UNIVERSITY OF KWAZULU-NATAL

A STUDY OF CLOUD COMPUTING TECHNOLOGY ADOPTION BY SMALL AND MEDIUM ENTERPRISES (SMEs) IN GAUTENG PROVINCE

BY

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the academic requirements for the degree of

Master of Commerce in Information Systems and Technology

School of Management, IT & Governance

College of Law and Management Studies

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DECLARATION

I, Lufungula Osembe, declare that

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- This dissertation has not been submitted for any degree or examination at any other university.
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ABSTRACT

This study investigates small and medium enterprises in the IT sector located within the province of Gauteng, to ascertain their perceptions on the benefits and risks associated with cloud computing, and to assess the extent of usage of cloud computing services. Fifty-two IT SMEs took part into this research and the findings revealed that respondents were IT consultants, IT managers, executive managers, middle managers, company owners, employees with IT expertise or knowledge, as well as IT specialists from each selected IT SME. IT SMEs that took part into the research had between 1-200 employees with primary users of computing devices being employees followed by clients. The findings revealed that IT SMEs operated in the following three sectors: computer/IT, mobile business, as well as digital solution. These organisations were in existence between one month and twenty years.

The research findings indicated that 71.4% of respondents used cloud computing and 28.6% of respondents did not use cloud computing. The findings also indicated that 75% of non-users were planning to use cloud computing as compared to 25% of non-users, who were not planning to use cloud computing. The findings revealed that non-users were likely to use SaaS as compared to other cloud services. Among the challenges faced by non-users in the usage of cloud computing, the following were identified as very important ones: awareness, implementation, complexities, as well as risks.

The findings revealed that the following services were highly likely to be used by users: SaaS, IaaS, as well as PaaS. The following factors were identified by users as highly influential in their decision to adopt cloud computing: improved service level management, cost-efficiency, standard-based security, as well as risks. The following factors were identified as important benefits in cloud computing by users: cost-efficiency, lower-implementation, scalability, saving time and cost, sustainability, customisation, as well as virtualisation.

The findings revealed the following factors as important concerns and limitations in cloud computing: risks, availability, security issues, regulatory requirements, awareness, performance, impact of security, impact of challenges, impact of availability, trust and transparency, shared technology issues, disaster recovery, service level agreement, virtualisation, as well as policy integration. The findings also revealed that service level agreement should be the foundation for cloud computing adoption.

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LIST OF ACRONYMS AND ABBREVIATIONS

ATU: Attitude Towards Technology

CEBR: Centre for Economics and Business Research

CSA: Cloud Security Alliance

GDP: Gross Domestic Product

GIDSD: Gauteng ICT Development Strategy Draft

IaaS: Infrastructure- as- a- Service

ITU: International Telecommunication Union

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PaaS: Platform-as-a-Service

PEOU: Perceived Ease Of Usefulness

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SaaS: Software-as-a-Service

SEDA: Small Enterprise Development Agency

SMEs: Small and Medium Enterprises

SMMEs: Small, Micro and Medium Enterprises

SP: Service provider

TAM: Technology Adoption Model

TheDti: The Department of Trade of Industry

TOE: Technology-Organisation-Environment

XaaS: Other variant forms of cloud computing services

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Chapter 1: Introduction

1.1. Introduction

Organisations of the twenty-first century strongly emphasise quality and productivity through organisational development and business strategies. These organisations are perceived to integrate new technologies in their business to ensure high returns and benefits. As new technologies develop, they are added to the structure of organisations to improve business development. Cloud computing has emerged as one of the most recent technology models used for the ultimate purpose of benefiting and uplifting business in a secure manner. The technology model allows for data access, as well as retrievable instance in which data loss protection is unprecedentedly expanded over long periods with regard to investments and overall business information.

This study considers cloud computing as a suitable technology model to meet the objectives and needs for almost all types and size of business organisations. While large organisations have mechanisms in place on how to use and implement a cloud computing model for their business objectives (Erol, Karatas, Ozen and Gulsecen, 2012), little is known of the small and medium enterprises (SMEs), and particularly those operating in the province of Gauteng, in the use of Information Technology (IT) tools namely cloud computing.

The study investigated the readiness of SMEs in the IT sector located in Gauteng on the adoption and the use of cloud computing as a model. The focus of the study was on the early adopters of the cloud computing technology model in Gauteng.

Various researchers argue that cloud computing plays an important role in meeting various organisations' needs in the developing world (Erol et al., 2012). However, there is limited knowledge on the viability of cloud computing technology model for IT SMEs in Gauteng with regard to perceived usefulness, security, performance, availability, privacy, regulatory and legal requirements, as well as service level agreement (management). The present study explored all these aspects with regard to SMEs in the IT sector operating in Gauteng.

The background to the research problem is presented in section 1.2, followed by the purpose of the study in section 1.3. The research problem is presented in section 1.4. The research questions that form the basis of this study are defined in section 1.5, and the research objectives are listed in section 1.6. The preliminary literature review is presented in section 1.7, followed by the conceptual framework in section 1.8. In section 1.9, the importance and significance of the study is presented. Section 1.10 provides the justification or rationale for the study, followed by the research design and methodology in section 1.11.

The limitations of the study are discussed in section 1.12, followed by the summary of the chapter in section 1.13. The thesis structure or layout is presented in section 1.14.

1.2. Background of the study

Small and medium enterprises in the IT sector located in Gauteng are representative of any other SMEs contributing to the general economy of the country. The Small Business Amendment Acts of 2003 and 2004 defines "small business" as an entity including co-operative enterprises and non-governmental organisations, managed by one owner or more, including its branches or subsidiaries that are predominantly carried on in any sector or sub-sector of the economy (TheDti, 2007). The study targeted SMEs in the IT sector located in the province of Gauteng because little is known about the adoption and usage of cloud computing.

Given the complexity of the IT market in the developed world, as well as in South Africa, the study is interested in investigating the viability of cloud computing model for IT SMEs in Gauteng. The question that still needs to be answered is whether cloud computing model achievements and successes could be replicated by companies that have not yet adopted the model.

Cloud computing is defined as a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service provider interaction (Mell and Glance, 2011). In this technology model, cloud computing service providers lease their services to consumers, who in return utilise those services, being online applications, through their web browsers while data and software programs are stored on the cloud servers located in data centres. Cloud computing services and deployment models will be further explained in this study.

The adoption of cloud computing has had remarkable results on SMEs that have already adopted the model. Kshetri (2010) established various benefits that SMEs in the developing world managed to maximise in the adoption of cloud computing as a technology model. The literature provides ample evidence of the adoption of cloud computing by a number of organisations (Carroll, Merwe and Kotze, 2011). However, little is known on the choice of cloud computing services used in order to meet their business objectives. The study assessed organisations that have adopted cloud computing as a model and evaluated how the model assisted to meet their needs.

The study further explored aspects related to benefits, as well as challenges associated with cloud computing adoption. The literature points out that a lot is known about the benefits and the challenges associated with cloud computing usage by adopters in the developed world. However, little is known about the benefits and challenges that cloud computing offers to IT SMEs located in Gauteng, South Africa. Thus, there is a great interest in conducting this study.

The focus on cloud computing adoption, the study assessed whether, given the benefits of cloud computing, its key drivers, as well as its cost-efficient ways of improving and remaining competitive business wise, IT SMEs in Gauteng were ready to adopt and implement cloud computing technologies.

1.3. Purpose of the study

The main purpose of the study is to investigate small and medium enterprises in the IT sector located within the province of Gauteng, to ascertain their perceptions on the benefits and risks associated with cloud computing, and to assess the extent of usage of cloud computing services.

1.4. Research problem/ Statement of the problem

The literature provides little information on the current developments of the cloud computing technology as a model in Gauteng, as well as on the current trends in the adoption and usage of the model. The study attempts to ascertain whether or not awareness plays a role in the adoption of cloud computing. The study also attempts to establish whether SMEs in the IT sector are ready to adopt and use the technology model. This research sets out to understand more about the actual state of cloud computing and its viability, as well as its impact on the business.

It is important to conduct this study because of the following reasons:

- There is a high possibility that SMEs in the IT sector in Gauteng will continue to use legacy systems with little knowledge about how to improve their business processes.
- There is a high possibility that SMEs in the IT sector in Gauteng will still lack the knowledge for improving their business processes in order to compete or gain competitive advantage.
- There is a high likelihood that SMEs in the IT sector in Gauteng will not be in a position to maximise profit on new technologies, as well as play a meaningful role in aligning IT to their business processes.

1.5. Research questions

The study research questions are aligned to its main objectives, outlined in section 1.6. The following are the main research questions that guided the study:

RQ1. To what extent is the level of cloud computing adoption and usage by IT SMEs in Gauteng?

- This research question elaborates on the use of cloud computing technology by IT SMEs in Gauteng, the purpose of their usage, as well as the extent of use.

RQ2. What are the IT SMEs' perceptions on the benefits of cloud computing technology?

- The question elaborates on the perceived benefits and usefulness of cloud computing adoption, and analyses the technology impact on those IT SMEs in Gauteng that have adopted it.

RQ3. What are the factors influencing the adoption and usage of cloud computing by IT SMEs in Gauteng?

- This question elaborates on a number of factors believed to influence the decision of IT SMEs to adopt and use cloud computing services.

RQ4. How viable is the cloud computing technology model for IT SMEs in order to meet business needs and objectives?

- A number of limitations and challenges will be analysed to establish whether they will continue limiting the adoption of the technology model for SMEs in the IT and global business market. This question would also establish whether IT SMEs would be in a position to overcome these limitations and challenges in regard to adoption of cloud computing while achieving their business goals in the global market.

Sub questions to RQ4:

- To what extent does the performance of cloud computing technologies impact the ability of IT SMEs to meet their business goals?
- To what extent does the availability of cloud computing technologies impact the ability of IT SMEs to meet their business goals?
- How is the security of the cloud computing technology model perceived in order for IT SMEs to meet their business goals?

- How are the risks of the cloud computing technology model perceived in order for IT SMEs to meet their business goals?
- What are the regulatory requirements associated with the cloud computing technology model for IT SMEs to meet their business goals?

RQ5. How does the service level management in the contract agreement to adopt cloud computing technology model promote the adoption and usage of the model for IT SMEs in Gauteng?

With the complexity of cloud computing technologies, the purpose of this question is to establish measures that can convincingly satisfy the service level management of IT SMEs to adopt cloud computing model services.

1.6. Research objectives

The following are the primary objectives of this study:

1. To determine the level of cloud computing adoption and usage by IT SMEs in Gauteng.
2. To ascertain the perceptions of IT SMEs on the benefits of cloud computing technology.
3. To understand the factors influencing the adoption and usage of cloud computing by IT SMEs in Gauteng.
4. To assess the perceptions of IT SMEs on the limitations and challenges of cloud computing technology.
5. To assess the viability of the cloud computing technology model to meet the business objectives of IT SMEs.

1.7. Preliminary literature review

1.7.1. Cloud computing technology model

There are various definitions included in the literature for cloud computing. For the purpose of this study, The National Institute of Standards and Technology defines cloud computing as a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service provider (Mell and Grance, 2011).

Services in cloud computing technologies are presented at three main levels: Software-as-a Service (SaaS), Infrastructure-as-a Service (IaaS), and Platform-as-a-Service (PaaS). A clear understanding of these services is very important in order to relate them to the various benefits and implications in the adoption of cloud computing as a technology. Walden (2012) and Mujinga (2012) present other forms of

cloud categories known as the 'X-as-a-Service'. A detailed analysis of these models will be presented in this study.

After analysing the services in cloud computing, it is important to understand the deployment model of cloud computing. Cloud computing can be deployed as public, private, community, and hybrid cloud types. In the public cloud model, services are made available to the general public through the Internet. In the private cloud model, computing resources are solely managed by one organisation that has full control of services and computing resources. In the community cloud model, the model is similar to private cloud model in that the cloud infrastructure and the set of computing resources are shared by various organisations having the same mission, policy and security requirements; and in the hybrid cloud model, it is a combination of two or more public, private and community cloud types structured, standardized and managed as a single unit (Youssef, 2012).

1.7.2. SMEs and their contribution to the national economy

The National Small Business Act of 1996, defines a small business as a separate and distinct entity, including co-operative enterprises and non-governmental organisations, managed by one owner or more which, including its branches or subsidiaries, if any, is predominantly carried on in a sector or sub-sector of the economy (TheDti, 2007). While SMEs are reported to contribute to the growth and development of the South African economy, the Small Enterprise Development Agency (2012) notes that SMEs are limited to compete at both national and international level.

There is little that is known in the literature on the perceptions of IT SMEs on the benefits of cloud computing and this study would like to ascertain the perceptions of IT SMEs on the benefits of cloud computing technology.

1.7.3. Perceived benefits and usefulness of cloud computing as a technology model

The presence of cloud computing as a model has shown real potential for innovation, business expansion and other great benefits from its inception. Although the model was initially designed for large businesses, cloud computing's perceived benefits and usefulness can be actually explored by SMEs. Carroll et al. (2011) argue that the adoption and usage of cloud computing technology should be largely observed in line with the perceived benefits that the model offers.

Avram (2014) argues that the perceived benefits and usefulness of cloud computing allow potential entrants including small enterprises to save on the fixed costs of investments in the adoption of the technology model and turn part of the costs into variable costs. He further argues that the reduction of the

constraints for entering the IT market could eventually promote business creation and facilitate SMEs to be part of the global market.

Some of the cloud computing benefits are considered as key characteristics of the models. Youssef (2012) presents these key characteristics as follows:

- On-demand self-service where users can provision computing resources with little human interaction.
- Mobility where users can access resources over the Internet anywhere.
- Multi-tenacity where cloud services are accessible to multiple users at the same time.
- Measured services where computing resources are charged as they are used.
- Rapid elasticity where computing resources are scaled according to user demand.
- Resource pooling where virtual and physical computing resources can be assigned and reassigned according to users' demand.

The study considers benefits discussed in this section as another important research question to be answered. This study attempted to ascertain the perception of IT SMEs on the benefits of cloud computing technology.

1.7.4. Challenges and limitations to cloud computing adoption

Despite the various benefits that cloud computing technologies present, the other side of the technology model must also be understood in terms of risks, security and other challenges in the implementation or deployment process.

Sravani and Nivedita (2012) discuss a number of these challenges as key barriers to cloud computing adoption. This section briefly discusses the risk, security, availability and performance issues. The section further discusses the regulatory requirements and the service level management as other concerns, and challenges related to cloud computing adoption and implementation.

These challenges and limitations to cloud computing constitute another research question. This question is critically analysed in this study to evaluate how IT SMEs that adopted cloud computing perceive these challenges to achieve and meet their business objectives.

1.7.4.1. Risk issues

Walden (2012) argues that risks faced by consumers in contracting to cloud computing provider should be raised in order to make consumers aware of the hidden risk of adoption. A number of risks including awareness to adoption, organisational risks, long-term viability of cloud computing provider including

long-term sticker shock, should be evaluated and clearly understood by consumers (Goyal and Supriya, 2013). These risks constitute the study's sub-question on how viable is the cloud computing technology model for IT SMEs to meet business needs and objectives.

1.7.4.2. Security issues

Security is one of the most important challenges reported in cloud computing, thus the topic attracts much attention in the adoption process (Louw, 2013 and Chou, 2015). The responsibility remains with the service provider to ensure security, protection of data from theft, malicious attacks and access (Murugaboopathi, Chandravathy and Kumar, 2013).

One of the study's research questions is to answer the two major aspects that security of cloud computing presents: firstly, as a major barrier to cloud adoption and secondly the peace of mind that security of data in the cloud presents to businesses that have adopted the model.

1.7.4.3. Availability issues

With data being held as a conglomeration of computing resources, the quality of data, reliability of data, back up of data and high availability of data in case of failure of one or multiple data centres, fast response time, as well as high performance or high-throughput processing powers are among great expectations from the consumers (Buyya et al., 2011).

The availability issue constitutes another research question to be evaluated in this study. The study has to understand how availability issues are addressed by cloud adopters in order to meet their business objectives.

1.7.4.4. Performance issues

Carlin and Curran (2012) argue that performance in cloud computing is associated with virtualisation where computing resources are enabled to release more than required capabilities when it comes to the processing power, storage, as well as memory capacities.

With high performance that cloud computing technology model provides through virtualisation, performance characteristic presents incredible challenges in cloud computing deployment and implementation of applications (Sravani and Nivedita, 2013). One of this research unanswered questions is to evaluate what are the performance issues associated with cloud computing services in order to meet the business objectives.

1.7.4.5. Regulatory requirements in cloud computing

The legal and practical liability of data is another cloud computing concern that needs to be addressed by cloud computing providers and consumers as well. With data being distributed around the globe, issues around data recovery, data restoration, migration mechanisms, data ownership, data retention just to name a few, should be understood by consumers (Mohammed, Alsudiari and Vasista, 2012).

Thus, one of the research questions evaluates how IT SMEs that have adopted cloud computing are addressing the regulatory framework, and critically analyses whether the regulatory framework in place is helping IT SMEs in Gauteng to adopt cloud computing as a technology model.

1.7.4.6. Service level management in cloud computing

Mohammed et al. (2012) argue that a service level management should be considered as the cornerstone in the adoption of the cloud computing model. The challenges posed to-date still lie on how the service should be measured, and what the contract agreement should constitute of. One of the study's research questions is to establish how cloud adopters address this concern to meet their business objectives.

1.8. Conceptual framework

There are various conceptual frameworks used to understand studies based on IT adoption. Various studies conducted on IT adoption have used Technology Acceptance Model (TAM) as a framework (Davis, 1986; Davis, 1989; Davis et al., 1989), as well as the Unified Theory of acceptance and Use of Technology (UTAUT) (Venkatech, Morris and Davis, 2003).

Arpaci, Yardimci, Ozkan and Turetken (2012) argue that the two theories though widely used in the adoption of technology, are more focused on the individual level rather than organisational level of the technology adoption. Constructs that could be identified using the two theories include perceived usefulness (PU), perceived ease of use (PEOU), attitude toward technology (ATU), as well as challenges and limitations to IT adoption (Davis et al., 1989).

There is a need to look beyond these conceptual frameworks since they do not represent the dimension of an organisation or a firm. Arpaci et al. (2012) claim that the gap identified in previous studies on IT adoption by organisations and firms can be clearly reduced by using the technology-organisation-environment (TOE) theory that incorporates all constructs needed to represent the study at both organisational and institutional level.

Technology-Organisation-Environment framework is the most suitable theoretical framework for this study since it includes all the key components or defining characteristics that may affect the adoption of

information technology (Arpaci et al., 2012; Tornatzky and Fleischer, 1990; Melville and Ramirez, 2008). Arpaci et al. (2012) argue that TOE framework has been used in similar studies to explain the adoption of IT by small and medium enterprises in areas related to e-commerce, Enterprise Resource Planning (ERP), Electronic Data Interchange (EDI), and Open Systems etc.

The following discussion elaborates on the conceptual framework that would guide this study. The discussion also elaborates on the need to expand the TOE framework to suit the context of the study.

1.8.1. Defining the Technology-Organisation-Environment conceptual framework

The TOE conceptual framework suggests that the adoption of information technology by organisations or institutions is largely influenced by three key context constructs, namely technological, organisational, and environmental (DePietro et al., 1990; Melville and Ramirez, 2008; Arpaci et al., 2012; Tornatzky and Fleischer, 1990). There is a need to explain these three constructs and understand how they fit in the study.

1. Organisational construct

This construct represents the business scope of an enterprise. Awa, Ukoha and Emecheta (2012) claim that the greater the scope of a business, the likelihood of a firm to invest in technology. Given the scope of the organisation, Arpaci et al. (2012) and Awa et al. (2012) claim that the following elements can have a significant impact in the manner in which the organisation functions or wishes to integrate technology:

- The size of the organisation
- The degree of centralisation
- The complexity of its managerial structure
- The quality of its human resources
- Top management support
- The amount of slack resources available.

2. Environmental construct

This construct represents the area where the business is conducted. The environmental construct also represents the facilitating and inhibiting factors in the area of operation (Awa et al., 2012).

Arpaci et al. (2012) propose the following key characteristics of the construct:

- Industry
- Regulations
- Competitions
- Trading partners
- Technology support infrastructure
- Competitive pressure.

3. Technological construct

This construct stipulates that the adoption of Information Technology depends on a pool of technologies both inside and outside the organisation (Awa et al., 2012). Arpaci et al. (2012) propose the following characteristics of the construct:

- IT platforms used by organisations.
- IT skills (technical and managerial know-how to adopt and implement IT effectively).
- Technology competency.

Awa et al. (2012) argue that the technological competency and know-how should go beyond physical assets; thus should include other resources that could generate maximum usage of IT or create competitive advantage for the organisation. Opportunities and constraints are other two elements that should be taken into account when addressing the technological construct according to (Arpaci et al.,2012).

1.8.2. Expanding the TOE conceptual framework

This study proposes an extension of the TOE framework to fit the context of the study undertaken. The three constructs namely the technological, organisational, as well as environmental aspects are discussed below:

1.8.2.1. Technological aspects of IT SMEs

The technological aspects of an organisation are equally important in the adoption of technology. Independent variables being investigated in this study include:

- Availability
- Agility
- Scalability
- Flexibility

- Higher reliability
- Better IT resource management
- Improved security
- Saving cost and time
- Sustainability
- Rapid development
- Greater mobility
- Improved automation
- Customisation
- Green IT data centers
- Higher performance
- Lower implementation and maintenance.

The successful adoption of IT depends on the value and importance of these internal and external variables (Awa et al., 2012). Small and medium enterprises in IT sector should consider these internal and external variables in the technology adoption process.

1.8.2.2. Organisational aspects of IT SMEs

It is imperative to understand the organisational structure of an enterprise and how it facilitates technology penetration. Arpaci et al. (2012) argue that the willingness of an organisation to accommodate innovation and changes can be very instrumental to the transformation of its business goals.

Independent variables being investigated in this study include:

- The size of the organisation
- The scope of the organisation
- The managerial structure of the organisation.

The level of technology adoption is largely dependent on these factors and thus, understanding their impact on the organisation is vital. Awa et al. (2012) claim that given the fact that these characteristics are vital in the organisation, they can influence the likelihood of technology adoption.

1.8.2.3. Environmental aspects of IT SMEs

It is vital to understand the environmental aspects associated with the operation of an enterprise. Independent variables being investigated in this study include:

- Service level agreement
- Product knowledge
- Technology support infrastructure.

SMEs in the IT sector have a role to play in identifying these characteristics as part of the organisation. Low, Chen and Wu (2011) claim that given the nature of socio-technical factors of cloud computing, environmental factors are equally important as technological factors.

1.8.3. Reasons for using the TOE conceptual framework

Fenerlicht (2010) claims that cloud computing adoption is perceived to be a different scenario when compared to other conventional innovation adoption and diffusion models. It is found that cloud services are offered to organisations by a third-party known as a cloud service provider.

Compared to other conventional innovations, cloud computing consists of three key players: cloud-based services, cloud computing users (clients), and cloud service providers (Dargha, 2009). The adoption of cloud computing is influenced by three key factors, which include characteristics of cloud computing technology in the form of technological context, the characteristics of firms or organisations as an organisational context, and the characteristics of a third-party as an environmental context (Louw, 2013).

The gap identified in previous studies on technology adoption is evident in the sense that previous studies managed to only identify the technological determinants of cloud computing (Low et al., 2011). Thus, the TOE conceptual framework will be useful to explain the adoption and usage of cloud computing by SMEs in the IT sector located in Gauteng.

The TOE conceptual framework can be represented as follows:

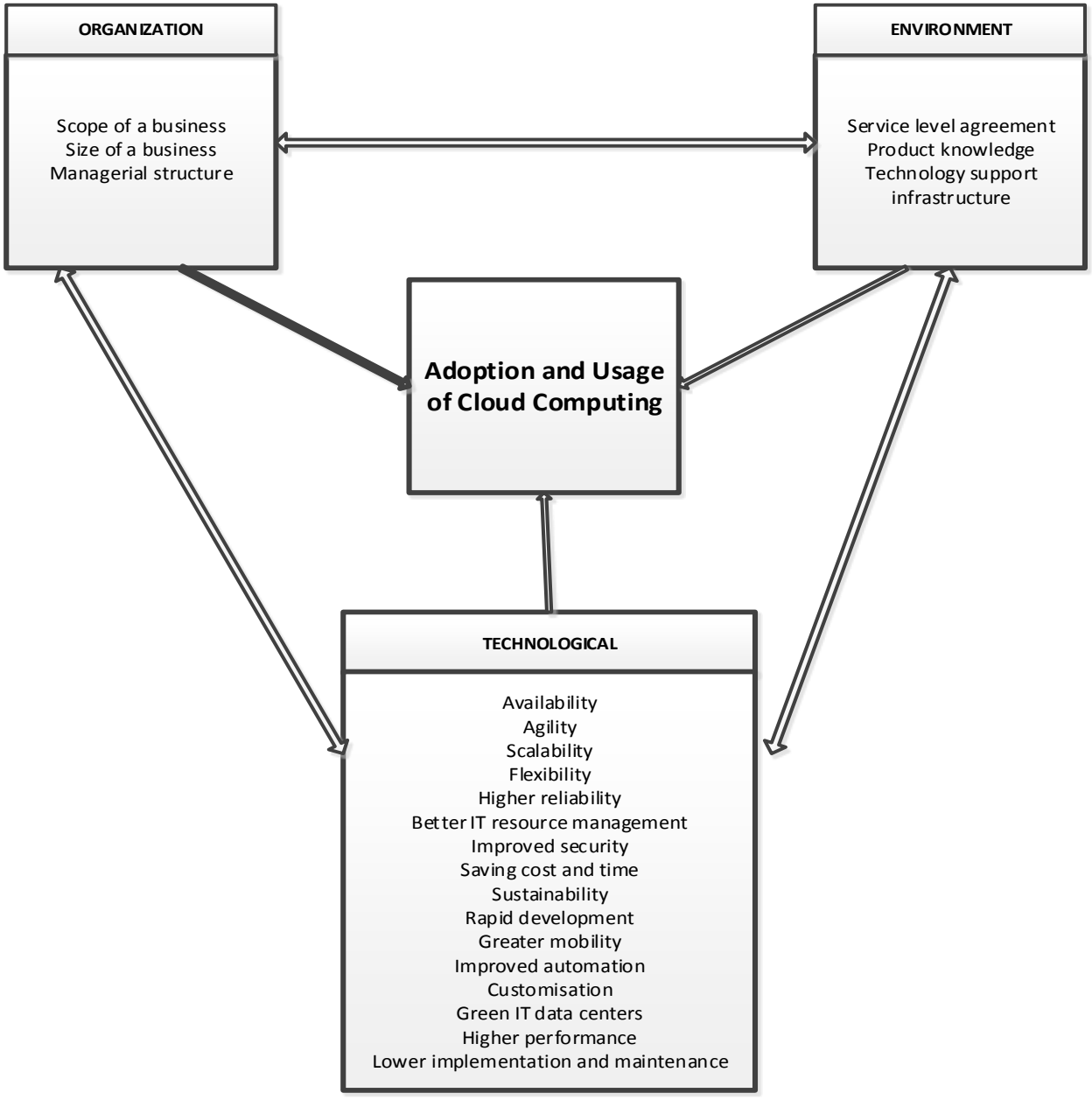

Figure. 1.1. The TOE conceptual framework adapted from Awa et al. (2012)

1.9. Importance and significance of the study

Cloud computing is considered as a developing phenomenon and there are still a lot of aspects that need to be understood in terms of the alignment with business strategies (Hemalatha and Manickachezian,

2012). This study provides a starting point in order to understand how SMEs in the IT sector can maximise their IT resources.

The study is significant for the following reasons:

- The framework that is used to study the adoption and usage of cloud computing by IT SMEs located in the Gauteng province. In evaluating a number of cloud users, the study has a great interest in establishing strategies on how non-users can implement the technology.
- The gap identified in the literature and the amount of information associated with the deployment, as well as the implementation of cloud computing are still not well understood unless the study of this nature is conducted.
- There is a great interest in closing the gap discovered in the literature on cloud computing adoption and usage by IT SMEs located in Gauteng.

Various organisations are interested in integrating new technologies to streamline their business processes. By conducting this study, there is a great value associated with the study's findings that could constitute a point of reference to non-users of cloud computing. The study's findings would also serve to provide a platform to non-users.

1.10. Justification/Rationale

The study is chosen for a number of reasons:

- The researcher is passionate about current trends of cloud computing and its global development. The researcher would like to make a contribution to IT decision–makers to take full advantage of cloud computing and concentrate on their core businesses.
- The researcher chose the study in order to evaluate the benefits and usefulness, as well as the viability of cloud computing adoption despite its challenges for IT SMEs to achieve their business objectives.
- The researcher chose the study to understand the perceptions on cloud computing benefits and challenges, as well as limitations among non-users of the technology model.

The negative consequences of not conducting a study of this nature are as follows:

- IT SMEs might not be in a position of meeting all their business objectives since there is little knowledge available on cloud computing regarding IT SMEs in Gauteng.
- The chances for IT SMEs not expanding beyond their current legacy technologies might likely remain higher across SA.

- The likelihood of competing globally and remaining competitive might remain very low since many IT SMEs lack information and therefore continue investing in legacy systems.
- The level of awareness on cloud computing might remain very low for a long-time with little interest among IT SMEs in Gauteng to adopt the cloud technology model.

1.11. Research design and methodology

This section presents a brief and clear description of the methodology used in the study. The study used a mixed methods research. Johnson, Onwuegbuzie and Turner (2007) define mixed methods research as being a class of research, where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts or language into a single study or set of related studies.

Mixed methods research has evolved as a response to limitations of both quantitative and qualitative methods (Venkatesh, 2013). Mixed research has become an alternative offering richer insights into the phenomenon under investigation, enhancing the body of knowledge and providing potential for a robust research (Caruth, 2013).

Saunders, Lewis and Thornhill (2009) and Venkatesh (2013) propose the following characteristics that are relevant for the purpose of this study:

- The ability to match the purpose of the method to the need of the study.
- The complementary relationship between qualitative and quantitative data providing much clarity throughout the study.
- The ability to provide more rich and useful answers to the research questions.
- The capability to generate the results compared to using only qualitative or quantitative study designs.
- The ability to present a more robust conclusion.

The study follows an interpretivism research philosophy. Saunders et al. (2009) argue that an interpretivism research philosophy is socially constructed, subjective in nature and focuses on the details of the situations. This research philosophy advocates that the researcher needs to understand the role of social actors in order to act and interpret data (Saunders et al., 2009).

The study used both qualitative and quantitative data gathering techniques. Qualitative data technique is considered as a systematic mode of inquiry into complex social structures, interactions or processes (Bhattacherjee, 2012 and Saunders et al., 2009). Bhattacherjee (2012) refers the technique to textual data as opposed to quantitative or numeric data. The technique uses subjective interpretations of the actors

involved and makes sense of the phenomenon in its socio-historic context (Bhattacherjee, 2012). The technique presents its benefits and limitations that are discussed extensively in Chapter 3 of this study.

Quantitative data technique assumes that the reality is relatively independent of the context (Bhattarcherjee, 2012). The technique uses objective techniques such as numeric data or standardized measures. As much as the qualitative data technique has its benefits and limitations, the quantitative data technique also presents its benefits and limitations that are discussed in Chapter 3 of this study. For the purpose of this study, the study used semi-structured in-depth interviews and questionnaires to gather data.

The study was conducted in the Gauteng province. Gauteng is one of the eleven provinces of South Africa. Gauteng is considered as one the fastest growing provinces economically and technologically as compared to the rest of the provinces, and it is considered as an important business and financial hub of South Africa (Gauteng ICT Development Strategy Draft, 2012).

Target population

The target population included IT SMEs in the Gauteng province. One decision-maker from each IT SME was selected to take part in the study. Among the decision-makers, the following were the respondents: IT managers, IT middle managers, IT specialists, executive managers, consultants, as well as employees with IT knowledge and skills.

Sampling strategies

The study used two sampling strategies in line with the proposed mixed-methods research design. The sampling strategies included purposive sampling for qualitative data and probability sampling for quantitative data.

Data analysis

The study used two techniques in order to analyse data. Qualitative data was analysed using a thematic analysis and the quantitative data was analysed using the descriptive statistics and inferential analysis.

1.12. Limitations of the study

This section discusses a number of anticipated constraints to be considered in doing this study and proposes ways on how to address them.

Some of the constraints and limitations to this study are as follows:

- The location of the study. The study is conducted in Gauteng which is considered as the commercial and financial hub of South Africa. Given the size of the province, it was a great challenge to identify, locate and categorise IT SMEs that should take part in the study.
    - The suggestion in resolving this challenge was to limit the study to the population of IT SMEs from Sandton, Midrand, centurion, and Pretoria. The decision to select the population of IT SMEs from these areas was motivated by the fact that these areas were at the heart of the IT SME sector.
- The use of the interview instrument is considered to be a time-consuming exercise for the researcher since it involved a lot of logistics from arranging appointments and meeting the respondents.
    - The suggestion in resolving this challenge was to ensure that telephonic appointments were made prior to meeting the respondents face-to-face.
- The challenge associated with the above-mentioned limitation was the resistance from some respondents to sign the consent form allowing the researcher to use their information.
    - The suggestion in resolving this was to kindly request respondents to sign the consent form voluntarily and also request their responses to be recorded. In instances where the respondents refused to sign but took part in the research their views were considered.
- The other challenge was to transcribe the recordings into comprehensive and meaningful texts using codes or themes.
    - Measures were taken in place to ensure that enough training were conducted through tutorials for the purpose of the study.
- The use of the mixed-research method and the complexity associated with the method were another limitation. Measures were taken to ensure that the method is suitable with this study taking into account similar studies conducted on cloud adoption.
- The availability of other methods to collect data, analyse and interpret data was another limitation to this study. Measures were taken to ensure that only the methods that could produce reliable outputs be used for the purpose of this study.
- The use of the conceptual framework in this study was another limitation. There might be other suitable constructs that are relevant but were not considered in this study.

1.13. Conclusion

This chapter discussed the main orientation of the study and the main objectives for the study. A background to the study was presented with a focus on SMEs in the IT sector located in Gauteng. This chapter provided a preliminary literature review of the study covering the main aspects of cloud computing, as well as SMEs.

This chapter discussed the main reasons for choosing the topic, the location where the study was conducted and the rationale for choosing to conduct this study. The research problem and the key questions were addressed in this chapter. The conceptual framework and the constructs to be used in this study were discussed, followed by the research design and methodology.

1.14. Thesis layout

This section presents the layout of the thesis.

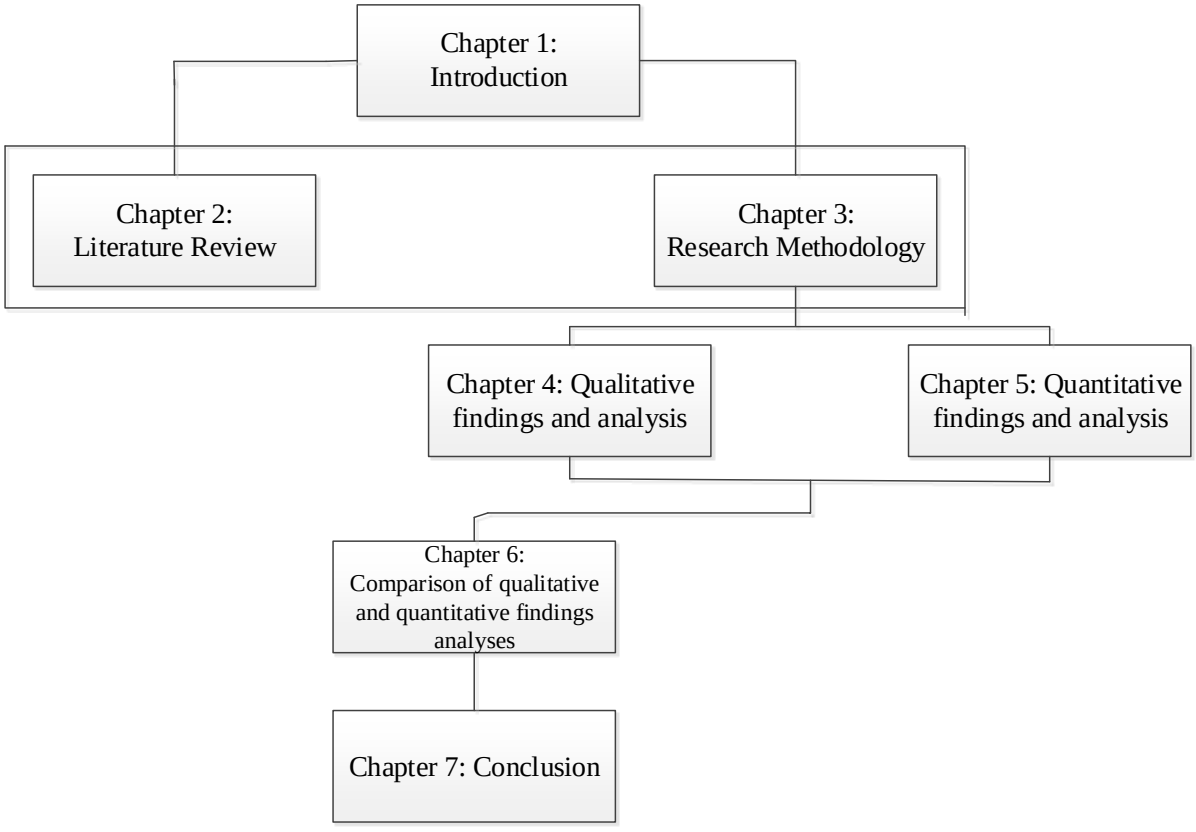

Figure 1.2: Thesis layout

Chapter 2: Literature Review

2.1. Introduction

This study investigates the readiness of IT SMEs in Gauteng to adopt cloud computing technology model as a business enabler. The previous chapter provided the background information about the study, the approach guiding the research design, as well as the conceptual framework used in the study. This chapter discusses fundamental concepts of cloud computing technologies. The purpose of this chapter is to review the literature on cloud computing and further examine what has been already researched on cloud computing in order to identify gaps or shortcomings that will be addressed by this study.

The general information about cloud computing technologies is presented in section 2.2, followed by cloud computing adoption and usage in section 2.3. The contributions of SMEs to the South African economy is discussed in section 2.4. The perceived benefits and usefulness of cloud computing are discussed in section 2.5. The challenges and limitations to cloud computing adoption are discussed in section 2.6. In section 2.7, the performance issues associated with cloud computing are addressed. The regulatory and legal issues in cloud computing are presented in section 2.8, followed by a discussion on the service level management in section 2.9. Section 2.10 discusses the conceptual framework of the study, followed by a summary of the chapter in section 2.11.

2.2. The cloud computing technology model

Cloud computing has evolved very quickly as a technology model for various large organisations in recent years (Erol et al., 2012). Zhang et al. (2010) argue that the expansion and the development of cloud computing as a technology model have been driven by a number of factors, which include the development of grid computing, the usage of high quality technology in storage and data transportation, the use of web 2.0 and 3.0 technologies, as well as the development of virtualisation.

The current state of developments experienced by organisations in terms of high cost of storage, increased power consumed by computers, as well as hardware has driven many organisations to look for alternatives in order to support their day-to-day business operations. Murugaboopathi et al. (2013) argue that cloud computing as a technology model is one of the platforms investigated by organisations in order to increase the economic efficiency, improve the utilization level of their resources, as well as decrease their equipment's energy consumption. The next section discusses the various definitions of cloud computing.

2.2.1. Definitions of cloud computing

Various definitions of cloud computing were included in this study to highlight the evolution and current trends of the phenomenon under study. Joshua and Ogwuelela (2013) claim that there are many

definitions of cloud computing as there does not seem to be consensus on its definition. The following are some of the definitions of cloud computing:

- Baskar, Kumar and Karthick (2013) define cloud computing as a virtual pool of resources, which are provided to the users through the Internet. They also add that cloud computing is classified as fifth generation of computers in computing after mainframe, personal computer, client-server computing, and the web.
- Kumar and Shinde (2013) define cloud computing as a new and emerging computing paradigm, which aims to provide reliable, customised and quality of service (QoS) that guarantees a dynamic computing environment for end-users.
- Singh and Seenhan (2013) define cloud computing as an increasingly important virtualisation technology that uses the Internet and central remote servers to offer the sharing of resources that include infrastructures, software, applications and business processes to fulfil the elastic demand in the market environment.
- Bennani et al. (2014) describe cloud computing as a revolutionary paradigm enabling on-demand provision of computing resources. They add that these resources are delivered through virtualisation capabilities over the Internet. They further add that the leverage model in cloud computing is presented in the form of an infrastructure, platform, and software as per-use services.
- Erol et al. (2012) refer to cloud computing as both the applications delivered over the Internet and the hardware including the systems software in data centers that provide those services. They further add that cloud computing is based on delivering Internet-based information and technology services in real-time.
- Kulkarni, Gambhir and Palwe. (2012) refer to cloud computing as a capability to access shared resources and common infrastructure, as well as offer services on-demand over the network while performing operations that meet changing business needs.
- Gartner (2010) defines cloud computing as a style of computing where scalable and elastic IT-related capabilities are provided as a service to external customers using Internet technologies.
- Joshua and Ogwuelela (2013) refer to cloud computing as a beginning of a new Internet-based service economy characterised as the Internet centric, web-based, on-demand, cloud applications and computing economy.
- Murugaboopathi et al. (2013) define cloud computing as a systematic arrangement of computer technologies, which is a kind of abstract concept where users can use the resources available in the cloud without having complete control over them.

