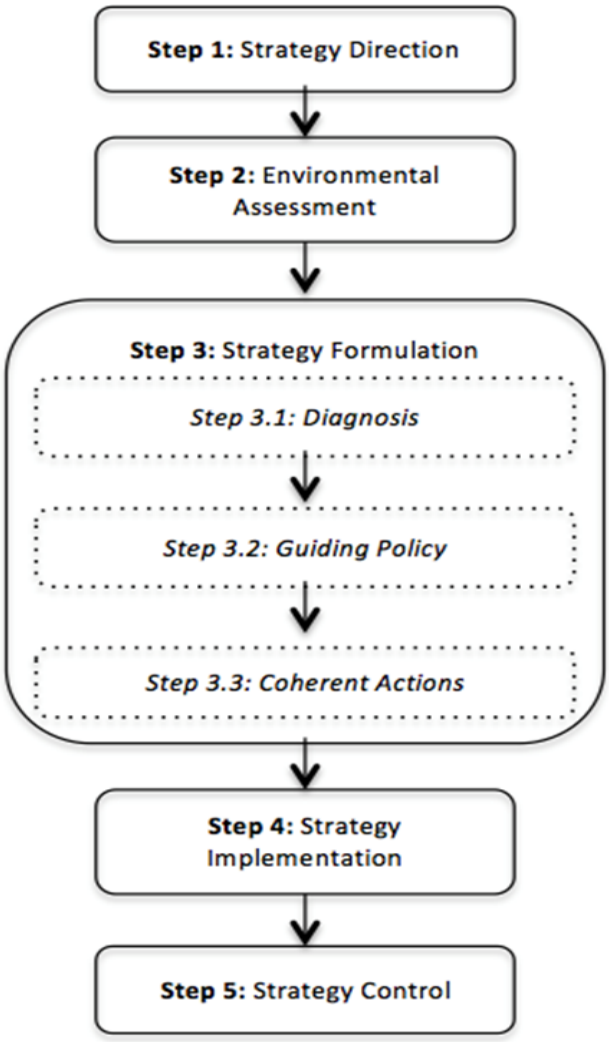


Figure 3.1 above, has been designed to consolidate the different strategy development approaches of Goldman and Nieuwenhuizen (2006), Enz (2009), Christiansen (2014) and Tsokota et.al. (2017) respectively. The result is a comprehensive approach to strategy development. Each step in Figure 3.1 will now be briefly discussed below.

3.4.1 **Establish the strategic direction**

The starting point for the development of any strategy is that of the identification of the business objectives (Tsokota et al., 2017). By establishing what the business's

objectives are, a business will then be able to correctly assess their environment. Such an assessment of the enterprise's environment will allow the entity to identify what gaps and opportunities could possibly be exploited by a business strategy.

The direction of a strategy can be derived from the long term goals and objectives of the organisation. Although most individual SMEs are likely to have their own set of goals and objectives, it is suggested that the most common strategic goal for these enterprises should be established in order to derive their objectives. Enterprise strategic goals are likely to be contained in the entity's business plan, and mission statement. In Duygulu, Ozeren, Işıldar and Appolloni's study (2016), survival, growth and profit were found to be the most frequently observed component of an SME's mission statement.

3.4.2 **Assess the entity's environment**

The second step of the strategy development process will be for firms to assess the business environment in which they operate. According to Lester and Waters (1985), the environmental assessment process is the process of gathering and analysing information to enable intelligent decision making. The aim of an environmental assessment is to identify any areas where the technology may be implemented to improve the business. SMEs should therefore assess what areas of their business may benefit from the implementation of the technology. One way to achieve this is to make use of a cloud computing reference model. A cloud computing reference model is the process of establishing what core cloud technology configurations are necessary to support a business's drivers and challenges, thus enabling a tighter alignment of cloud solutions to business goals (Marks & Lozano, 2010). Furthermore, a cloud computing reference model involves the process of evaluating a business's technical and operational requirements against a set of established patterns or approaches to determine an appropriate cloud pattern, architecture, deployment model and cloud solutions in order to meet the organisation's expectations (Surendro & Fardani, 2012). A cloud computing reference model comprises four supporting models, and these are:

1) A cloud enablement model - a cloud enablement model is used by an enterprise to describe the types of cloud computing services that may be required by the users of an organisation (Surendro & Fardani, 2012). With this model the organisation will select the type of cloud services which will be likely to enhance the business. There are three types of cloud services which may be selected by

the organisation: these are (1) infrastructure as a service (IaaS) (2) software as a service (SaaS) and (3) platform as a service (PaaS). Surendro and Fardani (2012) suggest that SaaS provides the most ideal enablement model for SMEs, as these entities often have a limited understanding of technology, and such a service will allow these enterprises to access a vast array of services without them needing to comprehensively understand how to operate a cloud system.

2) A cloud deployment model – the next supporting model in a cloud reference model is that of a cloud deployment model. In this step the organisation will identify and select one of the four cloud deployment models (Surendro & Fardani, 2012). In chapter 2 it was noted that there are four cloud deployment models namely public, private, hybrid and community cloud. Each cloud model has its own benefits and disadvantages (Branco et al., 2017).

3) A cloud governance model – is used by organisations to create a cloud based governance structure that appropriately defines policies and creates well-defined responsibility centres for the management of IT services, as these services relate to the business processes and applications (Becker & Bailey, 2014). Cloud governance models should therefore focus largely on policy creation and quality standards in order to drive direction within the business. In order to have a successful governance model, entities should have an in-depth understanding of all their people, process and technologies which are currently in place within their organisations, in order for them to develop a framework that can support the business needs and user requirements. Given the nature of SMEs, it is suggested that most SMEs are likely to favour simple governance structures that can be combined with existing structures. Therefore, existing business structures will need to be evaluated and their mandates extended to include cloud governance. These mandates will include aspects of security of cloud, and management of the cloud services.

4) A cloud ecosystem model - The final component of a cloud reference model is that of a cloud ecosystem model. A cloud ecosystem model is used to describe the enabling environment which is used to implement cloud computing (Surendro & Fardani, 2012). Such an environment consists of appropriate network

infrastructure, such as computers, access to the internet, browsers that support services and individuals that are capable of operating the service (Surendro & Fardani, 2012). A cloud enabling environment allows cloud computing services to work more effectively for the benefit of the organisation (Floerecke, 2016). Businesses should therefore look to ensure that their cloud computing services are integrated with all other business activities (Chang, Walters, & Wills, 2014). This allows organisations to improve their efficiency by not spending multiple resources to perform multiple tasks.

The environmental assessment stage will therefore be used to identify the most appropriate cloud structure for SMEs. Such a structure will be built on four key models, which will be tailored to address SME concerns. To tailor these models to SME operations, each of the recommended models were based on the generic structures of these entities. These included models that had low maintenance, are cheap to operate and require minimal IT expertise on their part to operate the selected model.

3.4.3 **Formulate the strategy**

Step 3 of the strategy comprises three important steps which need to be undertaken when formulating a strategy. These three steps are referred to as the kernel (Tsokota et al., 2017). The kernel is designed to help provide a strategy with rational actions, in order to enable the strategy to meet its objectives (Rumelt, 2011). Without these components embedded within a strategy, such a strategy would have a large gap between strategy formulation and the strategy implementation (Gcaza & Von Solms, 2016).

The first step of the kernel is the process diagnosis (D) stage. This step is designed to summarise the key overarching challenges, gaps and weakness. These challenges and gaps were identified and examined during the study. These barriers will therefore form the basis for the focus areas which will need to be addressed during the development of this strategy.

The second step of the kernel is that of the guiding policies (GP) stage. This step is used to identify the required philosophies/behaviors that are needed to properly address the identified diagnoses (D). This step is focused on creating an environment which will allow the diagnoses to be addressed and the coherent actions to be performed.

The final step of the kernel is that of the coherent actions. In this step actions are developed which will help to enable the success of the strategy implementation, which is to be undertaken in step 4.

3.4.4 Implement the strategy

In this step various activities are executed so as to enable the successful implementation of the proposed strategy (Goldman & Nieuwenhuizen, 2006). According to Rumelt (2011), most strategies are unable to be implemented due to the challenges and complexities involved with strategy implementation. Wheelen and Hunger (2012) identify three important questions to be answered before a strategy can be implemented. These are: who are the people, who will implement the strategy, what needs to be done in order to implement the strategy and how is everyone going to work together in order to do what is needed? Once these questions can be answered an enterprise is ready to implement a strategy.

In order to properly execute these activities a strategy document must include a comprehensive implementation plan. This is based on the idea that an implementation plan is likely to consist of a number of wide-ranging actions which will enable the success of the strategy. However, because the actions of an implementation plan are very extensive and are specific to an enterprise, the development of such a plan would be beyond the scope of this research project. This research project will therefore not attempt to develop a comprehensive implementation plan.

3.4.5 Strategy control

The final step is that of strategy control. The strategy control step is intended to ensure that the stipulated strategic objectives of the enterprise are achieved (Goldman & Nieuwenhuizen, 2006) and maintained.

The guiding policies and coherent actions that are defined in the subsections above play a central role in the strategy-control phase. In this section, it is suggested that the enterprise that adopts the aforementioned strategy, should adopt and define benchmarks for all the initiatives that will be developed. This is achieved by the enterprise setting clear success indicators for each of the initiatives. This will ensure that progress is made in achieving the targets. In order to successfully control and monitor this strategy a number of objectives and milestones will likely be needed. These

milestones are beyond the scope of this research project and are therefore not discussed.

3.5 Strategic Approach

In developing the proposed scientific artefact for this study, a three stage process was used.

3.5.1 Phase 1 Literature Review

The first phase took the form of an extensive literature review, into cloud computing. In this review the researcher was able to identify amongst others (1) the value of adopting cloud computing and to (2) outline the importance of implementing cloud computing in a business. Such a literature review was then able to put into context the idea of cloud computing in an SME environment. This review was conducted in chapter 2 of this research paper.

3.5.2 Phase 2 Measuring Instruments and Data Collection

The second phase of this research project took the form of a semi-structured interview. According to Longhurst (2009), a semi-structured interview is a verbal interchange where the interviewer attempts to elicit information from another person by asking questions. Although there is a set of predetermined questions, this interview is conversational in nature and allows participants to explore issues they feel are important.

The questions to be asked in the interview were self-constructed. According to Welman and Kruger (1999), there are a number of considerations which should be taken into account when developing questionnaires and these include: varying questions between open-ended questions and close-ended questions; being careful not to offend anyone with the questions asked; striving for conciseness and preventing ambiguity; maintaining neutrality and finally, ensuring that the questions are appreciable to all respondents. To conduct the interviews a mixture of open- ended and closed questions was used.

The aim of the second phase of the study was to identify amongst others (1) what these businesses' understanding is of cloud computing and (2) what cloud services are currently being adopted by these businesses. The outcome of this phase of the research

helped to gain an understanding of the barriers that prevent the adoption of these services and to identify what services could potentially be of benefit to these businesses.

3.5.3 **Phase 3 Strategy Development**

Finally, the third phase was to develop the strategy that these businesses can take when adopting cloud computing.

