

Perceptions of cloud computing as a disruptive technology in South Africa

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A research report submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Business Administration

Johannesburg, 2011

ABSTRACT

Disruptive technologies like cloud computing can assist an organisation in maintaining a competitive advantage in the marketplace. Different terminology is used in the literature to describe disruptive technologies and cloud computing associated with uncertainty and risk. The term 'disruptive technologies' is described and explained in comparison to sustaining technology. The purpose of this research is to explore perceptions of cloud computing as a disruptive technology in South African organisations, more specifically hosted services like Software as a Service (SaaS). For the purposes of this research, cloud computing is seen as the disruptive technology. The impact of disruptive technology is discussed in terms of the business value of information technologies, the value network of the organisation, the current security framework of the information technology architecture, business processes and standards, approaches to business strategy, involvement of executive management and influence on customers and clients of the organisation. Ten organisations within the South African environment agreed to be the subjects of the research. These were described and recommendations were made at the completion of the research.

DECLARATION

I, Fokion Natsis, declare that this research report is my own work except as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

Fokion Natsis

Signed at

On the day of 2011

DEDICATION

To my late father, George Natsis.

ACKNOWLEDGEMENTS

I would like to thank my Lord, God Almighty, for providing me the knowledge and the ability to use my gifts to honour and to worship Him in all that I am and in all that I do. “Remain in [Me], and I will remain in you”, John 15 verse 4.

My Supervisor, Antony Soicher, thank you for all your help and for your support. I really appreciate all the time and the effort you placed in helping and guiding me.

I would like to thank my wife, Maria, for being my safe “sound check” to bounce ideas and to always listen and give feedback on my ideas, and for always supporting me in everything that I do. Thank you for always believing in me and thank you for always reminding me that I can become whatever I want to, if I just put my heart into it and believe in myself!

And to my precious daughter, Gabriela, who in her own unique little way inspires me daily to do my best and give of my best.

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CHAPTER 1: INTRODUCTION

1.1 Purpose of the study

Cloud computing is defined as “a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g. networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction” (Mell and Grance, 2009:1).

Christensen and Bower (1995:10) define disruptive technology as “innovations that create an entirely new market through the introduction of a new kind of service or product”. This definition implies that disruptive technology is an innovation that will lead to a totally new way of doing things, changing how people work and how a firm runs its business.

Information technology (IT) is the enabler that supports the core business of an organisation (Evans, 2003). However, it is important to establish the best information technology solution, that not only supports the goals and operations of an organisation, but also holds the potential to give the organisation a competitive advantage.

The purpose of this research is to explore perceptions of cloud computing as a disruptive technology in South African organisations, more specifically hosted services like software as a service (SaaS). For the purposes of this research, cloud computing is seen as the disruptive technology.

Furthermore, the purpose of the research is to provide insight and principles when companies need to make informed decisions when to implement a disruptive technology. Companies do not know when a disruptive technology can potentially provide a competitive advantage or not.

1.2 Context of the study

There is an on-going race in the digital economy to find better, faster and more efficient technologies to support the value chain of any given organisation. The information technology platform should both effectively support the organisation and simultaneously seek innovative technologies that will give the organisation a competitive advantage within a specific industry marketplace. However, when disruptive technologies enter the industry marketplace, the potential to change the business landscape is increased (Patki, 2006). Organisations can use disruptive technology to maintain a competitive advantage or risk losing business through their reluctance to use the new technology. Organisations realised the importance of information technology and the role it plays in maintaining a competitive advantage. At the same time, however, investing in innovative technologies can also have a risk implication to the operation of an organisation. Dhar and Sundararajan (2007) point out that the dilemma the organisation faces is threefold: when to invest in new technologies that could disrupt the organisational operations; when to embrace an endeavour with uncertain results; and how to manage uncertainties in terms of developments in information technology. Organisations face enormous pressure to stay current in terms of innovative technology and simultaneously to maintain their competitive advantage. Organisations constantly need to perform based on the following issues:

- locate the right information at the right time for the right audience to support the management information of the organisation;
- stay abreast of business and technology trends;
- provide better products and services to be profitable; and
- maintain communication and build trust among peers.

Information technology has become central to business and society, and the success of a firm has become increasingly dependent on how the firm will be transformed by disruptive technology (Dhar and Sundararajan, 2007).

In the new digital economy, business is faced with new technological challenges such as the following:

Innovative technologies can integrate with in-use technologies but it could also be too innovative to integrate with current technologies (Tsui, 2001). The success of a business is increasingly based on the value that information technology is adding (Evans, 2003), however businesses should apply IT creatively and effectively to address the practical technology needs of a business. The complexity of disruptive technology may have serious consequences not only on individual organisational strategies and the execution of operations, but also on the global society. Therefore, users of Information Communication Technology (ICT) should take the influence of big companies and government organisations into consideration because these are the largest consumers of ICT (Cornford and Smithson, 2003). From the business perspective it is becoming vital that innovative technologies provide enough detail and information regarding the potential the technology holds for the organisation in terms of increased productivity, performance delivery and adding value to the business and business society (Dhar and Sundararajan, 2007). IT continuously transforms the operational or organisational excellence of a business and there is a growing concern amongst management regarding the inability to make decisions on implementing disruptive technology (Dhar and Sundararajan, 2007).

Data, information and knowledge may come in a structured, semi-structured or unstructured form and in various formats (hard copy, video, picture, texts, voice message, etc.) (Dhar and Sundararajan, 2007).

Data, information and knowledge can be received at any point in time;

- the unpredictability of the volume of data, information or knowledge increases the risk of maintaining information technology support;
- storage of information is another dilemma organisations have to face. The organisation has to ensure that different electronic devices will be able to handle new technologies.

1.3 Problem statement

1.3.1 *Main problem*

This study explores how cloud computing, as a disruptive technology, is understood and positioned within the ICT environment in South African organisations.

1.4 Significance of the study

Disruptive technologies can assist an organisation in maintaining a competitive advantage in the marketplace. Different terminology is used in the literature to describe disruptive technologies associated with uncertainty and risk. The term “disruptive technologies” is described and explained in comparison to sustaining technology. The research aims to determine the impact of disruptive technologies on the ICT environment of an organisation, with more specific emphasis on Software as a Service (SaaS). The impact of disruptive technology is discussed in terms of the business value of information technologies, the value network of the organisation, the current security framework of the information technology architecture, business processes and standards, approaches to business strategy, involvement of executive management and its influence on customers and clients of the organization.

The study fills a gap in that there is currently no research determining the impact disruptive technology will have on existing organisations in South Africa when looking at adopting cloud computing, more specifically SaaS within their IT environment.

Given the reduced cost and flexibility it brings, a migration to cloud computing is compelling for many organisations, specifically SaaS. However, concerns for migrating to the cloud include the confidentiality of their information and liability for incidents involving the infrastructure.

The study attempts to provide guidance to business leaders to facilitate their evaluation and mitigation of the risks associated with adopting cloud computing technologies, as well as security practitioners who evaluate, recommend, and lead the implementation of cloud computing services on behalf of their respective organisations.

The Cloud Security Alliance (2009:5) acknowledges that cloud computing is an “unstoppable force” and that security practitioners need to be pro-active in leading its secure adoption.

1.5 Delimitations of the study

Disruptive technology can have an impact on the business community as well as the social community. This research focuses on the business community in the South African context. Disruptive technology is applicable to different types of businesses, such as engineering, medical, or manufacturing. The scope of the research is limited to the business sector, and particularly the information technology departments within organisations that are responsible for the support and implementation of information technology. The study was narrowed down to specifically the information technology section within the various sectors of the economy, which is responsible for the implementation technology infrastructure of the organisation.

The scope of the research excludes the following:

- detailed description of the change management process;
- business sectors other than the specified industries in the research section;
- information technology strategic management;
- risk management.

The research focuses on qualitative results supported by descriptive statements.

1.6 Definition of terms

Cloud computing: “Is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g. networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction” (Mell and Grance, 2009: 1).

Disruptive Technology: Christensen and Bower (1995:10) define disruptive technology as “innovations that create an entirely new market through the introduction of a new kind of service or product”. This definition implies that disruptive technology is an innovation that will lead to a totally new way of doing things, changing how people work and how a firm runs its business.

Software as a Service (Saas): “The capability provided to the consumer is to use the provider’s applications running on a cloud infrastructure. The applications are accessible from various client devices through a thin client interface such as a web browser (e.g., web-based email). The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, storage, or even individual application capabilities, with the possible exception of limited user-specific application configuration settings” (Mell and Grance, 2009: 2). Salesforce.com is an example of a SaaS offering (Cloud Security Alliance, 2009: 22).

1.7 Assumptions

The following assumptions have been made regarding the study:

- a. The sample was able to share information on the adoption of cloud computing, due to their seniority and decision making capabilities within the organisation. Lack of knowledge of disruptive technology, cloud computing or SaaS negatively affected the credibility of the study.
- b. The total number of respondents was sufficient to gain adequate data.

- c. SaaS as a disruptive technology was conveyed honestly and truthfully by the respondents. False data could have a severely detrimental effect on the study's results.
- d. The respondent sample reflected the general perceptions of deploying cloud computing. Non-representative views could skew the results of the study and reduce its validity.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

A brief historical overview of the development, implementation and utilisation of information technology (IT) in the business arena and how it was applied, gives a holistic perspective of the purpose of using information technology and the approach management took to incorporate the technology into business. In the early years IT was used for specific purposes and only highly skilled users were able to utilise it effectively. As technology developed and software applications became more user-friendly, management was enabled to take control of these resources, which include hardware, software and skilled IT resources (Evans, 2003:xxii).

Jones and Smith (2005) highlight that when IBM introduced the personal computer in 1984, management could not foresee the dramatic impact of this new technology on business. Personal computers enabled firms to become less dependent on IT companies. IT became a new corporate investment in terms of products and training of staff. With the further development of intranet and Internet availability, IT became embedded in the nature of doing business. Firms had to develop an organisational IT architecture to support distributed technologies, staff and users in the global environment. The dot-com era provided an electronic commerce functionality and organisations realised the importance of applying new technology to create a competitive advantage. The dot-com era enabled connectivity between organisations and supported devices for communication by using laptop computers, Internet appliances, mobile phones and personal digital assistants (PDA's).

This overview of the development of IT clearly shows that management is challenged every time a new technology is launched.

Disruptive technology has the tendency of challenging or transforming the “current way of doing things” (Jones and Smith, 2005:19). The World Wide Web functionality required management to revisit or change IT models to adapt to new ways of applying and managing IT.

It may be concluded that change is inevitable and that any firm has to adapt to be able to incorporate a new technology to maintain a competitive advantage.

Information technology is beneficial to businesses in terms of improved productivity, support to business processes and investing in technologies. Businesses should realise that IT is central and provides a mediating role, which supports interaction between firms, consumers and customers (Dhar and Sundararajan, 2007). IT governance focuses on information technologies that deliver what is promised and business is following the back-to-basics approach which aims to balance IT costs and performance improvement. Therefore, it becomes important to grasp the business value of new technologies and whether or not the impact of new technology will actually enable the organisation or firm to reshape their business to achieve results, if it will support profitability or if it will provide the business value for investment.

Business approaches information technology from different angles and with various objectives, such as improved productivity, reduced costs, increased revenues, increased shareholder value, increased customer loyalty and satisfaction and reduction of risks and pitfalls.

In the information technology era, businesses are looking for emerging and disruptive technologies that will provide a source of growth and will enable competitive advantage. Therefore it is important for organisations to have insight into disruptive technologies to establish if the technology will create enterprise value, increase competitive advantage and business agility (Evans, 2003). Kasscieh, Kirchoff, Walsh and McWhorter (2002a) reached the conclusion that firms are usually more successful when they use a system architecture, consisting of a combination of disruptive and sustaining technology. When evaluating disruptive technology, the risk of implementing it must be taken into consideration.

Therefore, undertaking a study to understand disruptive technology would provide knowledge on how to approach disruptive technology in the business's strategic planning, and on how to manage possible risks effectively and to reap the benefit of the return on investment (Evans, 2003).

The purpose of this study is to understand cloud computing as a disruptive technology and the impact it could have on organisations. For the purpose of this study, the term organisation should be understood to refer to a business that uses information technology, for example financial institutions, publishing houses, retailers, educational institutions etc.

Cloud Computing is a new model of computing that is widely being utilised in today's industry and society (Hartig, 2008). According to Hartig (2008), cloud computing is a recent concept and one of the latest computer industry buzzwords. Hartig (2008:2) indicates that the concept is derived from the imagery of the internet cloud, in which the imagery of a cloud is traditionally "used to represent the Internet or some large networked environment". The idea depicted in the imagery is that client data and applications are stored and accessed "somewhere out there" (Hosch, 2009:2). As such, one definition offered for cloud computing is the "virtualisation of resources that maintains and manages itself (Hartig, 2008:2). To simplify the concept, cloud computing can be defined as simply the sharing and use of applications and resources of a network environment to get work done without concern about ownership and management of the network's resources and applications. With cloud computing, computer resources for getting work done and their data are no longer stored on one's personal computer, but are hosted elsewhere to be made accessible in any location and at any time.

The Software as a Service (SaaS) concept has been presented by ICT market analysts and software industry associations as an improved version of the Application Service Provider (ASP) model, in which providers host and provide access to a software application over a network (Mizoras and Goepfert 2003).

Mizoras and Goepfert (2003) state that the SaaS model has evolved to a web-based application interface, incorporating other attributes such as multi-tenant efficiency, configurability and scalability. Service providers were then able to shift from delivering on-premise software solutions to deliver a complete software application to end-users over the Web. Two major categories of SaaS can be identified.

First, business oriented SaaS services are offered to enterprises and organisations of all sizes, but typically focused on SMEs (e.g. Salesforce.com, RightNow, Amazon S3). Second, consumer oriented SaaS services are offered to the general public for a wide range of applications like hosting, news feeds, storage, and so on (e.g. Blogger, Dropbox).

Clarke (2009) highlights that earlier versions of outsourced service provisions offered a range of benefits to organisations and users. These include enhanced service accessibility (to services that are otherwise unavailable and to multiple desktops), scalability, professional backup and recovery, collaboration convenience, lower investment/up-front cost and lower operating costs.

2.2 Defining disruptive technologies

A number of definitions of disruptive technology can be found in the literature. In this paper, definitions were selected to reflect the concept in the information technology environment.

Christensen (2000) states that in the last half century, technology has become an integral part of the day-to-day running of a business, mainly by supporting people to complete the necessary tasks to make the company profitable and successful. The drive to improve performance, to be more profitable or to provide a better service to the client often fuels the need to change and improve technology. The business environment relies on technology development to support the firm's need to become more profitable, to attain and maintain a competitive advantage over their competitors. It is inevitable that innovative information technology will be developed with the sole purpose of providing a tool that will enable businesses to excel.

The innovation could be of such a dramatic nature that it will result in the disruption of the standard business procedures and even the culture of the business.

Christensen and Bower (1995:10) define disruptive technology as “innovations that create an entirely new market through the introduction of a new kind of service or product”.