- Buyya, Garg and Calheiros (2011) defines cloud computing as a type of parallel and distributed system consisting of a collection of inter-connected and virtualised computers that are dynamically provisioned and presented as one or unified computing resource(s) based on service level agreements established through negotiations between the service provider and consumers.
- The National Institute of Standards and Technology (NIST) defines cloud computing as a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service provider interaction (Mell and Glance, 2011).

All these preceding cloud computing definitions can be synthesised as follows: cloud computing is defined as a virtual pool of resources delivered over the Internet. It should be noted that cloud computing offers on-demand systems software over the network with minimal human interaction.

For the purpose of this study, the definition by the National Institute of Standards and Technology (NIST) on cloud computing is perceived as the most suitable since it has been widely used in similar studies.

2.2.2. Characteristics of cloud computing

Cloud computing is considered as one of the fastest and growing technology models. Kaur and Sing (2013) present its main characteristics as follows:

- On Demand Self-service: Cloud computing consumers are capable of self-management and perform computing tasks with no interaction from the service provider.
- Measured Service: Cloud computing consumers only pay for what they have used. This feature allows consumers to acquire services on a subscription basis in a pay-as-go model.
- Resource pooling: Cloud computing consumers are able to share computing resources through virtualised machines in a multi-tenant model. Multi-tenancy has been identified as an important element of cloud computing (CSA, 2009).
- Broad Network Access: Cloud computing resources are available through a network.
- Rapid elasticity and scalability: Cloud computing resources are delivered in a flexible manner, and they are scaled in and out to meet consumers' needs when required.

A number of applications and services offered are delivered over the Internet. Ali, Khan and Vasilakos (2015) compared the Internet delivery model of cloud computing to metered services that are similar to a utility. The following section discusses the services available in cloud computing.

2.2.3. Services in cloud computing

Services in cloud computing are presented at three main levels: Software-as-a Service (SaaS), Infrastructure-as-a Service (IaaS), and Platform-as-a-Service (PaaS). A clear understanding of these services is very important in order to link them to the various benefits and their role in the adoption of cloud computing as a technology.

Matuszak and Lamoureux (2013) argue that consumers cannot differentiate between the various services offered in the cloud because the distinction between these services are too blurred. Although consumers want the end result of what the adoption or migration to cloud computing brings to their organisation, they still cannot distinguish between services. Youssef (2012) presents a number of services available in the cloud, their description, and their targeted consumers as summarised in the table below:

Table 2.1. Primary cloud computing services (Youssef, 2012)

Service name	Service description	Targeted consumer and responsibility	Examples of service
Software-as-a-Service (SaaS)	The model takes into consideration the use, the management and maintenance of application software, operating systems and resources.	- The target is the end-user who accesses and utilizes these services on pay-as- you go basis. - End user accesses services through web based applications primarily delivered through Internet.	- Email services i.e. Gmail, Yahoo, and Webmail... - MS Office 365 Live - Google docs, - Freshbooks, - Salesforce and Basecamp. - Social networking sites i.e. Facebook, Twitter, and MySpace… - CRM, ERP, HRM…
Platform-as-a-Service (PaaS)	The cloud computing service provider is in total control of the system software and computing resources.	-The target is on the developers who manage, run and design applications under the operating system and virtual resources provided by the cloud computing provider.	- Windows Azure, - Google Apps Engine, - Force.Com - Cloud Control - Wave Maker

Infrastructure-as-a-Service (IaaS)	The model offers a set of virtualised computing resources such as capacity, memory, network bandwidth, processing power in the cloud.	- The target is on system administrators who manage and run operating systems and software applications on virtual machines.	- Dropbox, - Amazon EC2 - IBM Blue Cloud - OpSource - GO Grid - Zen Server - Google Drive - Microsoft SkyDrive

Cloud computing services discussed above namely SaaS, PaaS and IaaS need to be understood in terms of their advantages and disadvantages as they have an impact on the adoption and usage process. This topic will be further discussed under the cloud computing perceived benefits and usefulness of cloud computing technology.

Walden (2012) and Mujinga (2012) present other forms of cloud categories known as the 'X-as-a-Service'. These forms of services are developing on a regular basis taking the form of already known services: SaaS, IaaS or PaaS. Choudhary (2012) presents these X services as any computing function provided via the cloud computing. He also claims that more studies are conducted on the main services namely SaaS, IaaS and PaaS as compared to these XaaS services due to the fact that the later are developing very fast and out of control.

The following table presents some forms of X-as-a-Service. It should be noted the list of XaaS services is not exhaustive as other services might have been developed and have been included in other literature.

Table 2.2. Other forms of cloud computing services

X-as-a Service	Description
BaaS **Backup-as-a-Service**	- Cloud computing service model alternative to traditional backups. - Offers ability to do backups of data in the cloud. - It is considered by various organisations as a cost saving option.
NaaS **Network-as-a-Service**	- Considered as a cloud computing service model. - Delivers network services virtually over the Internet on a pay-per-use basis.
SecaaS **Security-as-a-Service**	- Considered as cloud computing model that delivers managed security services from the cloud.
STaaS **Software Testing-as-a-Service**	- Considered as an outsourcing model - Testing activities are outsourced to a third party in the cloud as per client requirements and when needed. - Other types of STaaS include functional testing as-a-service, performance testing as-a-service and security testing as-a- service.
BPaaS **Business Process-as-a-Service**	- Any type of business process delivered based on the cloud services. - It can be implemented manually or automatically as a packaged application in the cloud to suit the company's objectives.
ITaaS **Information Technology-as-a-Service**	- Offered alongside other services and technology. - The focus of the service is around the various IT services rather than technology provided in the cloud.
DBaaS **Database-as-a-Service**	- Provides access to a database with no need for setting up, installing or configuring the actual database.
DRaaS **Disaster Recovery-as-a-Service**	- Predetermined set of processes offered in cloud computing rather than in-house to companies to develop and implement a disaster recovery plan. - Key advantages: expertise and ability to configure provision and test an effective disaster recovery plan.
MaaS **Monitoring-as-a-Service**	- Still an emerging cloud model technology that provides monitoring tools for businesses in the cloud. - Its greatest advantage is to be able to monitor the status of key applications and services as opposed to fully invested in-house tools.
IGaaS **Information Governance-as-a-Service**	- Cloud computing service model enabling the delivery of managed information governance services such as policy definition, maintenance, lifecycle management, audit, policy classification in the cloud.

Adapted from Walden (2012) and Mujinga (2012)

The following section discusses the deployment models in cloud computing.

2.2.4. Deployment models in cloud computing

After presenting the services under cloud computing, this section focuses on the deployment models of cloud computing. Cloud computing can be deployed as a public, private, community, and hybrid cloud model.

Table 2.3. Deployment models (Walden, 2012)

Deployment Models	**Description**	**Locations**	**Service Providers**
Public cloud	- Services are made available to the general public through the Internet.	Offsite	- Amazon EC2 - Sun Cloud - Google Apps Engine
Private cloud	- Computing services are exclusively and solely managed by one organisation.	Onsite and Offsite	- Rackspace - Microsoft - SoftLayer - Eucalyptus - VMware
Community cloud	- Computing resources are shared by organisations with a similar mission or policy requirements.	Onsite and Offsite	- IBM - EC2
Hybrid cloud	- Combination of two or three of the above. - The combination is standardized and managed as a single unit and then deployed as a unique entity.	Onsite and offsite	- Microsoft

Computer users or consumers depend on various service providers for their use. To make the usage of cloud computing services and technologies possible, consumers need to be aware of their complexities in the selection process. Walden (2012) establishes three categories that consumers need to distinguish in the selection process. These categories are presented as follows:

- A cloud service provider, who has a direct contact with the subscriber of the given service i.e. SaaS, IaaS or other variants.

- A cloud infrastructure provider, who provides the cloud service in the form of infrastructure i.e. server farms, persistent storage capabilities and promising powers.
- A communication service provider, who provides the actual transmission service enabling the cloud consumer to communicate with the cloud service provider.

An understanding of the cloud service models, their deployment models, and the area of expertise of each service provider is essential for consumers to select or adopt the correct product in order to meet the organisational business goals. According to Walden (2012), it is imperative that consumers be aware of hidden risks in the adoption since they contract directly with the cloud provider and the communication service with little or no knowledge at all of the other lists of suppliers including the cloud service.

2.3. Cloud computing adoption and usage

Cloud computing is set to radically transform the IT business landscape and many organisations are looking at the advantages, as well as risks that the model brings to various aspects of businesses before a decision to adopt is made.

The Gartner 2013 report has predicted an excess in IT global spending toward cloud computing adoption or migration. The report has noted an increase in cloud computing around 10-15% for the past two years alone and this is said to increase.

Matuszak and Lamoureux (2013) note that organisations are likely to consider using cloud computing when they need major technology upgrades, and mostly when they are in need of some form of business transformation. As part of this research, the study is going to limit the scope of SMEs to the IT sector in order to ascertain the extent of usage of cloud computing.

2.3.1. Extent of use of cloud computing in emerging economies

The extent of usage and migration of IT businesses to cloud is being perceived by some organisations as a new driver for business innovation, thus cloud computing represents a major catalyst in today's business strategies. From an international perspective, it is believed that 54% of organisations in emerging and developed countries are already using SaaS, 44% are already using IaaS and 27% are using PaaS (Etro, 2009).

Brown and Madden (2012) argue that the first step in the adoption and migration to cloud computing is the SaaS. They also conclude that SaaS has accumulated a higher level of investments from decision-makers, shortly followed by IaaS and PaaS. The major perception in the higher spending development toward SaaS by organisations in emerging economies is informed by the fact that many organisations are

already using the technology in one form or another i.e. Customer Relationship Management (CRM), Office 365 or mail services as part of their daily business activities.

The Microsoft 2012 report suggests that around 40% of organisations especially small and medium sized organisations are considering the migration to cloud computing with clear focus on SaaS. The report also concludes that the global perception of SMEs on cloud computing adoption and migration is on SaaS aspects such as Email and collaboration offerings (Lync Online, Office web applications, SharePoint Online).

At the deployment phase, with clear distinction between private, public and community deployment models, organisations in emerging economies have put more emphasis on public deployment as one of the entry points to cloud migration and adoption. Brown and Madden (2012) claim that the choice of public deployment model is more influenced by the number of benefits that the model offers to their businesses. They also argue that the popularity of the public model is mostly linked to the speed to provision services such as flexibility and agility alternatives compared to in-house technologies. The increase in the level of competitiveness is another element widely considered when looking at most deployment models either be it private or community.

While much is published on cloud computing technologies in emerging economies regarding the services and the deployment models, there is little knowledge on the services and deployment models used by SMEs in the IT sector in Gauteng.

2.3.2. Extent of use of cloud computing in South Africa

South Africa as a developing economy needs to take the race toward implementing a technology that should assist organisations to meet their business objectives. It is reported that small enterprises in South Africa are starting to pick up the pace in cloud computing technology usage (Deloitte 2012 report). The report does not provide enough information about the concise contribution of the technology with regards to SMEs in the Gauteng province.

Edubey and Wagle (2007) argue that cloud computing was initially marketed and designed for developed economies and large organisations with less emphasis on small enterprises. There is little at this stage that is known about the usage of cloud computing by SMEs in the IT sector located in Gauteng. Edubey and Wagle (2007) argue that small enterprises could extensively benefit from cloud computing technology and its underlying customisation facilities. They argue that small enterprises are in a better position to maximise the technology from the higher level of customisation and flexibility. The literature does not provide an indication as to how SMEs in the IT sector benefit from customisation or flexibility

of cloud computing. Thus, the need for this study conducted so as to identify intrinsic characteristics that can assist organisations to meet their needs.

Tredger (2013) argues that the first step toward cloud computing adoption seems to be SaaS in South Africa. The Deloitte 2012 and Microsoft 2012 reports indicate that organisations in South Africa are making use of some cloud-based services such as Office 365 Live, as well as other customised cloud-based services. Other cloud-based services used include business analytics, human resources, storage, as well as customer relationship management. The reports do not provide enough information about SMEs in the IT sector located in Gauteng, and how they use cloud-based solutions to meet their business objectives. The reports do not provide a clear indication as to what services are used by SMEs in the IT sector, and this study is to assess the services used by SMEs in the IT sector located in Gauteng province.

These two reports also highlight the usage of cloud computing by organisations in SA. The reports indicate that the usage of cloud computing is currently expanding beyond SaaS; however, the reports do not provide further information about IT SMEs located in Gauteng. Subashini and Kavitha (2012) claim that SMEs are looking at cloud computing and its wide range of benefits to meet their business needs. The literature says a little about IT SMEs in Gauteng regarding the manner in which they tap into cloud benefits in order to meet their business objectives. There is a need in this study to assess the benefits that cloud computing offers to IT SMEs located in the Gauteng.

2.4. SMEs and their contribution to the South African economy

Small and medium enterprises constitute an important segment of the South African economy. Though the study focuses on SMEs in the IT sector, there is also a need to understand the current contributions of SMEs in all sectors. The following sub-sections discuss the contributions of SMEs in South Africa, their characteristics, as well as the challenges they are facing with regard to funding and growth.

2.4.1. SMEs in South Africa

There is a need to understand the perceptions of SMEs on the benefits and risks associated with cloud computing, as well as the extent of usage of cloud services. There is a lot that is known about SMEs in emerging economies and their contribution toward the Gross Domestic Product (GDP). SMEs have to be understood in terms of their contribution toward the national economy. In the South African context, the two terms SMMEs and SMEs are used interchangeably and the term SMEs will be used throughout in this study.

There is a need to define a SME. Lopez-Orlega, Canales-Sanchez, Bautista-Godinez and Marcia-Herrera (2016) argue that there is no one single definition of SME and there have been various interpretations in the literature. They classify an organisation as an SME if it fulfils maximum ceilings for staff head counts and either a turnover ceiling or a balance sheet ceiling. The NRC (2011) classifies an organisation as a small business if it meets the following criteria:

- Has a small market share.
- Is managed by an owner.
- Is independent.
- Is the size of a small firm sector in terms of its contribution to the country's GDP.
- Its general contribution is compared to other firms within the country (NRC, 2011).

The National Small Business Act defines SMEs by looking at the number of employees, its annual turnover and its gross assets (Falkena, Abedian and Blottnitz, 2002). TheDti (2007) extends this definition by making a clear distinction between small and large enterprises or corporations that are publicly owned and whose scope cover businesses at all stages of evolution. Another distinction between large and small enterprises can derive from pre-establishment to start-up, emerging, stable, as well as expansion of a business (TheDti, 2007).

An inclusive definition is needed to accommodate SMEs in this study taking into account a number of factors discussed in the definitions. For the purposes of this study, an SME can be summarised as an independently and privately owned organisation by one owner, with a small market and a small capital market share, as well as an annual turnover and gross assets.

In South Africa, the contribution of SMEs is estimated at between 52% to 57% of the gross domestic product (GDP), which creates more employment opportunities, generates higher production volumes, increases exports and introduces innovation and entrepreneurship skills (NRC, 2011). SMEs in the IT sector have to use all possible ways in order to meet their goals, and this entails adopting and using available new technologies in their business.

However, there are challenges for SMEs in South Africa to expand, compete, as well as achieve their business needs. The availability and accessibility of capital and technology resources have been identified as other challenges for enterprises to meet their organisational needs. The South African government has acknowledged the problem underpinning the South African economy by encouraging SMEs to play a vital role in the national economy. The Dti (2007) has also acknowledged that the creation of capital and growth has been a real drive from individuals characterized mostly by the lack of employment in the

public sector. The Dti (2007) adds that there is more about unemployment than employment when it comes to SA economy's job prospects. A start-up of a small business is now perceived by the government as means to create employment and generate sustainable or equitable revenue.

With massive contribution to the national economy, attention is paid to SMEs. SMEs require a lot of support in order to expand, compete and achieve their goals. In meeting their business goals, SMEs can address the economic growth and equity problem that the SA economy is faced with. This study assesses SMEs in all spheres of service production with a focus on the IT sector in order to highlight and evaluate the extent of cloud computing technology use.

The greatest challenge for SMEs is to compete nationally and globally in their respective fields, and further be able to maximise on cloud capabilities in order to adjust and adapt to changing market conditions. This study investigates whether SMEs in the IT sector are taking full advantage of cloud computing technology to remain competitive and achieve their business needs.

With cloud computing as a new catalyst in the way businesses should achieve their needs, awareness in the adoption and implementation of cloud technology is paramount for SMEs in Gauteng. On one hand, SMEs have to consider the advantages that cloud computing offers and on the other hand, SMEs have to overcome barriers whether it is access to capital and local or regional legislation or regulation in order to meet their organisational needs.

The study has been chosen to be conducted in Gauteng, South Africa following a number of considerations. There is a strong focus on business expansion in Gauteng and SMEs creation as compared to the rest of the country as highlighted in the Gauteng ICT Development Strategy Draft (GIDSD, 2012). Gauteng has been identified as one of the well vested environments with a good ICT infrastructure to facilitate expansion of SMEs, and contribute largely to their growth including ICT adoption as compared to the remaining other provinces in South Africa (GIDSD, 2012).

One of the reasons for choosing Gauteng as the area of the study was guided by the fact that when it comes to the business facilitation and implementation of SMEs, Gauteng tops the list. For example, it has been observed that there is a great amount of funding and initiatives related to SMEs in Gauteng as compared to the remaining provinces. Gauteng is in a better position for potential growth in the SME sector due to the accessibility of ICT resources and better network infrastructure already in place (GIDSD, 2012). In addition, Gauteng provides a vibrant hub for business and financial institutions that can easily support SMEs, as well as assist them to develop products and possibly compete beyond the regional and national markets.

With cloud computing being at the centre of this study, one of the greatest contributions to its adoption and usage is the accessibility to stable Internet infrastructure and network connectivity, which have been already implemented in Gauteng at a greater extent than at the national level (GIDSD, 2012).

As already stated Gauteng accounts for about 57% of all ICT penetrations for all firms in South Africa, thus providing the largest cluster with potential to lead innovation and implementation of new technologies. As a result of massive investments and greater interaction with the international community, Gauteng provides by large a viable environment for SMEs to expand, access capital and take full advantage of its IT infrastructure. The following section discusses the various contributions of cloud computing by SMEs that have adopted the cloud computing technology model.

2.4.2. Financial contributions of cloud computing by SMEs in developing economies

It is imperative to establish the extent of cloud computing adoption and usage, as well as its impact on SMEs in Gauteng. Erol et al. (2012) argue that cloud computing has been identified as a key driver to improve productivity and create jobs especially for SMEs. Cloud computing as a technology model presents a number of benefits that can be maximised by an organisation (Singh and Seenhan, 2013). Initially designed for emerging economies and large enterprises, the interest to implement cloud computing as a technology model has exponentially grown for IT markets including South Africa (Hinde and Charles, 2012).

Cowhey and Kleeman (2013) claim that cloud computing has been proved to reduce barriers to new products and improve on new business models. Avram (2014) and the CEBR (2010) provide evidence that the adoption of cloud computing has helped SMEs lower initial entry costs for new products, with fast expansion while maintaining the quality of services.

The start-up or upfront cost to start a business has been reduced or eliminated in some instances by cloud computing. Cloud computing has provided a means for SMEs to grow and become not only productive but also competitive (CEBR, 2010). In the EU, SMEs that have adopted cloud computing have proved to have created about one million new jobs, and their economic contribution is said to reach billions annually (CEBR, 2010). In developed economies, Avram (2014) points out that SMEs play a crucial role in the growth and productivity of the economy. However, the main obstacle is to remain competitive in the global arena. The strength of SMEs is their ability to enter the IT market and ability to compete globally with other major players in the field, and also their flexibility to adjust and adapt to changing market conditions.

Cowhey and Kleeman (2013) add that in the adoption process, SMEs have seen an increase in savings and massive cost reduction in up-front capital and operational execution risks facilitated by cloud computing technologies. Avram (2014) claims that cloud computing has moved from being CapEx (Capital expense) to OpEx (Operational expense) since business can now deploy, develop and use more application services as required with little to worry about the initial cost to invest in order to secure or maintain dedicated infrastructure. This has been for a long time a barrier to many SMEs to enter the global market and compete but now they have a chance to align their business and focus on their core objectives.

The chance of survival and success for new SMEs venture are on the increase, thus more start-ups, job creation and more local innovation (Cowhey and Kleeman, 2013). Avram (2014) argues that cloud computing benefits are perceived to allow potential entrants in the global market to save on the fixed costs of investments in the adoption of the computing technology model, and turn part of their expenses into variable costs. In addition, Avram (2014) explains that the reduction of the constraints for competing and entering the global market have been facilitated by cloud computing technologies for SMEs that opted for the technology, and thus further promoted business creation and enhanced competition. With the potential contribution of SMEs in the South African economy, the adoption of cloud computing as a model needs to be understood in terms of main drivers such as agility, scalability, and cost-efficiency.

There is a lot of information available in the literature about the contribution of cloud computing by SMEs in the developing economies. There is a need in this study to assess cloud computing services and establish their contributions for SMEs in an emerging economy such as SA.

2.4.3. Perceived barriers to growth and competition for SMEs in Gauteng

Seda (2012) reports that there are numerous barriers to SMEs growth and competition in South Africa and among them are access to local and global markets to meet industrial requirements and standards, red tape, as well as governmental regulations.

With specific consideration to the ICT contribution, Seda (2012) reports that if SMEs were to be given adequate support and access to finance, they can provide a number of services i.e.:

- Design and development
- Procurement
- Manufacturing and production
- Integration and production
- Customisation and configuration

- Maintenance and repair, as well as
- IT infrastructure support and quality assurance.

Soni (2005) also makes the same observations for SMEs at a global level. He further argues that SMEs at global level are faced with challenges to access capital, remain competitive and keep up with technology innovation. SMEs in Gauteng are no exception since in order to grow and compete locally and further globally, they need access to markets, financial assistance, as well as technical development (Seda, 2012). SMEs should also be able to overcome challenges of governmental regulations, as well as red tap bureaucracy (Seda, 2012).

The Dti (2007) reports that the government is trying by all means to come to the rescue of SMEs by providing financial support and introducing technological hubs to facilitate growth and competition for SMEs. The Dti (2007) reports acknowledge that the challenge is still immense and a strategic solution needs to be found. There is a need in this study to assess how cloud computing as a technology model can assist SMEs in Gauteng to benefit from the adoption of the technology toward growth and competition. The following section discusses the benefits of cloud computing technology model.

2.5. Perceived benefits and usefulness of cloud computing as a technology model

The usage of cloud computing as a model has revealed real potential for innovation, business expansion and other great benefits from its inception. Although the model was initially designed for large businesses, cloud computing's perceived benefits and usefulness can be actually explored by SMEs. Carroll et al. (2011) argue that the adoption and shift to cloud computing technology model should be largely observed in line with the perceived benefits that the model offers.

Carroll et al. (2011), Youssef (2012) and Joubert (2012) present the following benefits that cloud computing:

- Cost efficiency
- Lower implementation and lower maintenance costs
- Scalability
- Agility on computing platforms
- High performance of resources
- High reliability and availability of computing resources
- Better IT resource management and business focus

- Improved Security
- Saving on time and cost
- Sustainability
- Flexibility
- Rapid development
- Deployment and change management
- Better performance
- Greater mobility
- Improved automation
- Customisation
- Support management
- Green IT data centers.

Consumers and service providers need to be informed about these benefits in order to make informed decisions in the adoption and migration to cloud computing. Carroll et al. (2011) present the benefits of cloud computing as follows: cost saving, low implementation and low maintenance cost.

Carroll et al. (2011) add that the adoption and shift to cloud computing can, largely be influenced by the cost in the sense that the technology may require less hardware, software to be purchased, low support on maintenance and implementation. Issues around power, cooling, floor space and storage capacity are largely eliminated in cloud computing thus providing a reduction in operational costs, as well as a great business opportunity for considering cloud computing adoption (Carroll et al., 201).

Cloud computing provides the following technical benefits, namely, flexibility, scalability, agility, high performance, reliability, and availability of resources (Carroll et al., 2011). In addition, with organisations aiming to maximise profitability on their businesses, cloud computing technology adoption provides tremendous benefits in terms of application development, security and application deployment. Zabalza, Rio-Belver, Cilleruello, Garechana and Gavilanes (2012) argue that cloud computing as a technology model is expanding so fast, and has moved from its initial phase. In addition, they argue that cloud computing model currently provides a platform for businesses to exploit exponentially.

Sustainability of any business should be the ideal focus for its existence, and cloud computing offers incredible capabilities to sustain the ICT side of business either at its inception or maturity. Cloud computing is said to allow SMEs to sustain the business operations especially during the inception phase

(Etro, 2009). Avram (2014) claims that organisations that have tapped into cloud computing have found some form of relief for their businesses.

Youssef (2012) adds the following benefits namely, rapid elasticity where computing resources can be rapidly provisioned and released on-demand, customisation where cloud resources can be adjusted based on consumer demand, and virtualisation where there is a large provision of physical capabilities to be used by the consumer. Kaur and Singh (2013) explain that some of the cloud computing characteristics such as on demand self-service, measured service, resource pooling, network access, as well as scalability are also some of the most important benefits offered in cloud computing.

With the constant growth of cloud computing technology, Carlin and Curran (2012)'s short term forecasts predict that cloud computing is here to stay, and that many new commercial enterprise applications will be deployed in the cloud. In addition, the forecasts predict that the adoption of cloud computing technology is set to rise exponentially with many in-house applications being moved to the cloud (Carlin and Curran, 2012). Cloud computing benefits should be felt by both the consumer and the provider, and if equipped with the correct information, strategic decisions should be made in order to reduce potential risks, as well as enhance customer experience.

On the economic landscape of cloud computing adoption, Carroll et al. (2011) point out that one of the main drivers of cloud computing is cost-efficiency. They explain that this is a good opportunity for SMEs to maximise their profitability and concentrate on their core objectives. Nusca (2012) stresses that scalability and agility are other two key areas carefully watched by decision-makers when deciding whether or not to move their business to the cloud.

Joubert (2012) for example highlights some of these benefits, which are already being considered as key drivers in the adoption of cloud computing technology by some large organisations in South Africa. He mentions three services such as SaaS, IaaS or PaaS in the form of:

- Mail and Messaging, which largely benefit from cloud computing from access and exchange capabilities.
- Archiving: facilitated under cloud computing and ensuring massive security for business files and data exchanged.
- Backup: high capability offered in the cloud to copy, compress and encrypt files and safely store them in secure data centres with less human intervention.
- Storage: with cloud computing providing massive storage space of data and high possibility of access at any location.

- Security: Cloud computing service providers do everything they can to ensure security and protection of consumers' data while consumers only pay for the amount of service used.
- Virtual servers: Cloud computing technologies provide enough capacity and performance through virtualised servers just enough for consumers to use when required.
- CRM: the flexibility to access cloud-based CRM solutions at a fraction of the cost of investing in developing and deploying their own in-house applications.
- Collaboration: Cloud computing technologies provide communication and collaboration across enterprises, and further increases interoperability among various computing resources with less technical or expense hassle usually associated with software applications.
- Hosted PBX: high-end PBZ with remarkable features is enhanced when hosted in the cloud, which becomes more affordable with less risk.
- Video-conferencing: cloud-based solutions offer strong support for video based solutions such as Skype to be facilitated with little technical hassle.

These drivers constitute the bulk of benefits already identified by a number of earlier adopters of cloud computing in its combined form as SaaS, IaaS or PaaS. The question that will be addressed by this study is to ascertain the perceptions of IT SMEs on the benefits of cloud computing, and assess how these benefits will assist in meeting the business objectives.

Youssef (2012) argues that cloud computing is perceived to provide other forms of benefits that could not be possible in a house-based technology environment. The literature discusses extensively about the successful achievements of cloud computing in meeting business needs, and how they influence the adoption of the technology in large organisations. There is however, little that is known about IT SMEs in South Africa of such successful achievements in using cloud computing as a technology model. There is a need in this study to assess these benefits in cloud computing and analyse them carefully as a motivation for IT SMEs in Gauteng to adopt or migrate to cloud computing.

2.6. Challenges and limitations to cloud computing adoption

After discussing the benefits, as well as successful achievements of cloud computing as a technology model by large organisations, there is a need to discuss the limitations, concerns, as well as limitations to cloud computing adoption and usage. Understanding the challenges, limitations and barriers to cloud computing should be the decisive point in the adoption process. Questions have been risen such as why some organisations move in quickly to cloud, and why others quit after they have implemented the technology.

This study argues that understanding the challenges of cloud computing might not be the only basis for implementing the technology but also an opportunity for re-aligning the business objectives of your organisation. The argument behind is that organisations should carefully consider cloud computing driving factors, as well as risks before transferring one or more of their services to the cloud.

Sravani and Nivedita (2012) present most cited barriers argued by decision–makers in the implementation of cloud computing technology in their organisations. Most of these barriers are identified also as security risks or issues in the literature.

Most of these barriers have direct implications in the way the business operates while reaping the benefit of implementing or shifting to the cloud. Chou (2015) claims that security remains one of the main concerns in cloud computing adoption or migration, followed by the following barriers:

- Privacy
- Policy integration and governance
- Availability
- Data seizure
- Virtualisation paradigm
- Resource allocation
- Secure data management
- Challenges of security schemes
- Malicious insiders
- Shared technology issues
- Data loss or leakage
- Trust
- Visibility
- Identity management
- Data protection
- Software isolation
- Authentication
- Service level Agreement
- Performance
- Confidentiality
- Change control

- Workload management
- Transparency
- Disaster recovery
- Compliance
- Portability and interpretability
- Lack of standards
- Interoperability issues.

The literature provides a lot of information about the challenges, as well as the limitations that cloud computing poses to large organisations. However, the literature does not say much about the challenges and limitations faced by IT SMEs in the province of Gauteng. Murugaboopathi et al. (2013) claim that some of these challenges and limitations constitute a barrier to cloud computing deployment, and implementation for enterprises that have already adopted the technology. There is a need in this study to ascertain the level of severity of these challenges and limitations, and establish how IT SMEs located in Gauteng address them.

2.6.1. Risk issues associated with cloud computing

Sravani and Nivedita (2012) argue that risk issues associated with cloud computing have a negative impact in the adoption and usage of cloud computing. The following sub-sections discuss the awareness and global impact of risks in the adoption of cloud computing, as well as the organisational risks in cloud computing.

2.6.1.1. Awareness and global impact in the adoption of cloud computing

Awa et al. (2012) argue that decision-makers can lift or bring down their organisation to its knees due to the lack of knowledge or not being aware of the impact of their decisions. The literature explains that cloud computing technology is no more a new concept since its evolution is felt in various ways with direct implications in the business environments. There is a need to create awareness among decision-makers on cloud computing and its associated issues.

Louw (2013) claims that the debate on cloud computing is still far from over, and a lot of awareness needs to be created especially for organisations that are willing to adopt and implement cloud computing. He adds that though the decision to adopt or not to adopt is first and foremost a strategic one, decision-makers should be aware of the technology shortcomings. There is little that is known in the literature in creating awareness of cloud computing in Gauteng, thus the need for this study.

Awa et al. (2012) claim that the awareness of a technology is largely linked to the knowledge level of the user, but mostly to the competency and technology know-how to execute the technology. The need to adopt and use a cloud-based technology will be driven by factors that are considered to generate a maximum usage of IT, and create a competitive advantage in the organisation (Awa et al., 2012). There is a need in this study to ascertain the level of awareness of cloud computing by IT SMEs in Gauteng, and evaluate how it influences the adoption and usage process of the technology model.

2.6.1.2. Long-term sticker-shocker in cloud computing

This section discusses the long-term sticker-shocker in cloud computing. As one of the challenges and concerns in cloud computing, Ghanam, Jennifer and Maurer (2012) argue that the long-term sticker-shocker is among one of the hidden risks in the adoption and usage of cloud computing. They explain that organisations need to be aware of the long-term sticker-shocker in cloud computing. When contracting to cloud computing, the user needs to be aware of the changes that can happen in the course of the contract, that can affect severely the delivery of the service. Some of the anticipated changes in the process can be about the computation, communication, and infrastructure or technology integration.

Rao and Selvamani (2015) explain that while the cost of integration has been reduced under this new technology, the user can find itself facing charges on integration that might not allow him to pull easily from the contract. This raises two important issues on cloud awareness that has been discussed earlier in this chapter, as well as the service level agreement that will be discussed later in this chapter. The literature explains that there is a lot that is known about the impact of the long-term sticker-shocker in the adoption and usage of cloud computing by large organisations. There is limited knowledge on the impact of the long-term sticker-shocker on IT SMEs in Gauteng, and how it affects the adoption process.

Goyal and Supriya (2013) provide information on the long-term sticker-shocker that should be of concerns for most of the IT decision-makers. They declare that the sticker-shocker could be also explained when the user wants to transfer new computing resources from a public or community cloud. They also explain that sticker-shocker can happen when more specific units of the organisation are transferred from a hybrid cloud deployment model with data distributed among public/private clouds. They claim that the long-term sticker-shocker can be increased since both the resource pooling, as well as the rapid elasticity characteristics of cloud computing are not ordinary measured as compared to in house-based technologies, which raises further concerns.

In addition, Ghanam et al. (2012) present other hidden risks associated with the long-term sticker-shocker that can force consumers to remain with the provider while enduring the expenses. These hidden risks include:

- The cost for enhancing new products in the cloud such as re-design.
- Redevelopment.
- Customisation or even security enhancement.
- Providing new features.

These arguments provide valuable insights on the long-term sticker-shocker in cloud computing. There is a need in this study to ascertain the level of awareness of IT SMEs in Gauteng regarding the sticker-shocker, and assess how it influences the adoption and usage of cloud computing.

2.6.2. Security issues associated with cloud computing

After discussing the long-term sticker-shocker in cloud computing, this section discusses the security issues in cloud computing. Security remains one of the most debated topics in cloud computing, and this section pays a special attention to various aspects associated with security in cloud computing.

2.6.2.1. Cloud security

Security is considered as one of the major concerns in the implementation and adoption of any technology, and cloud computing is no exception. Security becomes an important factor since data used and shared by organisations should be protected, and no unauthorized agents must be allowed to have access (Murugaboopathi et al., 2013). The implication of security issues in the cloud leads to issues around privacy, confidentiality, authentication, encryption and decryption, data protection just to name a few (Merwe et al., 2012).

With data in the cloud and data centres being controlled by a third-party, there is no real guarantee for data security. This leaves the user with almost no power since the owner is not in control of his data. The security concern affects both the user and the service provider. This constitutes a challenge to ensure proper backup and recovery mechanisms for data and authentication of users, as well as data accessibility (Sravani and Nivedita, 2012).

Given the current security threats in cloud computing, studies conducted in this regard indicate that clear measures are being taken to deal with security in the cloud. Despite these clear measures, security still remains a big threat toward cloud adoption and implementation, with little room for consumers to make a choice other than to rely on the service provider (Goyal and Supriya, 2013). There is a need in this study

to establish the extent of security issues since there is little that is known about the impact of security in the adoption, as well as usage of cloud computing by IT SMEs in Gauteng.

2.6.2.2. The two sides of cloud security

With immense implications that security risks bring in cloud computing's implementation, the service provider finds itself under obligation to provide a number of security assurance mechanisms to consumers, who will also be responsible for reinforcing security controls. On one hand, Chang, Kuo and Ramachandran (2016) explain that the manageability of security offerings by service providers in many instances takes away much responsibility from consumers of these security risks.

On the other hand, Chang et al. (2016) claim that security mechanisms in cloud computing present a number of complexities. They argue that despite these security complexities in cloud computing, multi-domain interfaces of security present a number of benefits to consumers. Issues around technicalities, as well as complexities are left to the service provider to deal with.

Tudor (2013) explains that while security is still considered as one of the most challenging factors in cloud computing, some organisations are working toward reducing its complexities backed in service level agreements. A security solution backed by a comprehensive service level agreement is a good way to provide peace of mind to businesses in order to concentrate on other areas of improvement. This study discusses in detail service level agreements toward the end of the chapter. There is a lot of interest in this study to assess the security level of awareness by IT SMEs in Gauteng, and their perceptions toward cloud computing adoption and usage.

2.6.2.3. Organisational risks in cloud computing

Security in cloud computing has direct implications on how the organisation wishes to handle its privacy and data security. There are also direct implications when affected by security threats and the manner in which the organisation intends to respond in order to protect its reputation.

CSA (2009) notes that information security for any organisation remains a great concern, and protecting its reputation remains a great challenge. An effective information security governance should be in place to protect organisation's data as agreed upon in the service level agreement. CSA (2009) adds that this type of information security governance should be replicable across the organisation, as well as measurable, sustainable, repeatable and scalable.

2.6.2.4. Protection of data from theft in cloud computing

The greatest challenge identified so far is the protection of data in cloud computing. Cloud computing service providers and users have no full control over application deployment and service delivery in the cloud, thus making data more vulnerable in various ways. Goyal and Surpriya (2013) recall the two spheres of data protection with cloud computing providing no geographic boundaries, where data protection can be provided as compared to in-house environments.

With cloud computing, data becomes the subject of breach and unauthorized access from internal or external quarters. The use of available methods such as encryption, draft of policies or security assurance mechanisms to regulate breaches can reinforce data protection. Protection of data in cloud computing will go a long way as long as there is a full commitment from both the service providers and consumers. There is little that is known about IT SMEs' measures in place to address issues related to data theft and mechanisms to protect from such security issues. There is a need in this study to ascertain the perceptions of IT SMEs in Gauteng on data protection, and its influence in the adoption and usage of cloud computing. The following section discusses the data access and control in cloud computing.

2.6.2.5. Data access and control in cloud computing

While cloud computing provides data accessibility anywhere and anytime, there are various security risks to data stored outside the confinement of the organisation. Chou (2015) claims that despite the level of organisational security such as providing firewalls and other security controls, security remains a great challenge to deal with.

The complexity of organisational security is exacerbated by the fact that many insiders have access to organisational network systems on one hand and on the other hand, third-parties are allowed to carry out or manage data operations. Sravani and Nivedita (2013) note that data access and control can be even difficult to administer in the cloud since confidential data can be illegally accessed due to the lenient access control in the cloud. They also add that the duration of data in the cloud can also increase the high possibility risk for intruders to access data. At the same time, some of the increased risks associated with data access and control in the cloud emanates from both internal and external environment, and this poses a serious problem to cloud computing growth and adoption. The amplification of the accessibility risks in the cloud is made critical in the sense that IT services and consumers converge on one management domain with little transparency into the process and procedure (Sravani and Nivedita, 2013).

The policy of compliance and granting access to consumers might not be fully explained or highlighted in the service level agreement with service providers, which can contribute to an attractive opportunity ranging for hobby hackers, organized crime to state-sponsored intrusion. Another issue raised around

data accessibility is authentication, which should be reinforced in order to support the growth of cloud computing. Madhubala (2013) argues that the usual or standard way of addressing authentications such as username and password leaves a lot of loopholes for intruders to access data, and organisations should rather implement multifactor authentication and risk based authentication models that should be transparent to users to reduce risks associated with data control and accessibility.

Data access brings another dimension of trust in cloud computing. Bennani et al. (2014) claim that trust of data in cloud computing is critical to ensure a level of security in the provision of the service. The lack of trust often leads to issues of credibility, sensitivity and reputation, which have negative consequences. They further claim that the security of data in cloud should be trusted by consumers and the service provider through clauses established in the SLA. They also explain that these established parameters in the SLA should protect the sensitivity or criticality of data, the quality of data, as well as other security parameters.

These arguments contribute largely to the body of knowledge on data access and control in cloud computing and its impact on large organisations in developing economies. There is a need to assess the perceptions of IT SMEs in Gauteng on data access and control, as well as its influence in the adoption and usage of cloud computing since there is little that is known in this regard.