3.6 Population and Sample Selection

The population is defined as the collection of all persons that are eligible for voting (Ghauri, P., Grønhaug, K. and Kristianslund, 1995). In this case the population were all SMEs operating within the Nelson Mandela Metropole.

A sample is classified as a subset of the population. According to Hussey (2009), there are several reasons for sampling rather than testing the whole population, including: (a) lower costs, (b) greater accuracy of results, (c) greater speed of data collection, and (d) availability of population elements. On this basis the number of SMEs included in the study was sampled from the population. According to Wegner (2007), non-probability sampling is a sampling method whereby the sample members are not selected randomly. The sample is instead selected by the researcher and is thus based on the researcher's personal judgement and/or convenience.

To select the sample for this research project the researcher made use of non-probability sampling by selecting respondents based on convenience. The respondents were selected from different industries to improve the quality of data collected. The five selected SME's operated in the following sectors, professional services (1), banking and financial services (2), infrastructure development (3), retail and advertising (4) and logistics and transportation (5).

3.7 Data Validity

It is the responsibility of the researcher to ensure the integrity of any data that is collected during the research study. Data integrity can be maintained if the data that is collected, is collected in such a way that ensures its validity and reliability. Noble and Smith (2014) describe data validity as a process of ensuring that any findings which arise during the data collection process is an accurate representation of the original

data. Data reliability, on the other hand, can be described as the consistency of the analytical procedures that are used to collect the data (Noble & Smith, 2014).

Alshenqeeti (2015) indicates that, in order to ensure the reliability of the data that is collected, researchers should apply four key methodological techniques during the conducting of the research. Firstly, researchers should avoid asking leading questions, as leading questions can often skew the research results. Secondly, researchers should take notes during interviews and not just depend on tape recorders, as taking notes will help researchers to stay alert and possibly seek clarity on certain aspects that arise during interviews. Thirdly, researchers should conduct a pilot interview in order to help to refine the interview content, and also to help to assess the feasibility and usefulness of the interview process as a research instrument. Fourthly, researchers should give the interviewees a chance to sum up and clarify the points they have made so that they can make sure they understand interviewee's answers. To ensure the validity of the data collected, the actual responses of SMEs were used in the study.

3.8 Ethical Considerations

Before commencing with the primary research data process, ethical clearance was considered for the study. Based on the type of study and the rules governing conducting research at the Nelson Mandela University, it was determined that ethical clearance was not required from the Nelson Mandela University's Research and Ethics Committee. However, in light of the above it was still deemed necessary to obtain consent from the parties that were included in the study in order to allow for their information to be used in the study. Thus, written consent was received from all of the parties included in the study. It is worth noting that as part of the consent form agreement, none of the parties' identifiable information was included in the study. Thus this study refers to each of the parties that participated in the study as respondents with a sequential number attached to each respondent in order to separate each of the responses.

3.9 Conclusion

The aim of this chapter was to outline the process for the development of a strategy for the adoption of cloud computing services. In order to achieve this, this chapter used the strategy development process that was defined by Gcaza and von Solms (2016).

The outlined strategy for cloud computing adoption included a cloud computing reference model which helped to bring SMEs closer to the adoption of cloud services.

The chapter also presented the measuring instruments and data collection methods that were used to collect the data for the development of the strategy. The next chapter will be used to discuss the results of the interviews that were held with the SMEs selected for the study.

CHAPTER 4 FINDINGS AND RESULTS

4.1 Introduction

Chapter 3 of this research project was used to present the research approach, as well as the techniques, procedures and instruments that were used in carrying out this research project. The main aim of the previous chapter was to outline a proposed strategy for cloud computing adoption by SMEs in The Nelson Mandela Metropole.

The following chapter highlights the results from the interviews that were held with different SMEs in The Nelson Mandela Metropole. The aim of this chapter will be to identify the role that cloud computing currently plays within these enterprises as well as to examine what role cloud computing could potentially play in helping these businesses to achieve their objectives. The chapter will also establish the strategy for cloud computing adoption based on the responses provided by the SMEs.

4.2 Pilot Study

As discussed by Alshenqeeti (2015), one method that can be used for ensuring the reliability of the study is for the researcher to conduct a pilot study. A pilot study is where the researcher undertakes a pre-testing study such as an interview or questionnaire, in order to identify, or assess whether the method chosen for collecting data is useful. Thus, a pilot study was conducted as part of this research project. The details for the pilot study have been included in Appendix A.

4.2.1 Conclusions from the pilot study

By conducting the pilot study prior to seeking responses from the respondents, a number of key learnings were developed, which allowed the researcher to change and edit the approach to conducting the interviews. These included:

Firstly, not pre-empting the cloud enhancement and cloud reference models for SMEs. The original study looked to collect from literature the ideal cloud models and then to just ask SMEs if they agreed with this suggestion. However, it was found that this amounted to leading the SME into providing an answer that was consistent with the literature as opposed to developing a summarised opinion of the SMEs' responses based on their own experiences.

Secondly the pilot study revealed that the interview lacked questions about the enterprise's goals in order to create the starting point for the strategy development.

Thirdly the researcher also identified a number of closed questions which did not aid in the development of the strategy, so these questions were subsequently removed or reworded in order to be in line with the desired outcomes for the study.

In summary, by conducting the pilot study, the researcher learned that collecting data using an interview format was in fact a valid method for collecting the required information for this study.

4.3 Overview of the Respondents

Respondent 1 – is the managing director and sole shareholder of a professional services business. The company was registered in late 2015 and generates an estimated turnover of approximately R1 million per annum. The business has seven full time employees and one part-time employee. The firm generates its revenue by providing different companies across South Africa with various business related services such as VAT and employee tax returns, preparation and submission of a company's financial statements, company registrations and director training.

Respondent 2 – is the owner of an infrastructure development company. The business was registered in June 2011; however only began operating in late 2016. Currently the business is being operated on a part time basis by the owner and thus only generates a turnover of approximately R300 000 per annum. The company makes its money by offering clients different infrastructure services, such as the construction and destruction of residential structures, plumbing repairs and installation, paint work, roofing and tiling. The business currently has four part time employees that act as contract workers for each of its service offerings. The business offers its services throughout the Eastern Cape Province.

Respondent 3 – is the owner of a unique clothing design and manufacturing enterprise. The business was established in 2016 and designs dresses and skirts which it then offers to potential customers through different social media platforms such as Facebook and Instagram. Most of the company's goods are sold to customers in South Africa. However a small percentage of its sales are made to international clients. Customer orders are dispatched to customers via a courier company, which is paid for by the

business as part of the customer order. The business currently generates an annual turnover of approximately R 22 000 per annum. The owner is currently the only registered staff member of the business.

Respondent 4 – is the managing director of a company that was established in late 2014. The company is divided into three different subsidiary companies (sub-companies) that all fall under the same group. The first subsidiary is responsible for the resale and distribution of office equipment. The second acts as a link between construction companies and construction material suppliers. The company works by identifying construction companies that are unable to secure construction materials due to lack of funds or credit. The company will then finance the construction company's purchase of the building materials, by purchasing the materials for the construction company and selling it to them on extended credit terms. Finally, the third subsidiary offers various types of business related consulting services, and the company also leases office equipment under operating lease agreements.

The group is managed by two directors and currently has 12 full time employees and 12 interns. The business offers its services throughout South Africa and generates revenue of approximately R15 Million per annum.

Respondent 5 – is the business development director and owner of a logistics and transportation company. The company was established in 2012 and currently generates an annual turnover of around approximately R30 million. The company is responsible for the transportation and movement of different automotive goods across the country. To date the company employs just over 20 individual staff members.

4.4 Interview Responses

The responses received from the interviews will be set out in the sections that follow and arranged according to the Strategy Development Approach (Gcaza & von Solms, 2016), as depicted in figure 3.1. The first step is establishment of the business goals and objectives.

4.4.1 Establishing the Business Goals and Objectives

As mentioned earlier the starting point for the development of any strategic plan is to understand where the business hopes to be in the near future (Tsokota, von Solms & van Greunen, 2017). The responses below outline respondents answers.

1. **What are your business goals and objectives?**

Respondent 1 – “to be a well-known reputable professional services enterprise, that is able to compete with the major accounting enterprises operating in the country. We also aim to be known as a central hub for the training and development of businesses.”

Respondent 2 – “to position the business as a medium sized infrastructure development company operating across all the provinces of South Africa. I also aim to grow in such a way so that the growth is done using the business’s own cash reserves; in other words I do not want to have to seek outside financing in order to grow the business.”

Respondent 3 – “to grow the business to a stage where it is self-sufficient and able to support me on a full time basis.”

Respondent 4 – “to be able to grow and to become a self-sustaining business, to be the employer of choice.”

Respondent 5 – “the goal of the business is to continue to grow our current customer base and to one day be able to add air freight as part of our operations. I would also like the business to one day be able to diversify our operations to be able to offer venture capital services to other small businesses that need the finance.

4.4.1.1 Summary

Based on the above responses the objective for most SMEs remains to grow their organisations either through establishing new customer lines, increasing revenue or improving their reputation. Thus whilst each of the SMEs may have identified a different growth metric, growth as its stands remains the underlining objective for these SMEs. Based on this information the starting point for the cloud computing strategy will be to identify the SMEs’ chosen growth path: in other words each business should identify what particular area of their business they would like to grow.

4.4.2 Assessing the business Environment

The next phase of questions is designed to assess the businesses' operating environment. The aim of the environmental assessment stage is to firstly identify the ideal cloud enhancement model (i.e. SaaS, PaaS, IaaS), and cloud enablement model (i.e. Private, Public, Community, Hybrid) for SMEs. This will help SMEs to identify what type of cloud services would best suit their business. The environmental assessment will also help to identify any weaknesses in SME governance structures and IT operating environments, thus helping to establish the required coherent actions needed to address the weaknesses in SME IT operations.

In order to identify the businesses ideal cloud enhancement, the following questions were posed to the SMEs:

2. **What type of cloud computing enhancement model (IaaS, PaaS, SaaS) would work best in your business? And why?**

Respondent 1 – "PaaS, as this type of system would allow my business to adjust the cloud platform, we will also be able to develop and deploy new applications."

Respondent 2 – "SaaS, given the fees involved in using this type of system."

Respondent 3 – "SaaS, given the type of business that I am. I prefer a system that requires limited input from myself."

Respondent 4 – "PaaS, as this type of system would allow my business to adjust the cloud environment."

Respondent 5 – "SaaS, as this type of application is fully maintained by an external service provider so it is more likely to function better."

3. **Who maintains your IT infrastructure of your business?**

Respondent 1 – "The business hardware is not maintained by anyone specific, the software that I use is maintained by the service providers."

Respondent 2 – “No, unnecessary for my business, as I use my current employer’s PC so the PC is already maintained.”

Respondent 3 – “No one as I do not really make use of my computer for my business.”

Respondent 4 – “We make use of two external service providers, who maintain our operating, hardware and software systems, our packaged accounting software is maintained by us.”

Respondent 5 – “Our operating systems are maintained by external service providers.”

Based on the above responses most of the SMEs make use of third parties to maintain their IT systems.

4. **Do you currently make use of cloud computing services? If so which services do you make use of?**

Respondent 1 – “yes. I make use of the service to store my clients accounting information, as well as to prepare my clients financial statements.”