This definition implies that disruptive technology is an innovation that will lead to a totally new way of doing things, changing how people work and how a firm runs its business. The definition can be applied to the economic environment where new technologies may influence the entire digital economy environment in an unexpected manner. Christensen (2000) describes how companies failed because they did not include new technology in their operational framework. Disruptive technologies create new challenges and changes to the organisation which could be used to the benefit of the organisation.

Technologies are not only applied to support the business procedures of an organisation but also to provide a basis for competitive advantage. Kassicieh *et al.* (2002a:375) define disruptive technologies as “scientific discoveries that break through the usual product/technology capabilities and provide a basis for a new competitive paradigm”. Technologies enable a firm to be more competitive, secure more business, produce faster, work better and keep the customer satisfied. Disruptive technologies have the potential to create a new marketplace and in consequence make other industries redundant (Tsui, 2001).

Disruptive technology is defined by Daneels (2004:247) as “a specific type of technological change, which operates through a specific mechanism, and has specific consequences”. Daneels (2004) looked critically at the concept of “disruptive technology” to establish when a technology may be deemed “disruptive” or if “disruptiveness” is implied when new technology is implemented. Further, Daneels defines disruptive technology as “technology that changes the basis of competition by changing the performance metrics along which firms compete” (Daneels, 2004:249).

Technology per se is not disruptive, but it becomes disruptive when it exceeds the performance of technology that is currently in use.

Disruptive technology is also described as risky because it challenges current technologies and is difficult to recognise especially in the early development stages (Jones, 2005). Therefore, disruptive technology is a threat to market incumbents because market surveys do not always present the new technology as a serious technology that could move successfully into the upper-market.

Disruptive technology may also be described as technology of “radical change”. Other terms used to describe disruptive technology are “radical innovations” or “discontinuous innovation”, which implies that radical new technology displaces current technology and processes to provide competitive advantage (Kaplan, 1999:16). “Discontinuous innovation refers to radically new products technologies that involve dramatic leaps in terms of customer familiarity and use” (Veryzer, 1998:305).

Clark (2003:30) discusses other concepts which are similar to disruptive technology and defines disruptive technology as “innovation diffusion” (the action of spreading over a wide area). Innovation diffusion suggests that when a new technology is implemented in a section of a firm, the implementation will not only have an effect on other departments or business units within the firm, but also on other firms with which the firm interacts via information technology within the business environment (Clark, 2003).

To understand disruptive technologies, the concept “sustaining technologies” must also be examined. Christensen (2000: xv) describes sustaining technologies as technologies that “foster improved product performance”. This implies that established products can be incremental in nature. “Sustaining technologies create innovations that are modifications of, or improvements to, or replacements for existing products” currently used within the firm (Walsh and Kirchhoff, 2000:322). Walsh and Kirchhoff also use the term “evolutionary technology” as a synonym to sustaining technology. Businesses use information technologies for different purposes within the same firm.

These information technologies are updated and enhanced to improve functionality, increase profitability and increase other benefits of the firm. These information technologies provide the mainstream system architecture within a firm. Enhancing the mainstream information technology implies that the technology is sustained.

Sustaining technology can be described as successive versions which upgrade the system with improvements to enhance performance that market leaders incorporate into their current systems. To improve product performance, incremental technologies have a lifecycle of “continuous innovations” which do not alter markets (as disruptive technologies do), but develop information technology improvements in existing products as requested by users (Walsh and Kirchhoff, 2000:322).

Companies developing new technology seek input from end-users to establish the level of usability of the product (Lasry and Callahan, 2004). However, end-users who demand new or disruptive technologies may actually have a negative effect on the performance of the information technology architecture of an organization (Lasry and Callahan, 2004).

2.3 Model to describe disruptive technology

Figure 1 is a model presenting a relevant description and providing insight into the concept disruptive technologies used by Walsh and Kirchhoff (2000):

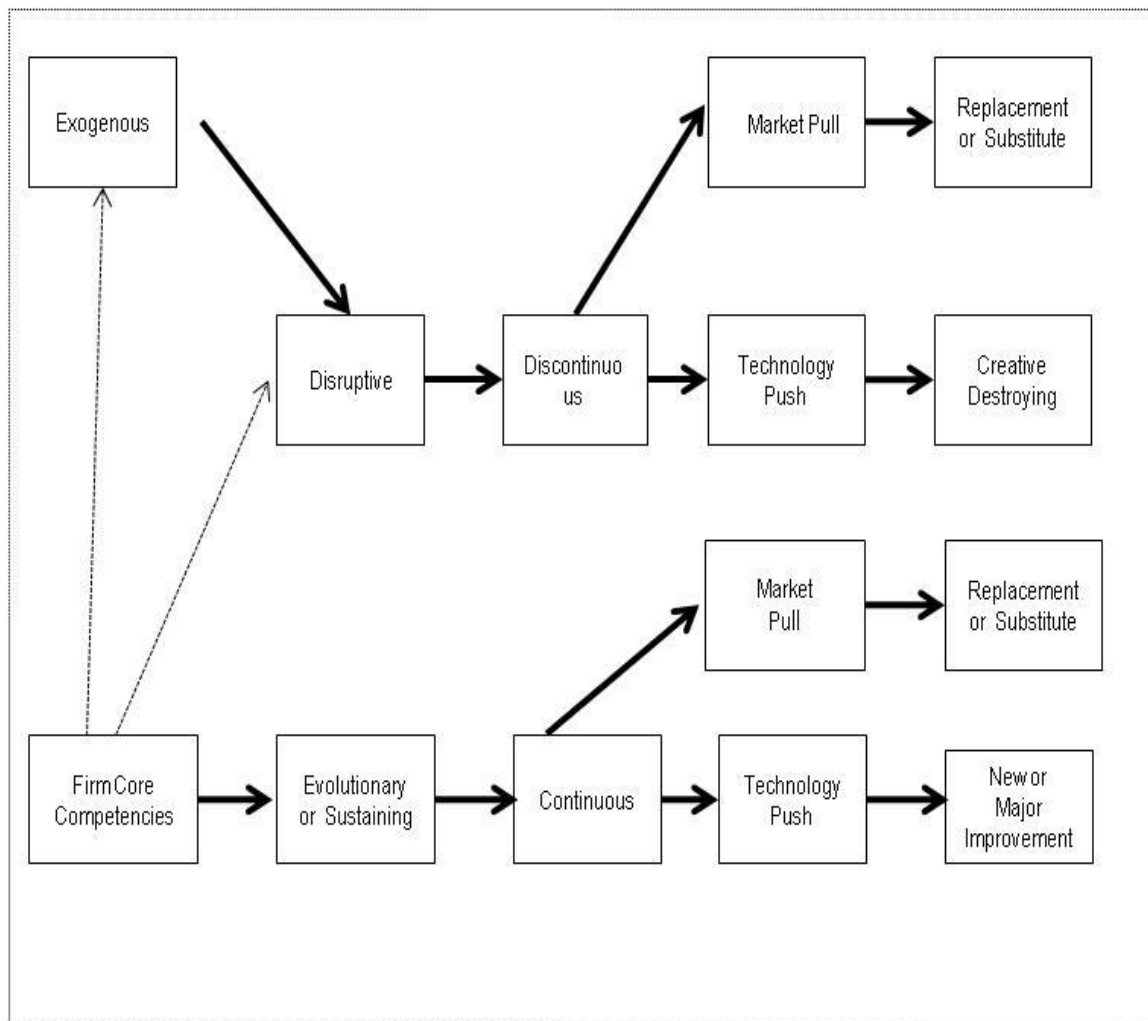


Figure 1: Model describing disruptive and sustaining technology (Walsh and Kirchhoff, 2000:323)

The model graphically illustrates the difference between disruptive technology and sustaining technology by showing how the idea leading to disruptive technology may either rise from the information technology used by a company's core competencies or from the exogenous input (Walsh and Kirchhoff, 2000:323).

Walsh and Kirchhoff (2000) state that disruptive technology has the characteristic to potentially discontinue technologies currently used in a firm.

The original idea or concept leading to disruptive technology may either rise from the information technology used for the core competencies within a firm or from exogenous input. If the market realises the potential of disruptive technology, the market may pull a product on the market with the effect of simply replacing or providing a substitute for current in-use technology. The difference between disruptive technology and sustaining technology is that disruptive technology can result in destroying or replacing sustaining technology. Sustaining technology, on the other hand, will be enhanced with a version upgrade as a result of new or major improvement of the system functionalities. Evolutionary or sustaining technology has the characteristic of continuing as the current in-use technology used by the firm. If sustaining technology pushes a product into the market it is basically the existing technology with new features that will provide a new and major improvement based on the request by the users or the firm.

From the model, Walsh and Kirchhoff (2000) clearly present the derivation that disruptive technology differs from sustaining technology in the sense that disruptive technology is a new creative technology, which replaces or has the effect of discontinuing current technology and making the current technology redundant and therefore, destroying the current technology. Sustaining technology entails development of current technologies but on a continuous basis. The result of innovation in terms of sustaining technologies is that the current technologies are enhanced or upgraded with new or major improvements.

Walsh and Kirchhoff (2000) concluded that during their research it was difficult to identify a disruptive technology prior to implementation and prior to the use by different users. It is often difficult to predict what effect disruptive technology will have on the industry and which industry the disruptive technology will enter. Characteristics of disruptive technology should give insight on how to predict whether a new technology will become a disruptive technology.

2.4 Characteristics of disruptive technologies

Christensen and Bower (1995) refer to disruptive technologies as innovations, however not all innovations are disruptive.

Walsh and Kirchhoff (2000) emphasised that disruptive technologies have to mature over a period of time to evolve from an innovation to a useable product. It is difficult to identify disruptive technology in advance because of its strange characteristics. Disruptive technologies are usually only identified after their effects are known and the benefit is seen with hindsight (Jones, 2005). To understand the characteristics of disruptive technologies it could be appropriate to look at the different types of innovation as presented by Rayport and Jaworski (2004: 81):

Innovation as a user-driven enhancement - the purpose of technology development that is user-driven enhancement tries to add low-cost, value added technology to sustaining technology implying low risk.

Innovation as a developer-driven development – developers of technology have identified a limitation in current technology and have developed a new solution. This means that user needs have been identified and a new solution is developed that will provide the technology according to the user's needs.

Innovation as a user-based context development – market research has identified a limitation in capabilities of technology. New technology is developed to make provision for the needs of the user and therefore the context of the user determined the development of the new technology.

Innovation as a new application or combination of technologies – the potential of technology developed for a specific industry is applied to another industry.

Innovation as technology/market co-evolution – these innovations create new industries by developing great solutions but the markets have not been established yet.

From the above it can be derived that it is only when an innovation addresses a new industry or an emerging market that the particular innovation becomes a disruptive technology. To clarify the difference between innovations and disruptive technologies the following characteristics (Christensen, 2000:xviii) can be listed:

- the disruptive technologies are cheaper when procuring and implementing the product;
- the disruptive technologies are simpler to ensure that the consumer will be able to use the technology without intensive training;
- the disruptive technologies are smaller than expected which indicates the advancement of the technology;
- the disruptive technologies are more convenient to use to limit the effort when using the technology;
- disruptive technology usually does not propose greater profits, but it would add value to lower margins;
- disruptive technology is also described as technology which has a characteristic of “radical change”. Radical change technology implies technology which requires very different technological capabilities. However, it is when a new technology is implemented and the technological change destroys the value of competencies, the new technology has a negative impact on the company. If the new technology enhances the value of competencies that the implementation of the new technology will be successful. Disruptive technologies have the characteristic that influence long-held business rules allowing organisations to break free and apply radical business changes;

- another aspect of disruptive technologies are that they can originate “from outside the industry that they affect”, also known as an exogenous effect (Walsh and Kirchhoff, 2000:321). This characteristic indicates the unexpectedness of disruptive technologies and the inability to predict how and where the technology will be used. It is difficult for potential customers to know that a need exists for the utilisation of a disruptive technology (Jones and Smith, 2005).
- the unpredictable characteristic of disruptive technology is also defined as “scientific discoveries that break through the usual product/technology capabilities and provide a basis for a new competitive paradigm that influence the behaviors and benefits for customers” (Kassicieh *et al.*, 2002a:340).
- risks are always involved when implementing disruptive technology because of the nature of unpredictability. Large firms, that are aggressive, innovative and customer-sensitive, usually follow the sustaining technology approach. The importance of supporting the customer is of greater importance to these large firms than innovative disruptive technology that could be a risk to the firm.
- it is difficult to predict the value of a disruptive technology. If disruptive technology does not promise to increase profits, large firms will not invest in such technology as they focus on profitability and growth. From the literature it can be derived that disruptive technology is most often launched in emerging markets and smaller companies where the risk of profit loss is smaller.

To understand the characteristics of disruptive technology it may be appropriate to examine technologies that have been displaced by disruptive technologies in the following section.

2.5 Disruptive technologies in the information technology environment

Disruptive technologies have the tendency to unexpectedly provide different functionality resulting in the displacement of current technologies or sustaining technologies which are part of the mainstream system architecture used in the organisation.

Table 1 presents some examples of disruptive technologies that have replaced sustaining technologies over the past couple of years:

**Table 1: Information technologies displaced by disruptive technologies
(Patki,2006)**

<u>Disruptive Technology</u>	<u>Displaced Technology</u>
Internet Protocol Suite	Networks that are proprietary or fixed-configurations
Minicomputers	Mainframe computers
Personal Computers	Minicomputers
Flash drives	Floppy disk drives
Wi-Fi (Wireless Networking)	Standard Network Infrastructures

Disruptive technology can provide functionality that is new and not available in the market. Table 2 presents innovative technologies that, while not necessarily displacing other technologies, provide functionality that have the potential of disrupting the technology currently used by businesses (Patki, 2006).

**Table 2: Disruptive technologies with possible disruptive functionality
(Patki,2006)**

<u>Disruptive Technology</u>	<u>Description</u>
VoIP	Voice over Internet Protocol
Bluetooth	Provides a universal short-range wireless capability (Stallings, 2005:310)
WiMAX	Worldwide interoperability for microwave access

The Internet is also an example of disruptive technology that changed the way business was done through the e-commerce approach. By applying Internet capabilities to business, the rapid development of many and varied innovative technologies have been established.

Evans (2003) describes the following as disruptive technologies in the information technology arena:

Web Services – these services enable businesses to provide services such as applications, information and tasks to be available on the network. Web services provide opportunities to businesses to enter new markets, provide more opportunities for business growth and improve the competitive advantage of a business.

Peer Services - peer-to-peer (P2P) is described as “any application or process that uses a distributed architecture and allows direct bidirectional communication between resources” (Tsui, 2001:16). P2P provides functionality, which enables the manageability of knowledge, consistency of information and system security.

Real-Time Computing – all transactions made on the system of a business are available in real-time, which imply that business reports can be produced within a very short period, even within minutes or seconds.

The opportunity of business benefit of this disruptive technology is applicable to operating systems, middleware, applications and business processes.

Business Process Management – information technology enables business to create and manage the business processes themselves and provide a holistic view on all business processes of the various business units to ensure efficient interactions between various entities, such as applications and people.