2.6.2.6. Data recovery and backup in cloud computing

Organisations will not be able to survive without a clear backup and recovery system in place. Tudor (2013) claims that robust recovery and backup strategies are sometimes overlooked by organisations. He adds that overlooking these aspects can bring an organisation to its knees. How long should it take to recover from outage and power failure in the cloud should be highlighted and accounted for in the service level agreement, and clear assurance mechanisms provided by the service provider (SP).

Consequences of not recovering data on time have immense financial and organisational implications for any business that has invested in the technology (Tudor, 2013). As stated previously, implications of not assuring data recovery and backup raise issues around compliance and governance, which should be agreed upon in the SLAs. CSA (2009) notes that having a good understanding of what are required in the SLAs can play an important role in the adoption and implementation process of cloud computing.

The issue of data recovery and backup in cloud computing has been one among other risks experienced in cloud computing adoption. There is a lot that is known about the perceptions of large organisations on data recovery and backup in cloud computing. A lot is discussed in the literature on how large organisations in advanced economies address these issues associated with data recovery and backup in

cloud computing. However, there is little that is known in the literature about IT SMEs in Gauteng regarding their perceptions toward data recovery and backup in cloud computing. Therefore, there is a need in this study to ascertain the perceptions of IT SMEs in Gauteng on data recovery and backup, and assess the influence on the adoption and usage of cloud computing.

2.6.3. Availability issues associated with cloud computing

Availability is considered as an important characteristic in cloud computing (Youssef, 2012). Schisser (2010) defines availability as a process of optimizing the readiness of production systems by accurately measuring, analysing and reducing outages to those production systems.

The major goal of data availability in cloud computing is to ensure that users can access data anytime and at any place (Goyal and Supriya, 2013). With no room for doubt, the three main cloud services do the same to provide the services anywhere when needed (Sravani and Nivedita,2013). Service providers are said to do everything at their disposal to provide redundancy to make data accessible to a number of users.

The challenge though remains on the service providers to ensure availability of data anywhere and anytime (Goyal and Supriya, 2013). When major operations or upgrades are undertaken by the service providers, serious risks of data unavailability and interruption are experienced by the user on one hand and on the other hand, the problem could even be exacerbated by the inefficiency of network or capacity of bandwidth to support upgrades.

The question of high availability of data in cloud computing constitutes one among other risks posed in cloud computing adoption. There is little that is known about availability and its influence on IT SMEs in the adoption and usage of cloud computing. Therefore, there is a need to ascertain the perception of IT SMEs in Gauteng, and establish how this influences the adoption and usage of cloud computing. The following section discusses the performance issues associated with cloud computing.

2.7. Performance issues associated with cloud computing

Performance issues in cloud computing are interpreted in the form of virtualisation. Carlin and Curran (2012) claim that virtualisation is an important characteristic in cloud computing. Virtualisation ensures portability of higher level functions, sharing and aggregation of physical resources, consolidation of servers and software, as well as memory (Carlin and Curran, 2012). Carlin and Curran (2012) argue that these underlying characteristics emanating from using virtualisation in the cloud could not be possible in a house-based IT environment. Virtualisation in this section is discussed both as a benefit, as well as a challenge in cloud computing. There is a lot that is known about virtualisation in developed economies,

and there is little that is known in the literature about the underlying characteristics of virtualisation in Gauteng. There is a need in this study to ascertain the perceptions of IT SMEs in Gauteng on performance.

Carlin and Curran (2012) explain that virtualisation is considered as the underlying technology in cloud computing ensuring portability of higher level functions, sharing and aggregation of physical resources. Virtualisation in cloud computing enables consolidation of servers, software, memory, storage, as well as data including networks. Taking into account multi-tenancy and resource pooling in cloud computing, virtualisation is considered as an underlying and complex paradigm in cloud computing technologies (Sravani and Nivedita, 2013). Virtualisation enables the consolidation of servers to do more with less hardware and assign and re-assign dynamically resources from processing, storage, memory, network bandwidth, data and networks (Carlin and Curran, 2012). With the capability to use needed resources on-demand for specific operations and release or relinquish unneeded resources, the main concern remains on how data is controlled and protected during the virtualisation process.

Carlin and Curran (2012) identify three types of virtualisation playing an important role in the performance process in cloud computing technologies:

- Full virtualisation where unmodified guest operating systems simulate hardware and software of a host machine.
- Para-virtualisation, where two operations can be performed: on one hand software allows a single machine to support multiple virtual machines and on the other hand multiple virtual machines can run on one host machine and replicate operations independently on their own virtual machines.
- Isolation where virtualisation is emphasized on the same operating system as the host that improves performance and efficiency.

Although there is a great level of performance realised through virtualisation processes, Sravani and Nivedita (2013) argue that consumers and service providers remain vulnerable to a number of security issues such as safety of data and protection, internal and external threats, DoS, policy-driven enforcement, segmentation, isolation, governance, as well as service levels for consumers. In addition, they explain that a level of consensus and mutual understanding can be only established through the SLAs in order to create consumers' confidence to realise the benefits of virtualisation.

These arguments contribute to the knowledge available in the literature on performance and its underlying characteristics. There is a lot that is known on the perceptions of large organisations in advanced economies regarding performance issues in cloud computing. There is little that is known in Gauteng on

the perceptions of IT SMEs regarding performance and its underlying characteristics. Thus, there is a need to conduct this study to ascertain the perceptions of IT SMEs in Gauteng on the performance issues in cloud computing, and how they influence the adoption and usage process of the technology model.

2.8. Regulatory and legal issues in cloud computing

After discussing the performance issues and their underlying characteristics, this section discusses the regulatory and legal issues in cloud computing. There is a need to explain aspects related to laws and regulations, as well as possible ramifications in the development of cloud computing adoption and usage. The first sub-section presents an overview of cloud computing regulation and legal aspects, and the second sub-section discusses the regulatory framework in SA on cloud computing regulation.

2.8.1. Overview of cloud computing regulation and legal aspects

Regulatory and legal uncertainties can present serious challenges to cloud computing adoption and growth in this current state. Walden (2012) claims that regulatory and legal uncertainties have serious implications and ramifications in the manner data is managed, owned, stored and controlled.

Data residing in various locations around the globe raises again issues of security and control, which create uncertainties in the type of law that should be administered to protect consumers' rights. While the protection of consumers' rights should be highlighted in the SLAs agreed upon with the service provider, Rao and Selvamani (2015) note that this is still a challenge since the location of data tends to take precedence on jurisdiction.

Rao and Selvamani (2015) claim that governments around the world have a duty to facilitate the implementation of cloud computing by developing regulations within their jurisdictions and by stepping in as national regulators. From a 2012's survey conducted by the Business Software Alliance (BSA), it was reported that most of developed and emerging economies have policies in place to deal with issues around cloud computing that are already benefiting the implementation and adoption of cloud computing with regards to privacy, information security, cybercrime, and intellectual property.

Heyink (2012) argues that there is little that has been done in SA to implement an effective regulatory framework in order to accelerate and facilitate the adoption and usage of cloud computing. There is a lot that is known about the regulatory and jurisdiction issues in developing economies, and their impact on the adoption and usage of cloud computing as a technology model as stated by the International Telecommunication Union (2012) 'survey. There is a need in this study to ascertain the perceptions of IT SMEs in Gauteng on the regulatory and legal issues, and evaluate how these issues influence the adoption and usage of cloud computing process.

2.8.2. Regulatory framework in South Africa on cloud computing

The privacy and protection of a user's right is considered as a government priority in the first instance, and privacy is a constitutional right in South Africa (Heyink, 2012). Heyink (2012) acknowledges the complexities to execute successfully issues of data privacy in cloud computing and suggests that binding agreements with a foreign country can be a solution to resolve issues of information security.

SMEs can find this an area of concern in the adoption and migration to cloud computing since the South African constitution is still working on the Protection of Personal Information (POPI) Bill in order to protect their rights in the cloud. An effective and comprehensive bill in the legislation will play an important role in resolving issues around regulation and jurisdiction of data, and provide a basis for SMEs in Gauteng to explore more on the use of cloud computing.

2.9. Service level management in cloud computing

After discussing the regulatory and legal issues in cloud computing, service level agreement is another closely related topic in the successful implementation of the technology model. This section discusses the service level agreements in cloud computing. The section has two sub-sections: the first subsection presents an overview of the service level agreements, and the second subsection discusses the challenges to-date to provide SLAs in cloud computing.

2.9.1. Overview of service level agreements (SLAs) in cloud computing

Service level agreements can be defined as parameters required by both the consumers and the service provider to highlight issues of service quality and request, feedback mechanisms to encourage and discourage request submissions (Buyya et al., 2011). They should be a starting point to establish a foundation for cloud computing adoption and effective migration.

The importance of addressing the issue around service level agreements is critical due to the complexity of cloud computing as an expanding technology. In order to address issues around the growth and adoption of cloud computing, a framework backed by service level agreements will be required. In addition, to ensure quality of data and service being provided, key issues should be identified, a clear management of those risks should be in place and an effective service level agreement should be drawn up that is well understood by both the consumer and the service provider (SP).

Choudhary (2012) notes that SLAs need to be flexible and contain intuitive metrics to monitor compliance, which can assist in making outsource decisions, and selecting a service provider. Besides SLAs being there to identify parameters of operations in the cloud for example, SLAs also provide

measurement of performance to satisfy consumers' needs and provide acceptable benchmarks in cloud that could facilitate the adoption and migration of realistic applications into the cloud (Buyya et al., 2011). There is a lot that is known in the literature about the perceptions of large organisations in developing economies on the service level agreements in cloud computing. There is little that is known in the literature about IT SMEs in Gauteng regarding the implementation of the service level agreements in cloud computing. There is a need in this study to assess the perceptions of IT SMEs in Gauteng on the service level agreements, and how they influence the adoption and usage of cloud computing.

2.9.2. Challenges to-date to provide SLAs in cloud computing

Some of the challenges in establishing effective SLAs go beyond the complexity of cloud computing, and include the level of awareness among consumers to ensure that they receive required services from cloud computing service providers.

While SLAs have a great standing in resolving issues around penalties, agreement, legislation and privacy, Mohammed et al. (2012) argue that no country has implemented a true cloud so far due to complex legal issues and various implications around privacy, security and right to information. Nevertheless, SLAs become a starting point in the adoption process and a clear interpretation of the SLAs will play a long way in the adoption process.

Buyya et al. (2011) explain that a lack of collaboration between the service provider and the consumers can make the implementation of cloud computing technology model even more challenging. They add that a good understanding of what is needed with a clear negotiation or concession can drive a successful implementation of cloud computing adoption. Buyya et al. (2011) argue that the implementation of a true service level agreement is sometimes complex when it comes to the design, development and implementation of policies that should be clearly understood by both parties. There is a lot that is known in the literature about the challenges of SLAs in the implementation of cloud computing technology adoption by large economies in developing economies. There is a need in this study to assess the perceptions of IT SMEs in the Gauteng province on service level agreements in cloud computing, and how they influence the adoption and usage of the technology model.

2.10. Conceptual framework

This section discusses the conceptual framework used in this study. The section discusses the three constructs supporting the conceptual framework. The three constructs include technological aspects, organisational aspects, as well as environmental aspects. Further discussions on the statistical analysis of the conceptual framework and the constructs used are presented in Chapter 5.

2.10.1. Technological aspects of SMEs

The technological aspects of an organisation are equally important in the adoption of technology. Awa et al. (2012) present the following technological characteristics: information technology infrastructure, gains, technical and organisational compatibility, trialability, complexity, and experimentation.

The successful adoption of IT depends on the value and importance of these internal and external resources (Awa et al., 2012). Small and medium enterprises should consider these resources internally and externally in the technology adoption process.

2.10.2. Organisational aspects of SMEs

It is imperative to understand the organisational structure of the enterprise and how it facilitates technology penetration. Arpaci et al. (2012) argue that the willingness of an organisation to accommodate innovation and changes can be very instrumental to the transformation of its business goals.

Key characteristics of the organisational structure include the degree of centralisation, the quality of its human resources, the complexity of its managerial structure, the size of the organisation, the organisational culture, as well as the organisational change (Awa et al., 2012; Arpaci et al., 2012). The level of adoption of technology will be largely dependent on these factors and thus, understanding their impact on the organisation is vital. Awa et al. (2012) claim that given the fact that these characteristics are vital in the organisation, they can influence the likelihood of technology adoption.

2.10.3. Environmental aspects of SMEs

It is vital to understand the environmental aspects associated with the operation of an enterprise. Arpaci et al. (2012) argue that the environmental characteristics of an organisation can include the related industry, the government regulations, technology supporting the business, the service level agreement, as well as the technology supporting the infrastructure (i.e. Access to quality and ICT consulting).

SMEs have a role to play in identifying these characteristics as part of the organisation. This study will establish organisations from the IT sector in Gauteng and their input will be significant to understand cloud computing adoption and usage aspects. Low et al. (2011) claim that given the nature of socio-technical factors of cloud computing, environmental factors are equally important as technological factors.

2.11. Conclusion

Chapter two presented a literature review of cloud computing to establish the need for this study. There was a need to use a more comprehensive definition of cloud computing in order to provide a direction for this study. A number of services in cloud computing were highlighted although their development keeps on expanding on daily basis. A comprehensive list of cloud computing benefits was provided in this literature to create awareness in the adoption process.

The barriers and challenges to cloud computing adoption and usage were discussed. The extent of usage of cloud computing in emerging economies was highlighted from two perspectives: developing and developed economies in order to provide an understanding of what is happening in the current state of cloud computing adoption. The current state of small and medium enterprises, and the challenges they faced towards growth and implementation of new technologies were discussed. The conceptual framework and the constructs emanating from SMEs' organisational structure were also addressed.

Chapter two further discussed the service level agreements by providing a comprehensive overview on the development, the implementation, as well as best practices for SLAs for an effective adoption and migration of services in the cloud.

Chapter 3: Research Methodology

3.1. Introduction

Chapter 2 discussed the literature review of the study. The literature review was more comprehensive in nature and discussed previous studies conducted on cloud computing, and the current state of IT SMEs in the province of Gauteng. This chapter provides an overview on the method and research design strategies used to answer the research questions formulated for this research. It is imperative that a concise and suitable research approach is adopted for the type of the phenomenon under investigation.

The chapter is structured as follows: section 3.2 discusses the research philosophy. Section 3.3 discusses the research methods and techniques. The sampling techniques are discussed in section 3.4. In section 3.5, the data collection methods are addressed. Section 3.6 discusses the data analysis techniques, followed by the limitations of the research methods in section 3.7. Section 3.8 covers the ethical considerations of the study, which is followed by a conclusion in section 3.9.

3.2. Research philosophy

The study follows an interpretivism philosophy. Bhattacherjee (2012) claims that interpretivism philosophy studies the social order through a subjective interpretation of various actors involved in the social reality (such as by interviewing different respondents) and reconciling differences among their responses using their subjective perspectives.

The philosophy is interested in understanding the difference between humans in their role as social actors (Saunders et al., 2009). Though the philosophy is highly subjective and gives autonomy to the researcher to interpret social and human factors, the researcher has to adopt an empathetic stance, and be able to be in a position to enter the social world of the research subjects and understand the world from the respondents' point of view.

While the philosophy presents its advantages and disadvantages, the philosophy suits the current study for the following reasons:

- The focus is on interpreting human perceptions as compared to objects.
- Interviews are conducted with different participants and their views are reconciled.
- A subjective perspective is used to understand and establish a relationship between aspects under investigation.

Saunders et al. (2009) argue that there are other philosophies that could be used to guide a study such as this one. The following adapted table from Saunders et al. (2009) presents a brief comparison of other research philosophies:

Research Philosophy	Positivism	Realism	Pragmatism	Interpretivism
Explanation	External, Objective and independent from social actors.	Is objective. Exists independently of human thoughts and beliefs or knowledge of their existence (realist), but is interpreted through social conditioning (critical realist).	External, Multiple, Views chosen to best enable answering of research questions.	Socially constructed, Subjective, May change, Multiple.

Table 3.1: Comparison of the research philosophies. Adapted from Saunders et al. (2009)

After careful consideration of the positivism, realism and pragmatism philosophies, interpretivism was the most suitable philosophy for the current study.

3.3. Research methods and techniques

The study used the mixed-methods design. As discussed in chapter one, a mixed-methods research can be considered as a class of research where the researcher mixes or combines quantitative and qualitative research techniques into a single study (Johnston et al., 2005).

Venkatech et al. (2013) argue that the intent for mixing quantitative and qualitative research designs is to maintain the strengths and enrich the weaknesses in both designs. The combination of both methods presents a more enhanced insight into the research problem (s) and question(s) than using one method independently (Creswell,2012; Frels and Onwuegbuzie,2013).

Venkatech et al. (2013) present seven reasons for conducting a mixed-methods research, and these reasons align very well with the study's objectives:

1. Complementary: A mutual viewpoint about similar experiences or associations can be obtained.
2. Completeness: A total representation of experiences or associations can be attained.

3. Developmental: Questions from one method can materialize from implications of a prior method and hypothesis can be tested in a subsequent method.
4. Expansion: High possibility of clarifying or elaborating on the knowledge gained from a prior method.
5. Corroboration/ confirmation: Trustworthiness of inferences gained from one method can be easily evaluated.
6. Compensation: There is a possibility to counter the weakness of one method by encompassing the other.
7. Diversity: The method proposes to obtain opposing viewpoints of the same experiences or associations.

The method presents its strengths and limitations. The following table adapted from Creswell (2012) summarises the strengths and limitations of the method.

Table 3.2: Strengths and limitations of the mixed-research method.

Strengths	**Limitations**
- Narratives add meaning while numbers add precision to words.	- More advanced.
- Can handle a wide range of research questions.	- Time-consuming.
- Can present a more robust conclusion.	- Extensive.
- Can offer an enhanced validity through triangulation (Cross validation).	- May necessitate the use of a research team.
- Can add insight and increase capability to generalize results as compared to using only qualitative study designs.	- Can be extensive when concurrency is involved.
-	- May require the researcher to learn and use multiple methods effectively.
	- May be conflicting at the time.

Source: Adapted from Creswell (2012)

The study used a sequential exploratory strategy associated with the mixed-methods research. Steven (2012) argues that using the sequential exploratory strategy, the collection and analysis of qualitative data is followed by the collection and analysis of quantitative data.

Steven (2012) claims that an equal priority is given to the two phases and data are integrated during interpretation. The following diagram adapted from Steven (2012) provides a brief sequence of activities for the two gathering techniques used in the study:

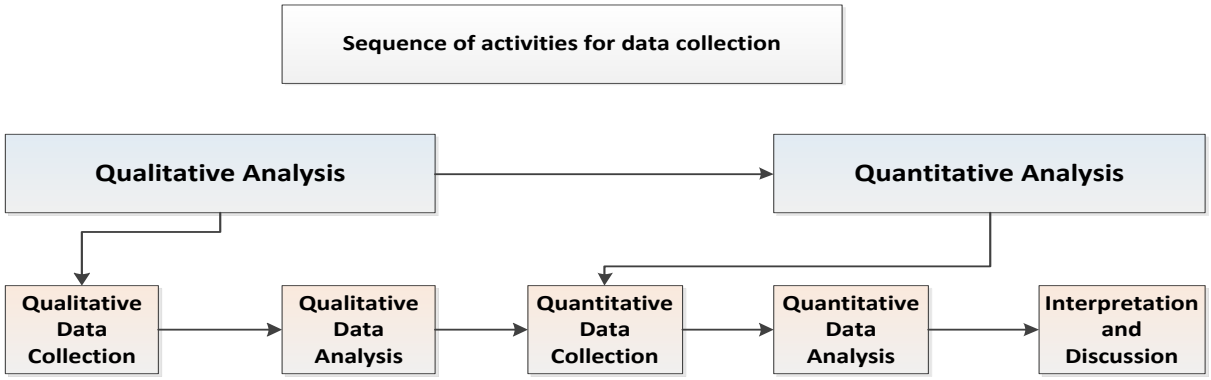

Figure 3.1: Sequence of data collection activities (Adapted from Steven, 2012)

The study used two data-gathering techniques: qualitative and quantitative. While the two data-gathering techniques have been identified as suitable for this study, they have their pros and cons in the manner the researcher inquires new knowledge and investigates the phenomenon. The following table presents a summary of divergences between the two approaches:

Table 3.3. Summary of divergences between qualitative and quantitative approaches

Qualitative Approach	Quantitative Approach
1. Process- Oriented.	1. Outcome-Oriented.
2. Focuses on narrative data.	2. Focuses on numerical data.
3. Mainly uses a non-positivist paradigm.	3. Mainly uses a positivism paradigm.
4.Its uniqueness is that it contributes to in-depth understanding of the context.	4. It generates generalizable data.
5. It is embedded in a flexible natural setting thus unscientific.	5. It is embedded in a highly controlled experimental setting thus scientific.
6. It is mainly subjective.	6. It is mainly objective.
7. The approach is inductive in nature where the researcher begins by making observation before developing a theory.	7. The approach is deductive in nature where the researcher begins with a known theory after which a test follows.

Adapted from the Handbook of Qualitative Research by Adler and Adler (1994)

From these distinctive characteristics, one can observe the differences between the two approaches. The strength of this study is enhanced by the co-existence of these characteristics, and thus constitutes the pillar to support new and emerging knowledge in answering the research questions.

3.4. Sampling techniques and description of the sample

3.4.1. Target population

The study targeted IT SMEs located in the Gauteng province. The target population was made up of IT SMEs in Sandton, Midrand, Centurion, and Pretoria since these areas were considered as the heart of IT SME sector in Gauteng. The study identified one decision-maker from each selected IT SME. Decision-makers from identified IT SMEs were IT managers, IT middle managers, IT specialists, executive managers, consultants, as well as employees with IT knowledge and skills. These decision-makers from each IT SME were selected due to the fact that they had an influence in the alignment of IT business goals and their views constantly shaped the direction of the organisation.

3.4.2. Sampling design

There is a need to explain the sampling techniques used in this study and the manner in which the sampling size was determined from the population of SMEs in IT sector located in the province of Gauteng.

Sampling is considered as a statistical process of selecting a sample of the population of interest for purposes of making observations and statistical inferences about the population (Bhattarcherjee, 2012). A representative sample was needed from registered IT SMEs in Gauteng to ensure that derived inferences from the sample could be generated back to the population of interest.

The sample for this study was selected using an online resource in order to compile a list of SMEs that satisfied the criteria set in this study, namely:

- Have a small market share.
- Be managed by an owner.
- Be independent.
- Be a size of firm in terms of its contributions as compared to other firms in the country.

The list of IT SMEs was generated from the following online resource: Gauteng Business News. In order to gather the study sample, two sampling techniques were used: purposive and probability sampling. The following sub-sections discuss the two sampling techniques and the reason why they were used.

3.4.2.1. Purposive sampling

Associated with qualitative data strategy, this sampling technique allows the researcher to select the sample on the basis of own knowledge of the population, its elements, and the nature of the research aims (Creswell, 2012). The technique is useful for the purpose of sampling a small subject group of a larger population in which participants or respondents of the subset are easily identified but the enumeration of all is nearly impossible (Frey, Carl and Gary, 2000).

Teddlie and Yu (2007) present the following reasons for using this technique:

- The technique is suitable in a study where pilot studies are used.
- The respondents are not selected randomly from each group within the stratification categories.
- The technique requires that the researcher understands the characteristics clearly, chooses the sample, and relates the findings to a specific group and not to the population as a whole.

Creswell (2012) indicates that the purposive non-probability sampling and stratified probability sampling are very similar; however, warns of the following strengths and limitations of purposive sampling:

Table 3.4: Strengths and limitations of the purposive sampling

Strengths	Limitations
- Able to accommodate a wider range of sampling research designs.	- Can be highly prone to researcher bias
- Can involve many phases that can build on previous one.	- Can include subjective components.
- Can provide a wide range of non-probability sampling techniques for the researcher to draw on.	- Can be difficult to convince the reader that the judgment you used to select units to study was appropriate.
	- Can be difficult to convince the reader that the researcher achieved conceptual/ analytical/logical generalization.

Source: Adapted from Creswell (2012)

Out of four hundred registered IT organisations in Gauteng, ten IT SMEs were selected for the purpose of the interview based on the criteria set in this study. The ten IT SMEs were selected from the study's target population of IT SMEs in Midrand, Sandton, Centurion and Pretoria. A formal request was sent to one decision-maker from each selected IT SME to allow for the interviews to take place.

3.4.2.2. Probability sampling

Associated with quantitative data strategy, probability sampling can be defined as a technique in which every unit or group in the population has a chance (non-zero probability) of being selected in the sample (Bhattacherjee, 2012).

Bhattacherjee (2012) presents the following reasons for using probability sampling:

- The method makes statistical inferences.
- The method achieves a representative sample.
- The method minimizes sampling bias.
- The method selects units using probability methods.
- The method meets the criteria set for probability sampling.

A type of probability sampling used in this study is a stratified random sampling. The stratified random sampling pays attention to a particular stratum (group) within the population. Bhattacherjee (2012) claims that with a stratified random sampling, there is an equal chance (probability) of selecting each unit from within a particular group when creating a sample. Stratified random sampling has its pros and cons, and Bhattacherjee (2012) presents them in the following summarised table:

Table 3.5: Pros and Cons of stratified random sampling

Pros	Cons
• Reduces the potential for human bias in the selection of cases to be included in the sample.	• The list of the population has to be delineated in to each stratum with each unit from the population belonging only to one stratum.
• Provides a sample that is highly representative of the population being studied.	• Time consuming to create a final list in case where a single detailed list of the population is not available.
• Allows to make statistical conclusions from data collected making it to be considered as valid.	• Sometimes becomes complex to prepare a list when compared with sample random or systematic sampling.
• Is viewed as superior procedure since it improves the potential for the units to be evenly spread across the population.	• Purchasing a detailed list of the population of interest may be expensive even if available in the public domain.
• Provides greater precision where the samples are the same size compared to a simple random sample.	• Populations might be expensive and time consuming to contact even where a list is available.
• When comparing the degree of precision of stratified random sample with a simple random sample, there is a possibility to use a smaller sample, which can save time and money in return.	• Managing the population (postal, telephone, email) that might need to be contacted may be challenging especially if they are geographically scattered.
• Helps the researcher to make valid inferences from the sample to the population.	• Must ensure that adequate proportion of the sample takes part in the research to avoid potential bias which will necessitate the researcher to re-contact non-respondents or reaching out to new respondents.

Source: Adapted from Bhattacherjee (2012)

For the purpose of this study, forty-two IT SMEs were identified from the list of four hundred registered IT organisations. The IT SMEs were selected from the target population of IT SMEs in Sandton, Midrand, Centurion and Pretoria. The selection of IT SMEs paid particular attention to a group of IT SMEs in order to give them a chance to be equally represented. One respondent of each selected IT SME was identified to take part in the research. IT SMEs were selected based on the following criteria:

- The market share.
- Being managed by an owner.
- Be independent and their turnover relatively smaller as compared to big companies.

A formal communication was established with one decision-maker of the selected IT SME to ensure the organisation meets the criteria set in this study. The communication with the respondents served to explain the purpose of the study and invite them to voluntarily complete the survey.

Some of the completed surveys were emailed back to the researcher and others were collected from the respondents' premises by the researcher in-person. The study adapted the formula by Serakan and Bougie (2010) in order to calculate a representative sample, where 95% represents the confidence level needed, K=applicable value 1.96 and 60 estimated number of IT SMEs in the Gauteng province:

$$\mu = \dot{X} \pm K S\dot{X}$$

Using the formula, the representative sample size was fifty-two IT SMEs of which ten were used for the interview purposes and forty-two were used for the survey purposes.

3.4.2.3. Time horizon

The study's data was collected over a period of six months. Thus, the research is considered as a cross-sectional study (Serakan and Bougie, 2010).

3.5. Data collection methods

The study used two data collection techniques: the semi-structured in-depth interviews and questionnaires.

The following diagram provides a visual description of the data collection approach used:

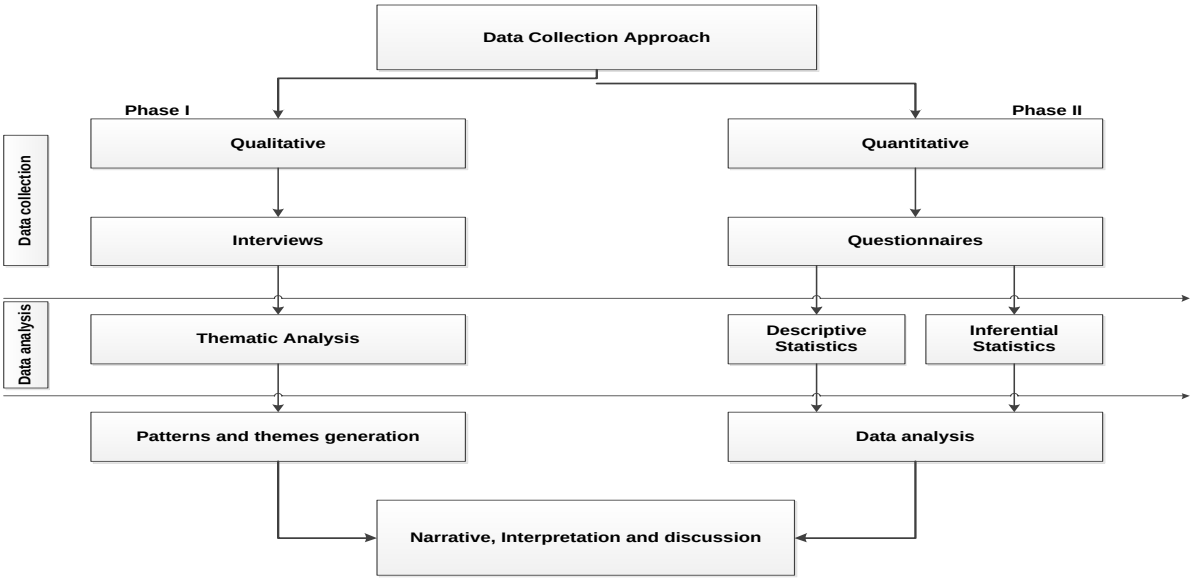

Figure 3.2: Data collection approach (Adapted from Steven, 2012)

3.5.1. Interviews

The choice for interviews as an instrument in this research was informed by the fact that there was a need to gain more insight about the topic under investigation. Saunders et al. (2009) argue that interviews are usually associated with a qualitative research, and the instrument presents its pros and cons. The following table presents the pros and cons of using interviews:

Table 3.6: Pros and Cons of using interviews

Advantages	Disadvantages
• Direct feedback from the respondent.	• Interviews need to be prepared.
• Opportunity to probe.	• Interviewer error or bias.
• Can use observation as another evaluation method.	• Can be time-consuming in terms of data collection and analysis.
• Yields rich data, details and new insights.	• It can be difficult to obtain reliable data on attitudes, opinions and values unless validated questionnaires are used.
• Personal interaction with respondent.	• The interviewer has to stick to the agreed questions even though new areas of enquiry might emerge during the interview.
• Opportunity to explain or clarify questions.	• Can be very expensive.
• Provides high possibility to bring a totally different light on the issue that the researcher had previously not considered.	• Analysis may be difficult.
• Topics can be explored in depth.	

Source: Welman et al. (2005)

3.5.1.1. Interview schedule design

A brief explanation of the interview schedule design is necessary to show how this relates to the study research questions. The following table presents a summary of the interview schedule design:

Table 3.7: **Interview schedule questions**

Question category	**Objectives of interview question categories**
Demographic details	To assess the respondents' background. The category assessed more general aspects about the respondents' position in the organisation, the business sector, the computing devices used in the organisation, as well as the number of years the organisation is in operation.
Awareness of cloud computing	To assess the awareness level of the respondents on cloud computing. The category is designed to assess information on the extent of the adoption and usage of cloud computing model by respondents.
Benefits of cloud computing	To assess the perception of IT SMEs on the benefits and usefulness of cloud computing.
Limitations and concerns in cloud computing	To evaluate the perceptions of SMEs on the limitations and concerns in cloud computing.
Service level agreement	To evaluate the perception of respondents on whether the service level agreement should be the foundation to adopt or use cloud computing services.

3.5.2. Questionnaires

Associated with quantitative research, questionnaires were intended to capture responses in a standardized manner.

3.5.2.1. Questionnaire design

A brief explanation of the research questionnaire is necessary to relate the questionnaires to the research questions. The following table presents a summary of the questionnaire design:

Table 3.8: Research questionnaire

Question category	Objectives of the questionnaire categories
Demographic details	To assess the respondents' background. The category assessed aspects related to employment status of respondents, their current position, and the size of their organisation.
Adoption levels of cloud computing	To assess the adoption levels of IT SMEs on cloud computing.
Benefits of cloud computing	To assess the perceptions of IT SMEs on the perceived benefits of cloud computing.
Factors influencing cloud computing adoption and usage among adopters	To evaluate the perceptions of IT SMEs on the factors that are believed to be influential in the adoption and usage of cloud computing technology.
Limitations and concerns in cloud computing	To assess the perceptions of respondents on the limitations and concerns in cloud computing.
Service level agreement	To evaluate the perceptions of respondents on whether the service level agreement should be the foundation to adopt or use cloud computing services.

3.6. Data analysis

This section discusses the statistical techniques used to analyse data in this study. The study used thematic analysis to analyse all the qualitative data and descriptive, as well as inferential statistics to analyse all the quantitative data.

3.6.1. Qualitative analysis

The study followed an interpretivism approach in that it aimed at in interpreting the views of respondents on cloud computing technologies. The qualitative data are interpreted using the thematic analysis technique, which suggests the reduction of qualitative data into consolidated patterns of themes (Creswell, 2012).

NVivo was used as a tool to analyse the output of the interviews. The tool provided a visual representation of the themes that emerged from the interviews.

3.6.1.1. Thematic analysis

Thematic analysis is used to classify and present themes (patterns) that relate to data. The choice for a thematic analysis technique is relevant for a study that seeks to discover new insights using interpretations (Ibrahim, 2012).

Creswell (2012) presents the following reasons for using a thematic analysis:

- Detect and identify factors or variables that influence any issue generated by respondents.
- Its flexibility to be used in an inductive study.
- Its capability to understand current practices of the respondents.
- Its flexibility to summarise data, answer research questions and compare results between different groups.

Braun and Clarke (2006) propose the following phases in conducting a thematic analysis:

Table 3.9: Phases for conducting a thematic analysis (Braun and Clarke, 2006)

Phase	Description of the process
Becoming familiar with the data	The phase involves the reading and re-reading the data, noting initial observations, thought, as well as ideas.
Generating initial codes	The phase involves coding interesting features of the data in a systematic manner.
Searching for themes	The phase involves organizing codes into potential themes, gathering data relevant to each potential theme or theme code.
Reviewing themes	The phase involves checking themes against individual transcripts and the entire data set, as well as creating a thematic map of the analysis.
Refining themes	The phase involves creating an explanatory platform consistent with the text. The phase can lead to further reviews or refinements or clarifications of the map.
Writing the analysis or narrative	The phase involves analysing and interpreting results by referring to the research questions.

Tables were used to group data and present the frequencies of themes generated from respondents' data.

3.6.2. Quantitative analysis

Quantitative analysis was used for the purposes of analysing gathered data and converting them in some form of measurements. The technique complements subjective interpretations conducted in qualitative analysis, and provides some form of tangible evidence using numerical and statistical data.

Two techniques were used to assist in the process namely the descriptive statistics and inferential statistics. A statistical tool SPSS version 22 was used to compute all the data and produce graphs.

3.6.2.1. Descriptive statistics

The study used descriptive statistics to interpret data. The tests used in the analysis are as follows:

- Descriptive statistics including means and standards deviations, where applicable frequencies are represented in tables and graphs.
- Chi-square goodness-of-fit-test: A univariate test, used on a categorical variable to test whether any of the response options are selected significantly more/less often than the others. Under the null hypothesis, it is assumed that all responses are equally selected.
- Wilcoxon Signed Ranks test: A non-parametric test used to test, in this study, whether the average value is significantly different from a value of 3 (the central score). This is applied to Likert scale questions. It is also used in the comparison of the distributions of two variables.
- Mann Whitney U Test: Non parametric equivalent to the independent samples t-test.
- Binomial test: Compares the observed frequencies of the two categories of a dichotomous variable to the frequencies that are expected under a binomial distribution with a specified probability parameter. For this study, the probability parameter for both groups is 0.5.

3.6.2.2. Inferential statistics

Inferential statistics were used to reach conclusions about associations between variables in this study. The study tested a number of variables where statistical results were considered significant.

The quantitative findings used the confidence interval which stands at 95% to justify the precision of the sample subjects. Factor analysis was also used to interpret correlations between observed variables.

3.6.3. Pilot study

Given the complexity of the study, a pilot study was conducted prior to the initial administration of the research instruments and data collection. All the research instruments namely the interviews and questionnaires were tested in order to improve the standard, as well as the effectiveness of the instruments.

The pilot study was conducted in two phases: the pilot interview schedule was administered first followed by the pilot questionnaires.

3.6.3.1. The pilot interview

The pilot interview was conducted with three participants. A formal appointment was made with the organisation’s managers or decision-makers.

After administering the interview instrument, changes become apparent. The pilot interview schedule did not provide enough information about the business processes, the type of computing devices used in the organisation, as well as the primary users of computing devices in the organisation.

Another important change that resulted from the pilot interview, there was no provision for follow-up questions to a number of critical questions used in the interview instrument. The pilot findings indicated that questions related to challenges in cloud computing, security issues, as well as availability issues were not properly addressed. There was a need to provide further information in this regard.

3.6.3.2. The pilot questionnaire

The pilot questionnaire was conducted with six participants. After administering the survey, a few changes were made to the final research instruments. In the section of the current position of the respondents, there was a need to add employees with IT knowledge or expertise to ensure that not just any employee answers the survey and this should be aligned with the criteria set in the selection of respondents.

Another important change that resulted from the pilot study administration was the need to elaborate on cloud computing services. The previous questionnaire did not provide enough information to respondents to select the services available in cloud computing. A list of examples describing services was added for both SaaS, IaaS, PaaS, as well as XaaS.

3.7. Limitations of the research methodology

The research methodology is considered as the most important section of the study. Frels and Onwuegbuzie (2013) claim that the research methodology is also more complex as various approaches can either be used independently or in conjunction with other approaches to come to a reliable conclusion. There are a number of limitations drawn from this study.

The study used a mixed-research method, and followed an interpretivism philosophy to conduct the research. The limitation in using the mixed-research method become evident since the method required an understanding of the concepts, that necessitated the researcher to learn in the process. The use of the method was also time-consuming since the method involved understanding the findings of the two approaches. The mixed-research method used semi-structured in-depth interviews and questionnaires to gather data. The literature shows that there were a number of limitations associated with the use of these research instruments, namely, analysis of the results using Nvivo, cost associated with the logistics, time consuming, bias and errors in interpreting themes, and the interviewer to stick to agreed questions.

The target sample and the sample subjects used in the study were also considered as another limitation since the number of subjects could be extended to a larger population sample given the number of IT SMEs registering with the Department of Trade and Industry on daily basis.

The logistics associated with the administration of the research instruments, collection of the instruments, reaching out to respondents, as well as interpretation of data gathered using the research instruments were also considered as other limitations to this study.

3.8. Ethical considerations

This study has fully complied with the ethical considerations of both the School of Management, IT & Governance and the University of KwaZulu-Natal. The following documents were sent to the School's ethical committee for approval: the research proposal, the ethical clearance application form together with the draft of the research instruments.

The research methodology was carefully designed to consider all ethical issues from protecting respondents' anonymity to their rights to withdraw from participating in this study. Obtained consents and responses would be kept in the strictness of confidence and will not be used for any other reason other than this study, after which they will be submitted to the school for archiving purposes.

3.9. Conclusion

The research methodology constitutes a rigorous process to put in place all the necessary mechanisms to gather relevant data to be used in the analysis of the study. This section elaborated on the research design. The study discussed the mixed methods research strategy, its strengths, as well as its limitations.

The study followed an interpretivism philosophy, which is more concerned with the subjective interpretation of subjects. The section discussed about the target population for the study and techniques used to sample the subject frames. The purposive and probability sampling techniques were used to sample the study subjects.

The chapter discussed the data collection methods used in this study. Two data collection instruments were used namely, the semi-structured in-depth interviews and questionnaires. The section also discussed the two data analysis techniques used in the study. Thematic analysis was used to analyse all the qualitative data. Descriptive and inferential statistics were used to analyse all the quantitative data.

The chapter also discussed the pilot study undertaken in order to test the research instruments. The findings of the pilot study were used to refine the research instruments.