Respondent 2 – “yes – use the service to receive online bids from clients.”

Respondent 3 – “yes – I use the service to receive orders and proof of payments notices from clients.”

Respondent 4 – “none – we used to make use of the service; however we found the controls over the loading of information to be inadequate.”

Respondent 5 – “yes currently the company makes use of a tracking service which is a separately maintained cloud system that is used to track the delivery of trucks to customers.”

4.4.2.1 Summary

Based on the above responses, question two and three show that most SMEs prefer the use of SaaS as they lack the skills necessary to develop and adjust their computing

environment. Question four indicates all of the respondents except for respondent four make use of SaaS services in order to conduct their business. This means that whilst these business may not be fully integrated with cloud services because they do recognise its importance in improving the businesses ability to service its customers. Furthermore respondent four's reluctance to make use of the service, due the companies fear over the lack of security of information stored by the service provider, is consistent with literature. This shows that although the service has improved over the years users still have the same fears as the ones that they had when the service was still new.

The next set of questions attempt to identify the ideal cloud service model for SMEs.

5. **Which type of cloud computing service model would work best for your business (Private, public, community, hybrid cloud)?**

Respondent 1 – "private cloud."

Respondent 2 – "public cloud."

Respondent 3 – "public cloud."

Respondent 4 – "private cloud as the information is likely to be more secure."

Respondent 5 – "private cloud as the information is likely to be more secure."

6. **Does your business make use of any customised software packages? And who is responsible for maintaining the software. So, is any software that you use specifically customised for your business operations?**

Respondent 1 – "none of software that I use in my business is customised. My accouting packages are both cloud based systems and therefore are operated by those service providers."

Respondent 2 – "none of my software packages are customised. I also have no direct maintenance partner who is responsible for IT operating systems."

Respondent 3 – “I do not make use any specific software packages, additionally I have no direct maintenance partner for IT operating systems.”

Respondent 4 – “none of my software packages are customised for my business. I have an agreement with an external company who are responsible for maintaining my hardware and software updates. My accounting system is maintained in-house through the experience and knowledge of the staff running the system.”

Respondent 5 – “none of my current software packages are customised my accounting and vehical tracking systems are maintained by external service providers.”

4.4.2.2 Summary

Based on the responses to question five most SMEs favour private clouds as they see these as being more secure for their business needs. However, in question four, *“Do you currently make use of cloud computing services? If so which services do you make use of?”* above it was noted that most of the current cloud services used by SMEs are only available on public clouds; furthermore question seven above noted all businesses make use of unmodified “off the shelf” software packages. Therefore, although most enterprises would like to utilise private clouds they are however not willing to spend the necessary resources in order to modify packages to better suit their business needs. Thus it seems the ideal cloud enablement model for SMEs is that of a public cloud system. It is submitted that most cloud services that are offered on public clouds do not need to be modified by users and are therefore adequate for users in conducting their operations. This means businesses, especially smaller ones, should be able to identify public cloud services that address their needs without them having to modify the environment.

The next set of questions will be used to assess the SME governance structures.

7. **Do you currently have any policies which govern your interaction with your IT service providers’ third parties? If no, why not?**

Respondent 1 – “no, as it would take too much time to construct one.”

Respondent 2 – “no, unnecessary for my business.”

Respondent 3 – “no, unnecessary for my business.”

Respondent 4 – “no, we don’t see a need to and we have yet to encounter a major problem.”

Respondent 5 – “no, not as yet.”

8. Do you have any IT policies which your staff members must adhere to?

Respondent 1 – “yes, not as yet, still in the process of developing a policy on that to be included in their staff contracts.”

Respondent 2 – “no, as my employees don’t use any IT to conduct their business.”

Respondent 3 – “no, as I do not have any employees.”

Respondent 4 – “yes we do have one included in their contracts of employment.”

Respondent 5 – “yes, I have a simple one included in the employee’s contract of employment.”

4.4.2.3 Summary

Based on the above responses none of the SMEs have any specific policies for governing their IT operations. Additionally these SMEs favour simple rules for managing their employees as IT policies are included in the employee’s employment contract. It is submitted that by not having any IT policies these business are likely to not have any sort of direction or structure when it comes to managing their business use of IT. Furthermore by including IT policies in employment contracts, employees of SMEs are likely to be unaware of any changes to IT policies. All in all these IT structures amount to an ineffective form of governance over IT by these SMEs. It is however submitted that some SMEs may be small enough to warrant the use of simple governance structures in order to conduct their business as each employee is likely to interact with

the decision makers on a daily basis which means their employees are likely to be aware of any changes in polices.

In order to assess whether SMEs have an environment that enables the use of cloud computing services, the following set of questions were posed to the SMEs.

9. **Would you say your access to the internet is a problem for your business?**

Respondent 1 – “no, I have good, cheap internet connectivity”

Respondent 2 – “I have no problems when connecting to the internet.”

Respondent 3 – “no problems with accessing the internet.”

Respondent 4 – “we have a good internet service that covers all areas of the business.”

Respondent 5 – “i have no internet connectivity problems at the office.”

10. **Can you rate your level of understanding of cloud computing? (Knowledgeable, moderate, fair)**

Respondent 1 – “moderate”

Respondent 2 – “moderate”

Respondent 3 – “fair”

Respondent 4 – “knowledgeable”

Respondent 5 – “moderate”

4.4.2.4 Summary

Based on the above responses it would appear that internet connectivity is not a hindrance to making use of cloud computing services, which means that any decision taken to implement of cloud computing services is unlikely to be hindered by internet

operations. Furthermore, although question ten shows that SME senior management may not be very knowledgeable when it comes to cloud services, Question three, **"Who maintains your IT system?"** shows that most SMEs have knowledgeable individuals that are responsible for maintaining their IT systems. Therefore, whist the SME owners may not be knowledgeable when it comes to cloud services, they at the very least have knowledgeable consultants upon whom they may be able call to help to operate the service.

The above questions were used to assess the SME environment in order understand their governance structures and ecological systems. These questions were also used to identify the best possible cloud enablement and cloud enhancement models for these entities. With this information in mind each of the final set of questions was used to help formulate the strategy for cloud computing adoption.

11. **What would you say are the barriers to you adopting cloud computing services?**

Respondent 1 – "none really, I would just need a more structured cloud service that integrates all my business aspects and currently there is no service package that caters to these needs."

Respondent 2 – "trusting that the information that is stored in the cloud is secure from any hackers."

Respondent 3 – "knowing how such an investment decision would affect my business. As I see it cloud computing would just increases my orders, but it would not address my business productions issues. Also trust regarding the security of the information stored in the cloud."

Respondent 4 – "we once made use of a cloud computing service; however, we found the protection of information controls to be lacking. For example, if I wanted to load information that only specific people had access to I was unable to do this as all people would have access to the information. Also, we have seen how external providers have held clients to ransom regarding their control for their business."

Respondent 5 – “the main barrier which exists is the lack of cheap integrated cloud systems that connect all areas of the business. Most companies have to spend large amounts of money investing in IT systems and software, however SMEs are unable to spend these amounts of money on research and development. Additionally, SMEs do not have the skills necessary to research new integrated IT solutions for their business.”

4.4.2.5 Summary

Based on the responses above the major barriers to the adoption of cloud computing appears to be that (1) SMEs may not trust the concept of external hosting of information, as they worry about the safety of information; (2) SMEs are unable to identify comprehensive cloud systems that cater to their needs as most systems appear to just cover a small component of their business; (3) Finally, SMEs appear to lack enough knowledge about how such a service would impact positively on improving their business returns from the use of the service.

12. How does your business go about making IT investment decisions? Thus, is there any form of research that goes into such an investment decision?

Respondent 1 – “IT decisions are made by me as I am the sole owner of the business. I sometimes consult with my staff or seek advice from experts but ultimately I make the decision on what to get and when.”

Respondent 2 – “all IT decisions are made by me. I normally google, to identify any new products which I may need, but ultimately I know what software I need to conduct my business.”

Respondent 3 – “as I am the sole owner of the business all IT investment decisions are made by me.”

Respondent 4 – “as we are in a partnership all decisions are discussed between myself and my partner. Should we need any IT expertise for a particular decision we consult with our external service provider.”

Respondent 5 – “as my wife is an IT professional I consult with her before I make any IT related decisions.”

4.4.2.6 Summary

From the above responses it appears as though none of the businesses make proactive, structured decisions when it comes to investing in their IT. None of the businesses appear to have any defined processes for making these types of decisions. However, before any decision is made, most organisations tend to conduct some or other form of research before the eventual decision is made. This indicates that most IT related decisions are not necessarily spontaneous but rather to a certain extent, thought out. However this form of decision making is still likely to be ineffective in governing SME IT operations, as none of these methods for decision making are written down thus these processes are unlikely to be applied consistently across all IT decisions.

13. **What are the major challenges to your business in achieving these objectives, and how will you overcome these?**

Respondent 1 – “to be able to service my clients and be able to win more clients, to be able to find the time to get all my activities done in a period of time.”

Respondent 2 – “the biggest hindrance to any infrastructure business is the country’s economic landscape. This is due to the fact that the construction projects are often seen as luxury projects thus if businesses are not growing they are usually unwilling to invest in these businesses. Although this is a problem from my experience I have seen that the best way is to be patient as the market will eventual turn, so while the market is down I just look to compete for smaller jobs.”

Respondent 3 – “in order for my business to continue to grow I will need to be able to service more customers. However currently as I am the only employee in the business my output is limited. I also do not have the financial resources to employ an additional full time staff member. In order to overcome this problem, I will maybe look to offer some part time work or outsource some of the work.”

Respondent 4 – “customers that do not pay when they are invoiced for something, like goods, so we really battle at times to get some of our money from some customers.”

Respondent 5 – “there are two main drivers that prevent my company from growing. The first issue can be experienced by any company, it is the lack of finance available to SMEs. As much as any businesses wishes to grow its operations, most financial institutions are unwilling to offer us (SMEs) additional finance, which means us as business owners, are having to try to find innovative ways to save and cut costs in order to continue its capital investment projects. The next issue, although it is mostly found in my industry it could be found in others, is the cost of repairs and breakdowns. As my business is situated in Nelson Mandela Metropole when breakdowns occur in other parts of the country we (the company) have to fund the cost of transporting repair personnel to fix any breakdowns. This slows down the speed of delivery of goods and at times causes the company to miss deadlines for the delivery of stock.”

4.4.2.7 Summary

Based on the above responses most of the SMEs identify not being able to service customers as the major business challenge to the achievement of their goals. This challenge of servicing of clients can include servicing more clients or speeding up their delivery of service in order to gain more market share. Thus the business strategy should be focused on addressing these challenges.

14. Do you foresee IT playing a role in the achievement of your goals, and how?

Respondent 1 – “yes as IT can be the driving force behind my business and its development practices. As new technology gets released this will allow my business to perform activities faster and more accurately.”

Respondent 2 – “yes, IT will play a key role when the business expands. IT could assist the business by creating digital timesheets for the recording of employee hours. Currently, as the construction projects are done all over the place it becomes difficult to find an effective way of keeping track of employee time spent on a job. Additionally, IT can help with the filing of information, as all information is currently held manually.”