Mobile Business – these services include the following: mobile commerce, electronic tagging, wireless infrastructure management, telematics, and location-based services (Evans, 2003).

Disruptive technologies often provide new technologies that can be applied to the benefit of the business. These positive aspects and qualities of disruptive technologies can be used to the advantage of a firm, but the firm should also take cognisance of the disadvantages of disruptive technologies.

2.6 Advantages and disadvantages of disruptive technologies

After assessing the advantages and disadvantages of disruptive technologies, the potential value of using disruptive technology will become clear.

2.6.1 Advantages of disruptive technologies

The following advantages of disruptive technologies have been identified:

Disruptive technologies provide an alternative to sustaining technologies. Innovators who are creating new ideas have to rely on sustaining technologies to manufacture or produce their products. Disruptive technology provides new capabilities in a shorter development period that support the innovator's ideas. Embedded technologies may allow the use of disruptive technology, improving the response time of the system that ensures reliability and provides determinism (Kulkarni, 2006).

Although disruptive technologies do not focus on profitability, they can provide immediate profitability when used in the relevant environment (Walsh and Kirchhoff, 2000). The literature indicates that small firms play a significant role in the commercialisation of disruptive technology. When small firms acquire disruptive technology the aim is usually to support creative innovation, which will secure profitability for fast financial growth for the business (Kassicieh, Walsh, Romig and Cummings 2001).

Disruptive technology enables businesses to implement technology on reduced costs. Patki (2006) provides a scenario where WiMAX was implemented on the island of Mauritius. By using WiMAX rather than broadband, the costs had been reduced and this made technology affordable for private as well as business users on the island. Disruptive technology allows the user quick entry into the market place. For small firms that are willing to take the risk, disruptive technologies promise opportunities for early and strong entry into existing and new markets (Walsh and Kirchhoff, 2000).

Disruptive technologies provide a growth opportunity to companies that recognise the opportunities offered (McGinn, 2001). VoIP is a service provided by information technology, and communication companies such as Time Warner and Comcast in America are scrambling to provide VoIP services as part of their offerings to their consumers (Sevastopulo and Taylor, 2004). VoIP is considered a disruptive technology in the information technology arena, and is cheaper than current communication service providers: this influences the use of fixed line telecoms as well as the mobile telecoms (Sevastopulo and Taylor, 2004).

2.6.2 Disadvantages of disruptive technologies

The following disadvantages of disruptive technologies have been identified:

Disruptive technologies do not support current firm based manufacturing practice or mainstream software (Walsh and Kirchhoff, 2000).

Current production processes have to adopt new technology or discontinue production, which could have a delay in production and ultimately influence profitability.

The use of new technology always implies inherent risks. Customers may resist new technology and therefore the business using the technology could experience failure (Walsh and Kirchhoff, 2000). Failure implies costly endeavours that do not deliver payoffs to investors.

Disruptive technology demands a new way of marketing a product. This could lead to additional problems. First, the marketing managers could resist marketing the new product because of their uncertainty regarding the estimation of the value of the new product or new technology. Second, business could also experience internal problems because of the resistance of the user to use the new technology and change management might be required to change the user's behaviour to incorporate the new technology (Walsh and Kirchhoff, 2000). Strong leadership is required to encourage the social system of the business to adopt new technology (Patki, 2006).

Disruptive technology also raises financial concerns. It is hard to quantify the commercialisation of disruptive technologies and therefore difficult to plan for financial investment (Walsh and Kirchhoff, 2000). It is difficult to commercialise disruptive technologies or to exploit the product for profit, especially when it is difficult to estimate the value of the product or the quality of the product (Dowd and Walsh, 1998). New technologies could be more complex and factors, such as the value and the application, could be difficult to determine.

Disruptive technology constitutes a threat to most companies, as the opportunities and growth possibilities are not recognised by the CIO (McGinn, 2001).

By evaluating the advantages and disadvantages of disruptive technologies should provide guidelines when considering whether to implement a disruptive technology or not. The insight gained could support the decision of whether or not to implement disruptive technology that may be beneficial to the value network of a company.

2.7 Technologies in a value network

A firm's success can be measured in terms of the firm's value network within the business environment. The value network is defined by Christensen (2000:36) as "a firm's interaction with entities such as customer needs, how problems are solved, how inputs are procured to strive for profitability and how it reacts to competitors". A value network may be described as a nested commercial system. The different business units within a firm contribute to the success of the firm. Success means to be profitable ensuring the growth of the firm. The information technology system architecture supports the different business units within the firm. The system architecture, which consists of various technologies and components such as hardware and software applications, forms the information technology value network.

Value networks have a profound influence on a firm when facing new technologies. Sustaining technologies support the mainstream system architecture to ensure the continuation and growth of a firm. Sustaining technologies are upgraded to support the value network of a firm on a continuing basis to provide a stable IT environment. It could be difficult for disruptive technologies to get a foothold in such an environment, which may impose a risk to the value network. When management considers implementing new technology, cognisance of the value network will be taken into account when evaluating the impact of the new technology on the value network. It is the perception of most managers that a new technology has to be able to interact with the mainstream system architecture in order to continuously support the business. However, management's recognition of the potential value of disruptive technology and the effectiveness of the technology application will influence the success of the business (Dhar and Sundararajan, 2007).

Sustaining technologies, which support the mainstream system architecture, can be perceived as organisational impediments when considering implementing disruptive technologies. Management may prefer upgrades for sustaining technologies that are familiar to the users or clients, which are easy to use and address the needs of current customers of a firm.

Furthermore sustaining technologies, which are successful in the value network, receive effort levels and expenses from management in terms of research, development, sales, marketing and administration.

It is clear that entrant firms or smaller firms have an advantage when implementing disruptive technologies (Christensen and Overdorf, 2000). A differentiation is made between “established firms” and “entrant firms”. Established firms are firms that use sustaining technology and are using the prior technology. Entrant firms are firms that are entering the industry during the event of technology change (Christensen, 2000:9).

Extensive system architecture usually does not exist at smaller or entrant firms; therefore a value network has not yet been established. Thus, the introduction of disruptive technologies into the value network will be easier for a smaller firm. On the other hand, larger established firms will take consideration of the known value network in determining if new technologies will be beneficial to the firm before taking the risk to implement new technologies. Established firms would rather change their strategies or cost structures to support sustaining technologies that will lessen the possibility of loss of clients, while entrant firms tend to implement strategies and cost structures to support the implementation of disruptive technologies (Christensen, 2000).

2.8 S-Curve Framework for disruptive technologies

The success of a firm can be measured in terms of the value network within the business environment. The impact of the value network has to be taken into consideration when strategic planning for information technology takes place, as the value network has a direct influence on the performance of the company. Strategic planning uses the S-Curve framework to make projections of the performance of the company. The S-Curve concept is also used to indicate the performance improvement of a product within a given period (Christensen, 2000). If a possibility exists that an established technology could be supplanted by a new technology, the S-Curve framework is often used to predict the outcome.

Managers in the digital economy environment face a monstrous wave of disruption of technologies, which will radically shift power and create wealth in virtually every sector of business. The S-Curve production line provides a measure to manage product performance. A continuous S-Curve indicates a product line that follows a general product lifecycle. Products usually reach a maturity stage during which it becomes very difficult to improve the product. During this stage the product lifecycle reaches a point of inflection, also referred to as the fault line.

It is at this point that a disruptive technology can overtake the established technology. When an S-Curve is intersected by another it indicates that the organisation has jumped from one technology (used over a period of time) to another technology, indicating the adoption of a new technology. Thus, a new technology has disrupted the product lifecycle of the existing technology.

Moore (2000) discusses the concept of the fault line presented in the S-Curve in the business model of product development. The following illustration, Figure 2, presents the S-Curve of a business model of a product. The second S-Curve illustrates how the disruptive technology will overtake the projected success of the first product.

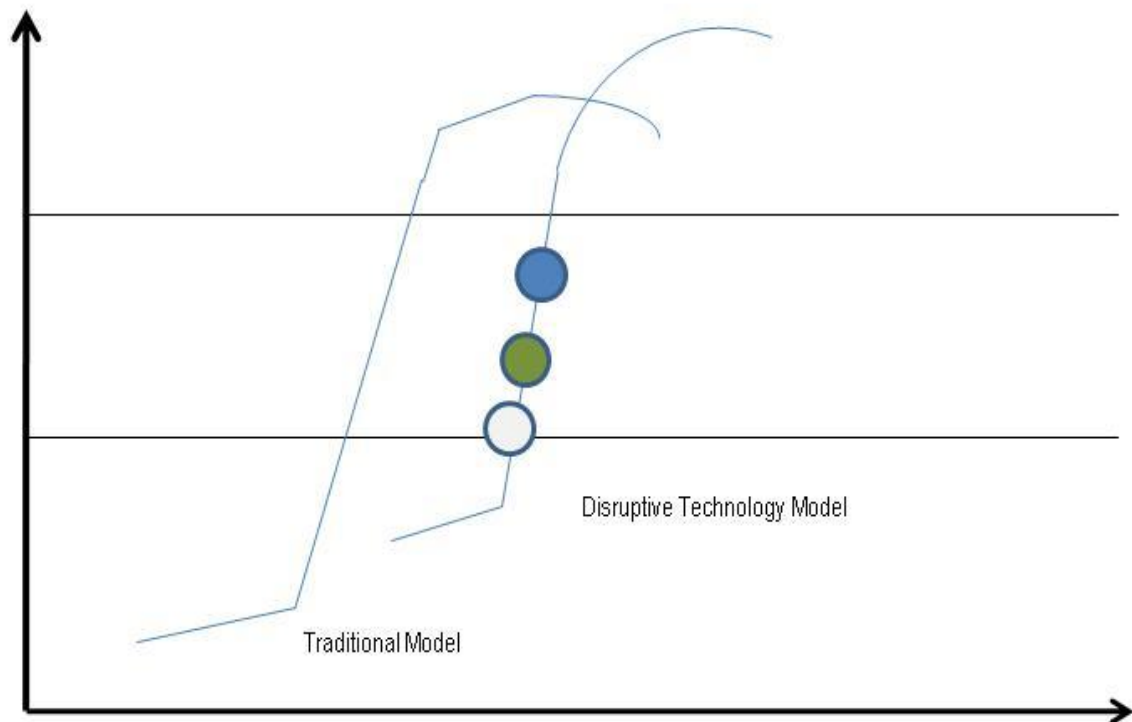


Figure 2: Disruptive technology model (Moore, 2000)

The disruptive technology S-Curve framework indicates the possible point of inflection. The point of inflection is usually the point where a new technology will succeed the previous technology. Usually it is difficult for companies to anticipate when a new technology is threatening an existing technology or when a new technology becomes the successor technology. The problem which companies face is to know when to switch to new technology to keep a competitive advantage in the business arena. Christensen (2000) indicates that the S-Curve framework is a good indicator when managing sustaining technologies. However, historical data is not available to indicate the movement of disruptive technology on the S-Curve. This means that the IT business unit has to observe the movement of the disruptive technology as it moves along the S-Curve of the sustaining technology. The IT business unit must be prepared and able to react when the point of inflection occurs. Disruptive technology often penetrates the market unexpectedly, as can be presented in Figure 3, which indicates the performance of the disruptive technology over a period of time.

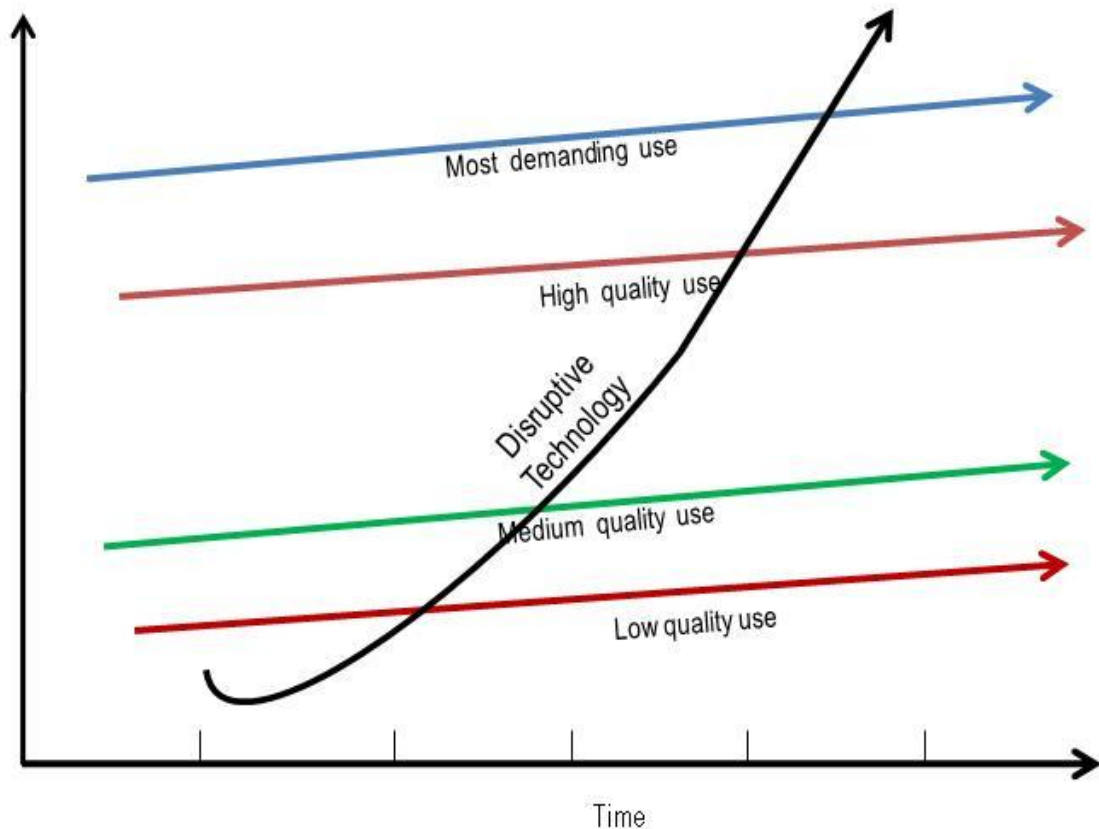


Figure 3: Performance of disruptive technology over time (Christensen, 2000)

The performance of disruptive technology over a period of time as presented in Figure 3 shows disruptive technology as it enters the low-end of the market sector where the full potential of the technology is underestimated. When the lower end of the market adopts the disruptive technology, the disruptive technology is improved to make it more attractive for adoption by the high-end of the market. The high-end of the market expects functionality of higher quality that will exceed current technology in the market sector. The functionality of the disruptive technology is improved to satisfy the needs and requirements of the customers who are willing to pay for a better product. It is when disruptive technology provides a better solution than sustaining technology and customers realise the potential of the disruptive technology, that sustaining technology will be replaced (Christensen, 2000).

Other factors also influence the decision to implement a new technology; these include business and information technology trends.

2.9 Impact of disruptive technologies on organisations

Disruptive technologies are technologies that influence the digital economical environment unexpectedly and without business's prior knowledge. Usually it is difficult to know which technology will disrupt the digital economy environment. Therefore, it is important to know how to identify a disruptive technology, how to apply it in a specific digital economy environment and control the influence of the disruptive technology in an organisation (Walsh and Kirchhoff, 2000).