Chapter 4: Qualitative findings and analysis

4.1. Introduction

The study investigates small and medium enterprises in the IT sector located within the province of Gauteng, to ascertain their perceptions on the benefits and risks associated with cloud computing, and to assess the extent of usage of cloud computing services. After discussing the current state of cloud computing, the benefits and challenges associated with cloud computing at both national and international level in Chapter 2, this chapter discusses the qualitative findings and analysis of the study. The qualitative findings and analysis constitute an important section of this study and serve to establish the main categories/themes relating to the respondents' views.

This chapter discusses the following aspects: The pilot findings are described in section 4.2. The qualitative findings and analysis are presented in section 4.3, followed by the chapter summary in section 4.4.

4.2. Pilot findings

This section discusses the findings of the pilot study. The interview questions were used to create initial categories and codes. The three respondents who participated in the interviews were given pseudonyms, namely, **A**, **B** and **C**.

The first section addressed the demographic details of the respondents. This section provided an understanding of all aspects related to the organisation, as well as the respondents' background. After analysing the first question, the pilot findings established three theme codes namely: the position in the enterprise, the size of the organisation and the duration in business.

It was found that the three theme codes did not provide enough information to interpret all aspects related to the organisation. Two new theme codes were added to the category in order to include computing infrastructure and the specific software used or loaded on devices.

The second section of the interview was meant to assess the adoption of cloud computing by respondents. After analysing the section, the findings' themes accommodated only one theme code, which was the adoption of cloud computing. The theme's code did not accommodate for the lack or non-adoption of cloud computing services.

The pilot findings did not provide an option for the respondents to say why they did not adopt cloud computing services. In this case for example, it was found that respondents **A** and **B** used cloud computing, and respondent **C** did not. Therefore, there was a need to include respondent **C's** views as well**.**

The third section assessed the services in cloud computing. The findings elaborated four theme codes: SaaS, IaaS, PaaS, as well as XaaS. The pilot findings did not provide enough examples about the cloud services being used. There was a need to elaborate on the follow-up questions with more examples to specify the type of services used from each cloud computing service or technology.

The fourth section assessed the benefits and usefulness of using cloud computing. The pilot findings were analysed using the code of data extracts related to the theme/category 'benefits' from interviewee responses. No changes were made to the category, and therefore the category was used in the final interview schedule.

The fifth section assessed the limitations and concerns in cloud computing. The findings were analysed using the code of data extracts related to the theme/category 'limitations' from interviewee responses. After the pilot findings analysis, new themes were generated, namely the impact of security in cloud computing, the impact of challenges in cloud computing, the impact of availability issues in cloud computing, as well as the need for more computing devices.

The sixth section assessed the service level agreement. The pilot findings were discussed using two theme codes. The two theme codes were subsequently used in the final version of the interview with no changes.

4.3. Qualitative Findings and Analysis

The thematic analysis technique was used to analyse the qualitative data. The following phases in analysing data were adapted from Braun and Clarke (2006):

- The first phase was to transcribe all the interviews.
- The second phase was to create initial codes pertaining to interesting aspects of primary data guided by categories addressed in the interview questions.
- The third phase was to establish data extracts coded once or multiple times.
- The fourth phase was to develop an initial thematic map where all the themes were identified.
- The fifth phase was to interpret the respondents' themes based on their frequencies.

Phase 1:

The first phase was to transcribe all the interviews. The phase required that the contents of the interviews were classified according to the appropriate category of the interview questions. All the interviews were recorded, and then transcribed. Therefore, the process was meticulous. A lot of precautions were taken to ensure that no details from the interviewees were omitted.

Phase 2:

The second phase led to the creation of categories identified in the interview questions. These categories of interest were developed as per interview questions. Six categories were established, and the table below presents these categories:

Table 4.1.: Categories of interest

1	**Category A**	**Demographic details**
2	**Category B**	**Adoption levels of cloud computing**
3	**Category C**	**Cloud computing usage**
4	**Category D**	**Benefits and usefulness of using cloud computing**
5	**Category E**	**Limitations and concerns in cloud computing**
6	**Category F**	**Service Level Agreement**

Phase 3: Data extracts

Given the number of research questions used in the study, the third phase was concerned with mapping data extracts to coded themes/categories. Each category of interest created in phase 2 was analysed separately. During this phase, data extracts were classified under one or multiple codes.

Table 4.2: Data extracts category A

Data extracts pertaining to: Demographic details	**Code**
The description of the employee's position. The type of work done every day in executing the role either as being employed or as the owner of the organisation.	The position in the enterprise
The individuals who use computing devices in the organisation. Individuals who interact on daily basis with the computing devices are so many.	Primary users of computing devices
The business sector in which operations are conducted. This also defines, determines the job or functions executed in the organisation.	Business sector/process
The number of employees working in the organisation.	The size of the organisation
How long have I been working for the organisation? The number of years working for the organisation. The number of years the organisation is in existence.	Duration in business
All computers used to perform tasks. Number of computers, cell phones or tablets available in the organisation used by employees, as well as clients.	Number of computing devices
Operating systems used on computers or cell phones or tablets. Microsoft Windows operating system is used on our computers. Android is used on cell phones. Software used to design graphical images such as Corel Draw.	Software used or loaded

Table 4.3: Data extracts category B

Data extracts pertaining to: Adoption levels of cloud computing	**Code**
I am using one of the services in the cloud. I am aware of cloud computing services. I am aware of cloud services though I have not yet implemented it in my organisation.	Adoption of cloud computing
I am not using cloud computing. I have never heard of cloud computing.	Lack of adoption of cloud computing

Table 4.4: Data extracts category C

Data extracts pertaining to: Cloud computing usage	**Code**
What service do you use…I use MS Office Suite product and Online Pastel Accounting. I use Internet Explorer to browse. I use Yahoo mail and Google to access emails. I use Office 365 for performing daily tasks.	Software-as-a-Service
Examples of services used in Infrastructure-as-a-Service. I use Google Drive to store data. I use Dropbox for data backup and storage	Infrastructure-as-a-Service
What service do you use in Platform-as-a-Service? … I have never heard about this service. I have not used the service. I am in the process of implementing this service.	Platform-as-a-service
What service do you use in other variants of clouds? … Examples of services I am familiar with. I have not used any variants of clouds. I am not aware of any cloud variant services.	X-as-a-Service

Table 4.5: Data extracts category D

Data extracts pertaining to: Benefits and usefulness of using cloud computing	**Code**
Benefits are varied. These benefits are experienced in cost-efficiency, lower maintenance cost and implementation. They are experienced in scalability and agility, higher and increased performance. Benefits are also expressed in the form of security and IT resources being well managed. There is flexibility and sustainability as a result of cloud computing usage. I have become aware of cloud computing and am able to customise cloud services to suit my needs.	Benefits and usefulness

Table 4.6: Data extract category E

Data extracts pertaining to: Limitations and concerns in cloud computing	**Code**
The concerns and challenges in cloud computing are multiple and varied. Security and availability issues of data in cloud are very concerning. Implementation of some services have various implications in terms of performance, as well as awareness. The impact of these challenges is always costly to the business.	Limitations and concerns

Table 4.7: Data extract category F

Data extracts pertaining to: Service Level Agreement	**Code**
Would you consider SLA as a benchmark for supporting cloud computing adoption? Yes, as it ensures accountability and reinforcement of compliance. Benefits of using SLA include streamlining the business and supporting business decisions.	Service level agreement

Phase 4: Initial thematic map

The fourth phase was to generate an initial thematic map. The thematic map was necessary to associate the theme codes for all the data extracts. After examining and grouping the theme codes, candidates' themes were grouped in tables based on their frequencies in order to analyse the theme codes as per the research questions. The following diagram presents an initial thematic map showing all the categories, all possible main theme codes, as well as themes identified by respondents.

Initial thematic map:

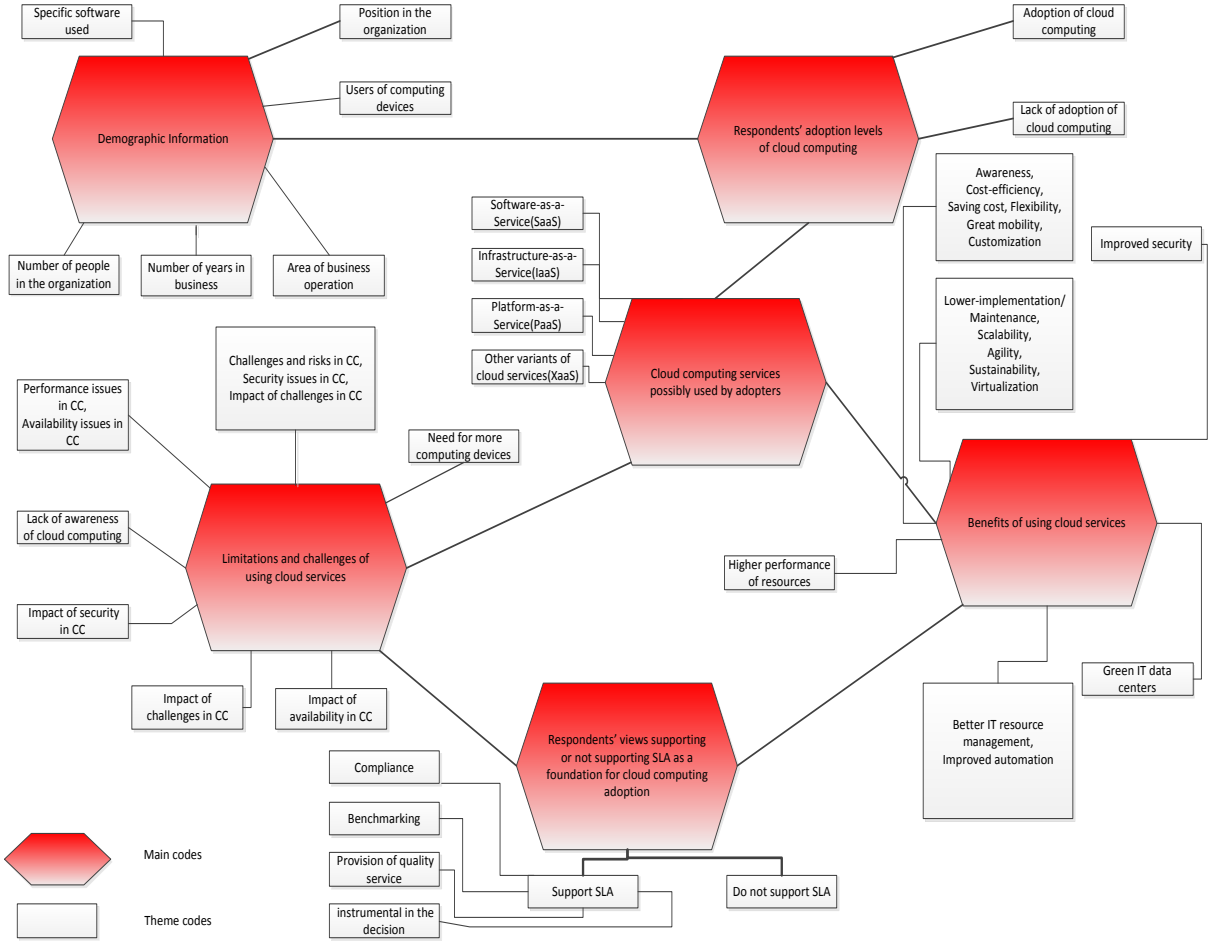

Figure 4.1: Initial thematic map

Phase 5: The narrative

This last phase discusses the interviewee responses as generated from the theme codes/categories. Tables were designed to accommodate the frequencies of themes, and each category generated in the interview questions was used to address the research questions.

4.3.1. Category A: Demographic details

This category discusses the background information of respondents and organisations. Theme codes generated from this category include: position in the organisation, primary users of computing devices, business sector/process, size of the organisation, the duration in business, number of computing devices, as well as specific software used or loaded.

The table below represents the themes generated for **Category A**:

Category A: Demographic details									
Theme codes		**Frequency count of themes**					Responses No.	Percentage %	Accumulated Value
Position in the enterprise		IT Manager	Executive manager	Owner	Consultant	Other			
		1	1	1	4	2	10	100%	50
Primary Users of computing devices		Employees	Clients						
		6	4				10	100%	50
Total Scores							20		
Business sector or process		Computer, IT	Mobile devices	Digital Solutions					
		8	1	1			10	100%	33
Size of the organisation		1-5 Employees	6-20 Employees	21-50 Employees	51-150 Employees	151-200 Employees			
		9	1	0	0	0	10	100%	33
Duration in business		1 Month-1year	2-5 years	6-10 years	10-20 years	20-30 years			
		4	0	5	1	0	10	100%	33
Total Scores							30		
Number of computing devices		**Using devices**	**Not using devices**						
	1-50PCs	9	1				10	100%	
	51-150PCs	0	10				10	100%	
	1-50 Laptops	4	6				10	100%	
	1-50 Tablets	3	7				10	100%	
	1-50 Mobile devices	1	9				10	100%	

Specific software used or loaded		Software used	Software not used						
	Windows Operating Systems	9	1				10	100%	
	Ms Office Package Suite	8	2				10	100%	
	Web browsers	6	4				10	100%	
	Android for Mobile devices	2	8				10	100%	
	Others	9	1				10	100%	
Total Scores									

Table 4.8: Number of relative frequencies for themes on demographics

4.3.1.1. Theme code: Position in the enterprise

This theme code discusses the various positions of respondents in the organisation. The findings on the position in the enterprise indicated that four respondents were consultants, three respondents were classified under the "other category", one respondent was an IT manager, one respondent was an executive manager, and one respondent was the owner of the organisation.

The findings were supported and discussed in the study. The study indicated that the position of an employee in the organisation was one of the key requirement criteria when considering an SME in Gauteng.

As discussed in this study, this theme code refers to a more general aspect of an organisation. As a requirement, TheDti (2007) reported that an SME needed to have an owner, and in this case the owner might fill one or more specific functions in the organisation. The position of the employee or owner in the organisation did not work in isolation with the position held in the organisation. Therefore, the position of the employee or owner in the organisation was instrumental in the adoption process.

4.3.1.2. Theme code: Primary users of computing devices

This theme code is closely related to the organisational construct of the conceptual framework used in this study. During the analysis, 6 employees and 4 clients were identified as the primary users of computing devices. The research findings pointed out to arguments discussed by Arpaci et al. (2012), who reported on the importance of users of technology and their impact on innovation, as well as the processes that accommodate changes in the organisation.

This theme code established employees and clients as the primary users of computing devices in the organisation. Arpaci et al. (2012) reported that understanding the managerial structure of the organisation was critical as far as technology innovation was concerned. This theme code is further discussed in the conceptual framework supporting variables in the last section of the quantitative findings and analysis.

4.3.1.3. Theme code: Business sector / Business process

This theme code discusses the business process or business sector of the organisation. The research findings on this theme code were critical since they addressed the study's organisational conceptual construct. The findings indicated that eight respondents operated in the computer/IT business sector, one respondent operated in the mobile device business, and one respondent operated in the digital solution business. This organisational theoretical construct was discussed and further supported in this study by Awa et al. (2012).

The findings on this theme code supported in principle criteria set in this study delimiting the study and its target market as specified in the research design.

4.3.1.4. Theme code: The size of the organisation

This theme code is closely linked to the study's organisational construct of the conceptual framework and discusses the more general aspects of the organisation. The theme code also supports key criteria set in the establishment of SMEs in Gauteng, SA (TheDti, 2007).

The findings indicated that nine respondents' organisations had 1-5 employees, and one respondent's organisation had 6-20 employees. These findings support in principle criteria set for considering an SME in the South African context (TheDti, 2007), as well as the organisational construct of the study's conceptual framework (Arpaci et al., 2012).

4.3.1.5. Theme code: Duration in business

This theme code establishes the number of years a business has been in existence. The findings on this theme code indicated that four respondents were operating for a year and a month in business, five were

operating between 6-9 years in business, and one respondent was operating between 10-20 years in business. The findings generated on this theme code were discussed in the literature review.

The findings indicated that though this theme code was general in this study, it related to aspects associated with the business sustainability and viability of the organisation. As mentioned in the literature review, Arpaci et al. (2012) discussed the factors associated with the existence of a business, which should be vital as far as technological factors were concerned.

4.3.1.6. Theme code: Number of computing devices

This theme code discusses all IT platforms used in the organisation to accomplish its daily activities. The following number of computing devices 1-50 PCs, 51-150 PCs, 1-50 laptops, 1-50 tablets, and 1-50 mobile devices were provided to respondents to select from depending on the size, as well as the business operations of the organisation.

The findings indicated that nine respondents used between 1-50 PCs for their operation, four respondents used between 1-50 laptops for their operation, three respondents used between 1-50 tablets for their operation, and one respondent used between 1-50 mobile devices. Given the size and the nature of the business operation, the findings revealed that one respondent could have been using either one or more of the computing devices' options in the organisation.

The findings on the number of computing devices were discussed in the literature review. Arpaci et al. (2012) argued extensively in section of the literature on the IT infrastructure, and how it supported business operations. The findings generated on this theme code supported this study's organisational construct of the conceptual framework, where IT infrastructure needs to be identified as important variables to support the running of a business.

4.3.1.7. Theme code: Specific software used or loaded

This theme code discusses the possible software used or loaded on a number of organisations' IT infrastructure. The following software were identified for respondents to select from depending on the business operations of the organisation: Windows Operating Systems, MS Office package suite, Web browsers, and Android for mobile devices.

The findings indicated that nine respondents used Microsoft operating systems, eight respondents used MS Office package Suite for their operations, six respondents used Web browsers, two respondents used Android for Mobile devices, and nine respondents used other varieties of software in their IT infrastructure. Given the nature of the business operations, the findings revealed that one respondent could have been using either one or more of the software in the organisation.

The findings pointed out that MS operating systems and MS Office Package Suite recorded the highest count among all the software used or loaded on most of the organisations' IT infrastructure. The findings did not point out at this stage to online software being used by the respondents, which should have constituted a starting point regarding the discussion on cloud computing adoption and usage. The study focussed more on MS Office 365 Live as the starting point for cloud computing adoption and usage for many small and medium enterprises (Tredger, 2013).

The findings pointed out that web browsers were used by a good number of the respondents, which could indicate that some respondents used some forms of cloud services classified under the software-as-a-service category. The discussion on the cloud services is further elaborated in the **Category C**.

4.3.1.8. Summary and analysis for category A

The research findings in category **A** were discussed under the more general aspects of the organisation. Though general, the findings assisted in understanding some of the characteristics, as well as constructs being investigated. The findings on the position in the organisation were useful to understand how the managerial structure in the organisation influenced the decision to adopt or use cloud computing on one hand. On the other hand, the primary users of organisations' computing devices were also established.

Furthermore, the findings established the scope of the business operations for organisations that took part in the study. The findings gave an indication as to how the respondents execute their business functions on daily basis. The scope of the business constituted an important organisational construct of the study's conceptual framework as discussed in Chapter 2.

The computing devices established in the findings provided an understanding into the IT infrastructure discussed in Chapter 2 of this study. The IT infrastructure supported the organisational construct of the study's conceptual framework. The findings also established the number of years the business had been in existence. As discussed earlier in this chapter, the viability of a business and its sustainability were important aspects to consider in the adoption of a technology (Awa et al., 2012).

The research findings also established the type of software used or loaded on various computing devices. The findings established a number of software packages and open source used by organisations. In the same light, the variety of software used provided an idea as to whether organisations used cloud services or not. Further discussions on the organisations using cloud services and those not using cloud services were covered in **category B** of this chapter.

4.3.2. Category B: Adoption of cloud computing

This category addresses respondents' themes on the adoption or lack of adoption of cloud computing. The findings on this category were useful to understand the level of usage, know-how, as well as technology competency regarding cloud computing adoption and usage.

The findings on the adoption of cloud computing were grouped into two theme codes: The first **theme code** discussed the adoption of cloud computing, and the second **theme code** discussed the lack of adoption of cloud computing by respondents. The graph below represents the adoption and usage levels between users and non-users of cloud computing:

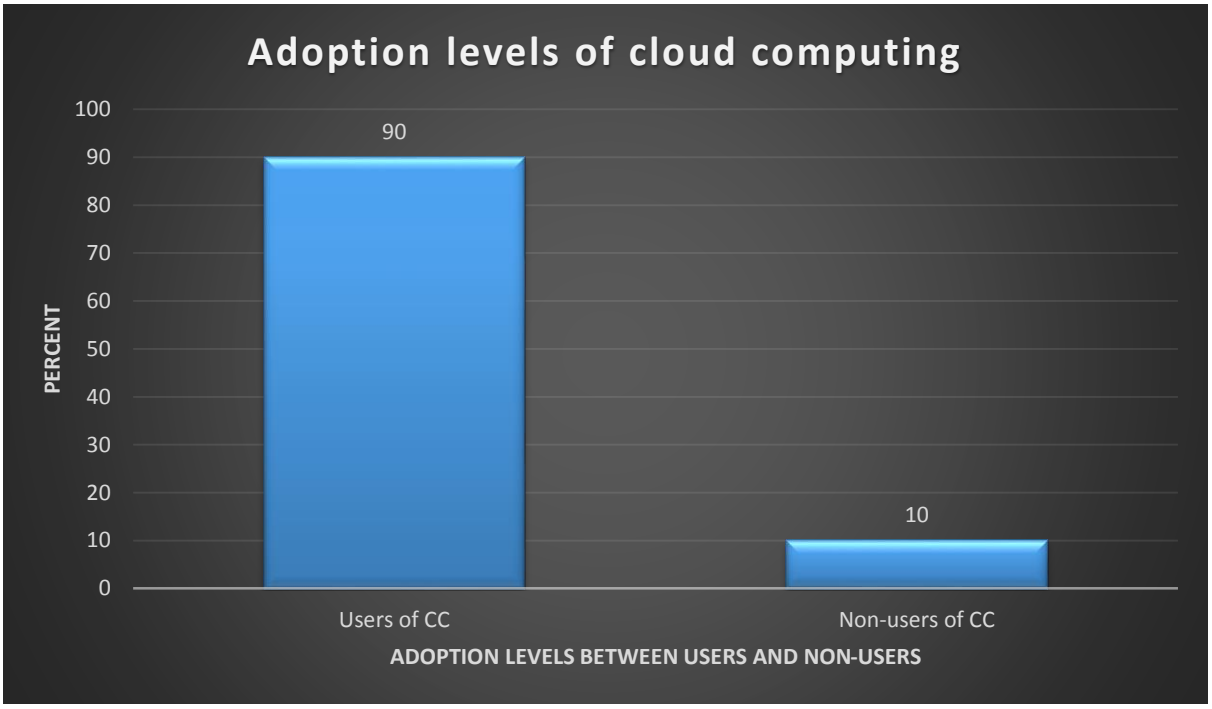

Figure 4.2: The adoption levels of cloud computing

The table below represents the themes generated for **Category B:**

Category B : Adoption levels of cloud computing						
Theme Codes		**Frequency count of themes**		Responses No.	Percentage %	Accumulated Value
Adoption of cloud computing		Adoption of cloud computing	Lack of adoption of cloud computing			
		9	0	9	90%	81
Lack of adoption of cloud computing		0	1	1	10%	10
Total Scores		9	1	10		

Table 4.9: Number of relative frequencies for themes on cloud computing adoption

4.3.2.1. Theme code: Adoption of cloud computing

This theme code discusses the number of respondents who used cloud computing in their business operations. The findings indicated that nine respondents used cloud computing, and one respondent did not use cloud computing.

The research findings indicated that a significant number of respondents used cloud computing for their business operations. The findings were significant to identify the number of IT SMEs in Gauteng that have adopted cloud computing. The findings on the adoption of cloud computing supported arguments discussed in the section of the literature on IT SMEs that have considered cloud computing as a technology model to support their business goals. The discussion on the adoption of cloud computing could not be explored further since there was still a need to identify the type of cloud services used by the respondents.

4.3.2.2. Theme code: Lack of adoption of cloud computing

This theme code discusses the lack of adoption or lack of use of cloud computing services. The findings indicated that one respondent did not use cloud services. The discussion on this theme code findings and possible reasons for not using cloud computing were incorporated in **categories D** and **F.**

4.3.2.3. Summary and analysis for category B

This category differentiated the users from the non-users of cloud computing services. The research findings established that the users of cloud computing services had a know-how of the technology on one

hand. On the other hand, the findings established the non-users of cloud computing, who did not use any form of cloud computing services in their organisations.

These research findings on **category B** constitute a starting point for the discussion on the adoption of cloud computing since the subsequent categories and theme codes deal in detail with the benefits, as well as the concerns and limitations of cloud computing.

4.3.3. Category C: Cloud computing usage

This category discusses the themes on the usage of cloud computing services. The literature discussed four main categories of cloud computing services, and this section presents the findings on cloud computing usage.

The table below presents the themes generated for **category C:**

Category C: Cloud computing usage						
Theme Code	**Frequency count of themes**			Responses No	Percentage %	Accumulated Value
Software-as-a-Service (SaaS)	Email Services	Social Sites	MS Office 365 Live			
Total	6	2	1	9	90%	60
Infrastructure-as-a-Service (IaaS)	Dropbox	Google Drive	Microsoft SkyDrive			
	4	2		6	60%	40
Total Scores				15		

Table 4.10: Number of relative frequencies for themes on cloud computing usage.

4.3.3.1. Theme code: SaaS

The graph below represents the adoption and usage for **theme code SaaS**:

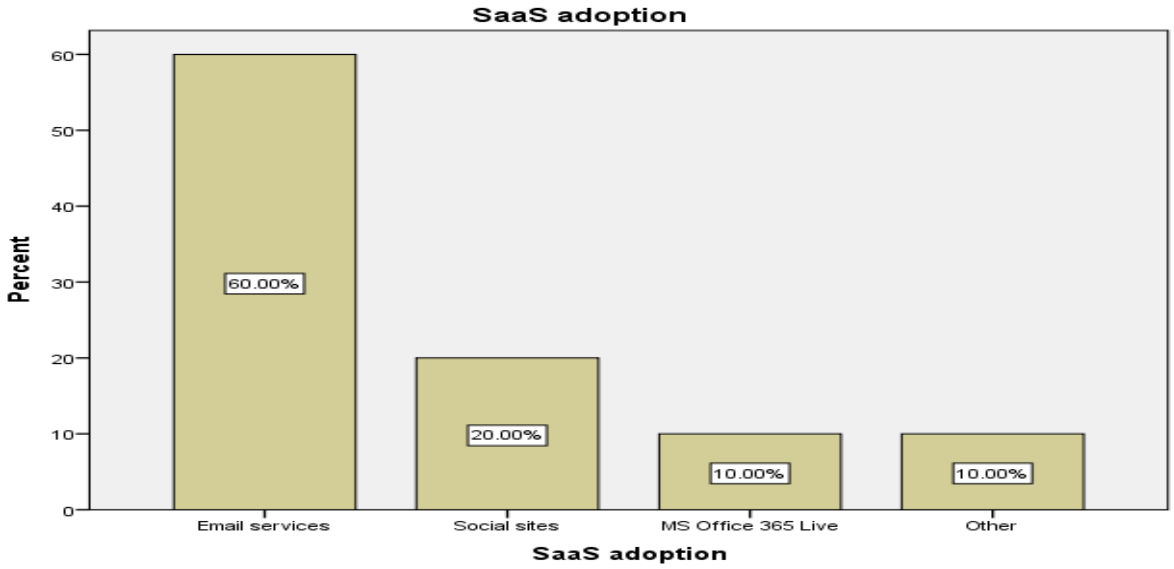

Figure 4.3: Adoption and usage for theme code SaaS

This theme code discusses the usage and adoption of SaaS. As reported in the literature, the service takes into consideration the use, the management and maintenance of application software, operating systems and resources (Kaur and Saur, 2013).

The findings indicated that six respondents used SaaS in the form of email services for their business operations, two respondents used SaaS in the form of social sites, and one respondent used SaaS in the form of MS Office 365 Live. These findings on the respondents' themes were discussed and supported in this literature.

Brown and Madden (2012) reported extensively in this literature that the first step for many organisations toward cloud adoption and usage seemed to be first and foremost SaaS. These research findings on **category B** were also discussed in the Microsoft 2012 report, which indicated an increase in investment with regard to SaaS adoption and usage among SMEs. In addition, Tredger (2013) explained that SaaS seemed to be the first step toward cloud computing adoption and usage in South Africa.

The research findings revealed that IT SMEs considered SaaS as a cloud computing service because of its agility, scalability and flexibility characteristics. Kaur and Saur (2013) further reported that the adoption of SaaS could be motivated due to the fact that users found the service very cost-effective in the management, maintenance and deployment of their business applications.

4.3.3.2. Theme code: IaaS

The graph below represents the adoption and usage for **theme code IaaS**:

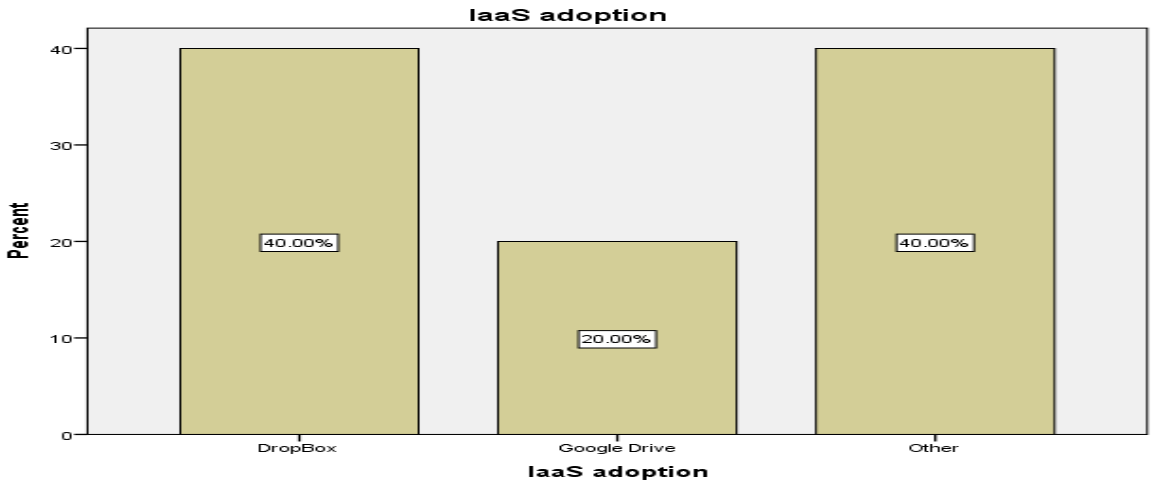

Figure 4.4: Adoption and usage for theme code IaaS

This theme code discusses the usage and adoption of IaaS. The service offers a set of virtualised computing resources in the cloud such as capacity, memory, bandwidth, as well as processing power (Youssef, 2012).

The findings indicated that four respondents used IaaS in the form of Dropbox, and two respondents used IaaS in the form of Google Drive. The findings on the adoption and usage of IaaS were discussed and supported in this literature.

The findings also indicated that the number of respondents using IaaS could not be compared to the number of respondents using SaaS. This confirms arguments discussed by Brown and Madden (2012), Erol et al. (2012), Singh and Seenham (2013), who claimed that the adoption of IaaS was slightly lower as compared to SaaS. Avram (2014) reported that the slight adoption and usage rate of IaaS was explained by the fact that organisations needed to be fully aware of SaaS before moving to IaaS. He also reported that organisations tend to adopt IaaS after they have understood the underlying benefits of SaaS, and required transformational needs in the organisation. From the respondents' perspective, the findings indicated that IaaS was primarily used for storage purposes, which could be translated as a secondary need for organisations that were already using SaaS.

4.3.3.3. Theme code: PaaS

This theme code discusses the usage and adoption of PaaS. The service puts the provider in control of the system software and computing resources (Singh and Seenham, 2013).

The findings indicated that respondents did not use this service. The literature review discussed the low adoption and usage levels of PaaS among SMEs. The literature explained that the lack of adoption or non-usage of PaaS among SMEs could be caused by the lack of transformation needs or business processes in the organisation (Matuszak and Lamoureux, 2013). Awa et al. (2012) further reported that the low adoption rate of PaaS by SMEs could be explained by the fact that users have little information about the service and its benefits.

This literature argued that the slow or lack of adoption thereof was not only a South African phenomenon but an international phenomenon as explained in the Deloitte 2012 report. These research findings were supported in this literature.

4.3.3.4. Theme code: XaaS

This theme code discusses the usage and adoption of other variants of cloud computing. These variants develop on daily basis, and they are so customised to suit a particular business need (Madden and Mujinga, 2012).

The research findings indicated that respondents did not use this service. Matuszak and Lamoureux (2013) reported in this literature that organisations tend to adopt or use these services when there is a need for major upgrades to the system. They also reported that organisations might have not reached the level of transformation required by their business objectives. The research findings indicated that organisations were not aware of these cloud variants, therefore were not in a positon to use them.

4.3.3.5. Summary and analysis for category C

This category discussed the usage and adoption of cloud computing services by SMEs in the IT sector located in the Gauteng province. The findings on **category C** provided more details on the various forms of services used by organisations in Gauteng.

The research findings indicated that respondents used SaaS in the form of MS Office 365 Live and email services. The literature reported that the usage of these services constituted the starting point for many organisations to adopt and use cloud computing. The research findings also indicated that respondents used IaaS in the form of Dropbox and Google Drive. The research findings indicated that there was a lower adoption level for IaaS as compared to SaaS. The research findings on these two services, namely, SaaS and IaaS provided enough evidence to assess the usage and adoption levels by SMEs in the IT sector.

The research findings indicated that respondents did not use any forms of PaaS or XaaS. The literature reported extensively on the lack or lower adoption level of XaaS services by SMEs. Arpaci et al. (2012) attributed the non-adoption or lack thereof of these services to the lack of awareness or lack of competency or IT skills with regard to cloud computing technologies. The literature also argued that the level of transformation required by the business could be another contributing factor in establishing whether or not to adopt some of these services. Matuszak and Lamoureux (2013) reported that organisations that did not yet find the need for further business transformations or further business upgrades were reluctant to use or adopt some of these cloud services.

4.3.4. Category D: Benefits and usefulness of using cloud computing

This category discusses the benefits and usefulness of using cloud computing. The table below represents the themes generated for **category D**:

Category D : Benefits and usefulness of using cloud computing			
Frequency count of themes	Responses No	Percentage %	Accumulated Value
Awareness	9	90%	69
Cost-efficiency	9	90%	69
Cost savings	9	90%	69
Flexibility	9	90%	69
Greater mobility	9	90%	69
Customisation	9	90%	69
Lower-implementation/Maintenance	8	80%	55
Scalability	8	80%	55
Agility	8	80%	55
Sustainability	8	80%	55
Virtualisation	8	80%	55
Higher performance	7	70%	49
Better IT resource management	5	50%	21
Improved automation	5	50%	21
Improved security	4	40%	14
Green IT data centers	2	20%	0
Total Scores	117		

Table 4.11: Number of relative frequencies for themes on benefits and usefulness of using cloud computing.

4.3.4.1. Theme 1: Awareness

This theme discusses awareness as a benefit in cloud computing. Awareness is considered as an important aspect in cloud computing since it represents factors associated with the skills, competency level, as well as technology know-how in regard to cloud computing adoption and usage. The literature reported that the decision to use and adopt cloud computing was largely dependent on the awareness level of respondents as discussed by Arpaci et al. (2012). Awa et al. (2012) reported that there was a relationship between awareness and usage of a technology, which should generate a maximum benefit to the organisation. The research findings revealed that organisations that were aware of cloud computing were in a better position to relate to its benefits as compared to organisations that were not aware.

4.3.4.2. Theme 2: Cost-efficiency

Cost-efficiency is considered as a benefit, as well as an important characteristic in cloud computing (Youssef, 2012). Its interpretation is related to the lower expenditure on cost and a high return on investments. Cowhey and Kleeman (2013) claimed that organisations have reduced up front capital and operational costs involved with the implementation and maintenance of technology. They reported that the cost associated with cloud computing implementation and maintenance has been drastically reduced, and there is an increase in cost savings as an effect of cloud computing adoption and usage. In addition, Erol et al. (2012) argue that this theme on cost-efficiency assisted SMEs to compete both nationally and internationally, which was one thing many SMEs could not do due to the high up front-cost and capital to run their businesses.

4.3.4.3. Theme 3: Cost savings

Cost savings mean that the initial cost to deploy and maintain resources and applications in cloud computing is relatively low. This theme on cost savings was argued by Avram (2014), who reported extensively on the theme associated with the deployment, and maintenance of applications since the advent of cloud computing. In addition, Erol et al. (2012) reported that the biggest beneficiaries of the cost savings seem to be SMEs since they are able to penetrate markets that were previously reserved to large organisations.

The research findings could mean that users might have seen further opportunities for conducting their businesses in the cloud as compared to in-house based environments. The findings could also mean that users have seen considerable reduction in the cost associated with maintenance and deployment of applications to support and execute business operations.

4.3.4.4. Theme 4: Flexibility

Flexibility presents a number of computing capacities and resources that can be added or removed as per customers' requirements (Youssef, 2012). This theme is discussed and supported in this literature. Carroll et al. (2011) and Zabalza et al. (2012) reported extensively about flexibility as an important characteristic in the cloud, and claimed that organisations that adopted this technology, had also established this theme as a benefit. The research findings could mean that respondents considered this theme as a benefit because they valued the particular characteristic that the theme offered in supporting and meeting their business goals. The findings could also mean that respondents found the theme helpful in assisting them in the deployment and maintenance of IT resources in cloud computing as compared to more rigid and complex processes in-house based environments.

4.3.4.5. Theme 5: Greater mobility

Greater mobility can be explained as a high possibility to move resources and adjust them based on customers' needs. The research findings could mean that respondents have perceived the benefit that the theme offered in moving resources and adjusting them to meet their business goals.

Zabalza et al. (2012) and Joshua and Ogwelela (2013) reported that this theme was considered as a benefit and an important characteristic in cloud computing. As discussed in the literature review, Joshua and Ogwelela (2013) argued that organisations that adopted cloud computing had also established this theme as a benefit. These research findings were supported in the literature.

4.3.4.6. Theme 6: Customisation

Customisation provides a high possibility to reconfigure IT resources and infrastructures to suit the customers' needs (Carroll et al., 2011). Carroll et al. (2011), Youssef (2012), and Zalbaza et al. (2012) explained that this respondents' theme was an important benefit and an important characteristic in cloud computing. They also claimed that organisations that adopted cloud computing, had established this theme as a benefit.

The research findings could mean that the respondents perceived this theme as an important benefit because of the remarkable characteristic that the theme presents in cloud computing. Furthermore, respondents might have perceived opportunities to consider this theme as a benefit because it provides the most sustainable ways to reconfigure IT resources in order to achieve organisational goals. Considered as a technology enabler, cloud computing through customisation provides flexible ways to rearrange resources in a cost-effective manner as compared to in-house technologies.

4.3.4.7. Theme 7: Lower-implementation and maintenance

Lower-implementation and maintenance means a lower cost to implement and maintain services in the cloud. The findings on lower-implementation and maintenance were discussed in the literature. Cowhey and Kleeman (2013) reported on the importance of this theme in the cloud, and its influence in reducing up-front capital cost to implement and maintain a technology. In addition, they explained that organisations that adopted cloud computing had established this theme as a benefit.

The research findings revealed that respondents pointed out lower-implementation and maintenance as a benefit in cloud computing. The findings could mean that respondents might have perceived the extent of the theme's benefit in the way they implemented and maintained IT resources. In identifying this theme as a benefit in cloud computing could mean that respondents have become aware of the reduced costs associated with the running and implementation of their business operations. Erol et al. (2012) further explained that SMEs did not only perceive the reduction in cost as a benefit but also a greater opportunity to compete nationally and internationally because of the reduced up-front capital and operational costs involved in deploying and maintaining IT resources.

4.3.4.8. Theme 8: Scalability

Scalability provides the higher ability to handle IT resources and accommodate the growth as per customers' needs (Youssef, 2012). As discussed in the literature review, this theme was highlighted as an important characteristic in cloud computing. The research findings indicated that respondents considered this theme as a benefit in cloud computing. The findings could mean that respondents perceived the positive impact that the theme presented to their businesses in meeting their needs. The findings could also mean that the respondents acknowledged the high-level of customisation and flexibility that the theme offers in the cloud as an important contribution to the sustainability of their businesses.

The research findings on this theme were discussed in section of the literature review. Brohi and Bamiah (2011) explained that organisations that adopted cloud computing had cited this theme as a benefit.