Respondent 3 – “IT may provide me with more orders from customers, so I could maybe set up a website or develop an application that people could download and make orders from me.”

Respondent 4 – “yes definitely, IT will always be a major part of the way in which we do things, we are looking at storage of information and getting our own servers which will enable us to store more information on site.”

Respondent 5 – “yes, because currently the business receives signed manual documents from customers when goods are delivered to their premises (i.e. proof of delivery). Once this document is received the business is then able to begin charging customers for deliveries made. However, as the document is physical the company only receives the document once the driver arrives back at the headquarters which could be days after the goods have been delivered. IT could assist by creating online signed forms which would be received by the accounting department as soon as the customer receives the order. This would enable the department to process the customer invoice thereby speeding up the revenue collection.”

4.4.2.8 Summary

Based on the responses above all SMEs foresee IT as playing some or other role in the envisioned growth of their business. This IT influence on the various businesses seems to be split along different areas of the enterprise; however most SMEs feel that the impact of IT is as an operational tool that feeds into other business processes, instead of a standalone development tool. This is very important as Low, Chen and Wu (2011) identify ownership buy-in as being critical to the success of cloud computing adoption.

4.5 Strategy formulation

As discussed in chapter three the cloud computing adoption strategy can be formulated, based on a three step process. The first part of the process is to identify the key overarching challenges, including gaps and weaknesses, then a diagnosis (D) should be summarised from questions put forward to the SMEs. Once this is done for each diagnosis process identified, a relevant guiding policy (GP) which is the recommended philosophy/ behaviour and an applicable coherent action (CA) should be listed, which will enable the strategy to work.

Using the responses to questions eleven, twelve, thirteen and fourteen following diagnoses can be made:

4.5.1 D1: Lack of Integrated cloud services are too expensive for SMEs

Although most SMEs agree that cloud services are relatively cheap to operate, SMEs still note that the majority of these cheap services are offered as stand-alone items, meaning most of the services on offer only satisfy a particular business requirement, such as storage or monitoring services. As a result, SMEs are unable to fully integrate all of their business practices into a cloud environment without a significant outlay of financial resources, which they may not have initially. By integrating business services SMEs would be able to save on costs of transfer of data across the business, thus the following are listed:

- GP1: Resource Allocation – although cloud services are cheap to operate, SMEs still need to invest the time and human resources in order to moderately develop the service to suit their needs, as only using off-the-shelf packages will not be of benefit to their business in the long term. Thus, there should be a process for slowly reviewing and allocating financial resources towards future long term cloud investments which can be built to suit the business's future growth plans.
- CA1: Allocate Resources – SMEs must continually budget and allocate a constant portion of their revenue into developing IT and cloud services that address their business's future objectives.

4.5.2 D2: Security of Cloud Services

The security of information that is stored in the cloud is a big concern to most SMEs, as most SMEs do not trust that cloud services are more secure than their existing methods of storing data, which leads to the following:

- GP2: Evaluation and Monitoring - SMEs should monitor the service that they receive from the service provider. This implies that SMEs should not abdicate their responsibility for the information once their cloud services have been implemented, but rather they should continue to monitor their service providers.
- CA2: Monitor the service – SMEs should review the service level agreement and hold the service provider accountable for the services which they receive.

- CA3: Define benchmarks – SMEs should create benchmarks that they want to see from the service provider and hold the service provider to these requirements.
- CA4: Develop evaluation criteria – SMEs should create their own criteria by which to evaluate the services of service providers. This will enable them to see if they are getting the service which they desire.

4.5.3 D3: Lack of Human Resources Skills

SMEs do not feel that they have enough of an understanding of how the service works to enable them to adopt the services, and they also note that this lack of understanding is prevalent throughout their businesses. Hence, outside service providers are always required to maintain IT systems. The following guiding policy and coherent action are suggested:

- GP3: Human Capital Investment – SMEs' concern about not having adequate human resources to be able to maintain major cloud service operations is understandable given the nature of these businesses. However, more investment in the existing personnel within the enterprise will go a long way to helping to ensure the feasibility of utilising the service long term.
- CA5: Establish training and support programmes – SMEs should establish training programmes which their staff can attend in order to equip them with the knowledge of how the service works. According to Mozael (2015), training plays a significant part in enhancing employee performance as well as organisational performance. Furthermore, such activities should be outsourced to external parties who have the necessary skills to be able to equip employees.

4.5.4 D4: Lack of IT structures

Based on the responses above most SMEs have undefined structures for making successful IT decisions. Such structures as mentioned previously can be harmful to ensuring that the cloud services are monitored and evaluated systematically, which leads to:

- GP4: Leadership - SME owners take an interest in guiding their businesses towards cloud computing by playing an active role in its implementation.

- CA6: Establish reporting structures – SMEs should establish business structures to allocate staff and resources to managing their IT environment. Huygh et al. (2018) suggest implementing a cloud governance structure, as such a structure will allow enterprises to reap the rewards from cloud computing.

4.5.5 D5: Lack of Policies for both third parties and staff

All SMEs interviewed do not invest in policies to govern their IT operations. By not having polices to direct their business on IT and cloud investment, the exercise of investing in the service is likely to prove futile, as the business will not receive the results, so:

- GP5: Governance – SMEs should exercise governance over their IT operations by implementing policies that direct how IT should be operated.
- CA7: Establish polices that govern the IT – all IT relationships within the enterprise should be documented and made available to all staff members. These polices should be reviewed and monitored on a continual basis. SMEs should also monitor employees' adherence to polices. According to Khan & Al-Yasiri (2015), entities must develop a set of cloud governance policies that address interactions with service providers, security of information in the cloud, reporting line managers, legal compliance and risk management.

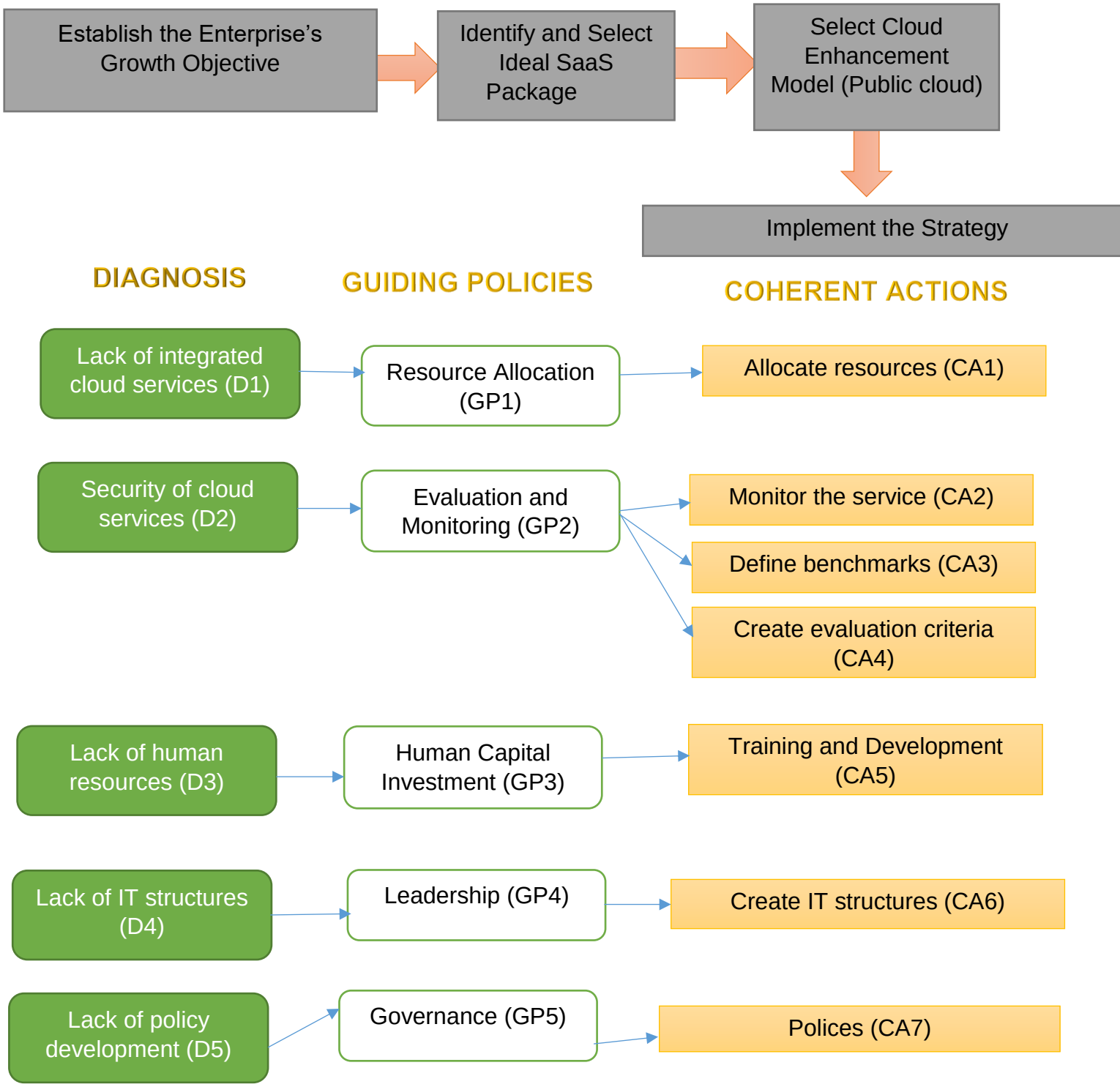
4.6 Strategy Implementation and Control

In chapter three it was noted that the development of a comprehensive strategy implementation plan and appropriate control milestones would fall outside the scope of this research project. Thus none of these steps have been included as part of this research process.

Summary

Based on the discussion above the ideal cloud computing strategic model for adoption can be represented as follows:

Figure 4.1: Proposed Cloud Computing Adoption strategy (Source: Own construction)



4.7 Conclusion

The aim of this chapter was to discuss and structure the findings from the interviews held with the five SMEs. The findings from the interviews were then brought together in order to create the strategy for cloud computing adoption (Figure 4.1). This strategy for cloud computing adoption was developed using the template set out in Gcaza and von Solms (2016), as discussed in chapter three.

In order to achieve this goal the interview questions were divided into two broad areas, with each area linked to a focus area of the strategy development. The first area looked at the SMEs and their operations in order to identify the enterprise's goals and see how these goals could possibly be addressed through the use of cloud computing as a technology. The results showed that most SMEs have a goal of growth for their business and any strategy implemented should be focused on this aim. The second focus area of the questions was used to evaluate the SME operating environment. By doing this the study was able to identify certain diagnostics which were preventing the enterprise from achieving this objective. The diagnostics were then addressed by guiding policies and coherent actions which, when implemented, result in the strategy for the business.

Chapter five of this research project draws conclusions on the research project and discusses how the objectives of this research project were achieved.

CHAPTER 5 CONCLUSION AND SUMMARY

5.1 Introduction

The previous chapter developed a strategy for cloud computing adoption by utilising the template developed by Gcaza & von Solms (2016). The aim of this chapter is to conclude this research project by providing a summary on how the objectives for this research project were achieved. The chapter will also summarise the research contribution made by this study and provide recommendations for both SMEs and cloud service providers.