Disruptive technologies can have an impact on any organisation. A business may be satisfied with the sustaining technology, and is not aware of disruptive technology that could be a threat to the information systems. If a business does not respond in time to the disruptive technology, the business could lose its competitive edge or the business could be vulnerable to threats. Businesses should always be aware of change to ensure that the leadership, vision, strategic focus, valued competencies, structures, policies, rewards, and corporate culture that were all so critical in building the company's growth keep the competitive advantage.

It has been shown that companies tend to fail when facing new technology. Studies undertaken focused on subjects, such as managerial problems, organisational and cultural changes of the organisation. Failure implies costly endeavours that may not necessarily deliver payoffs to investors (Walsh and Kirchhoff, 2000).

Christensen (2000) reports that for a firm to perform better than other firms, a correlation between the capabilities of the firm and the prevalence of implementing technological change must exist.

If a firm cannot solve technological problems, it will not venture to implement disruptive technologies.

When the value of competencies is negatively impacted by new technology, the firm will fail. It is only when new technologies support or enhance the value of competencies that a firm will be successful (Christensen, 2000).

The market is familiar to technology currently in use. Innovation for sustaining technologies is based on enhancing the information technology currently in use by business in terms of its products, processes or services with the purpose of increasing its profitability and/or market share. Innovations for sustaining technologies are less risky for a firm. Disruptive technologies however have the “nature of uncertainty, because the use of the technology has not yet been established, the processes or services that the technology could be applied to are not tested and/or the reaction of the market is unknown” (Kassicieh, Walsh, Romig and Cummings 2002b:342).

Well-established firms have the capability to perform marketing research and conduct good planning before taking the risk of procuring disruptive technology. However, if disruptive technology is not in use or applied, then markets do not exist. Therefore, market research is not viable and marketing data is not available for analyses. Firms will be taking a risk by procuring disruptive technology without market research data. Timing of when to enter the market with a disruptive technology is important for business success (Cooper and Smith, 1992). Nault and Vandebosch (2000) indicate that the disruptive technology with the most market response will be more successful and more profitable.

Established firms do not easily commit to implementing disruptive technologies either because of lack of vision, or unskilled resources, or even a lack of information of the technology (Cooper and Smith, 1992). Added to this, it seems as if sustaining technology does not provide a competitive advantage, because technology followers are on the same level as technology leaders. Only the first mover with disruptive technology will have the advantage and get the competitive lead in the business industry.

Christensen (2000) states that well-managed firms should deliver new technologies with functionality that is better than the customers requested. A successful firm will strive to provide the best solution at the right time to satisfy the needs of the customer. He also indicated that companies who do not invest in disruptive technology could not claim to base their decisions on principles of good management. The progress of new technologies has the potential of being more advanced than what the market requires. If management does not realise the potential of the innovative technology, the chances are that the competitive edge could be lost.

Management however has “trouble capitalising on the potential efficiencies, cost savings, or new marketing opportunities created by low-margin disruptive technologies” (Evans, 2003:11). Critical issues in terms of disruptive technology include the impact on a business in the following ways (Evans, 2003):

IT governance is questioning the real improvement of productivity and performance since information technology has been implemented in organisations. For an example, Internet technologies have been available since the 1970's, but were only fully adopted by some organisations during the last few years of the 1990's. The evaluation and investigation of disruptive technologies is important to ensure that services are improved and productivity is increased and that revenues are increased. Disruptive technology must support the IT governance and business strategy of the organisation.

Security of the information network of a business is a growing concern. The possibilities and functionalities of new technologies require businesses to ensure the safety of their information, their people, the physical assets and information systems. The Internet applications require businesses to open their network to enable customers, partners and suppliers to make transactions directly. This causes businesses to safeguard their information networks in terms of access control and encryption techniques.

In order to ensure security for business partners, business will approach new technologies with caution. If business is disrupted the effect can influence the stock price, which in turn may influence the reputation of the business amongst the customers and suppliers.

Within the information technology environment standards and protocols have been developed to ensure quality and improve standards of information technology hardware and software and also to establish a platform or foundation, which enables networks between businesses and other entities. Disruptive technologies could have an impact on these standards. With disruptive technology a firm should be able to accommodate the technology by adjusting the IT standards.

Economic uncertainty in business emphasises the control on costs and return on investments in information technology. Information technology departments have to justify costs and explain the value of information technology hardware and software in terms of the purpose and utility thereof. Established firms have to make difficult decisions on the level of investment in correlation to the magnitude of commitment to be made (Cooper and Smith, 1992). Serious investments are usually made by established firms after marketing data about the disruptive technology has become available or the potential of the disruptive technology has been established.

Disruptive technology can have an impact on any area in terms of information networks, e.g. security, copyright, etc.

Business must realise that to invest into disruptive technology is a high-risk endeavour. The proposition of high rewards is one of the advantages of disruptive technologies, but the increasing level of risk should be taken into consideration.

Disruptive technology also influences the organisation in the production line. Organisations must establish an awareness of the potential of disruptive technology that can penetrate the information technology market influencing of their current combination of products and services, which can have an influence on the financial success of the business.

This product will have the appropriate characteristics, production infrastructure, process methods and buyer needs that are identified and satisfied by the innovation.

Disruptive technologies can have an influence on the operational procedures of a business and therefore it should be required that the policies and procedures of an organisation are in place to control the impact.

A scenario can illustrate how disruptive technologies may impact an organisation. For example, an organisation can have a service level agreement with a specific vendor. A disruptive technology that will be more beneficial to the organisation may become available in the market. This organisation then has to make a decision whether to incorporate the new technology and terminate the services of the first vendor or to integrate the new technology with the current technology solution.

2.10 Guidelines and principles for managing disruptive technologies

As discussed above, emerging or disruptive technologies can have an impact on businesses; therefore business should follow an approach, or manage a business strategy, to handle emerging or disruptive technology. Established firms tend to follow traditional strategic approaches when contemplating disruptive technologies, however management should ensure that the strategic approach is flexible to allow for experimental strategies that will minimise the impact of implementation of disruptive technologies (Cooper and Smith, 1992).

Business has realised that when a disruptive technology is beneficial to the firm, it is important to estimate the business value of the emerging technology. Added to this, business should also be able to determine if any emerging technologies contain threats to the information system architecture, the information of the firm and the competitive advantage of the business.

The following information provides detail on how a business should be prepared to handle emerging technologies or disruptive technologies:

2.10.1 *Involve executives and management*

The IT business unit should ensure the involvement and buy-in from the executives of the firm to understand the possible impact of emerging or disruptive technologies on the firm. Executives should understand the importance of early detection of disruptive technology and understand the characteristics of these technologies to establish any value for competitive advantage, to identify technologies that could be an opportunity to reduce costs or to improve productivity. Therefore, management should support the effort the IT business unit has to put in or the strategy the IT business unit has to follow to detect emerging or disruptive technologies (Dickson and De Sanctis, 2001).

Generally speaking, the involvement of a firm's management has changed over the years. Information technology was used primarily for specific purposes and departments within the company. The firm's purpose was to financially support the project. As information technology has entered and been utilised throughout the firm, management realised that active engagement with the project is required. Therefore, firms had to change the concept of overall IT management.

As the management of information technology became more involved and complex, the firm has to change the approach towards IT project management. As firms took over the responsibility of the control of hardware, software and IT staff from companies providing these services, IT project management became the responsibility of the individual firm.

The IT department in a firm usually oversaw the IT project management on behalf of the various business units within the firm. However, as the environment changes, firms realised that a tight integration between business and technical activities is required to ensure that the information technology application support the business needs of the various units. Therefore, the composition of the project management team has changed to include information technology staff as well as staff from the business units (Dickson and De Sanctis, 2001).

2.10.2 Define business process

The IT business unit should define a business process, which indicates the different phases of how the firm should manage this strategy when disruptive technology is approached. The business process should include different phases from detection of a disruptive technology until the technology is evaluated, implemented and tested by the firm. During the detection phase it is important to consult advisors, customers, business partners, media, academics, consultants and analysts. The business process must manage the evaluation process of the disruptive technology, but also ensures that the effort of evaluation is not duplicated or over-estimated (Cooper and Smith, 1992).

The business process for disruptive technologies can include several activities as presented by Veryzer (1998:313). According to him, the business process begins with the “Dynamic Drifting Phase” during which the disruptive technology is explored. This is followed by the “Convergence Phase”, characterised by a person who acknowledges the potential of the technology, motivates the functionality and persuades the organisation to consider the technology. During the “Formulation Phase”, requirements and expectations of the technology are formulated. Then, the “Preliminary Design Phase” and “Evaluation Preparation Phase” follow. The technology is developed during the “Formative Prototype Phase”, which is followed by the “Testing and Design Modification Phases”. The last phase includes the “Commercialisation Phase” during which the product is made ready for marketing (Veryzer, 1998:316).

2.10.3 Prioritising disruptive technologies

Business objectives should be used to determine and prioritise which emerging or disruptive technologies will be selected for evaluation. Disruptive technologies can be prioritised based on various aspects such as maturity level of the technology in the market, unreliable vendor products, whether or not the outcome of implementation is too uncertain. Disruptive technologies that are identified as important can be used as a proof-of-concept.

Promising disruptive technologies that show business value benefit can be researched and experimented with on a small scale before it is applied to all the business units of the firm (Cooper and Smith, 1992).

2.10.4 Integrate disruptive technologies and current initiatives

Disruptive technologies that possess the potential of business value can possibly be embedded or integrated in current in-use technologies to extract more value from existing sustaining technologies. The IT business unit can use disruptive technology to enhance existing solutions and upgrade the information system architecture. When a disruptive technology is introduced to an organisation, most established firms will follow an approach to establish a close collaboration between organisational units, rather than total separate units. Highly skilled and experienced resources ensure that the implementation of disruptive technology happens within the administrative sections (Cooper and Smith, 1992).

2.10.5 Combine disruptive technologies or emerging technologies

Emerging or disruptive technologies can be combined to provide a solution that is beneficial to the business. However, it is a challenge for the IT business unit to recognise the potential of emerging technologies and how a combination of these technologies can be utilised that could fit in the value network of the business (Cooper and Smith, 1992).

2.10.6 Monitor on a continuous basis developments in the information technology arena

In order to be able to detect a disruptive technology that could be of business value, it is important that the IT business unit should continuously be alert to emerging technologies. The IT business unit should also be aware of the requirements and business needs of the different business units within the firm, to know if new technologies could be applied to the business.

It is expected that IT project management anticipates the changes that can have an impact on current systems used within the firm. This is difficult to anticipate, however, an important IT project management responsibility includes focusing on change within the different business units and the firm's relationship to other role players within the business arena, such as changes in customer needs, other business partners and the industry to determine the information technology required (Dickson and De Sanctis, 2001).

2.10.7 Test if a disruptive technology will be usable in the organisation

The IT business unit can identify in-use existing user applications that are used in the mainstream technologies that do not actually satisfy the user needs. Using this information the IT business unit has to research emerging technology and then identify a disruptive technology that could replace and/or substitute existing user applications (Cooper and Smith, 1992).

2.10.8 Creative thinking

Management should encourage entrepreneurial development throughout all levels in the company to be creative and develop new ideas. Creative thinking enables people to recognise the potential of disruptive technology and how it can be applied to the business (Patki, 2006).

2.10.9 Manage disruptive technologies as a risk

The basic principles of risk management can be applied to manage innovative technologies. Vedpuriswar, Chowdhary and Ghorl (1999) have described the basic principles of risk management that can be used to provide guidelines to companies to manage innovative technologies. In some instances not taking a risk with disruptive technology could be the risk the firm cannot afford not to take. Fundamental questions, such as the following, may assist an organisation to make an informed decision:

- What are the various risks the company is facing?
- What is the magnitude of each of these risks?
- How can the risks be managed to be beneficial to the wealth of shareholders?

2.10.10 *Manage the resources to research the impact of disruptive technology*

Bringing in a new technology in the organisation may divert resources from its existing business. Resources include employees, money, hardware and applicable software. Large firms often “neglect discontinuous innovations and resources are applied to incremental change or continuous improvement” (Kassicieh *et al.* 2002a:340) despite the fact that incremental innovation has not been shown to be a designated path for sustained competitive advantage.

2.10.11 *Marketing disruptive technology*

The IT business unit has the task to market a new technology within the firm during the total project lifecycle of a new technology. This implies that the IT business unit can introduce a change management programme, which will provide information of the new technology to the business. As previously indicated, it is difficult to envisage the viability and value of disruptive technology. Marketing data for the new technology is usually not available and therefore it is difficult to motivate the implementation of a new technology. It is generally accepted that it is easier to sell replacement or substitute technologies as with these products, customer behaviour does not have to change radically. The customer is familiar with previous versions of the product and therefore will support the sales aspect in terms of costs and performance advantages (Walsh and Kirchhoff, 2000).

Usually, management will base a decision of implementing a new technology on the data of marketing research. If the marketing research indicates that the feasibility of the new technology will not be rolled-out successfully because of lack of interest by other firms, management may shelve the proposal to implement a new technology.

The value of disruptive technology cannot be known in advance and marketing data is usually not available when disruptive technology becomes available in the market. Management will therefore have to make assumptions regarding how disruptive technology will be accepted by the users. To keep risks to the minimum, managers can test their initial assumptions against other similar situations. Although the data will not be accurate and fully applicable to the new technology, some data will be available that may be used to make predictions (McGrath and MacMillan, 1995).

2.10.12 *Use the information gathered during the commercialisation of the disruptive technology*

Kassicieh *et al.* (2002b) introduced various methods to be used to commercialise both disruptive technology and sustaining technology. The methods are based on certain tests that are based on differences in activities and decision-making processes influenced by the different technologies. Information technology companies use these activities and factors when they commercialise a disruptive technology. These activities and factors can be used by business when evaluating disruptive technology to make a strategic decision on procuring disruptive technologies. Kassicieh *et al.* (2001) defined factors that will influence the commercialisation of disruptive technologies, namely:

- the nature of the technology: sustaining or disruptive
- the size of the company: small firm or large firm
- the source of the technology: internal or external to the firm
- the strategic intent of the firms

Small firms reap the benefits of disruptive technologies and are the driving force behind the commercialisation of disruptive technologies.

2.10.13 *Maintain strategic flexibility*

A company should be able to incorporate disruptive technologies when it enters the emerging market. Strategic commitment is required to implement the new technology to ensure that entering the emerging market will be successful. Disruptive technology will effectuate changes to the current business model of a firm. Old business concepts have to be transferred into new business models to incorporate the new technology. Disruptive technology influences the way business is done, the way people are working. Disruptive technology changes the way a firm creates, produces and distributes products and services. Therefore, a new business model must make provision to incorporate all aspects of the new technology (Dickson and De Sanctis, 2001).

Forces that influence decision making in firms have an impact on the technology to be used, that is technology that forms part of the value network. These forces include powerful companies ensuring investment in the firm. Strategically, it makes sense that management will choose to implement technology that will support the needs of their most influential clients. Clients will be retained and the firm will be sure of income and growth (McGrath and MacMillan, 1995).