4.3.4.9. Theme 9: Agility

Agility supports a high flexibility to transform and customize resources based on customers' needs (Carroll et al., 2011). Respondents considered this theme as an important benefit in cloud computing. The findings could mean that respondents perceived the important contribution that this theme offers in transforming and deploying resources. The other reason why respondents might have considered this theme as a benefit could be because the theme provides a high level of customisation for any technology, which could be an important contribution to their business operations.

The research findings on this theme were discussed in the literature review. Carroll et al. (2011) reported extensively on this characteristic and its perceived benefits. In addition, they explained that organisations that adopted cloud computing, have also identified this theme as a benefit.

4.3.4.10. Theme 10: Sustainability

Sustainability refers to the possibility of an organisation to continue using the services and IT resources due to the high availability in the cloud (Youssef, 2012). The research findings on this theme were discussed in the literature review. Zabalza et al. (2012) explained that the sustainability of a business should be the focus of its existence. In addition, Zabalza et al. (2012) argued that cloud computing technologies offer incredible capabilities to sustain IT side of a business.

The findings could mean that respondents have realised the benefits that the theme offers to their businesses. The findings could also mean that respondents perceived the positive contribution of the theme whereby customers continue to use and access their services in the cloud. This perceived benefit has implications for business sustainability and existence. Avram (2014) reported on the high-cost to conduct IT businesses in house-based environments, and this theme is perceived by respondents as an important factor to sustain the business. Youssef (2012) and Carroll et al. (2011) reported that organisations that adopted cloud computing, cited this theme as a benefit.

4.3.4.11. Theme 11: Virtualisation

Virtualisation is considered as an important characteristic in cloud computing. The theme enables a great level of performance (Baskar et al., 2013). The research findings on virtualisation were discussed in the literature review. The findings could mean that respondents perceive improved performance associated with cloud computing as a significant contribution to the sustainability of their businesses. By identifying this theme as a benefit, respondents realised the capabilities that the theme offers in assigning and re-assigning more complex processes in cloud computing as compared to in-house environments, as well as the reduced cost associated to meet their business needs.

Carlin and Curran (2012) and Sravani and Nivedita (2013) reported extensively in the literature review on this theme and its importance with regard to the performance process. In addition, they claimed that organisations that adopted cloud computing, had also mentioned this theme as a benefit.

4.3.4.12. Theme 12: High Performance

High performance means that there is a high capacity of resources readily available in the cloud for use when needed by consumers at any given time. As discussed in the literature review, this theme refers to various performance aspects emanating from virtualisation (Baskar et al., 2013). Baskar et al. (2013) reported extensively on the higher performance aspects associated with cloud computing adoption and

usage, and further explained that organisations that adopted cloud computing, had also established this theme as a benefit.

4.3.4.13. Theme 13: Better IT Resource Management

Better IT resource management means how easy it is to manage IT resources in order to respond to customers' needs. The research findings could mean that respondents realised the important contribution of the theme in maximising growth and profit in their organisation. The findings could also mean that respondents had become aware of the important influence that the theme played in managing resources in their organisation and how easy the management process had become in cloud computing.

The research findings on this theme were discussed and argued in the literature review. Youssef (2012) argued that this theme was considered as a benefit by organisations that adopted cloud computing.

4.3.4.14. Theme 14: Improved automation

Improved automation refers to the capabilities that cloud computing offers to be automated based on users' requirements. The research findings on this theme were discussed in the literature review. By identifying this theme as a benefit, the findings could mean that respondents realised the important contribution that cloud computing technology model offers in improving the automation process. Youssef (2012) reported extensively on the remarkable ability of resources that could be provisioned and released on-demand in cloud computing. In addition, Youssef (2012) explained that organisations that adopted cloud computing cited this theme as a benefit.

4.3.4.15. Theme 15: Improved security

Improved security denotes that security is tailored to suit users' requirements. The literature explained that the general perception about this theme is that it poses serious risks, and thus is hardly perceived as a benefit. Chang et al. (2016) reported extensively on the benefits that this theme offers in cloud computing with regard to the security schemes and mechanisms that have been greatly tailored to suit users' requirements. The findings could also mean that respondents acknowledged the challenges and complexities associated with security mechanisms, which have been made much simpler in cloud computing.

The research findings on this theme were discussed in the literature review by Sravani and Nivedita (2012), Goyal and Supriya (2013), and Carroll et al. (2011). They explained that organisations that adopted cloud computing, mentioned this theme as a benefit.

4.3.5.16. Theme 16: Green IT data centers

Green IT data centers refer to the high provision of IT resources and services with minimal needs for power consumption. The premise of considering this theme as a benefit was argued by Walden (2012), who claimed that cloud computing technology could be more energy efficient as compared to traditional premises-based computing technologies. The research findings indicated that respondents considered this theme as a benefit. The findings could mean that respondents realised the contribution of the theme on the business. The findings could also mean that the respondents have acknowledged the capabilities that the theme presents to make the business more energy-efficient with direct implication on its sustainability.

The research findings on this theme were discussed and supported in the literature review. Kaur and Singh (2013), Carlin and Curran (2012), and Kulkarni et al. (2012) reported that organisations that adopted cloud computing, cited this theme as a benefit.

4.3.5.17. Summary and analysis for category D

The discussion on this category provided valuable information on the benefits, as well as perceived usefulness of cloud computing. The findings from the categories and themes supported the theory and findings of previous studies as presented in Chapter 2.

The benefits and perceived usefulness of cloud computing were discussed by Youssef (2012), Awa et al., (2012), Cowhey and Kleeman (2013), and Carroll et al. (2011).

4.3.6. Category E: Limitations and concerns in cloud computing

This category discusses the limitations and concerns in cloud computing. The table below represents the themes generated for **category E**:

Category E : Limitations and concerns in cloud computing				
Frequency count of themes		**Responses No**	**Percentage %**	**Accumulated Value**
Impact of security in cloud computing		10	100%	16
Challenges and risks in cloud computing		9	90%	13
Security issues in cloud computing		9	90%	13
Impact of challenges in cloud computing		9	90%	13
Impact of availability in cloud computing		8	80%	10
Lack of awareness of cloud computing		5	50%	4
Performance issues in CC		4	40%	2
Availability issues in CC		4	40%	2
Need for more computing devices		3	30%	1
Total scores		**61**		

Table 4.12: Number of relative frequencies for themes on limitations and concerns in cloud computing.

4.3.6.1. Theme 1: Impact of security in cloud computing

This theme refers to the impact that the security issues have on the organisation. The findings indicated that respondents considered this theme to have a negative impact on their business. The findings also indicated that this theme had a negative impact on the business, and that its related consequences were not negligible.

The research findings presented in **Table 4.12** were supported in the literature review. Goyal and Supriya (2013) reported on the consequences that this theme had on the consumers, and possible implications on the business. In addition, Goyal and Supriya (2013) claimed that while consumers and service providers tried to reduce the risk of security in cloud computing, there was little room to make a choice. Goyal and Supriya (2013) explained that this issue could negatively impact on the business, service providers and consumers might find it difficult to trust the service or even try to use the service in cloud computing.

4.3.6.2. Theme 2: Challenges and risks in cloud computing

Challenges and risks in cloud computing were perceived in the literature review as a limitation and a concern in cloud computing adoption and usage (Chou, 2015). The research findings presented in Table 4.12 were discussed in the literature review. The section on the challenges and risks in cloud computing

constitutes an important aspect in the literature. The research findings could mean that acknowledged the challenges and risks associated with cloud computing usage. The literature indicated that implementation of the cloud technology model and the deployment of resources constituted important challenges and risks in cloud computing. The literature further indicated that the risks posed in cloud computing were not negligible since the management of resources required a high level of expertise. The research findings could also mean that respondents were concerned for not being in full control of their businesses when deploying their IT resources in the cloud.

Sravani and Nivedita (2012) argued extensively on this theme and its implications. In addition, they claimed that organisations that adopted cloud computing, cited this theme as a limitation and concern in the adoption and usage process.

4.3.6.3. Theme 3: Security issues in cloud computing

Security issues in cloud computing refer to all aspects of security that respondents can think of in cloud computing. Security in cloud computing was considered as an important aspect and characteristic (Baskar et al., 2012). The research findings on this theme were discussed in the literature review.

Security issues associated with cloud computing were discussed in section of the literature review by Murugaboopathi et al. (2013), Carroll et al. (2011), and Goyal and Supriya (2013). They explained the various aspects that consumers and service providers were faced with in cloud computing such as privacy, confidentiality, authentication, encryption, accessibility just to name a few. They argued that these aspects presented a big threat toward cloud adoption and implementation. In addition, Murugaboopathi et al. (2013), Carroll et al. (2011), and Goyal and Supriya (2013) claimed that organisations that adopted cloud computing had mentioned this theme as a limitation and a concern.

4.3.6.4. Theme 4: Impact of challenges in cloud computing

The impact of challenges in cloud computing refers to the results or impacts of challenges on businesses in the adoption and usage process. The negative impact of challenges in cloud computing were discussed in the literature review. The research findings indicated that the immediate consequence of the impact might influence users not to adopt or use the service. Chang et al. (2016) presented a list of challenges associated with cloud computing that had a negative impact on the adoption and usage of services. As a result of the negative impact of challenges in cloud computing, new mechanisms should be put in place to address them. In addition, Chang et al. (2016) claimed that there was still quite a lot to be done to reduce these challenges, and organisations that had adopted cloud computing should think about new ways to address the impact. Murugaboopathi et al. (2013) indicated that these challenges were so diverse, and their implications in cloud computing adoption and usage process were significant.

4.3.6.5. Theme 5: Impact of availability in cloud computing

This theme refers to the result that availability poses to the business in the adoption and usage of cloud computing. As discussed in section of the literature review, this theme has huge consequences in a business context and ramifications in case of failure can be devastating (Buyya et al., 2011).

The research findings presented in **Table 4.12** were discussed in the literature review. Goyal and Supriya (2013) indicated that this theme might have negative consequences that could lead users not to use cloud computing services. The research findings on the impact of availability in cloud computing were extensively discussed in the literature review by Buyya et al. (2011), Chang et al. (2016), and Goyal and Supriya (2013).

4.3.6.6. Theme 6: Lack of awareness of cloud computing

Lack of awareness of cloud computing is considered in this study as a limitation or concern in the adoption or usage of cloud computing. The research findings on this theme were discussed in the literature review. Awa et al. (2012) discussed issues around awareness and its implications in generating maximum usage of technology and competitive advantage. In addition, the findings were discussed in relation to the competency, technology know-how and IT required skills to use a specific technology, which should be a contributing factor to the adoption and usage of a specific technology (Awa et al., 2012 and Arpaci et al., 2012).

4.3.6.7. Theme 7: Performance issues in cloud computing

While cloud computing is commended for its performance through virtualisation process, the research findings reported on the limitations or complexities associated with performance issues. The findings presented in **Table 4.12** were discussed in the literature review. Sravani and Nivedita (2013) reported extensively on this theme and its complexities, as well as challenges associated with virtualisation in cloud computing. The literature discussed the contributions of cloud computing in ensuring portability of higher functions, aggregation of physical resources and consolidations of resources through virtualisation. At the same time, the findings revealed that respondents realised the complexities associated with all aspects that performance through virtualisation posed in cloud computing.

4.3.6.8. Theme 8: Availability issues in cloud computing

Availability in cloud computing means the capabilities that cloud computing services were made readily available to users whenever they were needed. The research findings indicated that this theme was as a limitation and a concern in cloud computing. The findings on this theme were discussed in section of the literature review. Sravani and Nivedita (2012) explained that this theme presented a number of challenges

in the implementation process of cloud computing and organisations that adopted cloud computing cited this theme as a concern.

The findings could mean that respondents realised the impact of the challenges associated with availability of resources in cloud computing. Goyal and Surpriya (2013) reported that services in cloud computing provide redundancy to ensure that resources are available everywhere and every time to all users. While availability is an important characteristic in cloud computing ensuring that users access resources any time and everywhere, respondents pointed out the serious risks associated with availability in cloud computing. The findings could mean that respondents are concerned by any form of data unavailability or intermittent interruption. By identifying this theme as a challenge, respondents have also realised the negative impact that this theme posed to the sustainability of their businesses.

4.3.6.9. Theme 9: Need for more computing devices

The need for more computing devices was established by respondents as another limitation in the adoption and usage of cloud computing services. Though this theme was discussed in the literature review under the more general aspects supporting the environmental construct of the study's conceptual framework, the literature explains that this theme constitutes a limitation in the adoption of cloud computing technology. Awa et al. (2012) and Arpaci et al. (2012) presented arguments on the technology supporting infrastructure, which play an important role in the usage or adoption of a technology. They claimed that the lack of the appropriate technology to support the IT infrastructure might constitute a limiting factor to the adoption and usage process of cloud computing.

4.3.6.10. Summary and analysis for category E

This category discussed the themes on the limitations and challenges in cloud computing. The findings indicated that the themes presented in **Table 4.12** were discussed in the literature review. The research findings on **category E** indicated that the limitations and challenges in cloud computing were likely to discourage users to use cloud services.

Goyal and Supriya (2013) proposed that cloud computing users have to come up with mechanisms on how to deal with most of these limitations and concerns. The literature also pointed out that while cloud computing presented various benefits, organisations have a little choice not to adopt cloud computing when exposed to some of these concerns and challenges.

4.3.7. Category F: Service Level Agreement

This category discusses the perceptions of users on the service level agreement, and on how it affects the adoption and usage of cloud computing. The discussion regarding this category generated one theme code: service level agreement being the foundation for cloud computing adoption and usage.

The table below represents the themes generated for **category F**:

Category F : Service Level Agreement				
Theme Codes	**Frequency count of themes/sub-themes**	**Responses No.**	**Percentage %**	**Accumulated Value**
Service level agreement is the foundation for migrating to Cloud Computing	Compliance, benchmarking, provision of quality service, instrumental in the decision-making			
	10	10	100%	100%
Total scores	**10**			

Table 4.13: Number of relative frequencies for themes on service level agreement.

4.3.7.1. Theme code: SLA is a foundation for cloud computing adoption and usage

This theme code discusses the findings on SLA as a foundation for adopting and using cloud computing. The research findings on this theme indicated that respondents were of the view that the service level agreement should be the foundation since SLA was more about compliance, benchmarking, provision of service. The findings also revealed that SLA was instrumental in the decision making. The research findings presented in **Table 4.13** were discussed in section of the literature review. Buyya et al. (2011) argued that SLAs should be considered as a foundation to facilitate the adoption of cloud computing. They reported that the compliance of SLAs was to support key considerations in the provision of the service related to its quality and the service benchmark. In addition, Buyya et al. (2011) explained that various disputes in the provision of cloud services could be easily eliminated using SLAs. They also explained that SLA goes hand in hand with a better decision-making and accountability.

Mohammed et al. (2012) reported that SLAs should be the starting point in the adoption process given the fact that many service providers and consumers were not in a position to interpret all complex issues

and their immediate implications. Furthermore, they reported that these complexities could not be easily explained or translated in a manner that everyone could understand.

4.3.7.2. Summary and analysis for category F

Choudhary (2012) reported in section of the literature review that SLAs constituted an important aspect in the provision of service, as well as an important metric in cloud computing. The research findings on SLAs as a foundation for adopting and using cloud computing were discussed in the literature review. The research findings supported key considerations in the provision of cloud services such as compliance, accountability, improved decision-making, as well as improved service. The findings also indicated that some of the most complex issues in cloud computing could be easily resolved using SLAs as a standard for all cloud computing adoption and usage processes.

4.4. Conclusion

This chapter discussed the qualitative findings and analysis. The chapter consisted of two sections. The first section discussed the pilot findings followed by the final qualitative findings for the main study. The pilot study was conducted in order to test the interview schedule for accuracy.

The qualitative research findings used the thematic approach, whereby steps were used to interpret all the themes generated by the respondents. All the research interview questions were grouped in six distinct categories, namely, demographic details, adoption levels of cloud computing, cloud computing usage, benefits and usefulness of using cloud computing, limitations and concerns in cloud computing, as well as service level agreement.

The findings established the position of the respondents in the organisation, the organisation structure, as well as the scope of the business. The research findings also established the computing devices used, the type of software used for all the computing devices, as well as the primary users of these computing devices. The users of cloud computing and non-users of cloud computing were identified.

The types of services used by users were identified, and among them SaaS and IaaS were the most used as compared to PaaS and XaaS. The following factors were identified by users as the most cited benefits in cloud computing: awareness, cost-efficiency, saving cost, flexibility, great mobility, customisation, lower-implementation/maintenance, scalability, agility, sustainability, as well as virtualisation. The impact of security in cloud computing was identified as one of the most cited concerns in cloud computing.

The research findings indicated that service level agreements should be the foundation for adopting and using cloud computing. The sub-themes that were generated in support of this statement included compliance, benchmarking, provision of quality service, as well as better decision or improved decision-making.

Chapter 5: Quantitative findings and analysis

5.1. Introduction

A discussion on the qualitative findings and analysis was presented in Chapter 4. This chapter discusses the quantitative findings and analysis. This chapter uses descriptive and inferential statistics to interpret the data findings. The chapter discusses the following aspects: The pilot questionnaire and administration is presented in section 5.2, followed by the quantitative findings and analysis for the main study in section 5.3. The interpretation of the concepts for the research conceptual framework is discussed in section 5.4, followed by the summary for the chapter in section 5.5.

5.2. Pilot questionnaire administration

A pilot test is defined as a feasibility study that is conducted on a small scale version of the sample population for the major study (Serakan and Bougie, 2010). The test was primarily conducted to detect any weaknesses in the design of the instrument (Cooper and Schindler, 2013), as well as the following aspects:

- Layout and design of the questionnaire.
- Respondent's comprehension of the questionnaire.
- Wording and ambiguity of the questions.
- Missing categorical functions.

The pilot questionnaire was administered on six respondents. The pilot questionnaire was tested to see whether any changes were required in the final questionnaire. The pilot questionnaire consisted of six sections and each section is discussed below.

The first section of the pilot questionnaire addressed the demographic details of the respondents. The demographic details included the employment status, the current position, and the size of the organisation. After administering the pilot questionnaire, the findings indicated that there was no need to make changes to this section. This section was therefore used in the final version of the research questionnaire.

The second section of the pilot questionnaire addressed the adoption levels of cloud computing. This section included the adoption levels of cloud computing by respondents, the likelihood of adopting cloud computing by non-users, the challenges faced by non-users in the adoption and usage process of cloud computing, as well as the adoption levels by users of cloud computing. The pilot findings indicated that there was not enough information provided for non-users to answer the sub-section related to the likelihood of adopting or using cloud computing. There was a need to provide a brief description of cloud

services used in order for the non-users to select from. These changes were included in the final version of the research questionnaire.

The third section of the pilot questionnaire addressed the benefits of cloud computing. A list of benefits was provided to respondents to select from, namely, cost-efficiency, lower-implementation, scalability, agility, higher-performance of resources, higher reliability and availability, better IT resource management, improved security, saving time and cost, sustainability, flexibility, rapid development, greater mobility, improved automation, customisation, virtualisation, as well as green IT data centres. After administering the pilot questionnaire, the findings indicated that there was no need to change this section since respondents were in a position to interpret the question. The section was included in the final version of the research questionnaire.

The fourth section of the pilot questionnaire addressed the factors influencing the adoption and usage of cloud computing. The following factors were included in the questionnaire, namely, improved service level management, cost-efficiency, standard-based security, better accountability and auditability, improved performance as well as no lock-in terms. The pilot findings indicated that the respondents were able to choose from these factors. There was no need to amend the question and make any changes. The section was used in the final version of the research questionnaire.

The fifth section of the pilot questionnaire addressed the perceptions of the respondents on the limitations and concerns in cloud computing. The following factors were included in this section, namely, data privacy and security, availability, trust and transparency, shared technology issues, disaster recovery, service level agreement, regulatory and legal issues, challenges of security schemes, virtualisation paradigm, policy integration and governance, as well as risks of cloud computing technology. After administering the pilot questionnaire, the findings indicated that there was no ambiguity in the formulation of the question. The findings indicated that the respondents were able to interpret the question. The section was used in the final version of the research questionnaire.

The sixth and last section of the pilot questionnaire assessed the perceptions of the respondents on whether the service level agreement should form the basis or the foundation for cloud computing adoption and usage. The pilot findings indicated that the respondents were in a position to answer and interpret the question. No changes or modifications were needed in this section. This section was therefore used in the final version of the research questionnaire.

In conclusion, the pilot administration of the research questionnaire was used for the purpose of testing the reliability and validity of the research instrument. The pilot findings indicated that there was a need

to modify a sub-section of section 2 of the research questionnaire to allow non-users to select the appropriate cloud services. These changes were included in the final version of the research questionnaire. There was no need to make any other changes in the research questionnaire since the respondents were able to interpret clearly the questions for all the remaining sections.

5.3. Quantitative findings and analysis for the main study

This section presents the quantitative findings for the main study. The findings were analysed using a number of tests to interpret data. Some of the tests used in this study include descriptive statistics, Chi-Square goodness-of-fit-test, Wilcoxon Signed Ranks test, Mann Witney U test, as well as the Binomial test. The quantitative analysis used the SPSS 22 package to analyse all the data.

5.3.1. Demographic details

This section was designed to assess three general areas in the study, namely, the employment status, the position of the employees in the organisation, and the number of employees in the organisation.

The findings on the demographic details played an important role in the investigation of the phenomenon under investigation. The following figure represents the findings on the demographic details, and the discussion of each aspect for the demographic details is presented in a sub-section.

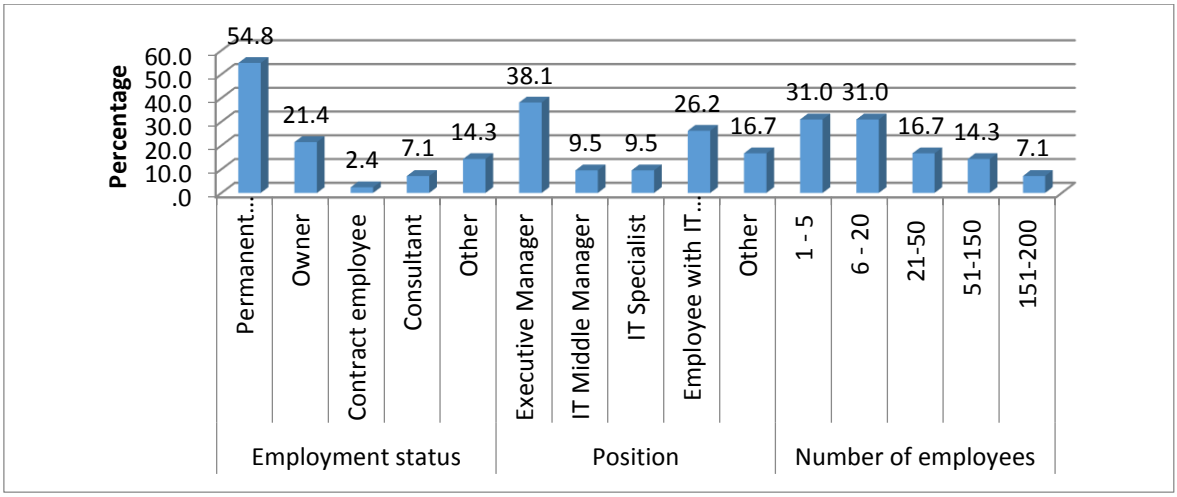

Figure 5.1: Demographic details of respondents

5.3.1.1. Employment status

The findings on the employment status indicate that 54.8% of respondents were permanent employees, 21.4% of respondents were owners, 14.3% of respondents fell under the "other category", 7.1% of

respondents were consultants, and the remaining 2.4% of respondents were contract employees. The frequency table for the employment status is presented in appendix 1.

The discussion on employment status was important in order to relate to the criteria set in this study in classifying an organisation as an SME. The Dti (2007) presented a number of criteria to classify an organisation as an SME. As discussed in the literature, the findings supported these criteria on the employment status. The findings also indicated that permanent employees accounted for the majority of the respondents who took part in the research.

5.3.1.2. Position in the organisation

The findings on the position of the respondent in the enterprise indicate that 38.1% of respondents were executive managers, 26.2% of respondents were employees with IT expertise or knowledge, 16.7 % of employees fell under the other category, 9.5% of employees were middle managers, and the remaining 9.5% were IT specialists. The frequency table for the position of respondents in the organisation is presented in appendix 1.

Arpaci et al. (2012) reported that the level of influence of a technology could be significant if the changes were encouraged and envisaged from the top management level. They argued that a level of awareness in this regard may constitute a starting point for a discussion on cloud computing adoption and usage. The findings indicated that there was a high frequency of executive managers that participated in the study. The findings also indicated that there could be a high possibility that most of organisations' owners played a more executive role in their own organisations, and this could have had an impact in the adoption process.

5.3.1.3. Number of employees

Though this section fell under the more general aspects in the study, the number of employees constitutes an important variable supporting the study's conceptual framework. The findings indicate that 31.0% of respondents' organisations had 1-6 employees, 31.0% of respondents' organisations had 6-20 employees, 16% of respondents' organisations had 21-50 employees, 14.3% of respondents' organisations had 51-150 employees, and 7.1% of respondents' organisations had 151-200 employees.

The discussion on the number of employees in the organisation adds more value to what has been discussed in the previous two sections on the criteria set to establish and consider an SME in South Africa, and particularly in Gauteng. The Dti (2007) reported that in order for an organisation to be considered as an SME, it should meet the size criteria, which means it should not have more than 200 employees. Arpaci et al. (2012) reported on the importance of the size of the organisation as a key characteristic for the organisational construct upon which the technology adoption level was largely depending on.

5.3.1.4. Comments and summary for the demographic details

5.3.1.4.1. Employment status

This section discussed the employment status of respondents in the organisation. Though this section discussed the more general aspects of respondents in the organisation, the findings assisted to explore further aspects under investigation. The employment status of respondents in the organisation may have some form of influence in the adoption and usage of cloud computing in the sense that the adoption and usage of a technology might need to get the backing of a senior person in the organisation. Given the criteria set by TheDti (2007) to consider an SME, an owner may execute various functions or roles that could influence the technological direction of the organisation.

5.3.1.4.2. Position in the enterprise

This section discussed the position of respondents in the organisation. This section also discussed the more general aspects of the respondents in the organisation. The findings indicated that the position of respondents in the organisation plays an important role in the implementation of a technology. Arpaci et al. (2010) discussed extensively in the literature on the position of the respondents or employees in the organisation and the level of awareness of a technology as crucial in the adoption process.

5.3.1.4.3. Number of employees

This section discussed the number of employees in the organisation. This section also discussed the more general aspects of respondents in the organisation. The findings indicated that the number of employees played an important and crucial role in the organisation. Though the number of employees was discussed under the more general aspects of the organisation, the findings supported the key criteria to consider an organisation as an SME.

5.3.2. Adoption and usage of cloud computing

This section was designed to establish users and non-users of cloud computing. The following figure represents the adoption and usage levels of cloud computing among the respondents:

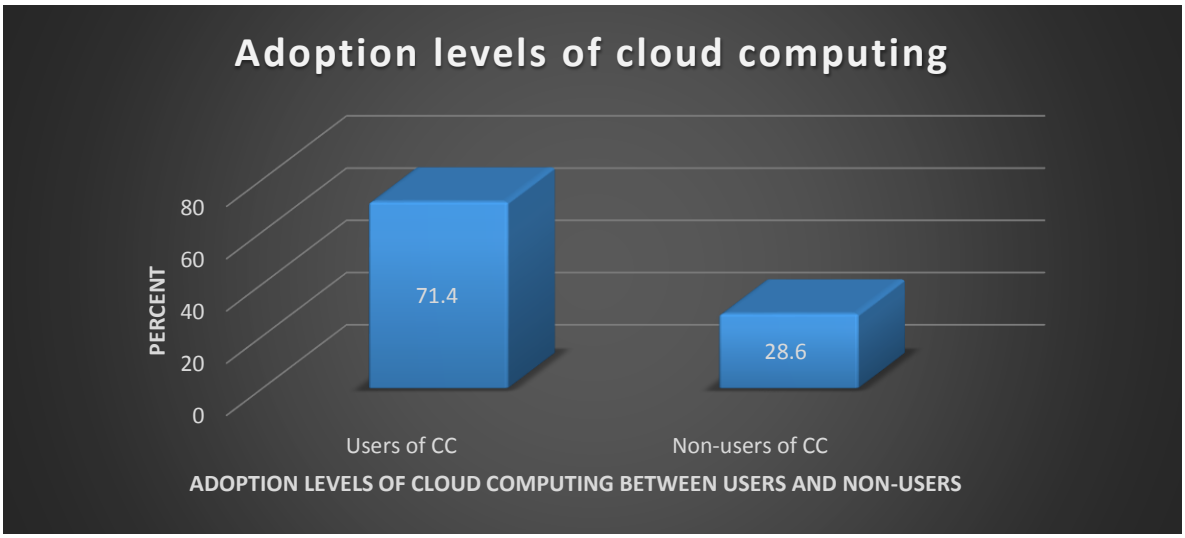

Figure 5.2: The adoption levels of cloud computing

The research findings on the adoption levels of cloud computing indicate that 71.4% of the respondents used cloud computing as compared to 28.6% of the respondents who did not use cloud computing. The frequency table on the adoption levels is presented in appendix 1.

The findings on the adoption levels of cloud computing were discussed in the literature review. Awa et al. (2012) reported that respondents who adopted cloud computing seemed to understand the benefits and related challenges or risks associated with the adoption and usage of the technology model. In addition, they explained that respondents who used cloud computing seemed to be in a position to engage on related aspects of technological change or transformation. They also reported that these users were in a position to engage on aspects that generate maximum usage of IT and provide competitive advantage for the organisation.

5.3.2.1. Non-users planning to use cloud computing

This section discusses the findings of non-users who were planning to use cloud computing. The findings indicate that 75% of non-users were planning to use cloud computing and 25% of respondents were not planning to use cloud computing. In order to test if there was a significant proportion of non-users who answered yes/no, a binomial test was used. The results show that a significant proportion of the sample indicated that they are planning to move to cloud computing (p=.008). The discussion on the reasons for using and not using cloud computing are further elaborated in this chapter.

5.3.2.2. Likelihood of adopting cloud computing by non-users

This section discusses the likelihood of non-users to adopt cloud computing services. The following graph indicates the likelihood of non-users to adopt cloud computing:

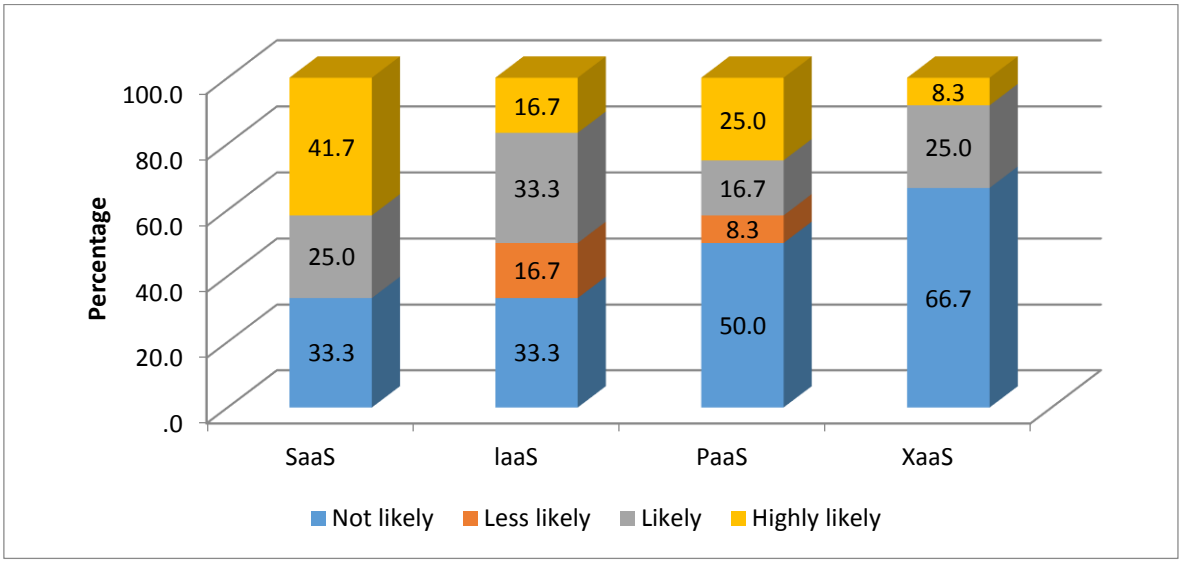

Figure 5.3: Likelihood of non-users to adopt cloud computing

Using the frequency test, the results show that the likelihood of adopting SaaS was highly likely as compared to the likelihood of adopting the remaining services, namely, IaaS, PaaS, and XaaS. The tables on the likelihood of adopting SaaS, IaaS, PaaS, as well as XaaS are presented in appendix 1.

The findings indicate that 41.7% of non-users were highly likely to adopt SaaS, 25.0% of non-users were likely to adopt SaaS, and 33.3% of non-users were not likely to adopt SaaS. The findings also indicate that 33.3% of non-users were not likely to adopt IaaS, 33,3% of non-users were likely to adopt IaaS,16.7% of non-users were less likely to adopt IaaS, and 16.7% of non-users were highly likely to adopt IaaS.

The findings indicate that 25.0% of non-users were highly likely to adopt PaaS, 16.7% of non-users were likely to adopt PaaS, 8.3% of non-users were less likely to adopt PaaS, and 50.0% of non-users were not likely to adopt PaaS. The findings also indicate that 8.3% of non-users were highly likely to adopt XaaS, 25.0% of non-users were likely to adopt PaaS as compared to 66.7% of non-users who were not likely to adopt XaaS.

In order to ascertain whether any of the response options was selected significantly more/less often than the others, the Chi-Square goodness-of-fit-test was used. The results show that a significant number of non-users indicated that they were not likely to adopt XaaS (χ^2 (3, N=12) = 12.667, p=.005). Since XaaS is more customised, Matuszak and Lamoureux (2013) reported that its adoption was motivated by some forms of transformation and changes required by the organisation. Awa et al. (2012) reported that the

adoption of services in the cloud was also influenced by an awareness level of users about the respective services. The findings indicated that the likelihood of adopting SaaS by non-users was likely very high and this was further discussed in the literature review. Brown and Madden (2012) reported that the likelihood of adopting SaaS was motivated by the fact that these services were readily available and were considered as a starting point in the adoption of cloud services.

5.3.2.3. Challenges faced by non-users in the adoption process of cloud computing

This section discusses the challenges faced by non-users in the adoption of cloud computing. Chou (2015) presents a list of challenges in the adoption process of cloud computing, and only the following were identified for the non-users: awareness, implementation, complexities, risks, as well as qualified IT personnel. The following figure shows the challenges faced by non-users in the adoption process of cloud computing:

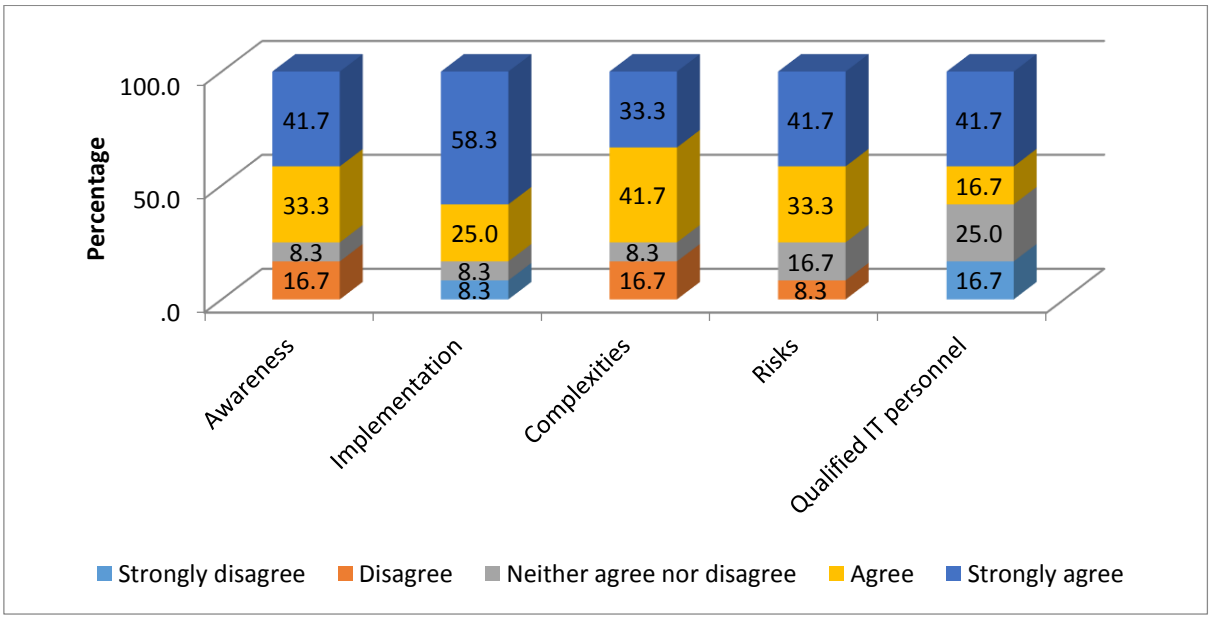

Figure 5.4: Challenges faced by non-users in the adoption process of cloud computing

a. Awareness as a challenge for non-users in the adoption process of cloud computing

The findings indicate that 16.7% of non-users disagreed that awareness was a challenge, 8.5% of non-users neither agreed nor disagreed that awareness was a challenge, 33.3% of non- users agreed that awareness was a challenge, and 41.7% of non-users strongly agreed that awareness was a challenge in the adoption process of cloud computing. The frequency table about awareness as a challenge for non-users is found in appendix 1.

b. Implementation as a challenge for non-users in the adoption process of cloud computing

The findings indicate that 8.3% of non-users strongly disagreed that implementation was a challenge, 8.3% of non-users neither agreed nor disagreed with implementation as a challenge, 25.0% of non-users agreed that implementation was a challenge, 58.3% of non- users strongly agreed that implementation was a challenge in the adoption process of cloud computing. The frequency table about implementation as a challenge for non-users is found in appendix 1.

c. Complexities as a challenge for non-users in the adoption process of cloud computing

The findings indicate 16.7% of non- users disagreed that complexities were a challenge in the adoption process of cloud computing, 8.3% of non- users neither agreed nor disagreed with complexities as a challenge in cloud computing, 41.7% of non-users agreed with complexities as a challenges, and 33.3% of non- users strongly agreed that complexities were a challenge in cloud computing. The frequency table about complexities as a challenge for non- users is found in appendix 1.

d. Risks as a challenge for non-users in the adoption process of cloud computing

The findings indicate that 8.3% of non- users disagreed that risks were a challenge in the adoption process of cloud computing, 16.7% of non-users neither agreed nor disagreed that risks were a challenge in the adoption process of cloud computing, 33.3% of non-users agreed that risks were a challenge, and 41.7% of non-users strongly agreed that risks were a challenge in cloud computing. The frequency table about risks as a challenge for non-users is found in appendix 1.

e. Qualified IT personnel as a challenge for non-users in the adoption process of cloud computing

The findings indicate 16.7% of non-users strongly disagreed that qualified IT personnel was a challenge in the adoption process of cloud computing, 25.0% of non-users neither agreed nor disagreed that qualified IT personnel was a challenge, 16.7% of non-users agreed that qualified IT personnel was a challenge, and 41.7% of non-users strongly agreed that qualified IT personnel was a challenge in the adoption process of cloud computing adoption. The frequency table about qualified IT personnel as a challenge for non-users is found in appendix 1.

There was a need to test whether the mean score was significantly different from a neutral score of '3'. If there is a significant difference, one can identify either agreement or disagreement from the size of the mean (>3 or <3). The Wilcoxon signed ranks test was used in this regard. The findings indicated that there was a significant agreement among non-users that the following were the most important

challenges: awareness (Z (N=12) =-2.377, p=.017), implementation (Z(N=12) =-2.373, p=.018), complexities (Z(N=12) =-2.299, p=.022, and risks (Z(N=12) =-2.565, p=010).