5.2 Research Summary

In chapter 1 of this research project it was highlighted that SMEs are essential for driving economic growth in South Africa. Thus, the survival of these enterprises will be key in helping to address some of the challenges of the country. However, in order for these enterprises to survive, there is a need for them to develop their operations to become more digitalised. This is because by digitalising their operations, SMEs will be able to reduce their operating costs, speed up their decision making and compete with larger more established enterprises. One suggested approach for achieving this objective of digitising operations is for SMEs to adopt cloud computing services.

However, in spite of the all of these benefits SMEs still remain reluctant to adopt cloud computing services as part of their business model due to a number of reasons. Based on this discussion, this study's research problem statement was defined as being, *"despite the benefits of cloud computing, SMEs in The Nelson Mandela Metropole are still reluctant to adopt cloud computing services as part of their business model."* In order to address this problem Chapter 1 established the main of objective of the research which was to devise a strategy to assist SMEs in The Nelson Mandela Metropole in adopting cloud computing services. In order to achieve this objective six secondary objectives were identified, and these included:

- To conceptualise cloud computing in the context of this study's research problem;
- To outline the advantages, disadvantages and barriers to businesses that choose to adopt cloud computing services;

- To outline a methodological process for developing a strategy, for adopting cloud computing services;
- To understand the role that cloud computing currently plays, or the role that it could play, in helping SMEs to achieve their objectives;
- To discuss the research findings and conclusions of the study and to provide recommendations.

In order "to conceptualise cloud computing in the context of this study's research problem," chapter 2 provided the literature that explained what cloud computing was as a discipline. The chapter also brought into context SMEs and their IT operations in order to show why cloud computing can play a role in addressing these businesses' problems. Furthermore the chapter "outlined the advantages and disadvantages that await any business that chooses to adopt cloud computing services." In summary the chapter found that, although there are a number of disadvantages associated with adopting cloud services, the benefit of having these services is far greater than the disadvantages facing an SME.

Chapter 3 was used to "outline a methodological process for developing a strategy, for adopting cloud computing services." This chapter based its methodological process on the strategy template developed by Gcaza & von Solms ((2016). The strategy focused on identifying weaknesses or problems that exist within SMEs and then addressing those problems by introducing coherent actions and guiding policies. These steps were found to be critical in establishing an adoption process for these entities.

Chapter 4 was used to "understand the role that cloud computing currently plays, or the role that it could play, in helping SMEs to achieve their objectives." This chapter summarises interviews with five different SMEs and examined their interactions with cloud computing. This information then assisted in developing the strategy for cloud computing adoption. The chapter was then used to "develop the strategy for adopting cloud computing services by SMEs in The Nelson Mandela Metropole." In order to do this the information from chapter 3 and the interviews conducted in 4, were brought together in order to establish a simple strategy for cloud computing adoption. The strategy was laid out in a flow chart form in figure 4.1.

5.3 Research Contribution

This study was designed to add to the body of knowledge by developing a strategy which aimed to allow SMEs to adopt cloud computing services. The theory behind this strategy was discussed at length in chapter three, and then applied in chapter four and can be seen in figure 4.1 in the chapter. The first part of the strategy asks SMEs to consider their growth objectives in order to help drive the strategy implementation steps. The strategy then requires these businesses to deploy certain guiding principles and coherent actions within their businesses, in order to bring about a changed environment for the adoption of the services.

5.3.1 Adherence to Research Paradigm Principles

IS research was discussed in chapter 3 as being research that is focused on delivering an artefact. This artefact must be classified as being design orientated research in order for this research to be said to have made a contribution to the body of knowledge. According to Osterle et al (2011), in order for an artefact to be classified as design oriented IS research, this artefact must adhere to the four principles. These four principles are adherence, originality, justification and benefit, and each of these principles will now be applied to Figure 4.1 below:

5.3.1.1 Principle of Adherence

This principle is achieved if the artefact that is developed can be applied to more than one problem. Based on the research conducted, it can be seen that this strategy is not only applicable to a single enterprise, but can be applied in a multitude of SMEs that fall within the scope of this study, as the diagnostics identified are likely to occur in most enterprises that operate within these parameters. Additionally, the coherent actions and guiding principles are generic and can be applied to any business.

5.3.1.2 Principle of Originality

The principle of originality is achieved if the developed artefact advances the body of knowledge. This strategy for cloud computing adoption is designed to aid SMEs in adopting the service, by providing them with a list of actions which must be accomplished in order to adopt the service. Thus, the strategy can be said to incorporate the principle of originality.

5.3.1.3 Principle of Justification

The principle of justification requires the artefact to be justified in a comprehensible manner by allowing for validation. Principle 15 of the King IV code on corporate governance requires the business to leverage technology in order to achieve the enterprise's objectives. This includes identifying new ways to improve the business and address the business issues. In chapter 2 this study established that cloud computing can have a positive effect on any enterprise that chooses to adopt its service. This effect can mostly be felt by SMEs as it allows them to compete with larger corporations. Chapter 4 then provided the means by which these enterprises could successfully adopt this service, by applying certain coherent actions and guiding principles. Thus, it is submitted that this strategy adheres to the justification principle.

5.3.1.4 Principle of Benefit

This principle is achieved if the research conducted can yield any benefit to its targeted audience. Based on the work conducted in chapter 2, the move towards cloud computing aids businesses in a multitude of areas by providing them with a focal point for directing their operations. Cloud computing also provides businesses with additional benefits such as reduction in costs and rapid deployment of services. Thus, SMEs will be able to reap these rewards should they adopt the service. Based on this discussion it is submitted that this research also adheres to this principle.

Taking all of the above into account, it can be contended that the above research project qualifies as design oriented IS research. As such, this study can be said to have contributed to the body of knowledge.

5.3.2 Research Limitations

As highlighted in the first chapter a number of limitations arose during this study's research process. These limitations included the access to a wider selection of SMEs to be evaluated in the study, as well as access to sufficient financial resources to be able to increase the scope of the study. As a result of these and other limitations, this study is only applicable to SMEs that fall within the ambit of the scope of the study. The study may be used for other SMEs; however, modifications will be necessary should this occur. Furthermore this study was only focused on developing a strategy which allowed SMEs to adopt cloud services, as a result this research did not discuss any suggested implementation or control strategies for SMEs that choose to adopt cloud services.

5.4 Recommendations and Conclusions

The following section will highlight the conclusions reached and the recommendations which were identified during the research project.

5.4.1 Recommendations for policy and practice

Based on the information gathered during this research project, it is submitted that most SMEs make use of some or other form of cloud computing. These services range from mail servers to large scale accounting programmes. Furthermore, the majority of these services are packaged services, which means that SMEs accept the service as it is without attempting to modify the cloud environment. This shows that while the majority of SMEs may in fact make use of cloud services, their businesses are still not fully integrated within the cloud environment. The reasons for this mid-level form of integration of cloud services ranges from lack of governance over the service in order realise the benefit of the service, to business owners fearing a potential loss of information should they use the service.

Thus, in order to bring into context the understanding of this research, certain conclusions can be drawn and explained based on this research study:

Firstly, SMEs have no pre-set structures for addressing their IT concerns, and thus invest in IT after the technology has been tried and tested. This implies that SMEs are not open to new IT products as they only invest in services once other enterprises have experienced these and raised their concerns. This shows that most SMEs are unlikely to present technology-based solutions for conducting business, as they are unwilling to invest in research and development in IT. Thus, although integrating the business operations using cloud services may be a relatively old concept, most SMEs are still waiting for this type of integration to become a necessity before deciding to invest.

Secondly, SMEs are not structure orientated. In the literature review section of this research project it was highlighted that the benefits of cloud computing are best realised when governance policies over the service are clearly marked and communicated across the enterprise. However during the interviews it was noted that SMEs even after adopting the service, are still not likely to implement any basic governance structures. Thus despite the importance of cloud governance, these enterprises have more pressing concerns and thus are unlikely to invest in implementing significant

governance structures. It is therefore submitted that as a result of this lack of governance SMEs usually do not recognise significant benefits from their investments in the service.

Thirdly, poor internet connectivity is not a barrier to adopting cloud computing. The literature review in chapter 2 highlighted internet connectivity as a significant problem in African countries which prevented them from fully adopting the services. However none of the SMEs described their access to the internet as a problem. In fact most found their services reliable and cost effective.

Fourthly, some SMEs have the resources to invest in cloud services but only if it addresses their immediate concerns. In the literature review it was noted that SMEs are reluctant to integrate cloud services in their business and this presents a barrier to entities adopting the service. Furthermore the chapter also highlighted the lack of available human and financial resources as significant barriers which prevent SMEs from adopting the service.

The decision on when and how much of the service to adopt can be a tricky question to answer. However from the interviews conducted it is noticeable that the smaller the business is, the less likely it is to adopt cloud services. This means that only as the business grows will it begin to invest time in researching different cloud services. Although this strategy was designed for all SMEs, it should be noted that it can only be applied to SMEs that have already made the decision to invest in the service and are looking for ways to grow or improve their investment in the service. This strategy cannot be seen as a way of convincing SMEs to invest in cloud services, but rather as a strategy to use once they have already made the decision to invest in the service. This is because SMEs will allocate resources to the cloud environment provided that they recognise a benefit from the service. It is therefore submitted that the lack of available resources to SMEs when investing in cloud services and the lack of internal expertise in SMEs are not major hindrances for them in adopting cloud computing services. The biggest hindrance to these businesses adopting the service is these businesses' lack of perceived benefit of the service towards assisting in their business needs. Thus should SMEs see a benefit in cloud services they are more than willing to allocate resources towards the service. This is seen in some bigger interviewees who adopted more current cloud based services and were quite willing to push financial resources towards this investment as they knew it would help their business.

Fifthly security over the service remains an issue for SMEs. Despite the added security offered by the service over user information SMEs are still not convinced regarding the security of the service. This conclusion has therefore been found to be consistent with literature and remains a problem to be addressed.

Based on the above conclusions this research must be seen as a contribution towards helping enterprises that have made the decision to further invest in cloud services and not as a way of convincing those that have not yet made the decision to invest in the service. As such an enterprise would require a more specifically created strategy.

Based on these conclusions the following two recommendations are suggested:

- Cloud service providers should consider developing integrated, secure private cloud services for small businesses. This will help to ease SMEs concerns regarding the security of their data stored in the environment.
- SMEs need to start allocating a percentage of their revenue to IT research in order to avoid falling behind in an advancing economy. SMEs should take control of their IT operations by setting aside time to consider different forms of IT and the role which these can play in improving their business operations. These businesses need to start doing more research on solutions that can be of possible benefit to their business.

5.4.2 Recommendations for further research

Chapter 3 of this research project highlighted that the implementation of cloud computing remains a challenge for most enterprises. Thus, whilst most SMEs are able to consider adopting the cloud service model, many might not know how the implementation of the system will actually be done within their business models. Thus, further research needs to be done on types of implementation programmes, the steps that should be taken when implementing the service, and which areas of the business are best to target when implementing the service. In chapter 4, some SMEs mentioned that their accounting function was where the service was most needed, so this therefore presents a starting point for such a research endeavour.