Another important strategy is to use sustaining technology to support the clients of the organisation. Sustaining technology supports a company by providing performance improvement.

The implementation of disruptive technology is dependent on the strategic planning proposed by the management of a firm. Implementing disruptive technology creates inevitable unpredictability and uncertainty.

When implementing a disruptive technology management should make provision in the business model for unknown events that may occur.

When the new technology is implemented and used, analysis can be performed to establish more accurate data to be used optimally in strategic planning. The firm's business plan should be flexible enough to incorporate assumptions and data when it becomes available, when a firm learns from experiences during the initial trial and error phase (McGrath and MacMillan, 1995).

2.10.14 *Humanistic approach to communication*

The humanistic approach to communication implies that the potential business unit should always be considered as a factor when technology is considered. The humanistic approach includes issues such as credibility, trust, emotion and image. When introducing and incorporating new technology to a firm, management must consider the impact of the implementation on communication between the technology and the people using the technology (Dickson and De Sanctis, 2001). The psychological distance between the technology and the user can be reduced by applying the following:

- the user has to be trained to use the new technology
- implementing user-friendly systems that will reduce the distance between the technology and the user
- communication between the sender and the receiver should be as streamlined as possible by the information technology.

2.10.15 *Knowledge Management*

Information technology enables businesses to communicate on a global scale, but this may involve teams working in different locations which will inevitably have a negative influence on knowledge sharing (Patki, 2006). Businesses should ensure that knowledge assets are managed to the advantage to the social system of the company and eventually to the advantage to the business.

2.11 Conclusion

Information technology has become an integrated part of business. It also supports the business and enables it to be profitable and to keep a competitive advantage. To increase competitive advantage, business leaders are continuously watching for new information technology developments that could enable the business to be more competitive. By defining the term disruptive technology and providing information on the characteristics of this concept, the business leader will understand how and when disruptive technology can have an impact on the organisation.

The value network of a firm is important and should be taken into consideration when a disruptive technology is investigated. The understanding of the relation between the business and its value network is required to establish the impact of a disruptive technology on the business. Business realises the importance of disruptive technology, but other business issues have to be considered when an emerging technology is evaluated.

The use of new technology always involves some risks. Customers may resist new technology and therefore the business using the technology could be unsuccessful (Walsh and Kirchhoff, 2000). Firms need to be flexible and have the ability to adapt to incorporate new technology and associated changes to keep a competitive advantage in the market place. These changes will be reflected in the overall management of the firm, IT project management and the establishment of a new business model. Technology implementation and organisational change go hand in hand (Dickson and De Sanctis, 2001).

Against the background of this available information, research will show how South African companies are handling new emerging technology, especially disruptive technology like cloud computing.

2.11.1 Research Question 1

The statement of the problem assumes that companies do not know when a disruptive technology can potentially provide a competitive advantage or not. The hypothesis proposed is that organisations are aware of disruptive or innovative technologies and the potential competitive advantage that may be achieved if the information technology is utilised efficiently.

2.11.2 Proposed Research Questions

1. Are organisations aware of disruptive technology and how is disruptive technology handled?
2. What is the business value of disruptive technology?
3. Will the disruptive technology have an impact on the in-use computer systems?
4. Will the in-use hardware and software architecture be able to accommodate the new technology?
5. Will the disruptive technology have an impact on organisational business processes and procedures?
6. Does the information technology business strategy make provision for disruptive technology and how is it managed?

CHAPTER 3: RESEARCH METHODOLOGY

This section outlines the methodology used to conduct this research. First, the research strategy and the research methodology will be discussed, as well as literature around qualitative research. This will be followed by a review of the research design and research instrument used. Issues of data collection and analysis in relation to this study will be provided, followed by a discussion on the validity and reliability of this study.

As the research topic examined a relatively new area of thinking in terms of cloud computing within the South African context, the research methodology selected will be that of a qualitative exploratory study.

3.1 Research methodology or paradigm

This study used a qualitative methodology in order to gather the most appropriate data to answer the research questions. Qualitative research is a holistic approach that involves discovery. Qualitative research is also described as an unfolding model that occurs in a natural setting that enables the researcher to develop a level of detail from high involvement in the actual experiences (Creswell, 1994). One identifier of a qualitative research is the social phenomenon being investigated from the participant's viewpoint. There are different types of research designs that use qualitative research techniques to frame the research approach. As a result, the different techniques have a dramatic effect on the research strategies explored. There are several different methods for conducting a qualitative research; however, Leedy and Ormrod (2001) recommend the following five: case studies, grounded theory, ethnography, content analysis, and phenomenological methods.

The purpose of this study is "to understand an experience from the participants' point of view" (Leedy and Ormrod, 2001: 157). The focus is on the participants' perceptions of the event or situation and the study tries to answer the question of the experience.

Creswell (1998) points out that the essence of this study is the search for “the central underlying meaning of the experience and emphasise the intentionality of consciousness where experiences contain both the outward appearance and inward consciousness based on the memory, image, and meaning” (p. 52). This is in line with the aims of this research. The difficulty of this study is that the researcher usually has some connection, experience, or stake in the situation so bracketing (setting aside all prejudices) was required.

Mason (2002) argues that qualitative research is ideal when an understanding of context, diversity, nuance and process might potentially be highly valued to the researcher. Qualitative research also enables the researcher to gain a better understanding of the dimensions of a problem (Zikmund, 2003,). Welman and Kruger (2001) further argue that exploratory research is appropriate when researching a relatively new area that lacks established theories. This is in line with the objectives of the research where cloud computing and the perceptions thereof within South Africa is in its infancy within the academic literature and further depth of understanding is required.

Creswell (1998) suggests the procedural format is writing the research questions that explore the meaning of the experience, conducting the interviews, analysing the data to find the clusters of meanings, and ending with a report that furthers the reader’s understanding of the essential structure of the experience. The study collects data that leads to identifying common themes in people’s perceptions of their experiences. Discussion of the perception of cloud computing as a disruptive technology required a methodology which allowed respondents to describe their experience, as well as activities. A qualitative approach is best suited to this endeavour. The data collected was a series of in-depth interviews with each respondent, lasting 30 to 45 minutes maximum. In-depth interviews enable the informant to relate experiences and attitudes to the researcher in their own words (Walker, 1985).

Although open-ended questions were used, the interviews were semi-structured to ensure the necessary data was collected (Creswell, 2003).

The assumption of honesty and candour from the respondents was taken within this study. It was the responsibility of the interviewer to ensure that the broad issues were being addressed and that the meaning of emerging data is constantly appraised, which is expected to raise further questions.

3.2 Research Design

A semi-structured one-on-one in-depth interview was selected as the research and data collection method. Dillon, Madden and Firtle (1993) argue that one-on-one interviews are appropriate when:

- the subject matter is sensitive so that few respondents would speak openly in a group setting. This is true for this study, as respondents may not feel comfortable sharing their strategies on the use of cloud computing with potential competitors and other organisations.
- when subject matter is complex and a greater depth of response per individual is required. The questions being asked may require greater probing of responses to gain a thorough understanding of the subject matter.

In-depth interviews are appropriate when attempting to uncover the content and intensity of respondents' feelings and motivations beyond straightforward or simplistic responses to structured questions (Dillon *et al.* 1993). Marshall and Rossman (2006:102) further argue that the use of in-depth interviews as the sole way of gathering data is appropriate when the purpose of the study "is to uncover and describe the participants' perspectives on events – that is, that the subjective view is what matters". This is in line with the aims of the research.

3.3 Population and sample

3.3.1 Population

Zikmund (2003:369) defines population as “a complete group of entities sharing some common set of characteristics”. The target population for this study was all potential respondents from various sectors of the industry. A prerequisite was that the interviewees should have a broad knowledge of information technology and be on a managerial level with a number of years’ experience in the organisation. It was necessary for the interviewees to be able to provide information from a strategic viewpoint, but also be able to provide scenarios for description purposes.

3.3.2 Sample and sampling method

a. Sampling Technique

The sampling procedure used for this study was that of a non-probability judgement sample. Judgement sampling allows for the researcher to select the sample based upon some appropriate characteristic (Zikmund, 2003). Such characteristics are further outlined under *sampling criteria* below.

In addition, the snowball sampling technique was also used, as this strategy is effective when sample respondents are difficult to access (Fossey, Harvey, McDermott and Davidson, 2002). Organisations that are making use of cloud computing in South Africa are sometimes difficult to identify and to access. Therefore, such a sampling technique is appropriate for this study. Snowball sampling does however tend to result in a homogenous sample as it relies on the quality of the participants’ network (Rice and Ezzy, 1999) and has been acknowledged as a limitation to the study.

b. **Sample size**

The companies selected are listed in Table 3.

Table 3: Profile of companies selected

Company	Industry	Move to SaaS
Organisation A	Publishing, Internet content business	October 2009
Organisation B	Section 21 Company	October 2009
Organisation C	Financial Services Provider	January 2010
Organisation D	Retail	July 2010
Organisation E	Education	June 2010
Organisation F	Financial Services Provider	July 2010
Organisation G	Financial Services Provider	June 2010
Organisation H	Financial Services Provider	July 2010
Organisation I	Telco Services Provider	September 2008
Organisation J	Financial Services Provider	February 2010

“In qualitative sampling no fixed minimum number of participants is necessary to conduct sound qualitative research. However, sufficient depth of information needs to be gathered to fully describe the phenomena being studied. Hence, sampling in qualitative research continues until themes emerging from the research are fully developed” (Fossey et al. 2002:726). Ten in-depth interviews were conducted until the researcher felt confident that sufficient ‘saturation’ and depth of data had been reached.

The senior members (directors, senior Managers, senior security practitioners) were selected from each company for their knowledge and experience of IT. Interviews were requested by telephone and by email to the respondents selected. For named individuals who were unavailable during the interview period a suitably experienced alternate respondent was requested.

It is anticipated that the required number of respondents will be found in each company, due to the limited time required of them.

Table 4: Proposed respondents

Company	Min. no's. to be sampled	Proposed Respondents
Organisation A	1	IT Project Manager
Organisation B	1	Contact Center /IT Manager
Organisation C	1	Operations Executive
Organisation D	1	Chief Operations Officer
Organisation E	1	Chief Executive Officer/Chairman
Organisation F	1	IT/Contact Center Manager
Organisation G	1	Chief Executive Officer
Organisation H	1	IT Manager
Organisation I	1	Enterprise Product Development
Organisation J	1	Chief Operations Officer

Although the different interviewees have different titles for their respective designations, the interviewees have vast experience of at least 5 years plus in their field and contributed extensively to the research project.

c. ***Sampling Criteria***

Interviewees selected met the following sampling criteria:

- senior members (directors, managers)
- if applicable, original founder of the organisation
- actively involved in the day-to-day operations of the business
- business employs a minimum of one full-time employee in addition to its founder

The samples were selected using non-probability, purposive sampling.

3.4 The research instrument

The research instrument used was that of a semi-structured schedule that speaks to the findings from the literature in Chapter 2 and relates to the research questions. The semi-structured interview followed the interview schedule provided in Appendix A. The interview guide questions were derived from the literature review and allowed for a more focused approach during the execution of the interviews. The schedule covered the main themes and made use of open-ended questions that allowed for further probing of respondents' answers, when required. This type of interview allowed for an informal conversational flow to take place between the researcher and the respondent.

3.5 Procedure for data collection

The data collection method chosen was that of a one-to-one semi-structured interview in order to seek answers to the research questions outlined in Chapter 2. The two main approaches to data collection methods have been defined as quantitative or qualitative (Olivier, 2004:100). This research report used the qualitative approach when collecting data as the responses to the questions could not be measured numerically. Issues such as security risks, impact of disruptive technology or threat of disruptive technology can only be expressed in qualitative terms.

Fossey et al. (2002) argue that semi-structured interviews are used when attempting to facilitate a more focused exploration of a specific topic accompanied by an interview guide. The study involved the collection of primary data by means of in-depth face-to-face interviews and when required phone interviews with respondents who met the sampling criteria. The researcher asked respondents open-ended questions that focused on specific topics, giving the respondents a high degree of flexibility in their answers. Where further information was required, the researcher asked probing questions to gain further insights into responses and the meanings behind them.

A total of ten interviews were conducted, six of which were conducted face-to-face at the respondents' offices, while the remaining four interviews took place telephonically as the respondents were situated in Cape Town. Each interview lasted between 30 and 45 minutes, providing sufficient opportunity for respondents to provide detailed answers to the questions asked. The interviews followed the interview guide (see Appendix A), which was designed to guide the interview in a "focused, yet flexible and conversational manner" (Fossey, et al., 2002:727), while attempting to answer the research questions outlined in Chapter 2.

During the interview the researcher took detailed notes highlighting emerging themes. In addition to written notes, the responses were electronically recorded.

The audio recordings will be kept for referral purposes. The results of the interviews have been documented under Chapter 4.

3.6 Data analysis and interpretation

Qualitative analysis is a "process of reviewing, synthesizing, and interpreting data to describe and explain the phenomena" (Fossey et al. 2002:728). Qualitative data may take the form of interview transcripts collected from research participants or other identified texts that reflect experientially on the topic of study (Anderson, 2007).

Data analysis was conducted through a thematic content analysis. Anderson (2007:1) states that, "TCA (Thematic Content Analysis) portrays the thematic content of interview transcripts (or other texts) by identifying common themes in the texts provided for analysis". Braun and Clarke (2006:77) argue that thematic analysis "offers an accessible and theoretically flexible approach to analysing qualitative data" and can potentially provide for a rich and detailed account of data. It is a descriptive presentation of qualitative data (Anderson, 2007) and is a method for identifying, analysing and reporting patterns within such data (Braun and Clarke, 2006).

3.7 Limitations of the study

The study is reliant upon the availability of a small sample of individuals. Although agreement to contribute may be achieved, interview cancellations were a distinct possibility. Every effort was made necessary to ensure respondents honour their agreement. The lack of quantitative findings is a limitation to those who wish to assess the IT-related risks within a cloud computing environment in a numeric framework.

There is a potential for interviewer bias during the data analysis phase as the interpretation of such data is judgmental and subject to interpreter bias. The researcher is involved in business that makes use of and sells SaaS to clients, adding to the potential interpreter bias.

The research is dependent on the respondents' ability to provide adequate insights during the in-depth interviews.

Due to the choice of a non-probability sample, projecting data beyond the sample is statistically inappropriate (Zikmund, 2003).

There is potential for sample bias as snowball sampling has a higher probability of respondents being similar (Zikmund, 2003).

The research is dependent on the respondents' ability to provide adequate insights during the in-depth interviews. A significant limitation of the study is that the target population was not determined and therefore the significance and relevancy of the sample is undetermined and limits the generalisability of the study.

3.8 Validity and reliability

Reliability is defined as “the degree to which measures are free from error and therefore yield consistent results” (Zikmund, 2003:300). Zhang (2006) notes that coders’ knowledge and experience have significant impact on research results.

As an executive involved in using and selling SaaS to organisations in South Africa, the researcher acknowledges the potential bias.