The following **Figure 5.5** represents the average agreement and neutral scores for non- users in the adoption process of cloud computing:

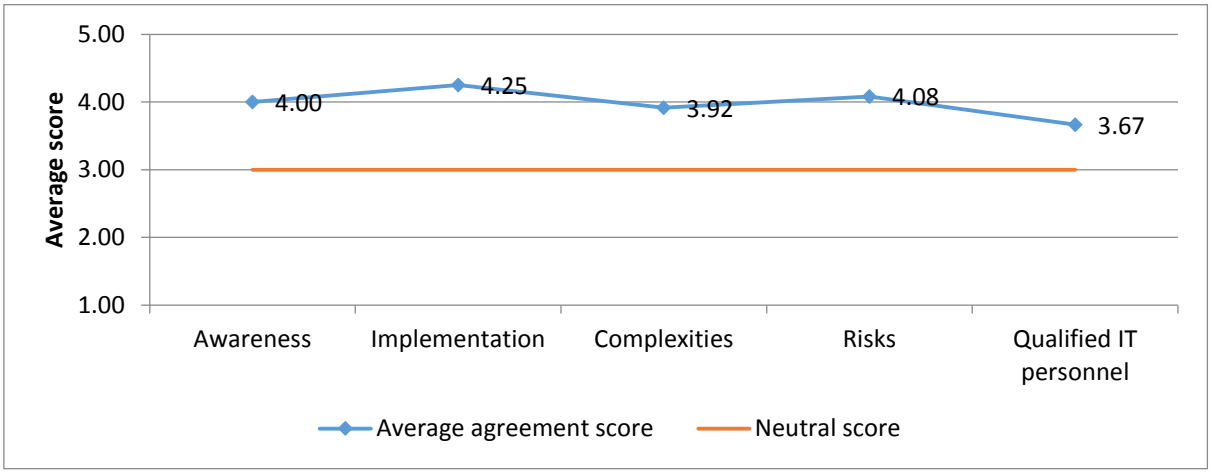

Figure 5.5: Average agreement and neutral scores for non-users in cloud computing.

5.3.2.4. Users of cloud computing

The following section discusses the adoption levels of cloud computing services by users. The figure below represents the adoption levels of cloud computing by users.

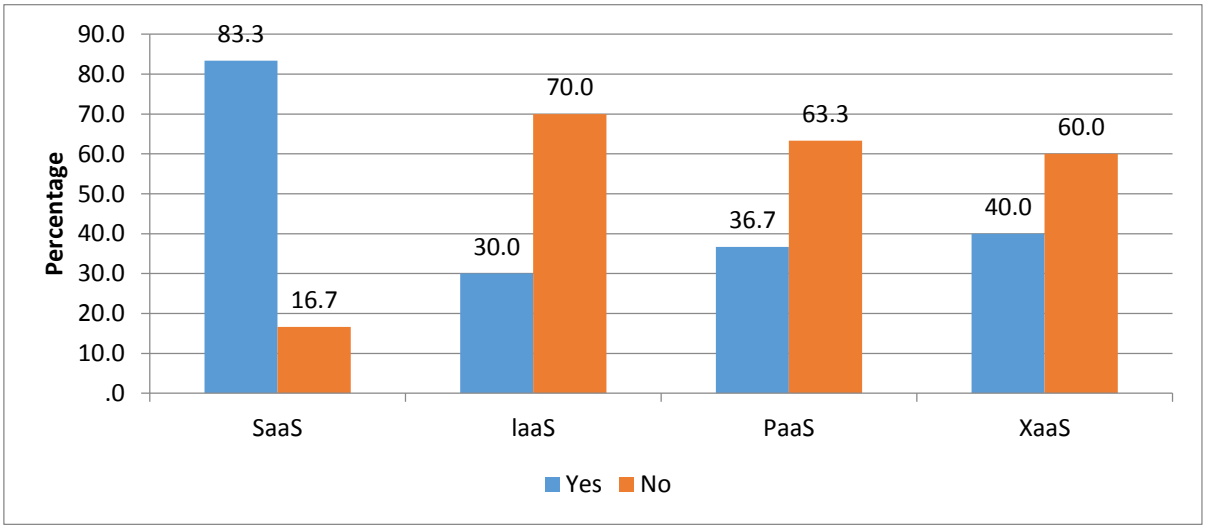

Figure 5.6: Adoption levels of cloud computing services.

5.3.2.4.1. Adoption levels of SaaS

The findings indicate that 83.3% of users used SaaS and 16.7% of users did not use SaaS. The findings on the adoption levels of SaaS were discussed in the literature review. Brown and Madden (2012) reported extensively on the adoption and usage of SaaS among SMEs. These findings were also discussed in section of the literature review by Erol et al. (2012) and Tredger (2013) who argued that SMEs were taking into consideration the usage of these readily available services in the cloud for the operation of their business.

There was a need to assess the services used in the adoption of SaaS among cloud computing users. The following figure indicates the adoption of services for SaaS:

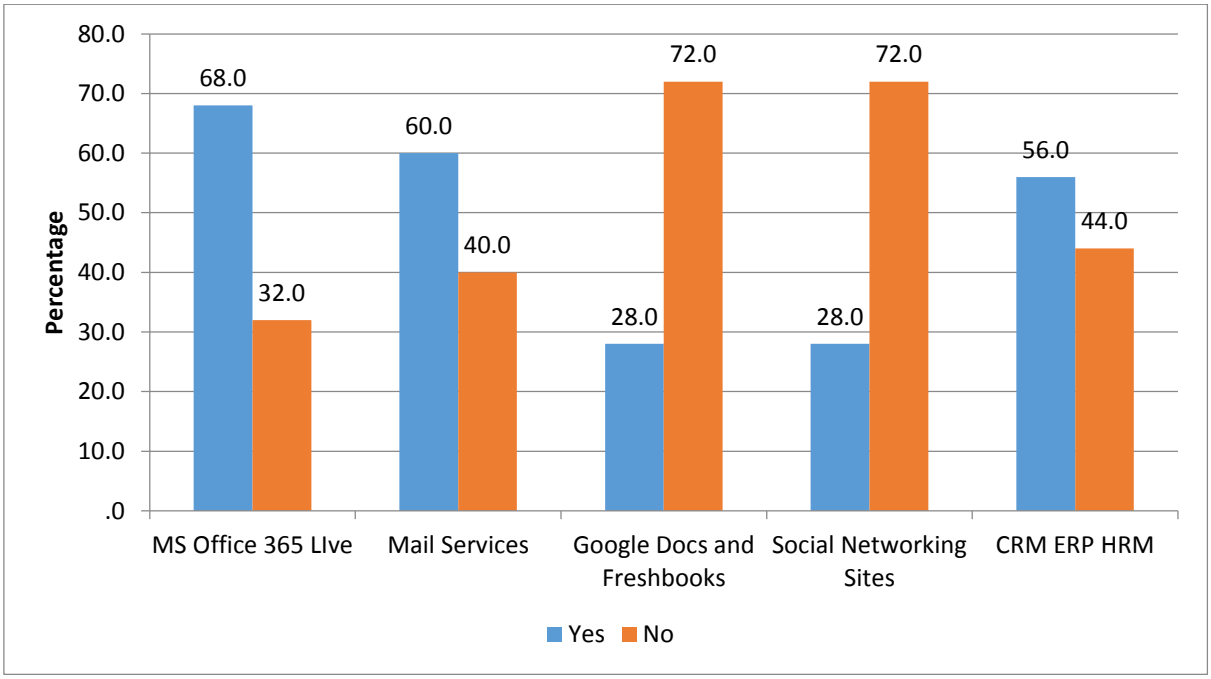

Figure 5.7: Adoption of services for SaaS

The findings indicate that 68.0% of users used MS Office 365 Live and 32.0% of users did not use MS Office 365 Live, 60.0% of users used mail services while 40.0% of users did not, 28.0% of users used Google Docs/Freshbooks and 72.0% of users did not use Google Docs/Freshbooks, 28.0% of users used social networking sites and 72.0% of users did not, and 56.0% of users used CRM_ERP_HRM. The frequency table on the services for SaaS is found in appendix 1.

To see whether there was a significant proportion of the sample who responded yes/no, the binomial test was used. The results showed a significant proportion of the sample indicating that they were using the following services for SaaS: MS Office 365 Live (p=.108), Mail services (p=.424), and CRM_ERP_HRM (p=.690). These findings were discussed in the literature review.

The analysis indicated that MS Office 365 Live, mail services, as well as the CRM_ERP_HRM were considerably used by cloud computing users. The Microsoft report 2012 considered MS Office 365 Live as the first step toward the adoption and usage of cloud computing. Arpaci et al. (2012) reported that the adoption and usage of services such as ERP and CRM was more dependent on the technological changes and needs required in the organisation. In addition, Arpaci et al. (2012) reported that the level of technology know-how and awareness could assist in implementing and maximising the usage of the technology adoption.

5.3.2.4.2. Adoption levels of IaaS

The findings indicate that 30.0% of users used IaaS and 70.0% of users did not use IaaS. Despite the fact that the results indicated a negligible adoption level of IaaS by SMEs, these findings were discussed in the literature review. As discussed by Avram (2014), the adoption and usage of IaaS was considered to be lower as compared to SaaS.

Awa et al. (2012) reported about the adoption and usage of cloud services, which should be dependent on the level of technological change and business transformation. In addition, Avram (2014) reported that organisations moved to IaaS once they were familiar with the usage of SaaS. He explained that depending on the level of transformational needs required, other services could be adopted in the process. Tredger (2013) reported that IT SMEs in Gauteng were using at some extent IaaS, though the usage was still at a very low level as compared to the rest of the developed world.

There was a need to assess the services used in the adoption of IaaS among cloud computing users. The following figure indicates the usage of services for IaaS:

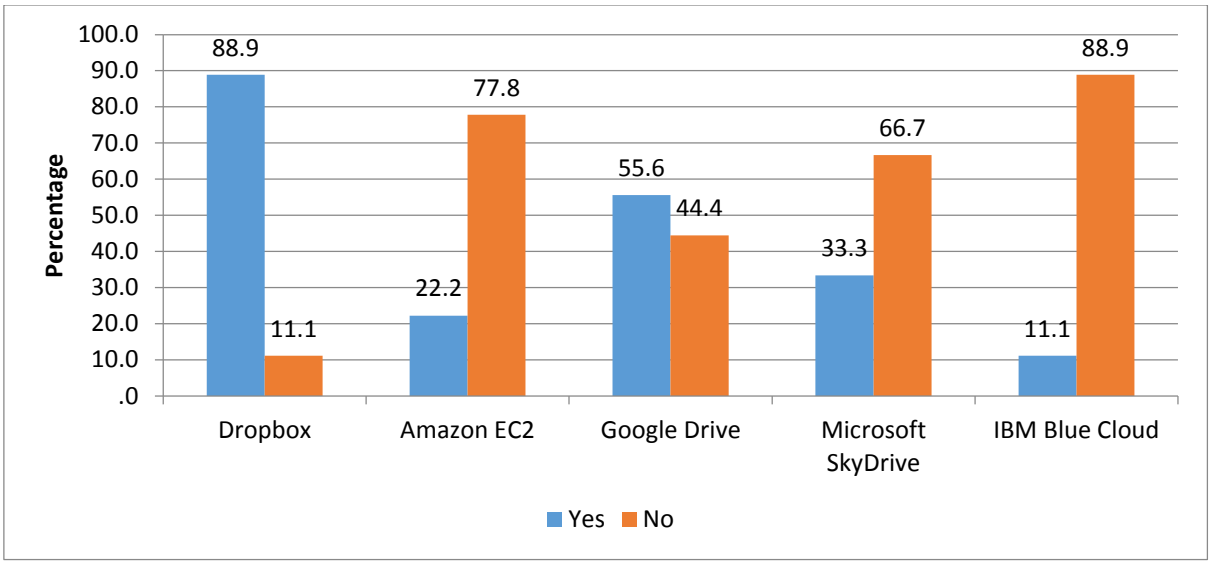

Figure 5.8: Adoption of services for IaaS

The findings indicate that 88.0% of users used Dropbox and 11.1% of users did not use Dropbox, 22.2% of users used Amazon EC2 and 77.8% did not, 55.6 % of users used Google Drive and 44.4% did not use Google Drive, 33.3% of users used Microsoft SkyDrive and 66.7% of users did not use Microsoft SkyDrive, and 11.1% of users used IBM Blue cloud and 88.9% of users did not use Microsoft SkyDrive.

The findings indicate that Dropbox as a service was highly used in IaaS as compared to other services. These findings were supported in the literature review. Avram (2014) reported that SMEs tended to adopt this service in IaaS after they had become very much aware with the usage of SaaS. Tredger (2013) reported that the usage of services for IaaS was sometimes used together with SaaS as the needs arise in the organisation. To see whether there was a significant proportion of the sample who responded yes/no, the binomial test was used. The results showed a significant proportion of the sample indicating that they were using Dropbox (p=.039). These findings were also discussed in the literature.

5.3.2.4.3. Adoption levels of PaaS

The findings indicate that 36.7% of users used PaaS and 63.3% of users did not use PaaS. The findings show that PaaS was used by a small portion of the users. As discussed in this literature, the adoption and usage of PaaS was considered when real investments were made in regard to SaaS and a real transformation need was required in the organisation (Brown and Madden, 2012). In addition, Avram (2014) reported that the adoption and usage of PaaS seemed to be the last step in the adoption process especially when SMEs had made use of either SaaS or IaaS.

There was a need to assess the services used in the adoption of PaaS among cloud computing users. The following figure indicates the adoption of services for PaaS:

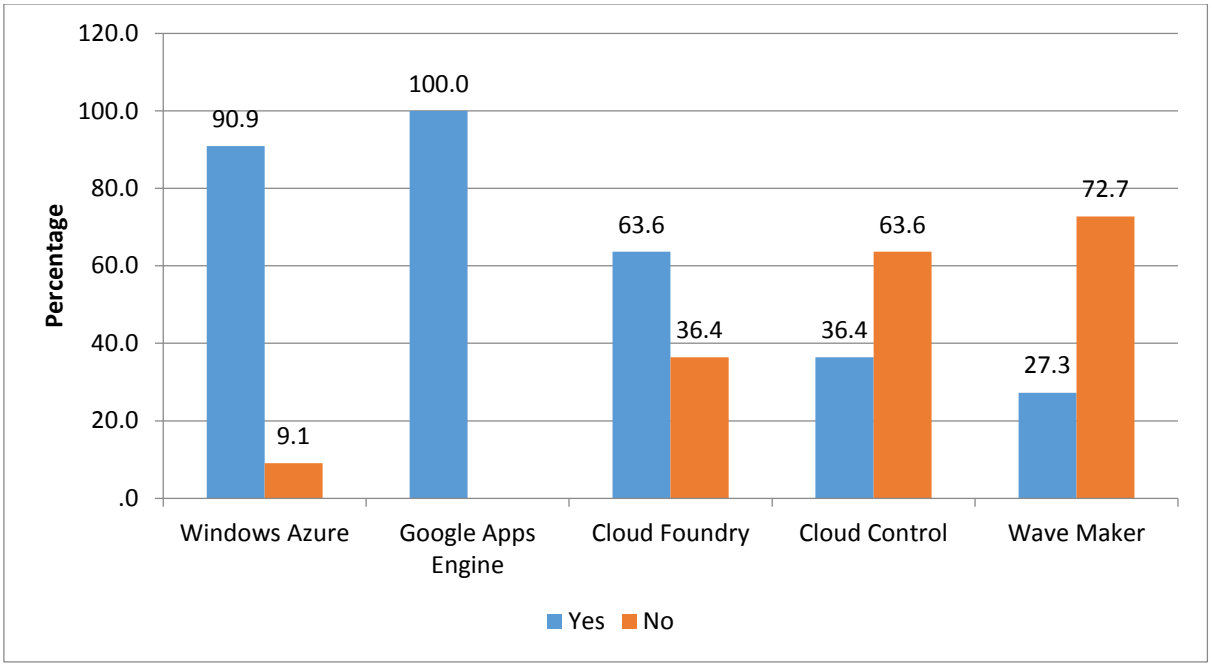

Figure 5.9: Adoption of services for PaaS

The findings indicate that 90.9% of users used Windows Azure and 9.1% of users did not use Windows Azure, 100% of users used Google Apps Engine, 63.6% of users used Cloud Foundry, 36.4% of users used Cloud Control and 63.6% of users did not use Cloud Control, and 27.3% of users used Wave Maker while 72.7% of users did not use Wave Maker.

To see whether there was a significant proportion of the sample who responded yes/no, the binomial test was used. The results showed a significant proportion of the sample indicating that they were using the following services for PaaS: Windows Azure (p=.012) and Google Apps Engine (p=.001). The findings indicated that despite the fact that the adoption level of PaaS was very low, services such as Windows Azure and Google Apps Engine were used by users. These findings were supported in the literature.

Brown and Madden (2012) reported that the global perception shows a lower adoption and usage level of PaaS. Brown and Madden (2012) have, however, acknowledged a paradigm shift in the usage of services for PaaS. Supporting the claim, Avram (2014) reported that it was only when enough investments were made that organisations considered using PaaS.

5.3.2.4.4. Adoption levels of XaaS

The findings indicate that 40.0% of users used XaaS and 60.0% of users did not use XaaS. The findings indicate that the adoption of XaaS was lower as compared to other services i.e. SaaS, IaaS, as well as PaaS. Matuszak and Lamoureux (2013) reported that companies consider to use XaaS when there was a need for a major upgrade or transformation required. In addition, they explained that since XaaS was so customised, organisations decided to use or adopt these services only when there was a real need for change in the operation and execution of their business processes.

There was a need to assess the services used in the adoption of XaaS among cloud computing users. The services included in this section were namely, SecaaS: Security-as-a-Service, BPaaS: Business Process-as-a-Service, DBaaS: Database-as-a-Service, ITaaS: Information Technology-as-a-Service, and DRaaS: Disaster Recovery-as-a-Service.

The following figure indicates the adoption of services for XaaS:

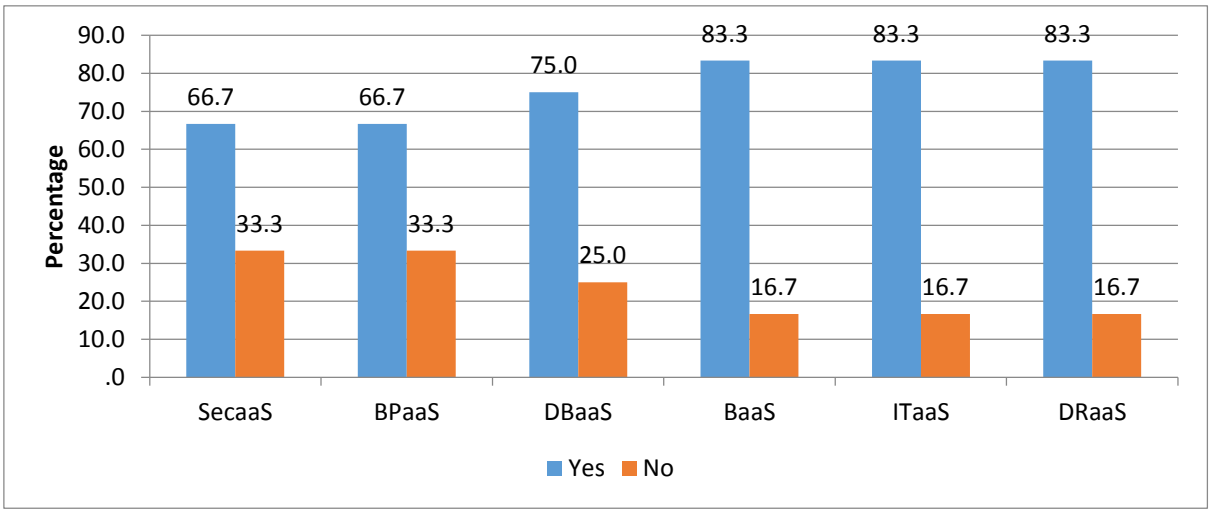

Figure 5.10: Adoption of services for XaaS

The findings indicate that 66.7% of users used SecaaS and 33.3% of users did not use SecaaS, 66.7% of users used BPaaS and 33.3% of users did not use BPaaS, 75.0% of users used DBaaS and 25.0% of users did not use DBaaS, 83.3% of users used BaaS and 16.7% of users did not use BaaS, and 83.3% of users used ITaaS and 16.7% did not use ITaaS.

To see whether there was a significant proportion of the sample who responded yes/no, the binomial test was used. The results showed a significant proportion of the sample indicating that they were using the following service for XaaS: BaaS (p=.039), ITaaS (p=.039), as well as DRaaS (p=.039). These findings

were discussed in the literature review. Matuszak and Lamoureux (2013) explained that organisations were interested in using variants of cloud services when more transformation or changes were expected or required in the organisation. Tredger (2013) reported that organisations in Gauteng were interested in using services in XaaS when there was a real need for change in the operation, execution and management of business processes.

After commenting on all the services used in cloud computing by users, there was a need to establish whether there was a significant proportion of the sample who responded yes/no for any of the services. A binomial test was used in this regard. The results showed a significant proportion of the sample indicating that they were using the following services: SaaS (p=<.005) and IaaS (p=.005). These findings were supported in the literature review. Avram (2014), Brown and Madden (2012), and The Microsoft report (2012) supported these findings. They reported that the first step toward cloud computing adoption and usage was SaaS followed by IaaS.

5.3.2.5. General comments and summary

This section discussed the research findings on the perceptions of users and non-users on the adoption levels of cloud computing.

5.4.4.5.1. Adoption and usage of cloud computing

This section discussed the findings on the adoption levels of cloud computing among respondents. The findings indicated that a significant sample of respondents used cloud computing services. These findings were discussed in the literature review. The research findings also established that there was a significant number of users using cloud computing.

5.4.4.5.2. Non-users planning to use cloud computing

This section discussed the findings of non-users of cloud computing planning to use cloud computing. The findings indicated that a significant sample of non-users were planning to use cloud computing. These findings were discussed in the literature review. Avram (2014) reported that a significant sample of non-users were planning to use cloud computing because of the high availability and accessibility that the technology offered. Supporting the arguments, Tredger (2013) argued that non-users perceived cloud computing as one of the most effective and efficient ways to conduct a business and integrate IT operations at a very low cost.

5.4.4.5.3. Likelihood of adopting cloud computing by non-users

This section discussed the findings on the likelihood of non-users to adopt cloud computing services. The findings indicated that the following services were highly significant to be used by non-users: SaaS, IaaS

and PaaS as compared to XaaS. These research findings were discussed in section of the literature review. The Deloitte 2012 and Microsoft reports indicated that many non-users were keen to using SaaS, IaaS, as well as PaaS due to the fact that these services were easily accessible online. These findings also explained that users were very much aware of these services as compared to XaaS, which was still very much complex in nature. Brown and Madden (2012) reported that the readily availability of resources online was an attractive factor for non-users to think of new ways of executing and conducting their business operations.

5.4.4.5.4. Challenges faced by non-users in the adoption process of cloud computing

This section discussed the findings on the challenges faced by non-users in the adoption and usage of cloud computing process. The findings indicate that non-users considered the following as significant challenges in the adoption process: awareness, implementation, complexity, as well as risks. These research findings were supported in this study. Chou (2015) reported that these challenges indicated in the findings were significant in the adoption and usage of cloud computing.

5.4.4.5.5. Users of cloud computing

After discussing the perceptions of non-users on the adoption of cloud computing, this section discussed the perceptions of users on cloud computing adoption levels. The findings established the adoption levels for the users of cloud computing. After a detailed analysis on the adoption levels of services in cloud computing, the findings indicated that SaaS and IaaS were significantly used by users. These findings were supported in the literature. The Microsoft and Deloitte 2012 reports reported in the literature on the first step toward cloud computing, which was SaaS, followed by IaaS.

5.3.3. Benefits of cloud computing

This section addresses the views of respondents on the perceived benefits of cloud computing. The discussion addressed each benefit in cloud computing and a detailed analysis is provided. For the purpose of the analysis, the Wilcoxon signed ranked and Mann Whitney tests were used, as well as the mean values for comparative purposes. Corresponding tables are presented in appendix 1.

The following figure represents the benefits of cloud computing:

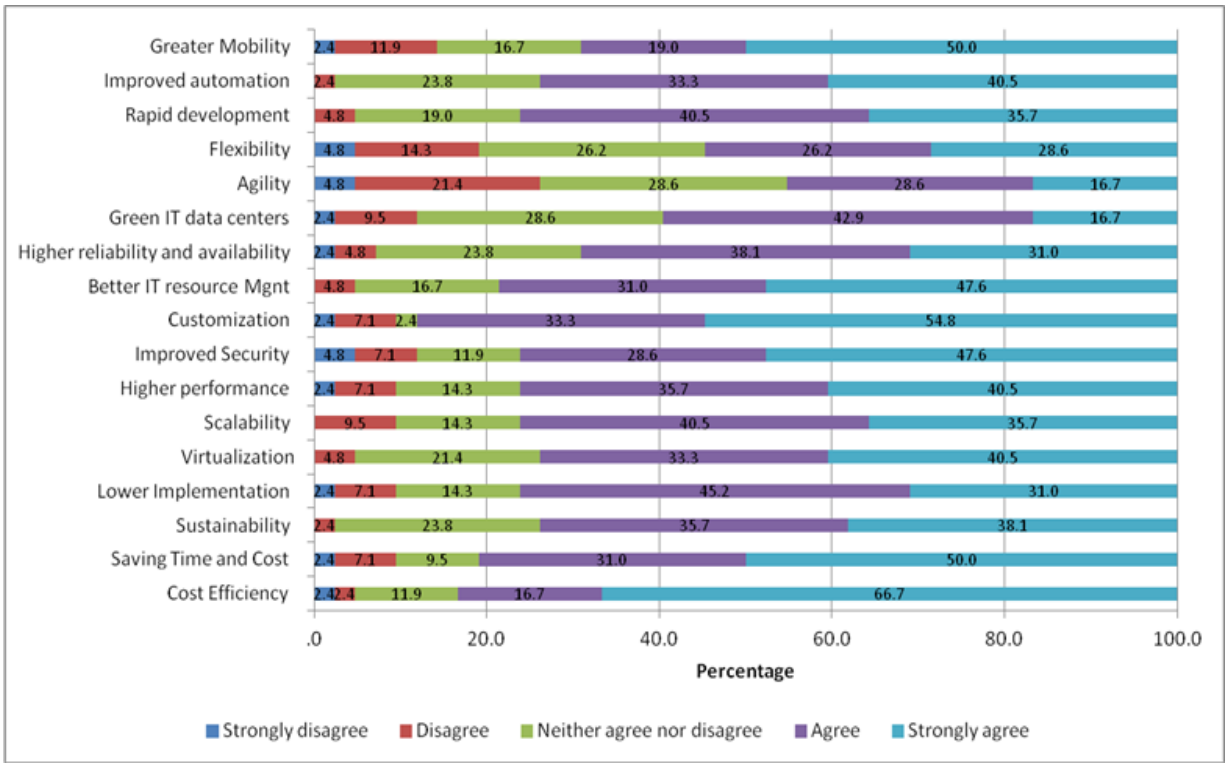

Figure 5.11: Benefits of cloud computing

5.3.3.1. Cost-efficiency as a benefit in cloud computing

Cost-efficiency is considered as an important factor and characteristic in cloud computing (Youssef, 2012 and Coweh and Kleeman, 2013). The findings indicate that 66.7% of respondents strongly agreed that cost-efficiency was a benefit, 16.7% of respondents agreed that cost-efficiency was a benefit, 11.9% of respondents neither agreed nor disagreed, 2.4% of respondents disagreed that cost-efficiency was a benefit, and 2.4% of respondents strongly disagreed that cost-efficiency was a benefit.

The findings indicated that there was a significant difference in the perceptions of cost-efficiency as a benefit between users and non-users (Z (N=42) =-3.783, p<.0005). Users (M=4.77, SD=.626) believed that cost-efficiency was a great benefit in cloud computing than do non-users (M=3.58, SD=1.165).

The findings on cost-efficiency as a benefit were discussed and supported in the literature. Cowhey and Kleeman (2013) reported about the increase in the cost savings and massive cost reduction in the adoption and usage of cloud computing technologies. They also reported that organisations that used cloud computing, mentioned cost-efficiency as a benefit.

5.3.3.2. Lower-implementation as a benefit in cloud computing

The findings on lower-implementation indicate that 50.0% of respondents strongly agreed that lower-implementation was a benefit, 31.0% of respondents agreed with lower-implementation as a benefit, 9.5% of respondents neither agreed nor disagreed with lower-implementation as a benefit, 7.1% of respondents disagreed with lower-implementation as a benefit, and 2.4 % of respondents disagreed with lower-implementation as a benefit in cloud computing.

The findings indicated that there was a significant difference in the perceptions of lower-implementation as a benefit between users and non-users (Z (N=42) =--2.575, p<.0005). Users (M=4.40, SD=1.003) believed that lower-implementation was a great benefit in cloud computing than do non-users (M=3.67, SD=.985). These findings were discussed and supported in this literature. Cowhey and Kleeman (2013) reported that there was a considerable reduction of up-front capital and operational cost associated with the implementation and maintenance of IT resources. In addition, Avram (2014) explained that the cost to implement and maintain IT resources assisted SMEs to become competitive at both national and international levels. He further argued that lower-implementation contributed immensely to a high competitiveness among businesses, something that never used to be possible in-house-based environments.

5.3.3.3. Scalability as a benefit in cloud computing

Youssef (2012) defined scalability as the higher ability to handle IT resources and accommodate the growth as per customer's needs. The findings on scalability as a benefit indicate that 38.1% of users strongly agreed that scalability was a benefit, 35.7% of users agreed with scalability as a benefit, 23.8% of users neither agreed nor disagreed with scalability as a benefit, and 2.4% of users disagreed with scalability as a benefit. The findings indicated that there was a significant difference in the perceptions of scalability as a benefit between users and non-users (Z (N=42) =-3.106, p<.0005). Users (M=4.33, SD=.844) believed that scalability was a great benefit in cloud computing than do non-users (M=3.50, SD=.522).

The research findings were discussed in the literature review. Brohi and Bamiah (2011) reported extensively on scalability as a benefit. They described the ability on-demand that scalability presents in cloud computing as an important characteristic. In addition, they indicated that organisations that used cloud computing, cited scalability as a benefit.

5.3.3.4. Saving time and cost as a benefit in cloud computing

Youssef (2012) explained that saving time and cost as a benefit in cloud computing provides lower cost and massive return on investment when it comes to deploying and maintaining resources and applications in the cloud. The findings indicate that 54.8% of users strongly agreed that saving time and cost was a benefit, 33.3% of users agreed with saving time and cost as a benefit, 2.4% of users neither agreed nor disagreed with saving time and cost as a benefit,7.1% of users disagreed with saving time and cost as a benefit, and 2.4 % of users strongly disagreed with saving time and cost as a benefit. The findings indicated that there was a significant difference in the perceptions of saving time and cost as a benefit between users and non-users (Z (N=42) =-3.972, p<.0005). Users (M=4.67, SD=.661) believed that saving time and cost was a great benefit in cloud computing than do non-users (M=3.42, SD=1.165). These research findings were discussed in section of the literature.

Avram (2014) reported about the relatively low cost that the adoption and usage of cloud computing brought in the deployment, maintenance, and development of applications. In addition, Avram (2014) claimed that organisations that adopted cloud computing, mentioned saving time and cost as a benefit.

5.3.3.5. Sustainability as a benefit in cloud computing

Carroll et al. (2011) defined sustainability as a possibility of an organisation to continue using its services and resources to their higher availability in cloud computing. The findings on sustainability indicate that 47.6% of respondents strongly agreed that sustainability was a benefit, 31.0% of respondents agreed with sustainability as a benefit, 16.7% of respondents neither agreed nor disagreed with sustainability as a benefit, and 4.8% of respondents disagreed with sustainability as a benefit. The findings indicate that there was a significant difference in the perceptions of sustainability as a benefit between users and non-users (Z (N=42) =-2.630, p<.0005). Users (M=4.43, SD=.817) believed that sustainability was a great benefit in cloud computing than do non-users (M=3.67, SD=.888). These findings were discussed in the literature review. Zabalza et al. (2012) reported extensively on sustainability as a benefit in cloud computing. They claimed that organisations that adopted cloud computing, cited sustainability as a benefit.

5.3.3.6. Customisation as a benefit in cloud computing

Youssef (2012) explained that customisation was considered as an important characteristic in cloud computing and provided a high possibility to configure IT resources and infrastructures to suit the customers' needs. The findings on customisation indicate that 35.7% of respondents strongly agreed that customisation was a benefit, 40.5% of respondents agreed that customisation was a benefit, 19.0% of respondents neither agreed nor disagreed that customisation was a benefit, and 4.8% of respondents

disagreed that customisation was a benefit. The findings indicate that there was a significant difference in the perceptions of customisation as a benefit between users and non-users (Z (N=42) =-3.262, p<.0005). Users (M=4.33, SD=.802) believed that customisation was a great benefit in cloud computing than do non-users (M=3.42, SD=.669). These findings were supported in this literature.

Carroll et al. (2011), Youssef (2012), and Zabalza et al. (2012) reported about customisation as a benefit. They pointed out that customisation was an important characteristic in cloud computing. They reported that organisations that adopted cloud computing, cited customisation as a benefit.

5.3.3.7. Virtualisation as a benefit in cloud computing

Carlin and Curran (2012) defined virtualisation as a high provision of IT resources and capabilities to be utilised as on-demand basis. The findings about customisation indicate that 40.5% of respondents strongly agreed that virtualisation was a benefit, 33.3% of respondents agreed that virtualisation was a benefit, 23.8% of respondents neither agreed nor disagreed that virtualisation was a benefit, and 2.4% of respondents disagreed that virtualisation was a benefit. The findings indicated that there was a significant difference in the perceptions of virtualisation as a benefit between users and non-users (Z (N=42) =-2.903, p<.0005). Users (M=4.37, SD=.765) believed that virtualisation was a great benefit in cloud computing than do non-users (M=3.50, SD=.798). These research findings were discussed in section of the literature review.

Sravani and Nivedita (2013) and Carlin and Curran (2012) reported extensively on virtualisation as a benefit in cloud computing. They also reported about the ramifications of virtualisation in the provision of IT resources and capabilities in cloud computing. In addition, they indicated that organisations that adopted cloud computing, mentioned virtualisation as a benefit.

5.3.3.8. Agility, higher performance, higher reliability and availability, better IT resource management, improved security, flexibility, rapid development, great mobility, improved automation, and Green IT data centers.

The research findings indicated that respondents did not consider the following variables as benefits, namely, agility, higher performance, higher reliability and availability, better IT resource management, improved security, flexibility, rapid development, great mobility, improved automation, and green IT data centers. The findings indicated that there was no significant difference in the perceptions of these perceived variables as benefits in cloud computing. Tables representing the findings of each variable mentioned-above are presented in appendix 1. The following table summarises the findings of the above-mentioned variables not perceived as benefits in cloud computing, as well as their significance values between the users and non-users:

Table 5.1: Summary of variables not perceived as benefits by respondents

Perceived benefits	Significance of values	Users considerable median and standard deviation values	Non-users' considerable median and standard deviation values
Agility	(Z (N=42) =-1.310, p>.0005)	(M=4.03, SD=1.066)	(M=4.08, SD=.754).
Higher performance	(Z(N=42=-251,p>.0005)	(M=4.10, SD=4.10, SD=.960)	(M=4.08, SD=.793)
Higher reliability and availability	(Z(N=42=-1.791, p>.0005)	(M=4.17, SD=.950)	(M=3.67, SD=.888)
Better IT resource management	(Z(N=42=-.976, p>.0005)	(M=3.93, SD=1.112)	(M=4.33, SD=.778)
Improved security	(Z(N=42=-1.809, p>.0005)	(M=4.27, SD=1.048)	(M=3.58, SD=1.311)
Flexibility	(Z(N=42=-1.656, p>.0005)	(M=4.07, SD=.907)	(M=3.50, SD=1.087)
Rapid development	(Z(N=42=-1.429, p>.0005)	(M=3.73, SD=.980)	(M=3.33, SD=.888)
Great mobility	(Z(N=42=-.057, p>.0005)	(M=3.30, SD=1.241)	(M=3.33, SD=.985)
Improved automation	(Z(N=42=-.647, p>.0005)	(M=3.67, SD=1.241)	(M=3.42, SD=1.084)
Green IT data centers	(Z(N=42=-1.934, p>.0005)	(M=4.23, SD=1.104)	(M=3.50, SD=1.243)

As indicated in this section, the research findings on these above-mentioned variables were not supported in the section of the literature. Though Carroll et al. (2011) reported extensively in section of the literature about these variables as benefits in cloud computing by organisations that adopted the technology model, the research findings indicated that these variables were not considered as benefits by respondents in the Gauteng province. Awa et al. (2012) reported that awareness could have been one of the contributing factors for respondents not being in a position to perceive the above-mentioned variables as benefits in cloud computing. They mentioned that the reason for not identifying the above-mentioned variables as benefits could have been associated with the lack of competency, technology know-how, and IT required

skills to use a specific technology. Matuszak and Lamoureux (2013) explained that respondents might have not realised the required need for transformation, which should have made them realise that these above-mentioned variables were benefits in their organisations.

5.3.3.9. General comments and summary

This section discussed aspects related to benefits in cloud computing. To answer this question, a list of benefits was designed from the most cited to the least cited benefits in cloud computing. The benefits were analysed separately to ensure that a conclusive view on these benefits was provided in order to relate to arguments discussed in the literature.

The findings indicated that only the following were perceived to be important benefits in cloud computing: cost-efficiency, lower-implementation, scalability, saving time and cost, sustainability, customisation, as well as virtualisation. These findings were supported in the literature review. Arguments presented by Cowhey and Kleeman (2013), Youssef (2012), Erol et al. (2012), Avram (2014), and Zalbaza et al. (2012) support the findings on these benefits by organisations that adopted cloud computing.

The research findings also indicated that the following variables were not perceived as important benefits by respondents: Agility, higher performance, higher reliability and availability, better IT resources, improved security, flexibility, rapid development, great mobility, improved automation, and Green IT. These findings were not supported in the literature review. Though the discussion by Carroll et al. (2011), Youssef (2012), and Avram (2014) indicated that these variables were important benefits in cloud computing, the research findings indicated that respondents in Gauteng did not perceive them as benefits. Awa et al. (2012) and Matuszak and Lamoureux (2013) suggested reasons why respondents might have not perceived these variables as important benefits in cloud computing. They explained that aspects related to awareness, technology know-how, technological needs, as well as competency might be contributing factors for not being able to identify these variables as benefits.

5.3.4. Factors influencing the adoption and usage of cloud computing

This section evaluates the perceptions of respondents on the factors considered to be influencing the decision to adopt and use cloud computing. The following factors were identified in this literature as influencing factors: improved service level management, cost-efficiency, standard-based security, better accountability and auditability, improved performance, as well as lock-in terms.

The following figure shows the responses of respondents on the influencing factors in cloud computing adoption and usage:

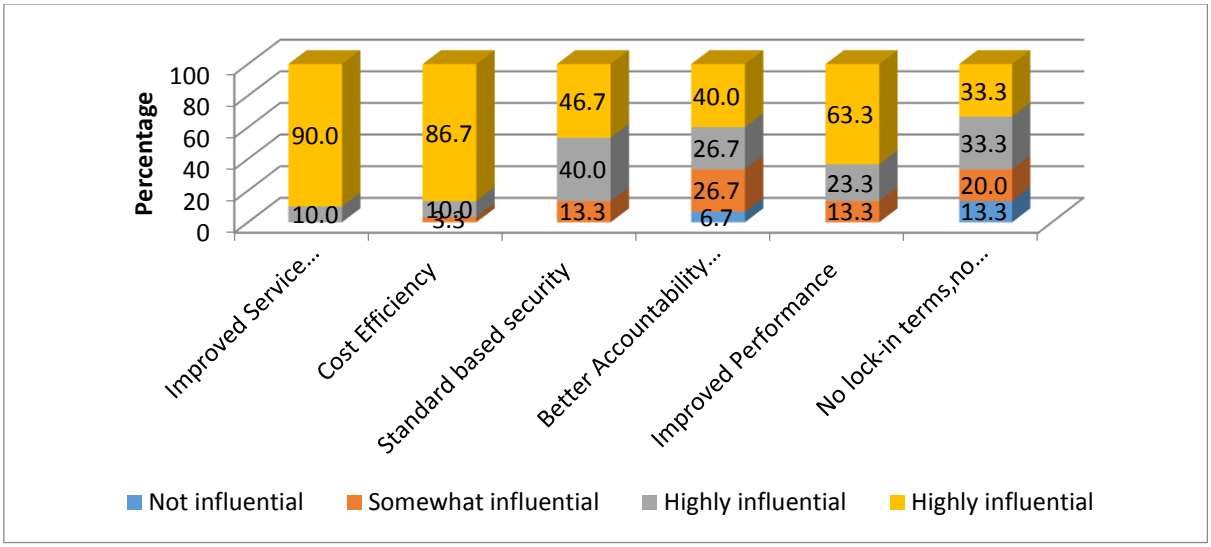

Figure 5.12: Influencing factors in the adoption and usage of cloud computing

5.3.4.1. Improved service level management as an influencing factor in cloud computing

Buyya et al. (2011) described improved service level management in cloud computing as a set of parameters required by both the consumers and service providers to highlight issues of service quality and request, including feedback mechanisms in order to encourage or discourage request submissions.