With any existing implementation, there is a need to monitor the service. Some monitoring programmes have been suggested in this research project, in chapter 4. However, these suggestions have not been researched but are instead suggestions on developing, adopting and using the service. Research needs to be done on the

monitoring of programmes which have been used by large businesses, which ones were found to be useful, and how can these programmes be tailored for the SME environment. Therefore overall more research needs to be done into developing cloud governance structures for SMEs that take into account best practice frameworks.

5.5 Conclusion

This research study focused on designing a strategy that would allow SMEs to adopt cloud computing services. As such, the aim of this research was to allow SMEs to gain access to a multitude of services available using cloud software, in order to allow these businesses to compete with larger businesses that continually invest in their IT. The idea was that, should SMEs invest in cloud services, they would be able to save on time, human and financial resources in processing information. They would also be able to service their customers better by offering them world class services at a fraction of the cost of the service, which will provide them with a competitive advantage.

The strategy developed focused on directing enterprises' cloud investments into addressing the businesses growth goals, so that the business would be able to see a link between the business and the cloud investment. Growth was the identified focus area of this strategy, as most SMEs aim not to remain SMEs. Thus, by setting growth as the focus area for the strategy, SME owners would be able to identify if the cloud investment was of benefit to the enterprise as a whole. They could now ask the question how will this investment make my business grow? Importantly though, cloud computing is here to stay. This does not mean that enterprises should immediately, without planning, start adopting these services. All business have different needs and requirements and they should assess these before adopting cloud computing (Apostu et al., 2013).

Finally a number of conclusions were reached during the research of this strategy; however the most significant one was that this strategy must not be used as a means for convincing enterprises to invest in cloud services; rather it should be used by enterprises that have made the decision to invest in cloud services, as these enterprises are likely to derive the most benefit from use of the strategy

REFERENCE LIST

Abaker, I., Hashem, T., Yaqoob, I., Badrul, N., Mokhtar, S., Gani, A., & Ullah, S. (2015). The rise of " big data " on cloud computing : Review and open research issues. *Information Systems*, *47*, 98–115. https://doi.org/10.1016/j.is.2014.07.006

Al-Ruithe, M., & Benkhelifa, E. (2017). Analysis and Classification of Barriers and Critical Success Factors for Implementing a Cloud Data Governance Strategy. *Procedia Computer Science*, *113*, 223–232. https://doi.org/10.1016/j.procs.2017.08.352

Alhassan, M. E., & Van Belle, J. P. (2017). Conceptual Enterprise Architecture Driven Framework for Information Technology Decisions in SMEs. *Proceedings of International Conference on Information Technology*, (December 2017). https://doi.org/10.1145/3176653.3176689

Alshenqeeti, H. (2015). Interviewing as a Data Collection Method : A Critical Review Interviewing as a Data Collection Method : A Critical Review, (January 2014). https://doi.org/10.5430/elr.v3n1p39

Apostu, A., Puican, F., Ularu, G., Suciu, G., & Todoran, G. (2013). Study on Advantages and Disadvantages of Cloud Computing - the Advantages of Telemetry Applications in the Cloud. *Recent Advances in Applied Computer Science and Digital Services*, 118–123.

Armbrust, M., Fox, A., Griffith, R., Joseph, A. D., Katz, R., Konwinski, A., … Stoica, I. (2010). A View of Cloud Computing. https://cacm.acm.org/magazines/2010/4/81493-a-view-of-cloud-computing/fulltext

Armbrust, M., Stoica, I., Zaharia, M., Fox, A., Griffith, R., Joseph, A. D., … Rabkin, A. (2010). A view of cloud computing. *Communications of the ACM*, *53*(4), 50. https://doi.org/10.1145/1721654.1721672

Assante, D., Castro, M., Hamburg, I., & Martin, S. (2016). The Use of Cloud Computing in SMEs. *Procedia - Procedia Computer Science*, *83*, 1207–1212. https://doi.org/10.1016/j.procs.2016.04.250

Avram, M. G. (2014). Advantages and Challenges of Adopting Cloud Computing from an Enterprise Perspective. *Procedia Technology*, *12*, 529–534. https://doi.org/10.1016/j.protcy.2013.12.525

Ayandibu, A. O., & Houghton, J. (2017). The role of Small and Medium Scale Enterprise in local economic development (LED). *Journal of Business and Retail Management Research (JBRMR) Www.Jbrmr.Com A Journal of the Academy of Business and Retail Management*, *11*(2), 133–139.

Becker, J., & Bailey, E. (2014). A Comparison of IT Governance & Control Frameworks in Cloud Computing. *Association for Information Systems Conference*, 1–16.

Bhardwaj, S., Jain, L., & Jain, S. (2010). Cloud Computing : a Study of Infrastructure As a Service (Iaas). *International Journal of Engineering*, *2*(1), 60–63.

BizNis Africa, 2017. https://www.biznisafrica.com/biznis-africa-2017-newsmaker-strive-masiyiwa/

Branco, T., De Sá-Soares, F., & Rivero, A. L. (2017). Key Issues for the Successful Adoption of Cloud Computing. *Procedia Computer Science*, *121*, 115–122. https://doi.org/10.1016/j.procs.2017.11.016

Brennen, S. & Kreiss, D. (2014). Digitalization and Digitization. Retrieved February 9, 2018, from http://culturedigitally.org/2014/09/digitalization-and-digitization/

Chang, V., Walters, R. J., & Wills, G. (2014). Review of Cloud Computing and Existing Frameworks for Cloud Adoption. *IEEE Security & Privacy*, (2014), 35. https://doi.org/DOI: 10.4018/978-1-4666-8210-8.ch001

Chen, A. P., Wu, S., & Chen, P. (2018). Information Systems Resecarli ¡¡ lfflffffü The Impact and Implications of On-Demand Services on Market Structure, *24*(3), 750–767.

Christiansen, B. (2014). Handbook of Research on Effective Electronic Gaming in Education, (June 2016). https://doi.org/10.4018/978-1-59904-808-6

Chimucheka, T. 2013. Overview and Performance of the SMMEs Sector in South Africa, (May 2016).

Cloete, E., Courtney, S., & Fintz, J. (2002). South Africa, 1–13. https://doi.org/10.1002/j.1681-4835.2002.tb00062.x

Collis, J., Hussey, R. (2009). Business Research – A practical guide for undergraduate and postgraduate students. 3rd ed. United Kingdom: Macmillan Publishers Limited.

Cross, N (2001). Designerly ways of knowing: design discipline versus design science. Design Issues, 17(3) pp. 49–55.

Dang, D. D., & Pekkola, S. (2017). Systematic Literature Review on Enterprise Architecture in the Public Sector . *Electronic Journal of E-Government*, *15*(2), 130–154.

Doherty, E., Carcary, M., & Conway, G. (2016). Migrating to the Cloud. *International Journal of Grid and High Performance Computing*, *8*(1), 70–75. https://doi.org/10.4018/IJGHPC.2016010106

Duygulu, E., Ozeren, E., Işıldar, P., & Appolloni, A. (2016). The Sustainable Strategy for Small and Medium Sized Enterprises: The Relationship between Mission Statements and Performance. *Sustainability*, *8*(7), 698. https://doi.org/10.3390/su8070698

Dymock, S., & Nicholson, T. (2010). “High 5!” Strategies to Enhance Comprehension of Expository Text. *The Reading Teacher*, *64*(3), 166–178. https://doi.org/10.1598/RT.64.3.2

Enz, C. (2009). *Hospitality Strategic Management: Concepts and Cases*. Wiley Publishing.

Erdogmus, H. (2009). Cloud Computing: Does Nirvana Hide behind the Nebula?, (July). https://doi.org/10.1109/MS.2009.31

Evolve. (2017). Why business strategy is important. https://evolve.ie/q-and-a/business-strategy-important/

Gartner. (2018). Gartner Says IT Spending in South Africa Will Grow 4.3 Percent in 2018. Retrieved October 15, 2018, from https://www.gartner.com/en/newsroom/press-releases/2018-08-27-gartner-says-it-spending-in-south-africa-will-grow-4-percent-in-2018

Gcaza, N., & Von Solms, R. (2016). A Strategy for a cybersecurity culture: A South African Perspective.

Ghauri, P., Grønhaug, K. and Kristianslund, I. (1995). Research methods in business studies: A practical study, New York: Prentice Hall.

Giuseppe, A., Alessio, B., Walter, D. D., & Antonio, P. (2013). Cloud monitoring: A

survey. *Computer Networks*, *57*(9), 2093–2115. https://doi.org/10.1016/j.comnet.2013.04.001

Goethals, F. G., Snoeck, M., Lemahieu, W., & Vandenbulcke, J. (2006). Management and enterprise architecture click: The FAD(E)E framework. *Information Systems Frontiers*, *8*(2), 67–79. https://doi.org/10.1007/s10796-006-7971-1

Goldman, G., & Nieuwenhuizen, C. (2006). *Strategy: Sustaining competitive advantage in a globalised context*. Juta and Company Ltd.

Goyal, S. (2014). Public vs Private vs Hybrid vs Community - Cloud Computing: A Critical Review. *International Journal of Computer Network and Information Security*, *6*(3), 20–29. https://doi.org/10.5815/ijcnis.2014.03.03

Gupta, A., & Milojicic, D. (2011). Evaluation of HPC Applications on Cloud, 22–26. https://doi.org/10.1109/OCS.2011.10

Gupta, P., Seetharaman, A., & Raj, J. R. (2013). The usage and adoption of cloud computing by small and medium businesses. *International Journal of Information Management*, *33*(5), 861–874. https://doi.org/10.1016/j.ijinfomgt.2013.07.001

Hasheela-Mufeti, V., & Smolander, K. (2017). What are the requirements of a successful ERP implementation in SMEs? special focus on Southern Africa. *International Journal of Information Systems and Project Management*, *5*(3). https://doi.org/10.12821/ijispm050301

Hassan, H. (2017). Organisational factors affecting cloud computing adoption in small and medium enterprises (SMEs) in service sector. *Procedia Computer Science*, *121*, 976–981. https://doi.org/10.1016/j.procs.2017.11.126

Huygh, T., Haes, S. De, Joshi, A., & Grembergen, W. Van. (2018). Answering key global IT management concerns through IT governance and management processes : A COBIT 5 View. *Hawaii International Conference on System Sciences*, *9*(1), 5335–5344.

Institute of Risk Management. (2018). Cyber risk and risk management. Retrieved October 16, 2018, from https://www.theirm.org/knowledge-and-resources/thought-leadership/cyber-risk/

Johnson, R. (2011). Server Virtualization : Expert Overview of Costs , Trends and More Server Virtualization : Expert Overview of Costs , Trends and More Table of

Contents :

Johnston, K. A., Loot, M., & Esterhuyse, M. (2016). The Business Value of Cloud Computing in South Africa. *The African Journal of Information Systems*, *8*(2).

Floerecke, S, Lehner, F (2016). Cloud Computing Ecosystem Model: Refinement and Evaluation.

Kent, C., & Tanner, M. (2016). How South African SMEs address cyber security : the case of web server logs and intrusion detection.