The research findings indicated that 64.3 % of users consider improved service level agreement as a highly influential factor in cloud computing adoption and usage as compared to 7.1% of users who consider the factor to be influential. In order to ascertain whether any of the response options was selected significantly more/less than others, the Chi-Square goodness-of-fit-test was used. The results show that a significant number of respondents indicated that improved service level agreement was an important influential factor in the adoption and usage of cloud computing (χ^2 (3, N=12) = 68.400, p=.005). These findings were supported in section of the literature review. Mohammed et al. (2012) reported extensively about the perceptions of organisations with regard to SLAs in cloud computing, and the simplification of complex issues in the provision of service between users and service providers.

5.3.4.2. Cost-efficiency as an influential factor in cloud computing

Cowhey and Kleeman (2013) argued that cost-efficiency played an important role in saving cost on expenditure when it comes to maintenance and deployment of organisational IT resources. They also reported that cost-efficiency has proven to bring a massive return on investment. The findings indicated

that 86.7% of users consider cost-efficiency as a highly influential factor in the adoption and usage of cloud computing, 10.0% of users consider the factor as influential, and 3.3% of users consider the factor as somewhat influential in the adopting and usage of cloud computing. In order to ascertain whether any of the response options was selected significantly more/less than others, the Chi-Square goodness-of-fit-test was used. The results show that a significant number of users indicated that cost-efficiency was an important influential factor in the adoption and usage of cloud computing (χ^2 (3, N=30) = 61.476, p=.005). These findings were discussed in the literature review. Cowhey and Kleeman (2013) and Low et al. (2011) reported extensively about cost-efficiency and its influence in the adoption and usage of cloud computing. Avram (2014) described cost-efficiency as instrumental and considerably influential by SMEs in their positioning as global market players.

5.3.4.3. Standard-based security as an influential factor in cloud computing

Youssef (2012) explained that standard-based security provided capabilities to tailor security issues based on users' requirements in cloud computing. The research findings indicated that 46.7% of users consider this factor as highly influential in cloud computing, 40.0% of users consider the factor to be influential, and 13.3% of users consider the factor to be somewhat influential in cloud computing. In order to ascertain whether any of the response options was selected significantly more/less than others, the Chi-Square goodness-of-fit-test was used. The results show that a significant number of users indicated that standard-based security was an important influential factor in the adoption and usage of cloud computing (χ^2 (3, N=30) = 17.467, p=.005). These findings were discussed in section of the literature review. Chang et al. (2016) reported extensively on the standard-based security as an influential factor in cloud computing. They indicated that though many users were more concerned about the risks associated with security, a standard-based security simplified complex security mechanisms and schemes in cloud computing.

5.3.4.4. Improved performance as an influential factor in cloud computing

Buyya et al. (2011) explained that improved performance in cloud computing speeds up the availability and usage of IT resources in the cloud. The findings indicated that 63.3% of users consider improved performance as a highly influential factor in cloud computing, 23.3% of users consider the factor to be influential, and 13.3% of users consider the factor to be somewhat influential in cloud computing. In order to ascertain whether any of the response options was selected significantly more/less than others, the Chi-Square goodness-of-fit-test was used. The results showed that a significant number of users indicated that improved performance was an important influential factor in the adoption and usage of cloud computing (χ^2 (3, N=30) = 26.800, p=.005). These findings were discussed in the literature review. Sravani and Nivedita (2013) reported extensively in the literature review on the improved performance

as an important influential factor in cloud computing. Sravani and Nivedita (2013) also reported that improved performance in cloud computing was not only an influential factor but also an important characteristic.

5.3.4.5. No lock-in terms, better accountability and auditability as influential factors in cloud computing

Although the above-mentioned factors were discussed in this literature as influential factors in cloud computing, the research findings of this study indicated that users did not consider them as influential. The findings indicated that there was no significant difference in the perceptions of users on these factors as influential in their decision to adopt or use cloud computing. Tables representing the findings of the above-mentioned factors are presented in appendix 1. The research findings indicated that there was not a significant number of users that indicated that no lock-in terms was an influential factor in cloud computing (χ^2 (3, N=30) = 6.800, p>.005). The findings also indicated that there was not a significant number of users that indicated that better accountability and auditability were influential factors in cloud computing (χ^2 (3, N=30) = 3.600, p>.005). These findings were not supported in this study.

As discussed in section of the literature review, Carroll et al. (2011) and Youssef (2012) reported extensively about these influential factors in cloud computing adoption and usage. Some of the reasons attributed to users for not being in a position to identify no lock-in terms, better accountability, and auditability as influential factors could be related to awareness issues as argued by Awa et al. (2012). They explained that issues around competency, technology know-how, as well as IT required skills to use a specific technology could have contributed to the users not being able to identify these factors as influential in cloud computing.

5.3.4.6. General comments and summary

This section assessed the perceptions of users on the influential factors in the decision to adopt and use cloud computing technology. Carroll et al. (2011) and Youssef (2012) identified a number of influential factors in cloud computing, namely, improved service level management, cost-efficiency, standard-based security, improved performance, better accountability and auditability, as well as no lock-in terms. The influential factors were categorized in the literature from the most cited to the least.

The research findings indicated that the following were important influential factors in cloud computing: improved service level management, cost-efficiency, standard-based security, as well as improved performance. The Chi-Square goodness-of-fit-test was used to ascertain the response options of the most selected factors by users. These findings were discussed in the literature review. The research findings also indicated that lock-in terms, better accountability, as well as auditability were not perceived as

influential factors in cloud computing. The research findings indicated that there was not a significant difference in the perceptions of users on these factors as influential in their decision to adopt or use cloud computing. These findings were not supported in this study. Awa et al. (2012) reported on some of the reasons that might have contributed to users not being able to identify lock-in terms, better accountability, as well as auditability as influential factors in cloud computing. They reported about issues associated with awareness of technology, competency level, and IT required skills, as well as technology know-how as contributing factors in the lack of identification of the variables as influential factors in cloud computing.

5.3.5. Limitations and concerns in cloud computing

This section assesses the perceptions of users on the limitations and challenges in cloud computing. Chou (2015) identified a number of limitations and concerns in cloud computing, namely, data privacy and security, availability, trust and transparency, shared technology issues, disaster recovery, service level agreement, regulatory and legal issues, challenges of security schemes, virtualisation paradigm, policy integration and governance, as well as risks of cloud computing technology. These limitations and concerns were categorized in the literature from the most cited to the least. The Wilcoxon signed ranks test was used to test for significant agreement or disagreement.

5.3.5.1. Data privacy and security

Murugaboopathi et al. (2013) described data privacy and security as important factors in cloud computing. They reported that given the data was shared across various organisations, the issue of data protection and unauthorized access posed serious concerns and limitations in cloud computing.

The findings indicate that 66.7% of users strongly agreed with data privacy and security as a limitation and concern in cloud computing, 10.0% of users agreed with data privacy and security as a limitation and concern, 13.3 % of users neither agreed nor disagreed with data privacy and security as a limitation and concern, 6.7% of users disagreed with data privacy and security, and 3.3% of users strongly disagreed with data privacy and concern as a limitation and concern in cloud computing. The research findings indicated that there was a significant level of agreement with data privacy and security as a limitation and concern in cloud computing (Z ($N=42=-4.170$, $p<.0005$). Users considered data privacy and security as an important limitation and concern in cloud computing ($M=4.30$, $SD=1.1.49$). These findings were discussed in the literature review. Murugaboopathi et al. (2013) and Walden (2012) reported about issues related to data privacy and the concerns they posed to organisations that adopted cloud computing. They explained that organisations that adopted cloud computing, mentioned data privacy and security as a limitation and concern in cloud computing.

5.3.5.2. Availability

While availability presents itself as an important variable in cloud computing due to the fact that data needs to be readily available to users whenever needed, Merwe (2012) reported that availability posed serious concerns in cloud computing. The challenge though, was when data becomes unavailable for a period of time as noted by Carroll et al. (2011), Sravani and Nivedita (2012), and Goya and Supriya (2013).

The research findings indicate that 53.3% of users strongly agreed with availability as a limitation and concern in cloud computing, 26.7% of users agreed with availability as a limitation and concern, 16.7 % of users neither agreed nor disagreed with availability as a limitation and concern, and 3.3% of users strongly disagreed with availability as a limitation and concern in cloud computing. The findings indicated that there was a significant level of agreement with availability as a limitation and concern in cloud computing (Z (N=42=-4.085, p<.0005). Users considered availability as an important limitation and concern in cloud computing (M=4.27, SD=.980). These findings were discussed in this literature by Carroll et al. (2011), Sravani and Nivedita (2012), and Goya and Supriya (2013). They claimed that organisations that adopted cloud computing, also cited availability as a limitation and concern.

5.3.5.3. Trust and transparency

Mohammed et al. (2012) explained that trust and transparency were considered as important factors in cloud computing since they represented aspects related to data sharing, privacy and communication that have become crucial in the adoption and usage of cloud computing.

The findings indicate that 33.3% of users strongly agreed with trust and transparency as a limitation and concern in cloud computing, 36.7% of users agreed with trust and transparency as a limitation and concern, 26.7 % of users neither agreed nor disagreed with trust and transparency as a limitation and concern, and 3.3% of users strongly disagreed with trust and transparency as a limitation and concern in cloud computing. The findings indicated that there was a significant level of agreement with trust and transparency as a limitation and concern in cloud computing (Z (N=42=-3.663, p<.0005). Users considered trust and transparency as an important limitation and concern in cloud computing (M=3.97, SD=.964).

The research findings were discussed in section of the literature review. Mohammed et al. (2012) reported that the usage and adoption of cloud services made issues of trust and transparency very complex. They explained that many consumers were not in a position to interpret complex technologic aspects as agreed upon in the SLA. In addition, they reported that organisations that adopted cloud computing have cited trust and transparency as a limitation and concern.

5.3.5.4. Shared technology issues

Buyya et al. (2011) explained that cloud computing presented a number of resources that were shared within the IT infrastructure. They explained that the challenge posed to-date was when these resources were shared by consumers. The sharing of these resources required a high level of planning on behalf of both the users and service providers taking into account relevant policies, standard, legislation including strong encryption mechanisms to ensure that resources were fully protected (Buyya et.al, 2011).

The research findings indicate that 30.0% of users strongly agreed with shared technology in cloud computing as a limitation and concern in cloud computing, 30.0% of users agreed with shared technology in cloud computing as a limitation and concern, 23.3 % of users neither agreed nor disagreed with shared technology in cloud computing as a limitation and concern, and 16.7% of users strongly disagreed with shared technology as a limitation and concern in cloud computing. The findings indicated that there was a significant level of agreement with shared technology in cloud computing as a limitation and concern in cloud computing (Z (N=42=-3.164, p<.0005). Users considered shared technology in cloud computing as an important limitation and concern in cloud computing (M=3.73, SD=1.081).

The research findings were discussed in the literature review. Sravani and Nivedita (2013) reported that the sharing of IT resources in the cloud had put a lot of pressure on consumers since there was a need for more planning on behalf of the consumers to ensure that relevant policies were in place. They indicated that it was the responsibility of consumers to secure IT resources with relevant and standard strong encryptions during the sharing process. In addition, Sravani and Nivedita (2013) reported that sharing IT resources made the usage process of cloud services more vulnerable. They also reported that organisations that adopted cloud computing, have mentioned shared technologies as a limitation and concern.

5.3.5.5. Disaster recovery

Buyya et al. (2011) explained the importance of data backup and mechanisms in this literature to ensure that data should be restored after any form of threat or security man-made disasters. They explained that the challenge with disaster recovery in cloud computing was in the event the mechanism could not be executed for the right purpose.

The findings indicate that 23.3% of users strongly agreed with disaster recovery as a limitation and concern in cloud computing; 36.7% of users agreed with disaster recovery as a limitation and concern, 33.3 % of users neither agreed nor disagreed with disaster recovery as a limitation and concern, 3.3% of users disagreed with disaster recovery, and 3.3% of users strongly disagreed with disaster recovery as a limitation and concern in cloud computing. The findings indicated that there is a significant level of agreement with disaster recovery in cloud computing as a limitation and concern in cloud computing (Z

(N=42=-3.165, p<.0005). Users considered shared technology in cloud computing as an important limitation and concern in cloud computing (M=3.73, SD=.980).

These researcher findings were discussed in the literature review. Buyya et al. (2011) explained the challenges that organisations faced with when it comes to executing disaster recovery in the event of any security threats. They reported that though the process was made easier in cloud computing, the challenges still remained with data recovery mechanisms when the process was not executed for the right purpose. In addition, Buyya et al. (2011) reported that organisations that adopted cloud computing have identified data recovery as a limitation and concern.

5.3.5.6. Service Level Agreement

Mohammed et al. (2012) reported that a service level agreement becomes a concern in cloud computing in the event all aspects and clauses related to service level agreements were not agreed upon. The findings indicate that 30.0% of users strongly agreed with service level agreement as a limitation and concern in cloud computing, 40.0% of users agreed with service level agreement as a limitation and concern, 23.3 % of users neither agreed nor disagreed with service level agreement as a limitation and concern, and 6.7% of users strongly disagreed with service level agreement as a limitation and concern in cloud computing. The findings indicated that there is a significant level of agreement with service level agreement as a limitation and concern in cloud computing (Z (N=42=-3.872, p<.0005). Users considered service level agreement as an important limitation and concern in cloud computing (M=3.93, SD=.907).

The research findings were discussed in the literature review. Mohammed et al. (2012) reported extensively about the service level agreement as a limitation and concern in cloud computing. They indicated that there has never been a true implementation of cloud due to the complexities and various interpretations of the contract and service level agreement. In addition, they reported that contracts in the cloud were usually open to various interpretations by both the consumers and users, which had always led to a no true implementation of a service level agreement.

5.3.5.7. Regulatory and legal issues

Wadden (2012) argues that regulatory and legal issues posed a challenge to users when it comes to the way data was controlled, managed and protected around the globe. The findings indicate that 33.3% of users strongly agreed with regulatory and legal issues as a limitation and concern in cloud computing, 46.7% of users agreed with regulatory and legal issues as a limitation and concern, 10.0 % of users neither agreed nor disagreed with regulatory and legal issues as a limitation and concern, and 10.0% of users strongly disagreed with regulatory and legal issues as a limitation and concern in cloud computing. The findings indicated that there was a significant level of agreement with regulatory and legal issues as a

limitation and concern in cloud computing (Z (N=42=-4.038, p<.0005). Users considered regulatory and legal issues as an important limitation and concern in cloud computing (M=4.03, SD=.928).

The researcher findings were discussed in section of the literature review. Walden (2012) explained the challenges that regulatory and legal issues presented when it comes to the management, accessibility, control mechanisms, and ramifications or implications associated with data in cloud computing. He also explained that the challenges posed by regulatory and legal issues in cloud computing were caused in many instances by the location of data, which tended to take precedence on jurisdiction. In addition, Walden (2012) reported that organisations that adopted cloud computing, mentioned regulatory and legal issues as a limitation and concern.

5.3.5.8. Challenges of security schemes

The challenges of security schemes were discussed in this literature as all aspects of security in cloud computing that affected the use, development, as well as the implementation mechanisms. The findings indicate that 60.0% of users strongly agreed with challenges of security schemes as a limitation and concern in cloud computing, 36.7% of users agreed with challenges of security schemes as a limitation and concern, and 3.3 % of users neither agreed nor disagreed with challenges of security schemes as a limitation and concern. The findings indicated that there was a significant level of agreement with challenges of security schemes as a limitation and concern in cloud computing (Z (N=42=-4.875, p<.0005). Users considered challenges of security schemes as an important limitation and concern in cloud computing (M=4.57, SD=.568).

These research findings were supported and discussed in this literature. Chang et al. (2016) reported extensively about the security schemes that have become a great concern in cloud computing. They explained that while security has been tailored to suit consumers based on specific requirements, the security mechanisms still forced consumers to exercise a high level of caution in order to reinforce security controls. In addition, Chang et al. (2016) reported that organisations that used cloud computing, have identified challenges of security schemes as a limitation and concern.

5.3.5.9. Virtualisation paradigm

Sravani and Nivedita (2013) explained that while virtualisation presented immense benefits in the cloud, it also posed serious risks and challenges to consumers. The findings indicate that 56.7% of users strongly agreed with virtualisation paradigm as a limitation and concern in cloud computing, 30.0% of users agreed with virtualisation paradigm as a limitation and concern, and 13.3 % of users neither agreed nor disagreed with virtualisation paradigm as a limitation and concern. The findings indicated that there was a significant level of agreement with virtualisation paradigm as a limitation and concern in cloud

computing (Z (N=42=-4.636, p<.0005). Users considered virtualisation paradigm as an important limitation and concern in cloud computing (M=4.43, SD=.728).

These research findings were discussed in section of the literature review. Carlin and Curran (2012) claim that organisations that used cloud computing, have established virtualisation paradigm as a limitation and concern. They also explained that there was a number of complex aspects that made virtualisation a concern in cloud computing. In addition, Sravani and Nivedita (2012) reported that consumers remained more vulnerable to a number of security issues, external threats, segmentation, as well as governance in the virtualisation process.

5.3.5.10. Policy integration and governance

Buyya et al. (2011) explained that policy integration and governance constituted important requirements that were aligned and established as part of good service levels in cloud computing. They reported that the policy integration and governance have become a concern in cloud computing in the manner in which they were implemented.

The findings indicate that 63.3% of users strongly agreed with policy integration and governance as a limitation and concern in cloud computing, 26.7% of users agreed with policy integration and governance as a limitation and concern in cloud computing, 6.7% of users neither agreed nor disagreed with policy integration and governance as a limitation and concern, and 3.3% of users disagreed that policy integration and governance as a limitation and concern in cloud computing. The findings indicated that there was a significant level of agreement with policy integration and governance as a limitation and concern in cloud computing (Z (N=42=-4.705, p<.0005). Users considered policy integration and governance as an important limitation and concern in cloud computing (M=4.50, SD=.777). These research findings were discussed in this literature. Buyya et al. (2012) reported that there were challenges from the consumers' perspectives in understanding and interpreting policies in a language that could be understood and interpreted by everyone. They reported that policy and integration had become a stumbling block for many users in the adoption and usage of cloud computing. In addition, they explained that organisations that adopted cloud computing, have mentioned policy and integration as a limitation and concern.

5.3.5.11. Risks of cloud computing

Risks of cloud computing were discussed in this literature as all the risks associated with cloud computing technology that have direct and indirect implications in the adoption and usage of the technology model. The findings indicate that 66.7% of users strongly agreed with risks of cloud computing as a limitation and concern in cloud computing, 23.3% of users agreed with risks of cloud computing as a limitation and

concern in cloud computing, 3.3% of users neither agreed nor disagreed with risks of cloud computing as a limitation and concern, and 6.7% of users disagreed that risks of cloud computing as a limitation and concern in cloud computing. The research findings indicated that there was a significant level of agreement with risks of cloud computing as a limitation and concern in cloud computing (Z (N=42=-4.690, p<.0005). Users considered risks of cloud computing as an important limitation and concern in cloud computing (M=4.50, SD=.861).

These findings were supported in this literature. Wadden (2012) reported extensively on risks of cloud computing and explained that there were so many hidden risks that many consumers could not understand. He added that some of these risks posed a serious challenge and limitation in cloud computing due to the fact that consumers were either not aware of these risks or lacked knowledge about these risks. In addition, Wadden (2012) reported that organisations that adopted cloud computing, have identified risks of cloud computing as a limitation and concern.

5.3.5.12. General comments and summary

This section assessed the perceptions of users on the limitations and challenges associated with the adoption and usage of cloud computing. The research findings indicated that the following factors were indeed a limitation and concern in cloud computing: data privacy and security, availability, trust and transparency, shared technology issues, disaster recovery, service level agreement, regulatory and legal issues, challenges of security schemes, challenges of security schemes, virtualisation paradigm, policy integration and governance, as well as risks of cloud computing technology. These findings were supported and discussed in the literature.

5.3.6. Service level agreement

This section assesses the perceptions of users on the service level agreement as a foundation to adopt or use cloud computing. The findings indicate that 90.5% of respondents considered service level agreement as a foundation in the adoption and usage of cloud computing, and 9.5% of respondents did not consider service level agreement as a foundation in the adoption and usage of cloud computing. Respondents believed that the service level agreement will facilitate a full implementation and quality of service by providers and increase a full accessibility to a quality service. Respondents also believed that the service level agreement will serve as an important parameter to force service providers to provide their services as expected of them in order to avoid penalties or even legal battles with their clients.

These findings were discussed in the literature review. To see whether there was a significant proportion of the sample who responds yes/no, the binominal test was used. The results showed a significant proportion of the sample indicating that service level agreement should be the foundation in the adoption

and usage of cloud computing (p <.0005). Mohammed et al. (2012) reported that the service level agreement in the cloud has been outstanding in resolving issues around penalties and agreements. As reported in this literature, most complex issues in the provision and quality of services were addressed in the service level agreement (Mohammed et al., 2012). In addition, Buyya et al. (2012) reported that though SLA might be complex to interpret in some instances, SLA could extensively assist in avoiding penalties and running into legal battles with consumers.

5.3.6.1. General comments and summary

This section assessed the perceptions of users on the service level agreement whether it should be considered as a foundation or basis for adopting and using cloud computing. The research findings indicated that there was a significant proportion of sample who agreed that service level agreement should be the foundation for adopting and using cloud computing. These findings were supported in the literature by Mohammed et al., 2012 and Buyya et al. (2012).

5.4. Interpretation of the concepts for the research conceptual framework

This section discusses the relationship between the findings of the main categories in the conceptual framework and the research instrument. There is a need to perform statistical analyses to test the influence of each of the factors (Technological, Organisational, and Environmental) on the usage of cloud computing. The testing of the variables of the conceptual framework used both the qualitative and quantitative research findings.

5.4.1. Technological construct/category

This construct represents the pool of technologies and characteristics inside and outside the organisation generating maximum usage of IT in creating a competitive advantage for the organisation (Arpaci et al., 2012). The technological characteristics supporting the technological construct of the conceptual framework are discussed below:

5.4.1.1. Cost-efficiency variable

The research findings indicated that there was a significant difference in the perceptions of cost-efficiency variable in the usage of cloud computing between users and non-users (Z (N=42) =-3.783, p<.0005). Users of cloud computing (M=4.77, SD=.626) believed that cost-efficiency was an important variable in the usage of cloud computing than do non-users (M=3.58, SD=1.165). The research findings indicated that cost-efficiency as a variable used in this study supported the research's conceptual framework.

5.4.1.2. Lower-implementation variable

The research findings indicated that there was a significant difference in the perceptions of lower-implementation construct in the usage of cloud computing between users and non-users (Z (N=42) =-2.575, p<.0005). Users of cloud computing (M=4.40, SD=1.003) believed that lower-implementation was an important variable in the usage of cloud computing than do non-users (M=3.67, SD=1.985). The research findings indicated that lower-implementation as a variable used in this study supported the research's conceptual framework.

5.4.1.3. Scalability variable

The research findings indicated that there was a significant difference in the perceptions of scalability variable in the usage of cloud computing between users and non-users (Z (N=42) =-3.106, p<.0005). Users (M=4.33, SD=.844) believed that scalability was an important variable in the usage of cloud computing than do non-users (M=3.50, SD=.522). The research findings indicated that scalability as a variable used in this study supported the research's conceptual framework.

5.4.1.4. Saving time and cost variable

The research findings indicated that there was a significant difference in the perceptions of saving time and cost as an important variable in the usage of cloud computing between users and non-users (Z (N=42) =-3.972, p<.0005). Users (M=4.67, SD=.661) believed that saving time and cost was an important variable in the usage of cloud computing than do non-users (M=3.42, SD=1.165). The research findings indicated that saving time and cost as a variable used in this study supported the research's conceptual framework.

5.4.1.5. Sustainability variable

The research findings indicated that there was a significant difference in the perceptions of sustainability as an important variable in the usage of cloud computing between users and non-users (Z (N=42) =-2.630, p<.0005). Users (M=4.43, SD=.817) believed that sustainability was an important variable in the usage of cloud computing than do non-users (M=3.67, SD=.888). The research findings indicated that sustainability as a variable used in this study supported the research's conceptual framework.

5.4.1.6. Customisation variable

The research findings indicated that there was a significant difference in the perceptions of customisation as an important variable in the usage of cloud computing between users and non-users (Z (N=42) =-3.262, p<.0005). Users (M=4.33, SD=.802) believed that customisation was an important variable in the usage of cloud computing than do non-users (M=3.42, SD=.669). The research findings indicated that customisation as a variable used in this study supported the research's conceptual framework.

5.4.1.7. Virtualisation variable

The research findings indicated that there was a significant difference in the perceptions of virtualisation as an important variable in the usage of cloud computing between users and non-users (Z (N=42) =-2.903, p<.0005). Users (M=4.37, SD=.765) believed that virtualisation was an important variable in the usage of cloud computing than do non-users (M=3.50, SD=.798). The research findings indicated that virtualisation as a variable used in this study supported the research's conceptual framework.

5.4.1.8. Agility variable

The research findings indicated that there was not a significant difference in the perceptions of agility as an important variable in the usage of cloud computing between users and non-users (Z (N=42) =-1.310, p>.0005). Users (M=4.03, SD=.754) believed that agility was not an important variable in the usage of cloud computing than do non-users (M=3.50, SD=.798). The research findings indicated that agility as a variable used in this study did not support the research's conceptual framework.

5.4.1.9. Higher performance variable

The research findings indicated that there was not a significant difference in the perceptions of higher performance as an important variable in the usage of cloud computing between users and non-users (Z (N=42) =-251, p>.0005). Users (M=4.10, SD=.960) believed that agility was not an important variable in the usage of cloud computing than do non-users (M=4.08, SD=.793). The research findings indicated that agility as a variable used in this study did not support the research's conceptual framework.

5.4.1.10. Higher reliability and availability variables

The research findings indicated that there was not a significant difference in the perceptions of higher reliability and availability as important variables in the usage of cloud computing between users and non-users (Z (N=42) =-1.791, p>.0005). Users (M=4.17, SD=.950) believed that higher reliability and availability were not important variables in the usage of cloud computing than do non-users (M=3.67, SD=.888). The research findings indicated that higher reliability and availability as variables used in this study did not support the research's conceptual framework.

5.4.1.11. Better IT resource management variable

The research findings indicated that there was not a significant difference in the perceptions of better IT resource management as an important variable in the usage of cloud computing between users and non-users (Z (N=42) =-.976, p>.0005). Users (M=3.93 SD=1.112) believed that better IT resource management was not an important variable in the usage of cloud computing than do non-users (M=4.33, SD=.778). The research findings indicated that better IT resource management as a variable used in this study did not support the research's conceptual framework.

5.4.1.12. Improved security variable

The research findings indicated that there was not a significant difference in the perceptions of improved security as an important variable in the usage of cloud computing between users and non-users (Z (N=42) =-1.809, p>.0005). Users (M=4.27 SD=1.048) believed that improved security was not an important variable in the usage of cloud computing than do non-users (M=3.58, SD=.1.311). The research findings indicated that improved security as a variable used in this study did not support the research's conceptual framework.

5.4.1.13. Flexibility variable

The research findings indicated that there was not a significant difference in the perceptions of flexibility as an important variable in the usage of cloud computing between users and non-users (Z (N=42) =-1.656, p>.0005). Users (M=4.07 SD=.907) believed that flexibility was not an important variable in the usage of cloud computing than do non-users (M=3.50, SD=1.087). The research findings indicated that flexibility as a variable used in this study did not support the research's conceptual framework.

5.4.1.14. Rapid development variable

The research findings indicated that there was not a significant difference in the perceptions of rapid development as an important variable in the usage of cloud computing between users and non-users (Z (N=42) =-1.429, p>.0005). Users (M=3.73, SD=.980) believed that rapid development was not an important variable in the usage of cloud computing than do non-users (M=3.33, SD=.888). The research findings indicated that rapid development as a variable used in this study did not support the research conceptual framework.

5.4.1.15. Great mobility variable

The research findings indicated that there was not a significant difference in the perceptions of greater mobility as an important variable in the usage of cloud computing between users and non-users (Z (N=42) =-1.429, p>.0005). Users (M=3.73, SD=.980) believed that greater mobility was not an important variable in the usage of cloud computing than do non-users (M=3.33, SD=.888). The research findings indicated that greater mobility as a variable used in this study did not support the research's conceptual framework.

5.4.1.16. Green IT data centers variable

The research findings indicated that there was not a significant difference in the perceptions of green IT data centers as an important variable in the usage of cloud computing between users and non-users (Z (N=42) =-1.934, p>.0005). Users (M=4.23, SD=1.104) believed that green IT data centers was not an important variable in the usage of cloud computing than do non-users (M=3.50, SD=1.243). The research findings indicated that green IT data centers as a variable used in this study did not support the research's conceptual framework.

5.4.1.17. Improved automation variable

The research findings indicated that there was not a significant difference in the perceptions of green improved automation as an important variable in the usage of cloud computing between users and non-users (Z (N=42) =-.647, p>.0005). Users (M=3.67, SD=1.241) believed that improved automation was not an important variable in the usage of cloud computing than do non-users (M=3.42, SD=1.084). The research findings indicated that improved automation as a variable used in this study did not support the research conceptual framework.

5.4.2. Organisational construct/category

This construct represents all aspects related to the organisational structure of the organisation (Arpaci et al., 2012). The following variables related to the organisational structure of the organisation were used in this study, namely, the size of the organisation, the scope of the organisation, as well as the managerial aspects of the organisation.

5.4.2.1. The size of the organisation variable

The research findings indicated that 31.0% of respondents' organisations had 1-6 employees, 31.0% of respondents' organisations had 6-20 employees, 16% of respondents' organisations had 21-50 employees, 14.3% of respondents' organisations had 51-150 employees, and 7.1% of respondents' organisations had 151-200 employees. The research findings indicated that the size of the organisation as a variable used in this study supported the research conceptual framework.

5.4.2.2. The scope of the organisation variable

The research findings indicated that eight respondents operated in the computer/IT business sector, one respondent operated in the mobile device business, and one respondent operated in the digital solution business. The research findings indicated that the scope of the organisation as a variable used in this study supported the research's conceptual framework.

5.4.2.3. The managerial structure variable

The research findings indicated that 38.1% of respondents were executive managers, 26.2% of respondents were employees with IT expertise or knowledge, 16.7 % of employees fell under the "other category", 9.5% of employees were middle managers, and the remaining 9.5% were IT specialists. The research findings indicated that the managerial structure as a variable used in this study supported the research's conceptual framework.

5.4.3. Environmental construct/category

This construct represents the environment in which the business is conducted (Arpaci et al., 2012). This study used the following variables related to the environmental structure of the organisation: service level agreement, product knowledge, as well as the technology support infrastructure.

5.4.3.1. Service level variable

The research findings indicated that a significant proportion of the sample showed that service level agreement should be the foundation in the adoption and usage of cloud computing ($p < .0005$). The research findings indicated that the service level management as a variable used in this study supported the research's conceptual framework.

5.4.3.2. Product knowledge variable

The research findings indicated that 71% of the respondents used cloud computing as compared to 28.6% of the respondents who did not use cloud computing. The findings provided a clear understanding of what respondents knew about cloud services, which supported in detail the environmental construct of the research's conceptual framework.

5.4.3.3. Technological support infrastructure variable

The research findings indicated that nine respondents used 1-50 PCs for their operation, four respondents used between 1-50 laptops for their operation, three respondents used 1-50 tablets for their operation, and one respondent used 1-50 mobile devices for its operation. The research findings indicated that the technological support infrastructure as a variable used in this study supported the research's conceptual framework.

5.5. Conclusion

This chapter discussed the quantitative findings for the main study. The study used inferential and descriptive statistics to interpret data. The study used a pilot questionnaire to test the validity of the research questionnaire with a small sample of respondents before administrating the research instrument on the remaining of the sample. The findings identified the employment status of the respondents, their position in the organisation, as well as the number of employees in the organisation.

The findings indicated that there was a significant sample of respondents who used cloud services. The findings also indicated that there was a significant sample of non-users who were planning to use cloud services such as SaaS, IaaS, and PaaS. The findings indicated that the likelihood of using XaaS by non-users was not significant. The following challenges were identified as highly significant by non-users in the adoption and usage of cloud computing, namely, awareness, implementation, complexities, as well as risks.

After discussing the perceptions of non-users on the adoption levels of cloud computing, the findings indicated that users of cloud computing were considering adopting the following services, namely, SaaS and IaaS as compared to PaaS and XaaS. These findings were supported in the literature review. The research findings on the perceptions of the benefits and usefulness of cloud computing revealed that the following variables, namely, scalability, saving time and cost, sustainability, customisation, and virtualisation were the most important benefits in cloud computing. The following factors were identified as influential in the decision to use cloud computing services, namely, improved services, cost-efficiency, and lock-in terms.

The research findings reported on the perceptions of users on the limitations and concerns in cloud computing. The findings indicated the following factors, namely, data privacy and security, availability, trust and transparency, shared technology, disaster recovery, service level agreement, regulatory and legal issues, challenges of security schemes, virtualisation paradigm, policy integration and governance, as well as risks of cloud computing as important limitations and concerns in cloud computing.

The findings also reported about the service level agreement. The findings indicated that a significant sample of respondents considered service level agreement as an important foundation or basis to adopt or use cloud computing technologies. The findings identified the main categories of the study and established how they supported the conceptual framework. The statistical analysis was used to test and interpret all the three constructs used to support the study including all their variables. These constructs for the conceptual framework included technological, organisational, as well as environmental (TOE).

Chapter 6: Comparison of qualitative and quantitative findings analyses

6.1. Introduction

The qualitative and quantitative findings and analyses were presented in Chapters 4 and 5. This chapter presents a comparison of the qualitative and quantitative findings. The purpose of the chapter is to establish how the two research approaches assisted in answering the phenomenon under investigation. Tables were used to present variables used in the analyses. Each research question is discussed using a brief summary using the patterns or trends identified in the research findings.

The chapter discusses the following aspects: The adoption levels of cloud computing is presented in section 6.2. The IT SMEs' perceptions are addressed in section 6.3. In section 6.4, the factors influencing the adoption and usage of cloud computing are discussed, followed by the limitations and concerns in cloud computing in section 6.5. The service level agreement is presented in section 6.6. The summary of the chapter is covered in section 6.7.

6.2. Adoption levels of cloud computing

This section of the research addresses the research question on the adoption levels of cloud computing. The section identifies how many IT SMEs in Gauteng are using cloud computing technology. The section also elaborates on the cloud computing technology being used by IT SMEs, the purpose of their usage, as well as the extent of use.

The following table represents the aspects addressed by the two approaches:

Table 6.1: Adoption levels of cloud computing

Qualitative findings	**Quantitative findings**
Adoption levels of cloud computing	Adoption levels of cloud computing
Non-adoption of cloud computing	Non-adoption of cloud computing
	Non-users planning to use cloud computing
	Likelihood of adopting cloud computing
	Challenges faced by non-users

6.2.1. Adoption levels of cloud computing

The qualitative research findings indicated that nine respondents used cloud computing. The quantitative research findings on the adoption levels of cloud computing indicated that 71.4% of the respondents used cloud computing.

The findings indicated that the two approaches assisted to identify the users of cloud computing. The patterns in the two different approaches indicated that there was a higher percentage of IT SMEs that was using cloud computing in Gauteng. Considering the two approaches, the research findings indicated that respondents were aware of cloud computing. Though the section did not specify the types of services used by respondents at early stage of the adoption, the pattern in the two approaches revealed that respondents perceived the technology model as an enabler for the business. They also perceived the benefits associated with the usage of the technology model.

6.2.2. Non-adoption of cloud computing

The qualitative research findings indicated that one respondent did not use cloud computing. The quantitative research findings indicated that 28.6% of the respondents did not use cloud computing. The patterns in the two approaches revealed that the number of respondents, who were not aware of cloud computing was very low in Gauteng. The literature indicated that though organisations were convinced that cloud computing was a new technology model for their businesses, there were other factors such as lack of awareness, lack of technology know-how, and lack of required IT skilled that influenced the non-adoption of the technology model.

6.2.3. Non-users planning to use cloud computing

The findings indicated that this section on the non-users planning to use cloud computing was only used in the quantitative analysis and not in the qualitative analysis. The quantitative research findings indicated that 75% of non-users were planning to use cloud computing and 25% of non-users were not planning to use cloud computing. The trends in the findings indicated that there was a higher percentage of non-users, who were planning to use cloud computing in Gauteng. The literature indicated that businesses were persuaded to find new and innovative ways to conduct their businesses. The trends in the two approaches revealed that respondents were considering new approaches to support their businesses and cloud computing was perceived as one of the cost-effective options. The trends could also indicate that respondents become aware of the benefits that the technology model offered in the deployment and implementation of IT resources as compared to in-house based technology environments. As a result, this sample of non-users were of the opinion that there was a justifiable reason to move their businesses in the cloud.

6.2.4. Likelihood of adopting cloud computing by non-users

The findings indicated that this section on the likelihood of adopting cloud computing by non-users was only used in the quantitative analysis, and not in the qualitative analysis. The trends in the findings indicated that there was a high percentage of non-users, who were likely to use SaaS. The trends in the two approaches were discussed by Tredger (2013), who argued that the first step in the adoption and usage of cloud computing seemed to be SaaS. The findings indicated that respondents were optimistic to use SaaS, and would like to have first-hand experience of the benefits offered in cloud computing. The trends also supported the arguments in the section of the literature where SaaS is considered as a readily available service in the cloud for the operation of various businesses. SaaS offers a variety of services that are easily manageable and less complex as compared to the remaining of other services in the cloud, namely, IaaS, PaaS, and XaaS (Brown and Madden, 2012).

6.2.5. Challenges faced by non-users in the adoption and usage of cloud computing

The quantitative research findings indicated that there was a significant agreement among non-users that the following were the most important challenges: awareness (Z (N=12) =-2.377, p=.017), implementation (Z(N=12) =-2.373, p=.018), complexities (Z(N=12) =-2.299, p=.022, and risks (Z(N=12) =-2.565, p=010).

The findings indicated that this section on the challenges faced by non-users in the adoption and usage of cloud computing was only used in the quantitative analysis, and not in the qualitative analysis. The trends in the findings revealed that the following were the most important challenges in the adoption and usage of cloud computing, namely, awareness, implementation, complexities, as well as risks.

The literature indicated that users who were aware of the technology model did not only use the technology but were also able to identify the challenges associated with the technology. Respondents acknowledged the complexities and risks associated with the adoption and implementation of the technology. The findings also revealed that while the respondents perceived cloud computing technology as an enabler for their businesses, they were also concerned about the risks associated with the technology.

6.2.6. Usage of cloud computing

This section of the research addresses the usage of cloud computing by the users. The following table represents the aspects addressed in this section:

Table 6.2: Usage of cloud computing

Qualitative findings	Quantitative findings
Software-as-a-Service (SaaS)	Software-as-a-Service (SaaS)
Infrastructure-as-a-Service (IaaS)	Infrastructure-as-a-Service (IaaS)
Platform-as-a-Service (PaaS)	Platform-as-a-Service (PaaS)
Other variants of cloud services (XaaS)	Other variants of cloud services (XaaS)

6.2.7. Usage of SaaS

The qualitative research findings indicated that six respondents used SaaS in the form of email services for their business operations, two respondents used SaaS in the form of social sites, and one respondent used SaaS in the form of MS Office 365 Live. The quantitative findings indicate that 83.3% of users used SaaS, and 16.7% of users did not use SaaS. The quantitative findings also indicate that 68.0% of users used MS Office 365 Live and 32.0% of users did not use MS Office 365 Live, 60.0% of users used mail services while 40.0% of users did not, 28.0% of users used Google Docs/Freshbooks and 72.0% of users did not use Google Docs/Freshbooks, 28.0% of users used social networking sites and 72.0% of users did not, and 56.0% of users used CRM_ERP_HRM

The findings indicated that the two approaches addressed the usage of SaaS. The patterns in the findings indicated that there was a high percentage of users, who used SaaS. The patterns also indicated that a higher percentage of users used MS Office 365 Live and mail services. Customer Relations Management, Enterprise Resource Planning, and Human Resource management were amongst the software used by IT SMEs in Gauteng. The patterns in the two approaches supported the discussion in the literature that indicated that many users considered SaaS as the first step toward cloud computing adoption. SaaS was considered because of its flexibility and agility to support various aspects of business operations (Brown and Madden, 2012). The literature indicated that many organisations considered the readily available and accessible characteristic of SaaS in cloud computing as a great investment to support their daily business activities.

6.2.8. Usage of IaaS

The qualitative research findings indicated that four respondents used IaaS in the form of Dropbox, and two respondents used IaaS in the form of Google Drive. The findings indicated that 30.0% of users used IaaS and 70.0% of users did not use IaaS. The findings also indicated that 88.0% of users used Dropbox and 11.1% of users did not use Dropbox, 22.2% of users used Amazon EC2 and 77.8% did not, 55.6 %

of users used Google Drive and 44.4% did not use Google Drive, 33.3% of users used Microsoft SkyDrive and 66.7% of users did not use Microsoft SkyDrive, and 11.1% of users used IBM Blue cloud and 88.9% of users did not use Microsoft SkyDrive.

The findings indicated that the two approaches addressed the usage of IaaS. The patterns in the findings indicated that the usage of IaaS was low among IT SMEs. The patterns indicated that IT SMEs used Dropbox and Google Drive. The patterns in the two approaches revealed that respondents used IaaS for storage purposes. Avram (2014) reported that once organisations were familiar with the usage of SaaS they moved to IaaS mainly for its cost-effective storage capabilities. The patterns suggest that respondents in Gauteng considered the two services, namely, Dropbox and Google Drive as more reliable storage services for their business activities. On the other hand, the patterns could also suggest that respondents were not exposed to other storage services in the cloud, or they might have found other storage services more complex to use as compared to Dropbox and Google Drive.

6.2.9. Usage of PaaS

The qualitative research findings indicated that the respondents did not use this service. The findings indicated that 36.7% of users used PaaS and 63.3% of users did not use PaaS. The findings also indicated that 90.9% of users used Windows Azure and 9.1% of users did not use Windows Azure, 100% of users used Google Apps Engine, 63.6% of users used Cloud Foundry, 36.4% of users used Cloud Control and 63.6% of users did not use Cloud Control, and 27.3% of users used Wave Maker while 72.7% of users did not use Wave Maker.

The findings indicated that the two approaches were used to address the usage of PaaS. The patterns indicated that the usage of PaaS was lower among IT SMEs in Gauteng. The patterns in the findings indicated that Windows Azure and Google Apps Engine were used by IT SMEs in Gauteng. The patterns in the two approaches suggest that respondents considered PaaS for technological needs as required by their organisations. The patterns also suggest that Google and Microsoft had a strong penetration and presence in the global market and as a result, respondents were likely to be exposed to use their products for various technological needs in their organisations.

6.2.10. Usage of XaaS

The qualitative research findings indicated that respondents did not use this service. The findings indicated that 40.0% of users used XaaS and 60.0% of users did not use XaaS. The findings also indicated that 66.7% of users used SecaaS and 33.3% of users did not use SecaaS, 66.7% of users used BPaaS and 33.3% of users did not use BPaaS, 75.0% of users used DBaaS and 25.0% of users did not use DBaaS, 83.3% of users used BaaS and 16.7% of users did not use BaaS, and 83.3% of users used ITaaS and 16.7% did not use ITaaS.

The patterns in the findings indicated that the usage of XaaS was lower among IT SMEs in Gauteng. The patterns also indicated that IT SMEs in Gauteng used the following services, namely, BaaS, ITaaS, as well as DRaaS. While the usage of XaaS is more customised, the patterns indicated that the three services, namely, BaaS, ITaaS, and DRaaS were used by respondents to execute their business operations. Choudhary (2012) explained that Backup-as-a-Service provides a cost-effective alternative to traditional backups. The patterns in the two approaches suggest that respondents found BaaS to be a cost-effective option to execute complex backup operations in the cloud as compared to in-house environments. The patterns revealed that Information Technology-as-a-Service was also used by respondents. The findings imply that respondents perceived the potential that this service offered alongside other services to execute more complex operations in the cloud. The patterns also revealed that Disaster Recovery-as-a-Service was used by respondents. The findings could mean respondents perceived the service as a cost-effective option as compared to in-house environments that require more complex disaster recovery processes.

6.3. IT SMEs' perceptions on the benefits of cloud computing technology

This section elaborates on the perceived benefits and usefulness of cloud computing adoption, and analyses the technology impact on those IT SMEs in Gauteng that have adopted it.

The following table represents the variables used in the qualitative and quantitative analyses:

Table 6.3: The benefits of cloud computing

Qualitative analysis	Quantitative analysis
Awareness	Cost-Efficiency
Cost-Efficiency	Lower Implementation
Lower implementation/Maintenance	Scalability
Scalability	Agility
Agility	Higher performance of resources
Higher performance of resources	Higher reliability and availability
Better IT resources management	Better IT resource management
Improved security	Improved security
Saving cost	Saving time and cost
Sustainability	Sustainability
Flexibility	Flexibility
Greater mobility	Rapid development
Improved automation	Greater mobility
Customisation	Improved automation
Virtualisation	Customisation
Green IT data centres	Virtualisation
	Green IT data centers

The patterns in the qualitative and quantitative research findings indicated that the following were the most important benefits in cloud computing, namely, cost-efficiency, lower-implementation, scalability, saving time and cost, sustainability, customisation, as well as virtualisation. The patterns in the two approaches were supported in the literature. The literature indicated that these variables were not only

perceived as benefits but also important characteristics in cloud computing. The patterns in the two approaches could mean that respondents agreed on the important contribution that these variables offered to the IT side of their business in regard to deployment, implementation, as well as management of IT operations.

6.4. Factors influencing the adoption and usage of cloud computing

This section addresses the research findings on the factors influencing the adoption and usage of cloud computing. The section on the factors influencing the adoption and usage of cloud computing was included only in the quantitative analysis. The factors identified in the research questionnaire are presented in the table below:

Table 6.4: Factors influencing the adoption and usage of cloud computing

Quantitative findings	
Improved service level management	Better accountability and auditability
Cost-efficiency	Improved performance
Standard-based security	No lock-in terms

The quantitative research findings indicated that the following were important influencing factors in cloud computing: improved service level management (3, N=12) = 68.400, p=.005), cost-efficiency (χ^2 (3, N=30) = 61.476, p=.005), standard-based security (χ^2 (3, N=30) = 17.467, p=.005), as well as improved performance (χ^2 (3, N=30) = 26.800, p=.005).

The trends in the findings revealed that IT SMEs in Gauteng considered the following factors, namely, improved service level management, cost-efficiency, standard-based security, and improved performance as influential in their decisions to adopt and use cloud computing services. The trends in the two approaches revealed that service level agreement was an influential factor in the decision of IT SMEs to adopt and use cloud computing. These findings were supported in the literature. The trends revealed that respondents agreed on the importance of having a true service level agreement that should support the adoption and implementation of cloud computing. The trends also suggest that respondents have acknowledged the challenges and complexities associated with adopting and using cloud computing. Respondents emphasised that a comprehensive service level agreement should address most of the limitations and complexities associated with the adoption and usage of cloud computing.

The trends in the two approaches revealed that respondents considered cost-efficiency as an influential factor in cloud computing. Cost-efficiency was discussed in the literature as a benefit, and the trends in the findings could mean that respondents perceived this variable as an important factor in sustaining their businesses.

The trends in the two approaches also revealed that respondents considered standard-based security as an influential factor in cloud computing. The trends could mean that respondents were concerned about the safety of their resources in the cloud. As a result, respondents perceived a standard-based security framework as an important contributing factor to the adoption and usage of cloud computing.

6.5. Limitations and concerns in cloud computing

This section addresses the limitations and challenges in cloud computing. The section also addresses how the following variables, namely, performance issues, availability issues, as well as regulatory issues associated with cloud computing technology are overcome by IT SMEs while achieving their business goals. The variables used in the qualitative and quantitative analyses are presented in **Table 6.5**.

Table 6.5: Limitations and concerns in cloud computing

Qualitative research analysis	**Quantitative research analysis**
Lack of awareness of cloud computing	Data privacy and security
Challenges and Risks in cloud computing	Availability
Performance issues in cloud computing	Trust and transparency
Availability issues in cloud computing	Shared Technology issues
Security issues in cloud computing	Disaster recovery
Regulatory requirements in cloud computing	Service level agreement
Impact of security in cloud computing	Regulatory and legal issues
Impact of challenges in cloud computing	Challenges of security schemes
Impact of availability issues in cloud computing	Virtualisation paradigm
Need for more computing devices	Policy integration and governance
	Risks of cloud computing technology

The patterns in the research findings indicated that IT SMEs in Gauteng considered the following variables as important limitations and concerns in cloud computing, namely, risks, availability and security issues, awareness, performance, impact of security, impact of challenges, impact of availability, trust and transparency, shared technology issues, disaster recover, service level agreement, virtualisation, as well as policy integration. The patterns in the two approaches revealed that respondents were concerned about the negative impact of these challenges and limitations on their business operations. The impact of these challenges has the potential to negatively influence the adoption and usage of cloud computing, implementation and deployment of IT resources, and possibly deter users from considering cloud computing as an alternative solution to in-house technology.

6.6. Service level agreement

The qualitative research finding indicated that service level agreement should be the foundation for cloud computing adoption and usage. The quantitative findings indicated that 90.5% of respondents considered service level agreement as a foundation in the adoption and usage of cloud computing, and 9.5% of respondents did not consider service level agreement as a foundation in the adoption and usage of cloud computing.

The pattern in the research findings indicated that a higher percentage of IT SMEs in Gauteng agreed that service level agreement should be the foundation for cloud computing adoption and usage. The findings from the two approaches were supported in the literature. The findings revealed that respondents were of the opinion that the usage of cloud computing required the establishment of a clear contract, the terms of which should be documented in a service level agreement. The patterns also suggest that respondents acknowledged the complexities associated with running business operations in the cloud, therefore considered service level agreement as the basis for a true implementation of cloud services.

6.7. Conclusion

This chapter attempted to answer the research questions by identifying patterns in both the qualitative and quantitative findings. The first research question addressed the adoption levels of IT SMEs in the province of Gauteng. The section identified the number of users and non-users of cloud computing. The patterns in the findings indicated that there was a higher percentage of IT SMEs using cloud computing technologies. The trends in the findings identified the following: there was a higher percentage of non-users, who were planning to use cloud computing in Gauteng, and there was a high percentage of non-users, who were likely to use SaaS. The trends in the findings also revealed that the following were considered as the most important challenges by non-users in the adoption and usage of cloud computing, namely, awareness, implementation, complexities, as well as risks.

The patterns in the findings also indicated the following: there was a high percentage of users, who used SaaS, and there was a higher percentage of users, who used MS Office 365 Live and mail services. Customer Relations management, Enterprise Resource Planning, and Human Resource management were also highly used by IT SMEs in Gauteng. The patterns in the findings indicated that the usage of IaaS was not higher among IT SMEs. The patterns indicated that IT SMEs used Dropbox and Google Drive, and the usage of PaaS was lower among IT SMEs in Gauteng. The patterns in the findings also indicated that Windows Azure and Google Apps Engine were used by IT SMEs in Gauteng. The patterns in the findings indicated that the usage of XaaS was lower among IT SMEs, and the following services, namely, BaaS, ITaaS, as well as DRaaS were used by IT SMEs in Gauteng.

The second section of the research addressed the IT SMEs' perceptions of cloud computing technology. The patterns in the qualitative and quantitative research findings indicated that the following were considered as important benefits in cloud computing, namely, cost-efficiency, lower-implementation, scalability, saving time and cost, sustainability, customisation, as well as virtualisation. The third section of the research addressed the influential factors in the adoption and usage of cloud computing. The trends in the findings revealed that IT SMEs in Gauteng considered the following factors, namely, improved service level management, cost-efficiency, standard-based security, and improved performance as influential in their decisions to adopt and use cloud computing services.

The fourth section of the research addressed the limitations and concerns in cloud computing. The patterns in the research findings indicated that IT SMEs in Gauteng considered the following variables as important limitations and concerns in cloud computing, namely, risks, availability and security issues, awareness, performance, impact of security, impact of challenges, impact of availability, trust and transparency, shared technology issues, disaster recover, service level agreement, virtualisation, as well as policy integration. The fifth section of the research addressed the service level agreement. The patterns in the research findings indicated that a higher percentage of IT SMEs in Gauteng agreed that service level agreement should be the foundation for cloud computing adoption and usage.

Chapter 7: Conclusion

7.1. Introduction

After discussing the comparison of the qualitative and quantitative research findings, this chapter presents a summary of conclusions for this study. The chapter covers the following aspects: summary of the main research findings, which is discussed in section 7.2, followed by the contribution of the study in section 7.3. In section 7.4, the limitations of the study are presented, followed by the recommendations and future research in section 7.5. The summary of the chapter is covered in section 7.6.

7.2. Summary of the main research findings

This section discusses the summary of the main research findings. The study's main findings were guided by the study's research questions, namely:

RQ1. To what extent is the level of cloud computing adoption and usage by IT SMEs in Gauteng?

RQ2. What are the IT SMEs' perceptions on the benefits of cloud computing technology?

RQ3. What are the factors influencing the adoption and usage of cloud computing by IT SMEs in Gauteng?

RQ4. How viable is the cloud computing technology model for IT SMEs in order to meet business needs and objectives?

Sub questions to RQ4:

- To what extent does the performance of cloud computing technologies impact the ability of IT SMEs to meet their business goals?
- To what extent does the availability of cloud computing technologies impact the ability of IT SMEs to meet their business goals?
- How is the security of the cloud computing technology model perceived in order for IT SMEs to meet their business goals?
- How are the risks of the cloud computing technology model perceived in order for IT SMEs to meet their business goals?
- What are the regulatory requirements associated with the cloud computing technology model for IT SMEs to meet their business goals?

RQ5. How does the service level management in the contract agreement to adopt cloud computing technology model promote the adoption and usage of the model for IT SMEs in Gauteng?

7.2.1. Answers to the research questions and sub-questions

The qualitative research findings indicated that nine respondents used cloud computing. The quantitative research findings on the adoption levels of cloud computing indicated that 71.4% of the respondents used cloud computing. The qualitative research findings indicated that one respondent did not use cloud computing. The quantitative research findings indicated that 28.6% of the respondents did not use cloud computing.

The quantitative research findings indicated that 75% of non-users were planning to use cloud computing and 25% of non-users were not planning to use cloud computing. The research findings indicated that non-users were likely to use SaaS. The research findings revealed that the following were the most important challenges in the adoption and usage of cloud computing, namely, awareness, implementation, complexities, as well as risks.

The qualitative research findings indicated that six respondents used SaaS in the form of email services for their business operations, two respondents used SaaS in the form of social sites, and one respondent used SaaS in the form of MS Office 365 Live. The quantitative findings indicate that 83.3% of users used SaaS, and 16.7% of users did not use SaaS. The quantitative findings also indicate that 68.0% of users used MS Office 365 Live and 32.0% of users did not use MS Office 365 Live, 60.0% of users used mail services while 40.0% of users did not, 28.0% of users used Google Docs/Freshbooks and 72.0% of users did not use Google Docs/Freshbooks, 28.0% of users used social networking sites and 72.0% of users did not, and 56.0% of users used CRM_ERP_HRM

The qualitative research findings indicated that four respondents used IaaS in the form of Dropbox, and two respondents used IaaS in the form of Google Drive. The quantitative findings indicated that 30.0% of users used IaaS and 70.0% of users did not use IaaS. The findings also indicated that 88.0% of users used Dropbox and 11.1% of users did not use Dropbox, 22.2% of users used Amazon EC2 and 77.8% did not, 55.6 % of users used Google Drive and 44.4% did not use Google Drive, 33.3% of users used Microsoft SkyDrive and 66.7% of users did not use Microsoft SkyDrive, and 11.1% of users used IBM Blue cloud and 88.9% of users did not use Microsoft SkyDrive.

The qualitative research findings indicated that respondents did not use this service. The quantitative research findings indicated that 36.7% of users used PaaS and 63.3% of users did not use PaaS. The findings also indicated that 90.9% of users used Windows Azure and 9.1% of users did not use Windows Azure, 100% of users used Google Apps Engine, 63.6% of users used Cloud Foundry, 36.4% of users used Cloud Control and 63.6% of users did not use Cloud Control, and 27.3% of users used Wave Maker while 72.7% of users did not use Wave Maker.

The qualitative research findings indicated that respondents did not use this service. The quantitative research findings indicated that 40.0% of users used XaaS and 60.0% of users did not use XaaS. The findings also indicated that 66.7% of users used SecaaS and 33.3% of users did not use SecaaS, 66.7% of users used BPaaS and 33.3% of users did not use BPaaS, 75.0% of users used DBaaS and 25.0% of users did not use DBaaS, 83.3% of users used BaaS and 16.7% of users did not use BaaS, and 83.3% of users used ITaaS and 16.7% did not use ITaaS.

The qualitative and quantitative research findings indicated that the following were the most important benefits in cloud computing, namely, cost-efficiency, lower-implementation, scalability, saving time and cost, sustainability, customisation, as well as virtualisation. The quantitative research findings revealed that the following were the most influential factors in the decision to adopt and use cloud computing, namely, improved service level management, cost-efficiency, standard-based security, and improved performance.

The qualitative and quantitative research findings indicated that the following variables were important limitations and concerns in cloud computing, namely, risks, availability and security issues, awareness, performance, impact of security, impact of challenges, impact of availability, trust and transparency, shared technology issues, disaster recover, service level agreement, virtualisation, as well as policy integration.

The qualitative research finding indicated that service level agreement should be the foundation for cloud computing adoption and usage. The quantitative findings indicated that 90.5% of respondents considered service level agreement as a foundation in the adoption and usage of cloud computing, and 9.5% of respondents did not consider service level agreement as a foundation in the adoption and usage of cloud computing.

7.3. Contribution of study

This study constitutes an important milestone in the development of cloud computing technology in South Africa, especially in the province of Gauteng where the study was conducted. These contributions were guided by the research findings.

The research findings and analyses have assisted to understand how IT SMEs approached the adoption and usage of cloud computing technology. The research findings identified the users from the non-users of cloud computing. These findings indicated that organisations in the Gauteng province were using the following cloud computing services: SaaS, IaaS, PaaS, as well as XaaS. The remarkable development in the research findings was that non-users of cloud computing were planning to use cloud services. The

likelihood of using cloud services by non-users was motivated by a number of variables such as cost-efficiency, lower-implementation, scalability, saving time and cost, sustainability, customisation, as well as virtualisation. The research findings indicated that these variables were also considered by users as the most important benefits in cloud computing. Users considered the following variables as the most influential in their decision to adopt and use cloud computing, namely, improved service level management, cost-efficiency, standard-based security, and improved performance.

The contribution to this study is the identification of these benefits and influential factors in the decision to adopt and use cloud computing by IT SMEs in Gauteng. Given the higher percentage of IT SMEs that identified these benefits and influential factors in cloud computing, organisations would be highly likely to implement cloud-based services to support their business operations.

The research findings indicated that the sample of respondents did not use cloud computing services because they were not aware of the technology and its influencing factors. The findings also indicated challenges faced by non-users as another contributing factor in the lack of usage of cloud computing services.

There is a lot to be done to shift the focus of non-users from using in-house or legacy systems to start using cloud-based systems. The study proposes strategies and mechanisms be used to address these challenges in cloud computing. The findings on the non-adoption and usage of cloud computing cited that awareness and the need for business change or transformation as some of the reasons for not using cloud computing. The research findings on the adoption and usage of cloud computing could be used to address these limitations, and promote cloud computing as a new technology model among non-users.

The research findings identified the benefits and the limitations of cloud computing. This study proposes that the research findings be used as cases or examples for cloud computing adoption and usage. This study also proposes that the findings be used to increase awareness among non-users of cloud computing.

The research findings indicated that cloud computing played an important role in the way businesses operated and met their organisational needs. While cloud computing is an important phenomenon with tremendous impact on businesses, the research findings indicated that awareness is still an important variable in the deployment of cloud computing since the variable is considered both as a benefit and limitation. This study proposes that well established businesses take on a leadership role in promoting and supporting new entrants in the market.

7.4. Limitations of study

This section discusses the limitations of conducting this study. This study was conducted in Gauteng province. Most of the respondents were often not available for interviews. This situation presented serious challenges to engage and interact with the respondents. This study used semi-structured in-depth interviews with open-ended questions to gather data. There was a limited period set aside for interviewing all the respondents. Appointments were made prior to the interview and arrangements were made to meet with the respondents. All the surveys were emailed to respondents and most of these surveys took a while to be returned back for analysis. In order to overcome the delay, respondents were frequently contacted to find out whether they had received the questionnaire, and if they could assist in completing and forwarding them back for analysis.

The greatest limitation was the distance between various respondents. The target population was split across the following main areas, namely, Pretoria, Centurion, Midrand, and Sandton. Some respondents had to be met on the premises when they took long to respond and complete the questionnaire.

The qualitative section of the study used NVIVO software package to transcribe data into meaningful texts. The use of the NVIVO package was a challenge given its complexities. To overcome the limitation, the package had to be learnt in the process to ensure that data were credible and reliable for the purposes of the study. The use of the thematic approach used in this study was another limitation. This research considers the thematic approach to be relatively complex and a lot of precautions were to be taken to ensure that the approach produces reliable findings. In order to overcome the limitation, the thematic approach had to be learnt and understood fully before it was used in this study.

This study used the SPSS Version 22 to interpret all the quantitative data. Given the complexities of the statistical software, all the quantitative data had to be sent to a statistician to ensure that accurate and reliable data were analysed for the purpose of this study. This study used the Technology-Organisation-Environment (TOE) conceptual framework. While this conceptual framework managed to provide an ideal representation of the organisational dimension, its application and interpretation in this study was not that easy. The interpretation of variables for each construct was another limitation. To overcome these challenges, similar studies were carefully considered in order to ensure that constructs and variables were accurately used to represent the dimensions of IT SMEs in the study.

7.5. Recommendations and future research

After discussing the limitations of the study, this section discusses the recommendations and suggestions for future research. These recommendations are addressed to decision-makers, management, as well as IT professionals.

7.5.1. Decision-makers and management

The pace of technology in today's business environment presents dynamic aspects that need to be carefully considered in the adoption of a technology. This study recommends that decision-makers take on a leadership role in leading and controlling the adoption and usage of a technology. Given that awareness was perceived in this study's findings as an important factor in the adoption and usage of cloud computing, this study recommends that decision-makers take full responsibility to engage their organisations on new technologies, their benefits, as well as their limitations for a successful implementation. The study recommends that a successful implementation of a new technology would heavily rely on the level of awareness and innovation of the decision-makers in the organisation. Therefore, decision-makers need to play an important role in ensuring that opportunities are not missed or misinterpreted in meeting their organisation or business needs.

The findings indicated that not all the benefits listed in the literature review were identified by IT SMEs in Gauteng. This study recommends that innovative ways be used to implement a new technology in organisations by providing further information to users.

7.5.2. IT professionals

IT professionals play a vital role in shaping the direction of IT and in assisting in the integration of the strategic vision for the organisation. A study such as this one on the adoption and usage of cloud computing by IT SMEs in the Gauteng province could be used as a typical example for a successful implementation of the technology model. The research findings could be used to motivate the need for non-users in Gauteng to use cloud-based services.

IT professionals should be at the forefront of the technology implementation. IT professionals could use the research findings with accurate and reliable facts to influence the usage of cloud computing among non-users. IT professionals could also play a vital role in spearheading the shift from in-house technology to a cloud–based technology using the study' research findings.

IT professionals could use the research findings to close the knowledge gap discussed in this study and assist non-users to understand the potentials of using this technology model. This study recommends that IT professionals serve as mentors and leaders in spearheading the adoption of the technology. The study

also recommends that further research be conducted on non-users of technology in order to understand what could have been done better in ensuring they are empowered and made aware of new technologies, identify its benefits and limitations, as well as address the shortcomings in the implementation process.

7.6. Conclusion

This chapter covered a summary of contributions. The key aspects discussed in this chapter include the summary of the main research findings, summary of contributions, limitations to the study, recommendations and future research, as well as the conclusion.

8. REFERENCES

Adler, P. A. and Adler, P. (1994). *Observational Techniques. In N.K. Denzin & Y.S. Lincoln (Eds.)*. Thousand Oaks, CA: Sage Publications.

Ali, M., Khan, S.U. and Vasilakos, A. (2015). Security in Cloud Computing: Opportunities and Challenges. *Information Science,305(357-383).*

Arpaci, I., Yardimci, Y., Ozkan, S. and Turetken, O. (2012). Organisational Adoption Of Information Technologies: A Literature Review. *International Journal of eBusiness And eGovernment studies, 4*(2), 2146-0744.

Avram, M.G. (2014). Advantages and challenges of adopting cloud computing from an enterprise perspective. The 17th International Conference Interdisciplinary in Engineering. Procedia Technology, 12(529-534).

Awa, H. O., Ukoha, O. and Emecheta, B. (2012). Integrating TAM and TOE Frameworks and Expanding their characteristic constructs for E-commerce Adoption by SMES.*Proceedings of Information Science & Education conference (Insite) 2012*.

Baskar, V., Kumar, S. and Karthick, N. (2013). Research Analysis of Cloud Computing. *International Journal of Computer Science and Mobile Computing (IJCSMC), 2*(5), 313-316.

Bennani, N., Boukadi, K. and Guegan, C. (2014). A Trust Management Solution in the Context of Hybrid Clouds. IEEE 23rd International WETICE Conference, 978(1), 4799 4249.

Bhattacherjee, A. (2012). Social Science Research: Principles, Methods and Practices (2nd Ed.). Florida. Jacobs Foundation.

Braun, V. and Clarke, V. (2006). Using thematic analysis in psychology. Qualitative research in Psychology, 3(2) 77-101.

Brohi, N.S. and Bamiah, M.A. (2011). Challenges and Benefits for Adopting the Paradigm of Cloud Computing. International Journal of Advanced Engineering Sciences and Technologies. Vol. No.8, Issues No.2, 286-290

Brown, I. and Malden, J. (2012). Advice and Analysis on the global IT market. *OVUM StraightTalk*. Retrieved from http://ovum.com/wpcontent/uploads/2012/03/STQ_IT_2Q12.pdf. Accessed on 12/09/2013

Business Software Alliance (BSA), (2012). BSA Global Cloud Computing Scorecard: *A Blueprint for Economic Opportunity*. Retrieved from http://cloudscorecard.bsa.org/2013/assets/PDFs/BSA_GlobalCloudScorecard2013.pdf and accessed on 12/12/2013.

Buyya, R., Garg, K. and Calheiros, R. (2011). SLA-Oriented Resource Provisioning For Cloud Computing: Challenges, Architecture, and Solutions. *Institute of Electrical And Electronics Engineers., 978*(1), 1637-1637.

Carlin, S. and Curran, K. (2012). Cloud Computing Technologies. *International Journal of Cloud Computing and Services Science, 1*(2), 59-65.

Carroll, M., Kotze, P. and A. Merwe (2011). Secure Cloud Computing: Benefits, Risks and Controls. SciTePress,2011.

Caruth, G. D. (2013). Demystifying Mixed Methods Research Design: A Review of the Literature. *Mevlana International Journal of Education, 3*(2), 112-122.

Centre for Economics and Business Research (CEBR), (2010). "The Cloud dividend Part one: The Economic Benefits of Cloud Computing to Business and the wider EMEA Economy". Retrieved from http://www.globbtv.com/microsite/35/Adjuntos/CLOUD DIVIDEND-REPORT.PDF. Accessed on the 09/10/2013

Chang, V., Kuo, Y.H. and Ramachandran, M. (2016). Cloud computing adoption framework: A security framework for business clouds. *Future Generation Computer Systems*, 57(24-41).

Chou, D.C. (2015). Cloud computing risk and audit issues. *Computer Standards and Interfaces, 42(137-142).*

Choudhary, A. R. (2012). Baseline Requirements and Architecture for Cloud Computing Services. *International Journal of Advanced Computer research, 2*(4), 2249-7277.

Cloud Security Alliance (CSA), (2009). Security Guidance for Critical Areas of Focus in Cloud Computing V2.1. *Computer Security Alliance*. Retrieved from https://cloudsecurityalliance.org/csaguide.pdf. Accessed on the 22/Dec/2012

Cowhey, P. and Kleeman, M. (2013). Unlocking the Benefits of Cloud Computing for Emerging Economies- A Policy Review. Retrieved from http://wwww.wto.org/english/tratop-e/serv_e/wkshop-june13_e/unlocking benefits_e.pdf. Accessed on 10 August 2013.

Dargha, R. (2009). Cloud computing: Key considerations for adoption for adoption. Retrieved from http:// www.infosys.com. Accessed on 08/09/2014

Davis, F. D. (1985). A technology acceptance model for empirically testing new end user information systems: Theory and results. *Unpublished Doctoral dissertation, MIT Slon School of Management, Cambridge, MA.*

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3), 319-340. Retrieved from http://www.jstor.org/pss/249008

Deloitte Report (2012). How to develop a strategy to navigate the cloud: Clear Skies Ahead. Retrieved from https://www.deloitte.com/assets/Dcom SouthAfrica/Local%20Assets/Documents/RA_Cloud_Readiness_Assessments.pdf. Accessed on 21/07/2013

DePietro, R., Wiarda, E. and Fleischer, M. (1990). The context of Change: Organisation, Technology and Environment. In L.G. Tornatzky & M. Fleischer (Eds.). *Proceedings of Technological Innovation* (Vol. 273, pp. 151-175). MA: Lexington Books.

Dubey, A. and Wagle, D. (2007). Delivering software as a Service. *The McKinsey Quarterly: The Online Journal of McKinsey & Co.* Retrieved from http://www.mckinseyquarterly.com/article_print.aspx?L2=13&L3=0&ar=2006. Accessed on 06/04/2013.

Erol, C., Karatas, E., Ozen, Z. and Gulsecen, S. (2012). Cloud Computing and Some Scenarios for its Applications in Universities. *European Researcher, 30*(9-3), 1515-1526.

Etro, F. (2009). The Economic Impact of Cloud computing on Business Creation, Employment and Output in Europe: An application of Endogenous Market Structures Approach to a GPT innovation. *Review of Business and Economics*.

Falkena, H., Abedian, I. and Blottnitz, M. (2002). 'SMES access to finance in South Africa'. The Task group of the Policy Board for financial services and regulations.

Feuerlicht, G. (2010). *Next Generation SOA: Can SOA Service Cloud Computing? Advances in Intelligent Web Mastering; In V Snael, P. SZCZEpaniak, A. Abraham & J. Kacprzyk (Eds.).* (Vol. 67, pp. 19-29). Heidelberg: Springer Berlin.

Frels and Onwuegbuzie (2013). Demystifying Mixed Methods Research Design: A Review of the Literature. *Mevlana International Journal of Education (MIJE).* Vol.3(2), pp.112-122.

Frey, L.R., Carl, H.B. and Gary L.K. (2000). Investigating Communication: An Introduction to Research Methods.2nd Edition. Boston, Allyn and Bacon.

Gartner. (2010). Cloud Computing: Key Initiative Overview. *Gartner*. Retrieved from https://www.gartner.com/doc/1263918/cloud-computing-key-initiative-overview. Accessed on 12/12/2013.

GIDSD (2012). Gauteng ICT Development Strategy draft. Retrieved from http://www.ecodev.gpg.gov.za/policies/Documents/Gauteng%20ICT%20Strategy.pdf Accessed on 2013/12/03

Ghanam, Y., Jennifer, F. and Maurer, F. (2012). Emerging Issues & Challenges in Cloud Computing- A Hybrid Approach. *Journal of Software Engineering and Applications, 5*(2012), 923-937.

Goyal, K. and Supriya. (2013). Security Concerns in the World of Cloud Computing. *International Journal of Advanced Research in Computer Science, 4*(4), 0976-5697.

Heyink, M. (2012). An Introduction to Cloud Computing: Legal Implications for South African Law Firms. *Law Society of South Africa* (120425).

Hinde, C. and Belle, J.P. (2012). Cloud Computing in South Africa: Risks and Rewards for Playing at Altitude. *International Journal of Computer Science and Electrical Engineering 1*(1), 2315-4209.

http://www.gbn.co.za/business/listings/ITservices.html. Accessed on the 18th of September 2013.

Ibrahim, M.A. (2012). Thematic Analysis: A Critical review of its Process and Evaluation. Academic conference proceedings. WEI International European.

Jackson, S. L. (2010). Research Methods: A Modular Approach (2nd Ed.). CA. Cengage Learning.

Johnson, R. B., Onwuegbuzie, J. and Turner, A. (2007). Toward a Definition of Mixed Methods Research. *Journal of Mixed Methods Research, 1*(112-133).

Joubert, A. (2012). Ten Drivers of Cloud Computing for South African businesses. Retrieved from http://www.itweb.co.za/index.php?option=com_content&view=article&id=58388. Accessed on 14 April 2013.

Joshua, A. and Ogwuelela, N. (2013). Cloud Computing with Related Enabling Technologies. *International Journal of Cloud Computing and Services Sciences, 2*(1), 40-49.

Kaur, A. and Singh, D. (2013). Enlightening the cloud computing domain. *International Journal of Computers & Technology, 4*(2), 2277-3061.

Kshetri, N. (2010). Cloud computing in developing economies: Drivers, Effects and Policy measures. *PTC'10 Proceedings*. Retrieved from http://www.ptc.org/ptc10/program/images/papers/papers/Paper_Nir%20Kshetri_B8.pdf

Kulkarni, G., Gambhir, J. and Palwe, R. (2012). Cloud Computing-Software as Service. *International Journal of Cloud Computing and Services Sciences, 1*(1), 11-16.

Kumar, R.J. and Shinde, N. (2013). Review of Delay and Cost Efficient Methods in Cloud Computing. *International Journal of Recent Technology and Engineering (IJRTE), 2*(5), 2277-3878.

Hemalatha, S. and Manickachezian, R. (2012). Present and Future of Cloud Computing: A Collaborated Survey report. *International Journal of Innovative Technology and Exploring Engineering (IJITEE), 1*(2), 2278-3075.

Lopez-Ortega, E., Canales-Sanchez, D., Bautista-Godinez, T. and Marcia-Herrera, S. (2016). Classification of micro, small and medium enterprises (M_SMEs) based on their available levels of knowledge. Technovation 47(2016) 59-69

Low, C., Chen, Y. and Wu, M. (2011). Understanding the determinants of cloud computing adoption. *Industrial Management & Data Systems, 111*(7), 1006-1023.

Louw, R. (2013). Six steps to taking the complexity out of moving to the cloud. *TechSmart, 2*. Smart Publishing. Pretoria.

Madhubala, R. (2012). An Illustrative study on Cloud Computing. *International Journal of Soft Computing and Engineering, 1*(6), 2231-2307.

Matuszak, G. and Lamoureux, T. (2013). Breaking Through the Cloud adoption barriers. *KPMG International cooperative*. Retrieved from http://www.slideshare.net/cmonnier/cloud-service-providers-survey-breaking-through the-cloud-adoption-barriers-kpmg-august-2012-30017630 on the 12/11/2013

Mell, P. and Glance, T. (2011). The National Institute of Standard and Technology Definition of Cloud Computing. *Computer Security 800-145*.

Melville, N. and Ramirez, R. (2008). Information Technology Innovation Diffusion: An Information requirements paradigm. *Information Systems Journal, 18*(3), 247-273.

Mohammed, A., Alsudiari, T. and Vasista, T. (2012). Cloud Computing and Privacy Regulations: An Exploratory Study on Issues and Implications. *Advanced Computing: An International Journal (ACIJ), 3*(2).

Mujinga, M. (2012). Developing Economies and Cloud Security: A study of Africa. *Journal of Emerging Trends in Computing and Information Sciences, 3*(8), 2079-8407.

Murugaboopathi, G., Chandravathy, C. and Kumar, V. (2013). Study on Cloud Computing and Security Approaches. *International Journal of Soft Computing and Engineering, 3*(1), 2231-2307.

National Credit Regulator (NRC), (2011). Literature Review on Small and Medium Enterprises' Access to credit and Support in South Africa. Retrieved from http://www.ncr.org.za/pdf website: http://www.ncr.org.za/pdf

Nusca, A. (2012). The future of cloud computing: 9 trends for 2012. Retrieved from http://www.zdnet.com/blog/btl/the-future-of-cloud-computing-9-trends-for-2012/80511. Accessed on the 12 May 2012.

Rao, R.V. and Selvamani, K. (2015). Data security and Challenges and its solutions in Cloud Computing. *International Conference on Intelligent Computing, Communication and Convergence*. *Procedia Computer Science.48(204-209).*

Rani, S. and Suri, K. (2012). Grid Computing and Cloud Computing: Description and Comparison. *International of Journal of Advanced Research in Computer Science and Electronics Engineering, 1*(7), 2277-9043.

Saedi, A. and Noorminsnshah, I. (2013). "An Integrated Theoretical Framework for Cloud Computing Adoption by Small and Medium-Sized Enterprises". *Pacis 2013 Proceedings*.

Saunders, M., Lewis, P. and Thornhill, A. (2009). *Research Methods for Business Students* (5th ed.): Pitman Publishing Imprint.

Schissser, R. (2010). Information Technology Systems Management. City: Prentice Hall. ISBN 13:978-137-02506-0

Seda. (2012). Analysis of the Needs, State and Performance of Small and Medium Businesses in Agriculture, Manufacturing, ICT and Tourism sectors in South Africa. *Small Enterprise Development Agency (2012).*

Serakan, U. and Bougie, R. (2010). *Research Methods for Business: A Skill Building Approach* (5th Ed.). Chichester: Wiley.

Singh, H. and Seenham, D. (2013). Current Trends in Cloud Computing: A Survey of Cloud Computing Systems. *International Journal of Electronics and Computer Science Engineering (IJECSE), 2277*(1956), 1214-1219.

Soni, S. (2005). The Challenges Facing Small Businesses: A Global Perspective. Retrieved from http://www.dorriangroup.com/docs/NewsNov2005.pdf. Accessed on 21/Sept/2013.

Sravani, K. and Nivedita, L.A. (2012). Effective Service Security Schemes in Cloud Computing. *International Journal of Computational Engineering Research, 3*(2), 2250-3005.

Subashini, S. and Kavitha, V. (2010). "A Survey on Security issues in service delivery models of cloud computing". *Journal of Networks and Computer Applications 34*(1-11).

Teddlie, C. and Yu, F. (2007). Mixed Methods Sampling: A Typology with examples. Journal of Mixed Methods Research, Vol1,No.77

Thedti. (2007). Annual Review of Small Business in South Africa 2005-2007. Retrieved from www.thedti.gov.za/sme_development/docs/smme_report.pdf. Accessed on July 08th, 2013.

The Gartner Report (2013). Midsize Enterprise Summit Audience Survey. The Channel Link to Gartner article. Retrieved from http://www.gartner.com/it/page.jsp?Id=2163616. Accessed on September 1st, 2013.

Tornatzky, L. and Fleischer, M. (1990). *The process of technology innovation*. Lexington, M.A: Lexington Books.

Tudor, G. (2013). The Importance of backup and recovery for mid-sized businesses. *TechSmart Business, 2*. SmartPublishing. Pretoria.

Tredger, C. (2013). Africa's top multinational cloud service providers. Retrieved from: http://www.itnewsafrica.com/2013/09/africas-top-multinational-cloud-service-providers/. Accessed on 20/10/2013.

Youssef, A. E. (2012). Exploring Cloud computing Services and Applications. *Journal of Emerging Trends in Computing and Information Sciences, 3*(6).

Venkatech, V., Morris, M.G., Davis, G.B. and Davis,F.D. (2003). User Acceptance of Information Technology: Toward A Unified View. *MIS Quartely, 27*(3), 425-478.

Walden, I. (2012). Demystifying Regulation in the Cloud: Opportunities and Challenges for Cloud Computing. *International Telecommunication Union*. Retrieved from http://www.itu.int/ITUD/treg/Events/Seminars/GSR/GSR12/documents/GSR12_Cloud Walden_5.pdf. Accessed on 21/08/2013.

Welman, C., Kruger and Mitchell, B. (2005). *Research Methodology* (3rd Ed.): Oxford University Press.

William, C. (2007). Research Methods. *Journal of Business & Economics Research, 5*(3).

Zabalza, J., Rio-Belver, R., Cilleruello, E., Garechana, G. and Gavilanes, J. (2012). Benefits Related to Cloud Computing in the Small and Medium Enterprises. *6th International Conference on Industrial Engineering and Industrial Management. XVI Congresso de Ingenieria de Organizacion, Vigo.*

Zhang, S. Zhang, S., Chen, X. and Huo, X. (2010). Cloud Computing Research and Development Trend. IEEE 978-7695-910

APPENDICES

Appendix 1: Summary of statistical tests

Appendix 2: Ethical clearance document

APPENDIX 1:SUMMARY OF STATISTICAL TESTS