Kevin, A., Muzaffar, L. & Esterhuyse, M. (2016). The Business Value of Cloud Computing in South Africa

Khan, N., & Al-Yasiri, A. (2015). Framework for Cloud Computing Adoption: A Roadmap for Smes to Cloud Migration. *International Journal on Cloud Computing: Services and Architecture*, *5*(5/6), 01-15. https://doi.org/10.5121/ijccsa.2015.5601

Klaus, H., Rosemann, M., & Gable, G. G. (2000). What is ERP? *Information Systems Frontiers*, *2*(2), 141–162. https://doi.org/10.1023/A:1026543906354

Kuhn, T. (1970).The Structure of Scientific Revolutions 2nd eddtion

Kushida, K. E., Murray, J., & Zysman, J. (2015). Cloud Computing: From Scarcity to Abundance. *Journal of Industry, Competition and Trade*, *15*(1), 5–19. https://doi.org/10.1007/s10842-014-0188-y

Lester, R., & Waters, J. (1985). *Environmental Scanning and Business Strategy*.

Lian, J. W. (2015). Critical factors for cloud based e-invoice service adoption in Taiwan: An empirical study. *International Journal of Information Management*, *35*(1), 98–109. https://doi.org/10.1016/j.ijinfomgt.2014.10.005

Lian, J. W., Yen, D. C., & Wang, Y. T. (2014). An exploratory study to understand the critical factors affecting the decision to adopt cloud computing in Taiwan hospital. *International Journal of Information Management*, *34*(1), 28–36. https://doi.org/10.1016/j.ijinfomgt.2013.09.004

Lim, N., Grönlund, Å., & Andersson, A. (2015). Cloud computing: The beliefs and perceptions of Swedish school principals. *Computers and Education*, *84*, 90–100. https://doi.org/10.1016/j.compedu.2015.01.009

Longhurst, R. (2009). Interviews: In-Depth, Semi-Structured. International Encyclopedia of Human Geography., 580–584. Retrieved from https://www.researchgate.net/publication/288218013_Interviews_In-Depth_Semi-Structured

Low, C., Chen, Y., & Wu, M. (2011). Understanding the determinants of cloud computing adoption. *Industrial Management & Data Systems*, *111*(7), 1006–1023. https://doi.org/10.1108/02635571111161262

Marks, EA., Lozano, B (2010). Executives Guide to Cloud computing - http://repository.fue.edu.eg/xmlui/bitstream/handle/123456789/3566/8454.pdf?sequence=1

Marston, S., Li, Z., Bandyopadhyay, S., Zhang, J., & Ghalsasi, A. (2011). Cloud computing - The business perspective. *Decision Support Systems*, *51*(1), 176–189. https://doi.org/10.1016/j.dss.2010.12.006

Mavimbela, R., & Dube, E. (2016). Can an Internet Adoption Framework be Developed for SMEs in South Africa, *2*(2010). https://doi.org/10.1177/2393957516647250

Mohamed, A., Eman S, N., & Geith, M. (2016). Benefits and challenges of cloud ERP systems – A systematic literature review. *Future Computing and Informatics Journal*, *1*(1–2), 1–9. https://doi.org/10.1016/j.fcij.2017.03.003

Mozael, B. M. (2015). Impact of Training and Development Programs on Employee Performance, *4*(9), 1–10.

Nazir, M., Tiwari, P., Tiwari, S., & Mishra, R. (2015). Cloud Computing : An Overview. *Journal of Systems Integration*, *3*(4), 3–14. https://doi.org/10.4018/978-1-4666-4801-2.ch001

Nattional Insitute of Science and Technology. (2011). The NIST Definition of Cloud Computing Recommendations of the National Institute of Standards and Technology. *Nist Special Publication*, *145*, 7. https://doi.org/10.1136/emj.2010.096966

Njenga, K., & Jordaan, P. (2016). We Want To Do It Our Way : The Neutralisation Approach to Managing Information Systems Security by Small Businesses Way : The Neutralization, *8*(1).

Noble, H., & Smith, J. (2014). Issues of validity and reliability in qualitative research, *18*(2015). https://doi.org/10.1136/eb-2015-102054

Odendaal, N. (2017). Number of South African SMME's growing. Retrieved from http://m.engineeringnews.co.za/article/number-of-south-african-smmes-growing-2017-06-26/rep_id:4433

Okello-Obura, C., & Matovu, J. (2011). SMEs and Business Information Provision Strategies : Analytical Perspective SMEs and Business Information Provision Strategies : Analytical Perspective.

Österle, H., Becker, J., Frank, U., Hess, T., Karagiannis, D., Krcmar, H., … Sinz, E. J. (2011). Memorandum on design-oriented information systems research Eur. J. Inf. Syst., vol. 20, PP. 7-10.

Owen, S. (2011). Cloud vs. Hosted Services, what's the difference?

Park, E., & Kim, K. J. (2014). An integrated adoption model of mobile cloud services: Exploration of key determinants and extension of technology acceptance model. *Telematics and Informatics*, *31*(3), 376–385. https://doi.org/10.1016/j.tele.2013.11.008

Peffers, K., Tuunsnen T., Rothenberger M & Chatterjee, S. J. (2008). A Design Science Reserch Methodology for Information Systems Reserch: http://www.sirel.fi/ttt/Downloads/Design%20Science%20Research%20Methodology%202008.pdf

Phaphoom, N., Wang, X., Samuel, S., Helmer, S., & Abrahamsson, P. (2015). A survey study on major technical barriers affecting the decision to adopt cloud services. *Journal of Systems and Software*, *103*, 167–181. https://doi.org/10.1016/j.jss.2015.02.002

Porter, M. (1986). The strategic role of international marketing. Journal of Consumer Marketing. https://www.emerald.com/insight/content/doi/10.1108/eb008159/full/html?skipTracking=true

Protection of personal information act, ActU.S.C. (2013). http://www.justice.gov.za/inforeg/docs/InfoRegSA-POPIA-act2013-004.pdf

Rajaraman, V. (2014). Cloud computing. *Resonance*, *19*(3), 242–258.

https://doi.org/10.1007/s12045-014-0030-1

Rantapuska, T., & Ihanainen, O. (2007). Knowledge Use in ICT Investment Decision Making of SMEs, 1–13. https://www.researchgate.net/publication/220306205_Knowledge_use_in_ICT_investment_decision_making_of_SMEs

Rumelt, R. (2011). Good Strategy/Bad Strategy The Difference and Why It Matters. http://www.anzishaprize.org/wp-content/uploads/2016/04/Richard-Rumelt-Good-Strategy-Bad-Strategy_-The-Difference-and-Why-It-Matters-Crown-Business-2011.pdf

Sagiroglu, S., & Sinanc, D. (2013). Big Data : A Review, 42–47. http://www.scirp.org/(S(351jmbntvnsjt1aadkposzje))/reference/ReferencesPapers.aspx?ReferenceID=2163642

Santos, C., Mehrsai, A., Barros, A. C., Araújo, M., Ares, E., Santos, C., … Ares, E. (2017). ScienceDirect ScienceDirect ScienceDirect ScienceDirect Towards Industry 4 . 0 : an overview of European strategic roadmaps Towards Industry an overview European roadmaps International of Towards Industry an overview of European strategic roadmaps. *Procedia Manufacturing*, *13*, 972–979. https://doi.org/10.1016/j.promfg.2017.09.093

Scheers, L. Van. (2018). Strategies of global recession for small business enterprises in emerging markets : Case of South Africa, *12*(2), 163–173.

Sharma, R., & Mann, M. (2012). Cloud Computing New Cutting Edge to Business,Redefining the IT Business. *International Journal of Computer Application Issue2*, *2*(April), 81–86.

Shimba, F. (2010). Cloud Computing:Strategies for Cloud Computing Adoption. *Dublin Institute of Technology*, 133.

Shin, D. (2014). Beyond user experience of cloud service: Implication for value sensitive approach. *Telematics and Informatics*, *32*(1), 33–44. https://doi.org/10.1016/j.tele.2014.02.002

Skolmen, D. E., & Gerber, M. (2015). Protection of Personal Information in the South African Cloud Computing environment: A framework for Cloud Computing adoption. *Information Security for South Africa (ISSA), 2015*, 1–10.

https://doi.org/10.1109/ISSA.2015.7335049

South African Government Gazette. (2013). National Small Business Act 102 of 1996

South African Government Gazette. (2013). Protection of Personal Information Act, (912).

South African Government Gazette. (2013). Income Tax Act 58 of 1962

Stieninger, M., Nedbal, D., Wetzlinger, W., Wagner, G., & Erskine, M. A. (2014). Impacts on the Organizational Adoption of Cloud Computing: A Reconceptualization of Influencing Factors. *Procedia Technology*, *16*, 85–93. https://doi.org/10.1016/j.protcy.2014.10.071

Subramanian, K. (2011, April) VMWare disrupts PaaS space with Cloud Foundry – an analysis. [Online]. Available: http://www.cloudave.com/11714/vmware-disruptspaas-space-with-cloud-foundry/

Sultan, N. A. (2011). Reaching for the "cloud": How SMEs can manage. *International Journal of Information Management*, *31*(3), 272–278. https://doi.org/10.1016/j.ijinfomgt.2010.08.001

Surendro, K., & Fardani, A. (2012). Identification of SME readiness to implement cloud computing. *Proceedings - International Conference on Cloud Computing and Social Networking 2012: Cloud Computing and Social Networking for Smart and Productive Society, ICCCSN 2012*, (April 2016). https://doi.org/10.1109/ICCCSN.2012.6215757

Syspro. (2018). SYSPRO Defines the Meaning of ERP.

Talia, D. (2013). Clouds for scalable big data analytics. *Computer*, *46*(5), 98–101. https://doi.org/10.1109/MC.2013.162

TechTarget. (2018). https://searchcloudcomputing.techtarget.com/definition/Software-as-a-Service

Tsokota, T., von Solms, R., & van Greunen, D. (2017). An ICT strategy for the sustainable development of the tourism sector in a developing country: A case study of Zimbabwe. *Electronic Journal of Information Systems in Developing Countries*, *78*(1), 1–20. https://doi.org/10.1002/j.1681-4835.2017.tb00573.x

Uzair, M. Y. (2017). Forth Industrial Revolution Retrieved. Retrieved February 9, 2018,

from https://www.dawn.com/news/1331909

Velumadhava Rao, R., & Selvamani, K. (2015). Data security challenges and its solutions in cloud computing. *Procedia Computer Science*, *48*(C), 204–209. https://doi.org/10.1016/j.procs.2015.04.171

Voorsluys, W., Broberg, J., & Buyya, R. (2011). Introduction to cloud computing, 3–42.

Wang, Y., Kung, L., & Anthony, T. (2018). Technological Forecasting & Social Change Big data analytics : Understanding its capabilities and potential bene fi ts for healthcare organizations. *Technological Forecasting & Social Change*, *126*, 3–13. https://doi.org/10.1016/j.techfore.2015.12.019

Wegner, T. (2007). Applied Business Statistics – Methods and Excell-based applications. 3rd ed. South Africa: Juta and Company LTD., 214.

Welman, J. C., & Kruger, S. (1999). *Research methodology for the business and administrative sciences. Johannesburg, South Africa: International Thompson*.

Wheelen, T. L., & Hunger, J. D. (2012). *Management and Business Policy: Towaes Global Sustainability*.

Yeboah-Boateng, E. O., & Essandoh, K. A. (2014). Factors Influencing the Adoption of Cloud Computing by Small and Medium Enterprises in Developing Economies. *International Journal of Emerging Science and Engineering (IJESE)*, *2*(4), 13–20. https://doi.org/10.1007/978-3-319-07863-2_60

Zhang, Q., Cheng, L., & Boutaba, R. (2010). Cloud computing: State-of-the-art and research challenges. *Journal of Internet Services and Applications*, *1*(1), 7–18. https://doi.org/10.1007/s13174-010-0007-6

APPENDIX A: PILOT STUDY INTERVIEW

The following interview was conducted with an interviewee as part of the study on developing a strategy for adopting cloud computing services by SMEs in Nelson Mandela Metropole. The information form this study was then used to help form some of the questions that were used in the actual study which has been documented in Chapter four.

Interviewee Background

The interviewee, is the owner and director of a professional services business. To date the company has 3 full time employees including the owner, and in the most recent financial year generated a revenue of approximately R350 000. The business was registered in March 2017, and offers accounting, tax and company secretary services to approximately 15 clients across the country.

1. What type of computer systems does your company make use of?

“pastel accounting, microsoft office and kaspersky antivirus software”

1. **Do you require access to the internet to conduct your business? If yes what system do you use to gain access to the internet**

“yes I require access to the internet in order to submit tax return, I also send my clients their annual financial statements using email. I gain access to the internet using WIFI package, which is supported by an external company”

2. **Currently where is your information stored?**

“at this point all the information is stored, on a single personal computer which is used for backing up of information. No one uses this the personal computer for any client related work thus this computer is just used to store information. When someone needs information they then transfer the documents from the back up computer onto their laptop. Once they complete working on a client file then then save it back onto the standing personal computer.”

3. **How often do you back-up your information?**

“as a business we do backups once a month onto the main storage personal computer”

4. **What do you understand by cloud computing?**

“cloud computing is where information is stored somewhere, and allows you to access the information at any time. However I do not trust cloud computing”. **Why?** “because one of my company values is to maintain the integrity of information that is stored and as I do not know much about cloud computing I am not sure how safe the information stored there is.”

5. **What is your biggest reason for not using cloud computing?**

“mine is the security of information as well as the fact that I do not really understand what is and how it works.” **So if someone were to explain this service to you would you then use it?** “I am not sure as the security of the information is still a worry to me”

6. **Would you say that of all the three cloud operating models (Iaas, Paas, Saas), Saas would be the most likely to work in your business?**

“yes - as I have a limited understanding of cloud computing and just need something where I can store my data.”

7. **According to literature the best cloud operating deployment model for SMEs is that of a Public cloud would you agree?**

“no, I believe that a private cloud is actually right for me as this appears to be more secure than other cloud models”

8. **Does your business make use of any customised software packages? And who is responsible for maintaining the software. I.e. is any software that you use specifically customised for your business operations.**

“no my business does not, we have updates done by the service providers that prescribe the packages”

9. **How does your business go about making IT investment decisions? I.e. is there any form of research that goes into such an investment decision.**

“I make all the decision, and I do research on a need to know basis”

10. **Do you currently have any policies which govern your interaction with your IT service providers 3rd parties? If no why not?**

“no, I have no policies in my business”

11. **Who maintains your IT infrastructure of your business?**

“I do not have a service provider for this i just take it into the shop should something go wrong”

12. **Do you have any IT policies for which your staff members must adhere to?**

“I only have an employment contract for my staff members:

APPENDIX B: INTERVIEW QUESTIONS

NELSON MANDELA UNIVERSITY

DISCLAIMER: Your participation in this survey is voluntary and your individual responses will remain confidential and anonymous. We will neither divulge such information to any outside party, nor identify it without your written permission. As such, no individual will be identifiable in any written or published research reports. By completing this survey, you consent to participate in this research study. Furthermore, participants may withdraw from the research study at any time without penalty.

Thank you for partaking in this research study, which forms part of an MPhil in IT Governance degree at the Nelson Mandela University.

Background and Purpose

The following study is aimed at developing a strategy for the adoption of cloud computing services by SMEs in Nelson Mandela Metropole. The problem identified during the literature review process of this study is that despite the benefits of cloud computing, SMEs in Nelson Mandela Metropole are still reluctant to adopt cloud computing services as part of their business model. Thus the idea is that should SMEs begin to adopt cloud services they can improve their businesses.

Details

Company Name:
Interviewee:

Describe your company

1. What are your business goals and objectives?
2. What type of cloud computing enhancement model (IaaS, PaaS, SaaS) would work best in your business? And why?
3. Who maintains your IT infrastructure of your business?
4. Do you currently make use of cloud computing services? If so which services do you make use of?

5. Which type of cloud computing service model would work best for your business (Private, public, community, hybrid cloud)?
6. Does your business make use of any customised software packages? And who is responsible for maintaining the software. So, is any software that you use specifically customised for your business operations?
7. Do you currently have any policies which govern your interaction with your IT service providers' third parties? If no, why not?
8. Do you have any IT policies which your staff members must adhere to?
9. Would you say your access to the internet is a problem for your business?
10. Can you rate your level of understanding of cloud computing? (Knowledgeable, moderate, fair)
11. What would you say are the barriers to you adopting cloud computing services?
12. How does your business go about making IT investment decisions? Thus, is there any form of research that goes into such an investment decision?
13. What are the major challenges to your business in achieving these objectives, and how will you overcome these?
14. Do you foresee IT playing a role in the achievement of your goals, and how?

APPENDIX C: ETHICAL CHECKLIST

NELSON MANDELA UNIVERSITY

Faculty of Engineering, the Built Environment and Information Technology

Self-Assessment Research Ethics Checklist

The checklist should be completed by the researcher (PI) in consultation with supervisor/promotor (PRP) and attached to the research proposal. Please note that retrospective approval for studies is not possible.

Principle Investigator (PI):	George Sarpong
Department of PI:	Information Communication Technology
Title of Research Project:	A strategy for adopting cloud computing services in small medium and micro enterprises in Nelson Mandela Metropole
Registered Degree:	MPhil in IT Governance
Staff or Student Number:	207077211
Primary Responsible Person (PRP):	David Joubert

1. Familiarity with ethical codes of conduct	
a) I have familiarised myself with the Research Ethics and Code of Conduct Policies for Researchers at Nelson Mandela University	
Yes	
No	*If no, do so before proceeding*

b) I have familiarised myself with the professional code(s) of ethics and/or guidelines for ethically responsible research relevant to my field of study	
Yes	*If yes, please specify the professional code(s) of ethics and/or guidelines which were consulted*

No	*If no, do so before proceeding*

The level of risk involved in your proposed research is measured as follows:

No risk	No approval is necessary
Negligible to Low risk	Faculty level ethics approval is necessary
Medium to High risk	Institutional level ethics approval is necessary

Please answer the questions below. Select one or more of the options that in your opinion might be applicable to your investigation

2. Does the proposed research intentionally involve the collection of data on people in the following categories?	
	NMMU staff/students
	Persons that are in a dependency relationship with the Principal Investigator (PI) and/or Primary Responsible Person (PRP)
	Children under the age of 18
	Handicapped (e.g. mentally or physically) persons
	Socially and/or economically disadvantaged persons
	Persons of diminished physical and/or mental and/or educational capacity (e.g. traumatised)
	Persons who are not competent to give participation consent (e.g. due to language challenges)
	None of the above

3. Are you administering any process and/or treatment that	
	Involves participants undergoing psychological, physiological or medical testing or treatment.
	Involves the collection and use of human biological samples (e.g. skin, blood, urine, saliva, hair, bones, tumour and other biopsy specimens) or their exhaled breath.
	Could be hazardous to the physical health (e.g. possibly results in illness, injury, pain) of the participants and/or researcher.
	Could be hazardous to the psychological well-being (e.g. possibly results in feelings of worthlessness, guilt, anger, fear) of the participants and/or researcher.
	Could be hazardous to the legal well-being (e.g. possibly results in the discovery and prosecution of criminal activity) of the participants and/or researcher.

	Could result in the participant learning about a genetic possibility of developing an untreatable disease.
	Could be hazardous to the economic well-being (e.g. possibly results in the imposition of direct and/or indirect financial commitments on participants) and/or result in discomfort associated with the economic well-being of the participants and/or researcher.
	Collects any articles/documents of property, personal or cultural from participants.
	May result in a traumatic experience for the participants and/or researcher.
	May result in the disclosure of sensitive and/or embarrassing information about the participants and/or researcher.
	Involves covert observation of behaviour that is not normally in the public domain.
	Could result in the participants feeling humiliated, manipulated and/or in other ways treated disrespectfully and/or unjustly.
	Could result in discomfort associated to the physical health (e.g. the act of measuring blood pressure, minor side effects of taking medication) of the participants and/or researcher.
	Could result in discomfort associated with the psychological well-being (e.g. feelings of anxiety due to being interviewed) of the participants and/or researcher.
	Could result in the identification and/or re-identification of a participant from a resulting report.
	Could result in risks to non-participants (e.g. distress to relatives upon discovering that a participant suffers from a serious genetic disorder, infectious disease risks to a community, social/economic discrimination of subgroup populations).
	Is expected to result in the only foreseeable discomfort being that of inconvenience (e.g. time and effort required by participants to complete questionnaire/form, participate in a street survey).
	Is expected to result in no foreseeable risk, harm or discomfort to the mental and/or physical well-being of the participants.

4. Are you administering a questionnaire / survey / interview / focus group that	
	Collects sensitive data from the participants (e.g. personal data that is not normally in the public domain).
	Does not guarantee the anonymity of the participant.
	Does not guarantee the confidentiality of data collected from the participants.
	None of the above.

5. Are you intending to access participant data from an existing stored repository (e.g. school, institutional or university records) that	
	Requires access to participant information (in individually identifiable or re-identifiable form) as part of an existing published or unpublished source or database?

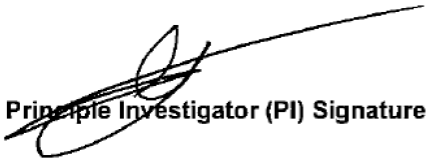
	Requires access to participant information (in non-identifiable form, e.g. summarised form) as part of an existing published or unpublished source or database?
	None of the above.

6. Do you intend publishing the findings of your study in a publication that	
	Requires evidence of human ethics approval/acknowledgement?
	Requires no evidence of human ethics approval/acknowledgement?

7. Is this study	
	An international/cross border study?
	A local (e.g. regional, national) study?

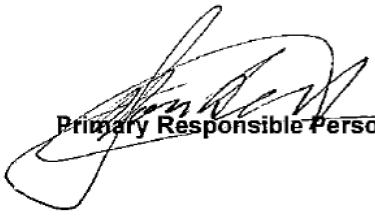
Your proposed study's risk is summarised below:

No risk	No approval is necessary
Negligible to Low risk	Faculty level ethics approval is necessary
Medium to High risk	Institutional level ethics approval is necessary



Principle Investigator (PI) Signature

01/04/2018
Date



Primary Responsible Person (PRP) Signature

1/4/18
Date