Hence, to ensure reliability interview schedules followed the same standardised script, and verbatim transcription of the interview was performed providing access to the raw data. Zhang (2006:2) argues that in order to ensure the validity and reliability of inferences from the data, qualitative analysis requires a “set of systematic and transparent procedures for processing data”. The researcher has attempted to provide such validity by providing access to the raw data.

It is noted that the researcher performed an integral part in analysing the data, making the analysis subjective and susceptible to bias.

3.9 Conclusion

The research design and methodology selected was intended to meet the objectives of the research report. An exploratory research method was deemed to be appropriate, and was selected. Semi-structured depth interviews were used as the data collection method, allowing the researcher to perform the necessary analysis to gain insights into the research topic results, which are discussed in the next chapter.

CHAPTER 4: PRESENTATION OF RESULTS

4.1 Introduction

Chapter 4 summarises the information and results gathered from the in-depth interviews conducted with the ten organisations. A key objective of the interviews was to gain a deeper understanding from the organisations about the impact cloud computing had as a disruptive technology within their IT environment. As such, the questions asked of respondents aimed to elicit information that would answer the main research question highlighted in Chapter 2, by answering the stated problems focused around what, how and why organisations have been using cloud computing and what the impact has been. The interviews followed the structure of the interview discussion guide (see Appendix A).

Each interview lasted between 30 and 45 minutes, was electronically recorded and later transcribed. The large volumes of information generated were analysed using thematic content analysis highlighting major themes, which were then aggregated and are discussed in this chapter.

The discussion of the results is broken up into the following sections:

- demographics of the organisations
- results of research questions

4.2 Demographic profile of respondents

Table 5 highlights the details of the ten organisations that participated in the study. To preserve their anonymity, respondents have been classified from Organisation A to Organisation J. Each company was selected by the researcher who was aware that they were using cloud computing and could be interviewed.

Table 5: Demographics of respondents

Respondent	Industry	Move to SaaS	Business Nature
Organisation A	Publishing, Internet content business	October 2009	B to C
Organisation B	Section 21 Company	October 2009	C to C
Organisation C	Financial Services Provider	January 2010	B to B/C
Organisation D	Retail	July 2010	B to C
Organisation E	Education	June 2010	B to C
Organisation F	Financial Services Provider	July 2010	B to C
Organisation G	Financial Services Provider	June 2010	B to C
Organisation H	Financial Services Provider	July 2010	B to C
Organisation I	Telco Service Provider	September 2008	B to B/C
Organisation J	Financial Services Provider	February 2010	B to C

The types of companies interviewed ranged from publishing houses to financial services providers to retail, such as a retail sunglass outlet and education institutions to majority 'online' businesses focusing on software development, website design, and online communities. In terms of business nature, the majority of the ten organisations have a business-to-consumer (B-C) focus with only one organisation having a consumer-to-consumer (C-C) focus .

4.3 Results pertaining to Research Question 1

The fact sheet contains an interpretation of the answers provided by the interviewees from the different organisations. In some instances the terminology of the interviewees has been used. Each question is numbered and the answers provided are presented as organisation A to J. The electronic recordings containing the actual interviews are available for reference purposes.

Table 6: Presentation of results

Question	Description of Question	Notes and answers to questions
1.	Awareness of cloud computing and disruptive technologies or are other terms used for the same concept?	ORGANISATION A: The interviewee who runs and project manages the IT of the company was well aware of the concept of cloud computing and disruptive technology and seeks ways to use it to gain a competitive advantage. However, it was pointed out that people outside of the IT department would probably not know or be aware of the terms. ORGANISATION B: The interviewee who runs the IT of the company was aware of both terms, although other people in the company use other terms like private and public cloud. ORGANISATION C: Organisation C is well aware of the concept 'cloud computing' and 'disruptive technology'. The interviewee emphasised the difference between innovation and disruptive technologies. Technologies can be innovative but are not necessarily disruptive. Disruptive can also mean that technology is used in a disruptive way influencing the way business is done. The organisation is aware of disruptive technology, understands why it is good for the organisation and knows that using disruptive technology will provide a competitive advantage.

		ORGANISATION D: Organisation D is well aware of cloud computing and disruptive technology. ORGANISATION E: The organisation is aware of cloud computing and disruptive technology, although next generation technology is the preferred term used in the organisation. ORGANISATION F: The concept disruptive technologies are not used within this bank environment, but the bank is aware of new technologies and seeks ways of implementing it to get a competitive advantage. ORGANISATION G: This financial services provider was aware of cloud computing and disruptive technology. They perceive disruptive technology as any new technology deployed that will revolutionise their business. ORGANISATION H: This small start-up was very well aware of cloud computing and disruptive technology and how it can positively contribute to make the company more competitive in the market. ORGANISATION I: The interviewee was very much aware of cloud computing but not familiar with the term, 'disruptive technology', but once it was explained, they emphasised the
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		difference between innovation and disruptive technologies. The interviewee has the opinion that organisation I is one of the world leaders in using IT in the telecommunications sector. ORGANISATION J: The interviewee is not familiar with the term disruptive technology, but having understood the explanation provided by the researcher, the interviewee realised that these technologies have been used extensively in the bank. <u>Emergent themes or patterns:</u> • Awareness is evident for both terms, disruptive technology and cloud computing.
2.	Business value of IT in the company?	ORGANISATION A: IT is classified as a strategic partner in the business. The business depends on IT to operate on a daily basis. All customer data is key in running their business. ORGANISATION B: Sees IT as a technology enabler. Business could not run without IT. Classified as the most important entity in the organisation. ORGANISATION C: The core business of the bank is dependent on IT. The bank cannot function without information and all data is embedded on IT platforms. ORGANISATION D:

		There is high business value in IT within the organisation. Company cannot operate without IT systems. Seen as critical part of their business. Used example of the point of sale system which is now IT enabled, they no longer use cash registers and all the branches are linked together using the 'cloud'. ORGANISATION E: Large percentage of budget goes towards IT. Example was stated of how productivity levels increased dramatically by over 30% with the use of SaaS, more specifically the hosted IP contact center. ORGANISATION F: It is required by the bank that a business case is prepared that provides the motivation to implement new technology. The business case must provide Return on Investment (ROI) and a Net Present Value (NPV). The values of these measurements must provide a positive result. The bank sees the business value of IT as highly important and budgets for IT (at six million per year), which could be increased in the following year. If a project does not indicate business value to the business, the project will not be approved. If a project needs to be done because of regulations set by the government, the business will seek ways of providing the best possible solution to satisfy the requirements. ORGANISATION G: Categorically stated that IT drives the business and is one of the most important areas
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		of business. High value placed on IT. ORGANISATION H: Firm believer that in this day and age, a business cannot function or be productive without IT. ORGANISATION I: Company provides IT services and technology as a product in the market; and as such it has to ensure that their own in-house IT is capable of handling this, hence very high business value placed on IT. ORGANISATION J: Technology is an enabler. Technology can be used by the business to be competitive. It depends on the type of technologies and the capabilities, which will be utilised for a specific service. <u>Emergent themes or patterns:</u> • Core business of organisation dependent on IT.
3.	What is the relation between profitability or competitive advantage and IT?	ORGANISATION A: Interviewee indicated a positive relation between IT and competitive advantage. ORGANISATION B: Definite relation seen between IT and having a competitive advantage which in turn is profitable.

		ORGANISATION C: The only way of retaining competitive advantage is to use IT in such a way, that is more advanced than the IT used by other banks (their competitors). ORGANISATION D: This organisation has found IT not to have a competitive advantage. Sees IT as the 'necessary evil'. ORGANISATION E: IT seen as a competitive advantage but not profitable as it is more of a cost at the moment. ORGANISATION F: The result of competitive advantage is profitability. IT ensures that the bank will keep a competitive advantage. All products and services that can be provided by a bank, is also provided by organisation F. The only difference between organisation F and its other competitors is the technology it is using to keep a competitive advantage. ORGANISATION G: This business is a high volume-based business, so IT is very important and thus provides the competitive advantage. IT plays a huge role in making the company profitable because of the high volume of transactions on a daily basis. ORGANSIATION H: This start-up deals with many campaigns consisting of thousands of leads or contacts,
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		so to get through these within a reasonable period of time, the use of a hosted IP contact center in the cloud is a competitive advantage. ORGANISATION I: Interviewee I sees a direct relation between competitive advantage and profitability. In their industry of providing IT and telephony services to business consumers, they need to have a competitive advantage in the market and are hence profitable. ORGANISATION J: If the purpose is to be profitable then the interviewee expected that new technology may be utilised for that reason. Disruptive technologies are also used to improve the way people work which does not have a direct influence on competitive advantage. For example, Wi-Fi is used to enable employees to have access to applications on the network from different campuses of the bank. Wi-Fi does not provide a competitive advantage in the sense of financial gain, but it does make working in the company easier. <u>Emergent themes or patterns:</u> • IT perceived as a competitive advantage.
4.	How does the company perceive new technology like cloud computing (advantage or	ORGANISATION A: Interviewee will not say. Does not see an advantage or a threat. Existing technology has proven to be just as effective.

	threat)?	ORGANISATION B: Definitely considered an advantage as it has streamlined their business and made managing remote staff easy. ORGANISATION C: The interviewee perceives new technology to be an advantage for the bank as a whole. Disruptive technology is not a threat to the systems of organisation C, as advanced firewalls prevent any access to internal systems of organisation C, e.g. wireless technology. Disruptive technology is a threat to the people inside the bank, as it changes procedures within the bank. This implies that people have to change the way they work. Disruptive technology can be a risky business. Organisation C invested in this area by sending a group of people on a course on disruptive technology. However, many of these employees who attended the course resigned. ORGANISATION D: Definitely see it as an advantage. ORGANISATION E: Sees cloud computing as a new technology and a definite advantage. ORGANISATION F: Organisation F perceives new technology as an advantage. Executives and
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		management require solutions from the IT department to provide satisfactory services to the client. Designated employees are tasked to be aware of new technology and how it can be utilised by the bank. New technology is perceived as important for the growth of the bank to keep a competitive advantage and technology is important to provide services requested by clients. If the software is not available at the bank, the bank looks for technology that will support the requirements of the client. ORGANISATION G: Is considered an advantage in their business. Going the hosted route takes away the general barrier to entry to new technology and affordability. This way they get the latest and greatest and can focus on what they do best. ORGANSIATION H: See cloud computing as an advantage in their business. Storage of data is expensive to store on-site so going the hosted route has proved to be financially viable. ORGANISATION I: This is the biggest advantage for the organisation, as they offer IT and telecommunication services over the 'public cloud'. ORGANISATION J: Some new technologies can be advantageous while others can be a threat. Wi-Fi and 3G can be serious security threats, which is a risk to the company. The bank has to
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		investigate and implement solutions to ensure that a disruptive technology is not a threat to the business, but can be utilised in a positive way. The interviewee does not perceive disruptive technology as a threat to employees, because the younger generation is used to technology and can adapt easily. <u>Emergent themes or patterns:</u> • Innovative technology considered advantageous to the organization.
5.	How easy is it that the company will start using cloud computing realising that sustaining technology may be replaced?	ORGANISATION A: Interviewee pointed out that this is a difficult one. A thorough evaluation process pre-implementation is conducted when selecting the technology. The organisation started using cloud computing for over a year now and sometimes the decision is questioned. Continuously evaluating whether this was the right decision. ORGANSIATION B: Organisation B implemented cloud computing easily. Their previous contact center was a legacy outdated platform and the company decided to pursue a cost effective OPEX based model. The hosted solution was evaluated first in the form of a pilot before the decision to implement was taken. ORGANISATION C: Organisation C realises the importance of new technology, but it is an extensive process to implement it, taking into account the approval process and the long

		evaluating procedure within the organisation. ORGANISATION D: Organisation D follows a carefully planned migration strategy. ORGANISATION E: The organisation acquired a business that was already using cloud computing, so it was very easy for them. ORGANISATION F: Organisation F uses systems for different purposes and will use a system that is reliable and cost effective. A new technology that could replace sustaining technology will be thoroughly evaluated before it will be considered as a replacement. Furthermore, organisation F will usually customise or modify an information system software solution to be applicable to the organisations' requirements. Therefore, it is difficult to upgrade these systems because of the customisation. In this case, organisation F will prefer using the sustaining technology. Organisation F runs a number of legacy systems that needs to be replaced by new technology. Organisation F will replace older systems if the system becomes unstable, or developers become unavailable or the system cannot interface with other systems. If there is no proof that new technology will be better than the sustaining technology, the new technology will not replace the sustaining technology even though it might be considered to be faster or provide quicker response-time.
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		ORGANSIATION G: Organisation G realises the importance of cloud computing as a cost effective and reliable solution for their business. ORGANISATION H: Organisation H uses systems for different purposes. Security is an important factor that was required to be thoroughly evaluated before cloud computing was implemented. ORGANISATION I: Organisation I follows an extensive process before a new technology is implemented. An example of this process is a request for information, followed by a request for proposal, technical clarifications, proof of concept, request for quotation and then finally procuring and implementing the new technology. ORGANISATION J: The decision for disruptive technology or new technology is based on the business case. If the business case proves that the new technology will replace the old or current technology, the new technology will be adopted. <u>Emergent themes or patterns:</u> • Evaluation of new technology is conducted before implementation.
6.	Describe when the company	ORGANISATION A:

	has implemented disruptive technology with positive/negative results and what were these positive/negative results?	Organisation A started using cloud computing with positive results. They started using a hosted IP contact center solution which is a new way of doing business for this company. There is no question of ownership of the hardware (as opposed to it being done in-house). ORGANISATION B: Implemented cloud computing with positive results. Organisation B described a scenario that since implementing the hosted IP contact center, there has been an increase in the number of call flows into the business and they can now measure those call flows as well. ORGANISATION C: Organisation C described a scenario where disruptive technology was used with a positive outcome. Innovative IT development enabled a link between PC's and a mainframe. The technology was developed for organisation C during the 1970's. Organisation C started using PC's to work out the high payment of fleet purchases. Data was captured on PC's, which were connected with the mainframe. The captured data was inputted directly into the mainframe. Organisation C: Cheque payment solution: Organisation C provides a cheque payment solution as a service to the community and Kwazulu Natal (KZN) Department of Health. This initiative was the solution for the problem which exists in the rural areas of KZN. Patients need to pay a clinic for
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		services but cash is not available in the rural areas of KZN. Paying by cheque is also a problem as cheque fraud occurs frequently. If a person has to pay the clinic for services rendered, the person requests to pay electronically. The request is forwarded to the KZN Health Department in Pietermaritzburg where the credibility of the requester is authorised. If the person has enough money in his bank account, the cheque is authorised and paid directly into the account of the clinic. The advantage of this system is that electronic payment is easy and quick and cheque fraud is eliminated. Organisation C: Solution for payment of speed fines for the traffic department: Organisation C provides a solution to the traffic department with the “point-of-sale” machine manufactured by a company based in France. The battery of the car provides the power for the point-of-sale device, which is connected with GPRS. The point-of-sale device enables the public to pay traffic debts when caught in roadblocks. The GPRS transfers information to organisation C allowing real-time bank transactions. The extensive evaluation process and red tape mechanisms within organisation C do not allow any implementation of technology with negative results. Organisation C uses innovative ways of delivering services that can be used by the departments, public or businesses that do not interface directly with the internal systems of organisation C, and therefore cannot have a negative effect on the systems within organisation C.
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		Telephone banking is one technology that cannot yet be launched successfully within organisation C. For banking transactions, Internet banking enables the connection from PC's to Internet for banking transactions to be successful. Telephone banking however was not successful yet. Telephone Banking Type 1: Phone Call Center and request money transferal; possible reasons for failure are that people do not want to communicate with others about personal matters. Clients do not want other people to manage their money. Telephone Banking Type 2: Using SMS functionality to initiate money transferal. Possible reasons for failure is that the SMS banking functionality is very slow. Different types of cell phones require different functionality and interfacing. People perceive electronic banking using the cell phone as a risk. ORGANISATION D: Organisation D described their latest scenario of also implementing a hosted service with positive results. The interviewee pointed to two positive metrics or benefits: 1. Ability for the solution to provide accurate indicators of the functioning of the contact center. 2. At a click of a button a supervisor can ramp up or ramp down agent numbers, so the flexibility and scalability is positive for the business. ORGANISATION E: Organisation E mentioned that their connection to the cloud has been positive and
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		negative. The hosted solution has added flexibility to their contact center. More positively there was no CAPEX to implement the hosted service. On a negative note, the bandwidth requirement on a hosted solution is very extensive and still quite costly. ORGANISATION F: A successful project used satellite technology that enabled the previously “un-banked” customers to use bank facilities in the rural areas. Organisation F described the “Letter of Credits” project which uses the technology available in the USA. The process includes the capturing of data of corporate information. The data is sent to the USA where the processing and credit worthiness are validated. The result of the processing is sent back to organisation F. The advantage of this process is that the client can have a result within 2 days, whereas previously this process took 2 weeks to be finalised. Organisation F launched a project specifically developed for the rural areas in South Africa. It is called the “Branch in a box” which refers to a branch of organisation F being deployed in a box-like structure. Organisation F uses satellites to send data from these branches in the rural areas and all transactions happen in real-time. Satellites as a disruptive technology are successfully used to replace broadband which uses cabling. Transactions are quicker, it is more convenient for customers because the bank facility is closer to their homes, and the bank gained customers. It is cheaper to use
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		the satellite technology than cabling technology. The change management process is implemented to ensure that no system will be implemented with negative results. The bank has processes, which have to be followed when a new technology or product is implemented. These processes include feasibility studies, business cases that have to be delivered and approved, pilot projects and lengthy evaluations of the technology or product. Example: The Capital Section has implemented a functionality, which allows customers to have access to the Stock Exchange by using the website if the customers qualify. This product, supported by new technology, was aimed at a specific sector in the banking industry. However, the product was not successful for various reasons and profit was not made. The bank changed its strategy and opened the product to other sectors in the banking industry, which made the product profitable only one year later. ORGANISATION G: The hosted contact center offering was implemented with both positive and negative results. On a positive note, it allowed the organisation to focus on their core business. The negative is that due to the poor quality of service, it is difficult for them to switch to another service provider. ORGANISATION H: Organisation H implemented SaaS with both positive and negative results. The
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		company saved a bundle on no CAPEX spend for the new technology, but suffered technically due to high cable theft in their physical area of business. This break in service has hurt the organisation financially. ORGANISATION I: This service provider uses SaaS for their own organisation and also launched SaaS as a service offering with success into the market. The ramp up has been very positive for the organisation, since the business case for them going hosted has been the same 'selling' points in taking this service to market ORGANISATION J: Cellphone banking was an implementation of disruptive technology with positive results. The SMS functionality of a cellphone is used for banking. The project was aimed for the younger generation (20 to 30 years) in the market sector. This market sector is used to new technology and is cellphone keyboard literate. The project was a success and this was profitable. Wi-Fi is used for connectivity between different workstations within the bank. Shortly after the implementation of the disruptive technology (Wi-Fi) by one vendor, the system was cracked and the organisation had to search for another product. Problems were encountered with the security of the business's information network. To resolve this problem, organisation J changed to another software provider to solve the problem.
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		<u>Emergent themes or patterns:</u> • Both positive and negative results arose for each organisation.
7.	At which stage does the organisation invest in new technology when it becomes available? • As soon as the product can be utilised (before available on the market); • As soon as the product is available in the market ? • If other competitive companies buy the product, this organisation will also purchase the product; • Delay investing in (purchasing) the product.	ORGANISATION A: Will consider implementing a new technology before its competitors. Prefer to go pilot route. External factors play a big role. ORGANISATION B: Adopted a wait and see attitude. Need to determine whether it can be afforded or not. ORGANISATION C: Organisation C will never to wait and see the result of technologies. This organisation will initiate investigations to establish if the technology will ensure a competitive advantage. Pilot projects are sometimes executed. The organisation will quickly investigate the disruptive technology to establish if the technology will be beneficial to the company. ORGANISATION D: Not considered leading edge, but would like to use product as soon as it becomes available. However does prefer the tried and tested solution when others have started to use the product.. ORGANISATION E:

	Wait to see the result of trails done by other companies before purchasing the product. • Arrange pilot project to test new technology in an organisational environment. • Never buy disruptive technology; must be proven as best-practice technology.	Prefers to adopt solution as soon as it can be utilized. However highly unlikely they will be the first to implement. Evaluates technology in terms of the current value network ORGANISATION F: As soon as the product becomes available because it can give the bank a competitive advantage. Organisation F tries to implement a product before other banks to keep a competitive advantage. Will sometimes delay, for example the SMS banking facility. Organisation F watched the other banks to see which problems would be encountered interfacing with cell phone providers. When planning to launch a new product, a pilot will be used to test the success rate of the product. Organisation F does not follow a big bang approach, but will pilot in designated branches before the product is rolled out to all branches. Organisation F cannot wait until a new technology has been proven as best-practice, because the other banks which are using the technology will already have gained the competitive advantage. If Organisation F has information regarding a new technology that will be available (e.g. Microsoft Windows), organisation F will propose to test the technology. By testing the technology, organisation F can be the first to implement the technology and ensure competitive advantage
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		ORGANISATION G: Organisation G's motto is innovation. They see themselves as pioneers in their industry. They always try to implement new technology before their competitors. Will not wait and see until technology is proven, because their competitors could gain advantage. They have their own in-house developed software applications. Always looking to enhance and make sure it's working within other cloud applications. ORGANISATION H: Will try and adopt before it's available on the market. They want to ensure they implement before their competitors. ORGANISATION I: As much as they would like to implement new technology as soon as it does become available they cannot as they are bound by policies and processes. Have to go the pilot route. So they do not follow the 'big bang' approach. ORGANISATION J: Highly unlikely that this organisation will use a product, which has not been proven and needs only be utilised. Organisation J will not consider using a product as soon as it becomes available in the market. Organisation J will not purchase a product only because its competitor has bought the product. The product has to be evaluated to estimate the value of the product before
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		it will be purchased. It is not the norm for organisation J to wait for results from the competitors before investing in technology. Trials will be executed by the company itself and evaluation will be done before investment will be done. Arrange a pilot project to test the technology in the organisation's environment. If it is successful it will be rolled-out. Organisation J will investigate the new technology and with enough information a decision will be made whether a technology will be implemented or not. <u>Emergent theme or pattern:</u> • A direct effect of profitability.
8.	Describe disadvantages of disruptive technologies as experienced in the business environment. The following may be used as guide-lines: • Customers or clients or employees resist the new technology	ORGANSIATION A: By consolidating their contact center environment and going the hosted route, the business units are losing more control. It was highlighted that it's a changing model in the publishing and news industry. Looking at advantage of cloud computing, failure is not an option, so constantly evaluating. Profitability cannot be affected. A scenario was pointed out whereby being connected to the cloud caused a delay in agent productivity due to internal applications not being able to integrate fully with the

	• The implementation of disruptive technology could result in the delay of production and/or influence profitability. • Negative effect on change management. • Quantifying the financial investment of disruptive technology. • Motivate the value of disruptive technology to exploit the product for profit.	application offered in the cloud. This had an impact on losing some customers and affected profitability. ORGANSIATION B: Has fortunately not experienced any disadvantages but did highlight that any disruption or failure will not be tolerated. There has been a good retention of customers of 5% due to the stability of the service. ORGANISATION C: Young and early adopters want to use the new technology as that is a way of attracting new customers. New technology is also a threat to elderly people, as they usually prefer doing banking in a way that is comfortable for them. However, elderly people often enjoy new technology, because it allows them to access services they did not have in previous years. Organisation C will not allow failure of disruptive technology to cause a delay in production or have an influence on profitability. The long approval process for new solutions is in place to ensure a successful outcome. Management of organisation C is reluctant to change because of high risks that need to be taken into consideration. However when a new solution is implemented, all roll-players are trained and educated to ensure successful delivery of the system. Organisation C does not invest in disruptive technology. Disruptive technology is used outside the bank to its benefit, and organisation C derives value from disruptive
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		technology by providing services to clients that ensure that organisation C retains its clients. These services sometimes use disruptive technologies or the combination of technologies provides a disruption in the way organisation C is doing business. ORGANISATION D: Interviewee D mentioned it was a combination of all the points. They each have a direct effect on profitability. Important to note is that any break in the service is not accepted and service level agreements need to be enforced. ORGANISATION E: Indicated a delay in productivity due to bandwidth constraints, purely because of the physical location that the company is situated in. ORGANISATION F: Customers, clients and employees resist new technology in the organisation F environment. Employees tend to use old systems because they are familiar with the system. Therefore organisation F usually removes the old system completely and deploys the new system to ensure that all new transactions will be done on the new system. Clients living in the rural areas or in squatter camps do not trust the process of banking with a card. In some instances, clients still need to use bank books, which are used to keep track of transactions. Older clients experience technology as intimidating while the younger generation
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		accepts technology more easily. Disruptive technology will never have an influence on or delay in productivity. Organisation F uses a Change Management process that ensures that technology is well tested before the technology is implemented. The purpose of the Change Management process is to ensure that new technology will not have a negative effect. Before organisation F implements a new technology, all users are trained. All technologies to be implemented at organisation F have to be quantifiable in terms of Rand value to capitalise the product. On the other hand, the Return on Investment (ROI) has to indicate the value of the technology to ensure that the technology is quantifiable, but it is difficult to quantify is market risk. Organisation F will use new technology to reach a designated sector in the banking industry in order to market another product to gain competitive advantage. ORGANISATION G: Main disadvantages include the time and effort to ensure that it works. To get it right sometimes can become a very costly exercise. ORGANSIATION H: Organisation H being a startup has not experienced any disadvantages, but it is still early days. However, any disruption in service will cost the company its profits ORGANISATION I: Organisation I has lost customers due to the stability of the solution implemented
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		within their environment, the hosted contact center. The main culprit being the network. ORGANISATION J: Cell phone banking was aimed at users in the age group between 20 and 30 years. These users are used to technology and adapt easily to new technology. Other users tend to resist new technology. Some people still will not use an ATM (Automated Teller Machine) and others do not trust the Internet Banking functionality. Delays in production have happened when rolling out new technology in previous years. Unanticipated factors occurred during the testing phase, which forces the delaying of the implementation of new technology. Delaying of the production has an effect on profitability in the sense that if the product is not available, the customers will not use it and the company will not have an income deriving from the technology. Using of cell networks for outline branches could be used instead of Telkom networks, which was seen to be rather unreliable. If the new technology is implemented, all users need to be trained. In some instances the company has derived significant financial advantage from implementing a new technology compared to other companies. Organisation J will not use new technology to exploit the product to make money from the product.
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		<u>Emergent themes or patterns:</u> • Profitability will be affected with any form of new disruptive technology.
9.	How does the company see the relationship between a value network and disruptive technologies?	ORGANISATION A: The term 'Value network' was not clearly understood. From an end to end user/business experience, the end user does not see this as a component driving the end-end service level agreement. Interpreted value network in terms of profitability to the organisation. ORGANISATIONB: The term 'Value network' was not clearly understood. Cloud computing must have an advantage to the value of the network. ORGANISATION C: The term 'value network' was not clearly understood. Disruptive technology must provide value and advantages to the customers to ensure that the customers will be willing to use the technology. ORGANISATION D: The organisation was not familiar with the term 'value network' and needed to be explained. ORGANISATION E: The term 'value network' was not understood. Different technologies have different relationships with each other. The new technology must be able to interact with

		existing technology. ORGANISATION F: Organisation F currently runs approximately 160 systems that integrate with in-house as well as external systems. Organisation F does not allow any technology that will negatively influence any of these 160 systems. Organisation F uses the Services Orientated Architecture, which ensures that new technologies will interface with all 160 systems. ORGANISATION G: Interviewee did not understand the term 'value network'. However after the term was explained the interviewee did highlight the relationship between a value network and profitability. ORGANISATION H: The term 'value network' was not understood. When the company considers new technology, it has to be able to integrate with the existing sustaining technology. ORGANISATION I: Interviewee I had his own definition of 'value network' which was almost correct, but the interviewer still had to explain the term. It was highlighted that the interaction between the new and existing technology needs to be error free in order for the business to be supported. ORGANISATION J:
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		The organisation is not familiar with the term Value Network. Within the organisation different technologies have relationships with each other. If a new technology is investigated and it is realised that the current system architect has to change to incorporate the new technology, organisation J will consider it. <u>Emergent themes or patterns:</u> • Organisations interpret value network as value in terms of profitability and advantages to the organization.
10.	Has it happened that customers have been retained because of implementing new innovative technology like cloud computing/hosted SaaS?	ORGANISATION A: Organisation A provides news publications to end consumers. Experienced loss and retention of customers. Initial outages of the service caused loss of customers. However added functionality like remote agent recording storage has retained customers. ORGANISATION B: Experienced a retention of 5% of customers. ORGANISATION C: Organisation C provides services to municipalities by providing payment kiosks inside the municipality building where people can pay utility accounts. Advantages of this solution are that the municipalities do not have to handle cash, fewer cashiers are

		required and ratepayers can complete their transactions 24 hours per day 7 days a week, municipalities do not have to transport money and the chance of being robbed is reduced. Organisation C has retained the municipalities as a customer. Organisation C could lose customers based on bad services or a bad branch manager, but the bank has not lost customers because of disruptive or innovative technologies. ORGANISATION D: Organisation retained customers due to implementing the hosted contact center solution. It was imperative for them to deploy. If they did not, they would have lost customers. ORGANISATION E: The interviewee was not aware of any loss of customers. If there were it was not because of the technology, but purely bad service. ORGANISATION F: Organisation F was the first bank to introduce the cash box in the market. The customer cashes up at the end of the day and by using the cash box technology, the transaction is updated on the bank system as soon as the customer cashes up. Organisation F has nearly lost customers because of problems of the new technology, but further enhancement to the technology ensured organisation F retained their customers.
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		Organisation F provides a “Drive-Through-Banking” in areas such as Lesotho and Swaziland, where the driver of a vehicle can drive into a banking facility, which is a secured area, and complete a banking transaction. Internet banking services were not always successful because customers do not always get statements according to requirements. ORGANISATION G: Going with the cloud has enhanced this organisations business profile. It is used as a selling point. ORGANISATION H: This start-up and new entrant to the market could not comment as they are still in the infancy stage of the business. However it was pointed out that disruptive technology cannot be the only cause for losing customers. The interviewee believes it’s sometimes attributed to bad management. ORGANISATION I: The interviewee mentioned that in their line of business the churn rate of losing and gaining customers is high, so in effect it balances out. ORGANISATION J: The Speed-Point technology is an example where corporate customers were retained, because of the exceptional functionality of the technology. Customers could not get the technology from any other business, thus the customers were retained.
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		The interviewee is under the impression that customers have not been lost because of using disruptive technology. There are a number of ways that customers can use their banking services. <u>Emergent themes or patterns:</u> • A positive outcome of retaining and gaining additional customers across all the organisations.
11.	Does your company use the S-Curve concept when researching disruptive technology or sustaining technology? Describe your answer.	ORGANISATION A: Interviewee A was not familiar with the S-curve and hence does not make use of it. They sort of understand where the products are in the life cycle and use industry market information. ORGANSIATION B: Organisation was not familiar with this concept. The interviewee is familiar with the Gartner hype curve and uses that to research technology. ORGANISATION C: Organisation C does not use the S-Curve concept to evaluate disruptive technology because disruptive technology is seen as a high risk. Organisation C would rather use sustaining technology. From the interviewee's viewpoint, it is individuals (Mavericks) who will recognize the potential of disruptive technology. ORGANISATION D:

		Not familiar with this concept. The company does not really have a rigid structured approach. Company uses the standard RFI and RFP practice to find out what is out there. ORGANISATION E: The interviewee was not familiar with the concept. They do not consider themselves that advanced, so rely on standard market reports available on-line. ORGANISATION F: The interviewee from organisation F was not familiar with the S-Curve concept but after explaining the concept a description was provided. Organisation F will evaluate the new technology and use the complete change management process before implementing new technology and discontinuing the older system. ORGANISATION G: Interviewee G not aware of the concept. Company will conduct a cost benefit analysis. Whether it is tried and tested is not relevant. They will research the technology, evaluate the costs to run it, support it and make the decision. ORGANISATION H: Interviewee H was not familiar with S-curve concept and does not use it. ORGANISATION I: Interviewee I was under the impression that the Gartner hype curve and S-curve were the same. After explaining the difference, it was clear the interviewee was not familiar
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		with the concept. ORGANISATION J: The interviewee does not know what the S-curve means and therefore does not use the concept. <u>Emergent theme or pattern:</u> • No organisation was familiar with the S-curve concept.
12.	Does the company follow an approach or use a business strategy to handle disruptive technology? (IT business unit should continuously be aware of emerging technologies, be aware of the requirements and business needs of the different business units within the company, changes in needs of customers, other business partners and the industry.)	ORGANISATION A: Interviewee A made it very clear that organisation does indeed have a business strategy for IT. The organisation makes it a point to meet with vendors to keep abreast of the latest trends in the market. ORGANISATION B: The organisation does not have a business strategy directly for disruptive technology but there is a strategy for IT. The interviewee indicated that they attend monthly sessions with key vendors on solution and product updates. ORGANISATION C: Organisation C does not have a specific strategy for disruptive technologies per se. Organisation C has a strategy that supports sustainable and incremental technology development. ORGANISATION D:

		Interviewee D pointed out that his organisation does have a business strategy for IT. The continuously meet with vendors and functional areas of the business. There is a three year business IT strategy in place. ORGANISATION E: Interviewee E, who is the CEO of the company, highlighted that although there is a business strategy for IT, it is very raw and young in development. Unfortunately it is not officially documented and adhered to. Organisation E however does make a point to try and attend as many conferences as possible to keep abreast of new developments. ORGANISATION F: The IT strategy indicates the road map for the rest of the bank. Designated employees are tasked to look for new technologies, which will improve banking solutions and which will influence the strategy the bank will follow in future endeavours. ORGANISATION G: Interviewee G confirmed that a business strategy is in place for IT. The approach they follow is to try and meet with new vendors to always get a fresh perspective of what is available and new. Interviewee made it clear that they need to be on top of this. However the statement was made that if it's not broken then don't fix it. ORGANISATION H:
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		Interviewee stressed the point again that since they are a start-up, no official business strategy is in place, however since they consider their motto to be innovation they ensure that all functional managers are kept abreast of what's new. This is made possible by making it compulsory for each functional area manager to attend the monthly meetings with vendors. ORGANISATION I: Interviewee I pointed out that since organisation I is a well-respected player in the telecommunications space, a clear business strategy for IT is in place and updated on an annual basis. Organisation I continuously goes out with an RFI to keep abreast of what's new in the market. ORGANISATION J: No specific strategy is in place to deal with new technology. The organisation has developed a business unit model where each business unit is responsible for their own strategies for innovation and new technologies. The architectural board oversees all implementation of technology and uses standards to guide the different business units to implement technology which will fit into the architectural framework rather than dictating which technologies should be used. <u>Emergent themes or patterns:</u>
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		• Business strategy for IT exists • Continuous communication with vendors to keep updated on new technologies and solutions
13.	What is the involvement of executives and management?	ORGANISATION A: Executive's view is that IT knows best and that's why they are and exist in the organisation. Interviewee gave the scenario that there was a requirement by business. An RFI was issued to find out what was out there. From the responses it was clear that cloud computing was the way to go. Business went to the technical team to get sign-off, as they only looked at the functionality. Executives did not get involved until the final recommendation was presented to them for formality sake. The interviewee pointed out they are conservative in terms of change and that a change management process is enforced to minimize any negative impact. ORGANISATION B: The executives do play a role, but do not dictate what technology should be used. ORGANISATION C: Executive Management supports the concept of disruptive technology. Executive management is still very conservative and would rather continue working with current systems and procedures rather than taking the risk to implement new technologies that will change procedures. Currently an Innovative Department exists within the bank, however from the interview it is clear that this department is not successful in

		launching projects. The change management process enforces long evaluating processes that have a negative impact on rapid change of disruptive technologies. The interviewee works in the Public Sector of the bank, which provides innovative services for the public sector. However it is the Mavericks, creative thinkers, employees who can think out of the box, that provide ways of using disruptive technology as solutions, which are beneficial to the company. ORGANISATION D: Interviewee D stressed that change management has been crucial and that processes are in place and strictly adhered to in order to minimize any risk whatsoever. A scenario was presented whereby organisation D wanted to implement cloud computing. The concept and solution was sold at the so-called 'leadership' level, but translating the message to lower levels in the organisation proved to be more challenging. ORGANISATION E: The CEO of this organisation made it very clear that the executive's involvement is very limited in making any decision. They do however encourage that any new technology is universally used and accepted. There is very little or no influence from customers. ORGANISATION F:
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		Executives and management have realised that IT is the core on which the business runs; therefore the quality of the IT will ensure the competitive advantage of the company. The executives and management encourage the IT department to search for technology that could be used to keep the customer satisfied. Management supports the IT strategy, because it indicates the approach the bank has to follow to keep a competitive advantage. ORGANISATION G: Executives do not dictate what technology should be used, although final sign-off is required by the executive decision. If the service provided will change the environment completely, organisation G will involve customers to provide input. ORGANISATION H: Still in its infancy stage, all decisions are made by the owner. ORGANSIATION I: Executive involvement is in the form of thorough investigations. A scenario was tabled whereby all senior managers and executives should be using Blackberry's . Executive insisted on a thorough research investigation as to why Blackberry and not Apple and it concluded after the investigation that the technology did not provide the applicable functionality for the specific purposes required by the organisation. ORGANISATION J: Executive management dictates the autonomous business model to encourage for
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		instance a common e-mail system (which is not currently the case), but management do not dictate technology. <u>Emergent theme or pattern:</u> • Executive support and involvement is required to implement any new/disruptive technology.
14.	Does the company follow a process when evaluating disruptive technology? The following can be used as examples: • Maturity level of the technology in the market • Unreliable vendor products • Outcome of implementation is too uncertain • Usability of technology in company	ORGANISATION A: Interviewee A emphasised that all the points are considered. This change management process however takes time. But it was pointed out that the pilot projects are normally very effective. ORGANISATION B: Interviewee B pointed out that they do follow process. They use the market as a form measurement (medical market). They follow the trends in that sector and then follow or go better. ORGANISATION C: The Change Management process within organisation C encourages red tape and long evaluating process and testing of technology before it can be implemented. The period for this process can span over 3 years. However the interviewee has described projects where disruptive technology or disruptive ways of doing business have been used outside the bank, but only to

		ensure retaining or gaining customers. During these projects disruptive technology is tested before being implemented. Disruptive technologies are also used in combination with other technologies to provide an innovative way of doing business. ORGANISATION D: Interviewee D highlighted that they do not want to be bleeding edge. Even though they follow the process of RFI and RFP, they still experienced a headache with 'go-live' on the hosted IUP contact center deployment. They use the reason that the service provider was not mature in the lifecycle. ORGANISATION E: A change management process to ensure that the correct service provider is selected and is followed but not formalized or officially documented since the company acquired the business which started using cloud computing. ORGANISATION F: Organisation F will look at the value of the new technology, will examine possible risks in terms of the new technology, or verify the stability of the product and execute feasibility studies as part of the process when evaluating a new technology. Organisation F uses the change management process to verify the quality of the vendor and to make sure that the outcome of implementing the new technology will be positive. ORGANISATION G:
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		Interviewee G re-confirmed that since they are pioneers in their industry they do follow a change management process but do not use it as a blueprint and is not enforced. The reason for this is to maintain the innovation. ORGANISATION H: Interviewee pointed out again that since they are a new company, and always want to be the first to market, processes are adhered to but only for the benefit of the organisation. ORGANSIATION I: Being a major telecommunications service provider, the interviewee highlighted that processes are clearly defined and implemented within the organisation. Any evaluation of technology has to follow the pre-defined process. This involves the RFI, RFP and technical qualification process as previously mentioned. ORGANISATION J: No formal process of evaluating new technology is in place at organisation J. Each business unit will use its own evaluating process. Usually a business case will be put together and will be discussed. The case will be put together and discussed at the architectural board.
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		<u>Emergent themes or patterns:</u> • Change management process in place and followed with most of the organisations
15.	Describe a scenario during which disruptive technology was integrated with sustaining technology or implemented to be used in combination with sustaining technology?	ORGANSIATION A: Interviewee A stated that they have not formally integrated into their back-end systems since being connected to the cloud. Investigations in the form of scoping workshops are being held currently in order to see how this integration will happen smoothly and error free. ORGANSIATION B: Interviewee mentioned that organisation B is still in the process of integrating with other back-end applications; i.e. Customer Relationship applications. Investigations into the best way of doing this are still being debated. ORGANISATION C: The project for the KZN Department of Health is an example where a payment solution has been developed which interacts with the current applicable organisation C system. ORGANISATION D: Interviewee D shared how a thorough investigation was conducted to ensure a smooth integration of the hosted IP contact center with their home grown, web-based customer relationship application. A particular script had to be written to link the

		hosted solution and the back-end platform in order for the customer information to pop up on the agent screen desktop. ORGANISATION E: Interviewee E explained how their hosted solution had to be linked with a scanning technology that had been written in ASP code (own code). A thorough investigation into the feasibility of doing this smoothly was conducted and the decision was taken to do it. ORGANISATION F: The new technology has to integrate with sustaining technology. If a new technology is not compatible with sustaining technology, the new technology will not be implemented. ORGANISATION G: Interviewee explained how an in-house designed workflow had to be integrated with the hosted solution and worked without any issues. This integration however could not work with the existing sustaining technology they had hence why they elected to go hosted with cloud computing. ORGANISATION H: Interviewee H mentioned that there are no integration requirements at present but that this could change soon. For them they need to ensure a smooth integration so feasibility studies (investigations) are key.
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		ORGANISATION I: Organisation I has strict policies and procedures in place that involve all integration to be done on test beds before being implemented onto production. ORGANISATION J: Internet Banking is an example where the front end was on a Microsoft web platform, which integrated with the organisation's old IBM mainframe back end. The way the integration was done was disruptive and a breakthrough for integration between mainframe and Microsoft web platform. <u>Emergent themes or patterns:</u> • All organisations require investigative effort to be conducted to ensure smooth and error-free integration efforts
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4.4 Summary of the results

The results from the research questions highlight significant themes in the perception of cloud computing as a disruptive technology in South Africa. The results demonstrate support for the existing literature and provide unique and insightful findings into how organisations in South Africa are making use of disruptive technologies such as cloud computing, as well as the reasoning behind such strategies and the challenges that they face in doing so. In Chapter 5, these results are discussed in further detail.

CHAPTER 5: DISCUSSION OF THE RESULTS

5.1 Introduction

This chapter discusses in detail the research findings outlined in Chapter 4. These findings are compared with the literature review in Chapter 2; and outlined in accordance with the six research questions proposed in Chapter 2. The in-depth interviews with the ten organisations provided an extensive set of data from which emergent themes were drawn, providing insights into the perceptions of the role, usage, effectiveness and challenges faced by organisations when using cloud computing as a disruptive technology.

The research results discussed in this chapter contribute to an improved understanding of the literature regarding cloud computing as a disruptive technology.

5.2 Analysis of the results

The execution of the interviews followed the order of the interview guide, which was used to present the results of the analysis as follows:

5.2.1 Awareness of cloud computing and of the concept “disruptive technologies” by the organisations

This question sought to identify if organisations in South Africa are aware of cloud computing. Organisations must establish an awareness of the potential of disruptive technology.

All organisations were aware of the concept cloud computing and disruptive technology, but the concept of disruptive technology specifically had to be explained to organisations I and J. This is in line with the research from Evans (2003) which states that organisations must establish an awareness of the potential of disruptive technology that can penetrate the IT market influencing their current combination of products and services, which can have an influence on the financial success of the business. The interviewee from organization I emphasised the difference between innovation and disruptive technologies. According to organisation I interviewee, technologies can be innovative but are not necessarily disruptive. Disruptive can also mean that technology is used in a disruptive way influencing the way business is done. The interviewee has the opinion that organisation I is one of the world leaders in using information technology in the telecommunications sector. The organisation is aware of cloud computing, understands why it is good for the organisation and knows that using cloud computing will provide a competitive advantage. The representative of organisations J was not aware of the concept “disruptive technologies” or “cloud computing”, but after the researcher explained the concept, the interviewee confirmed that their organisation seeks ways of implementing new technology to obtain a competitive advantage. The researcher found it interesting that many of the responses highlighted that there was a competitive advantage associated with cloud computing and disruptive technology.

5.2.2 Business value of information technology within the organisation

The question attempted to explore the business value of IT as it becomes important to grasp the business value of new technologies – whether or not the impact of new technology will actually enable the organisation or firm to reshape their business to achieve results.

The result of the research highlighted an emergent theme, in which all the organisations confirmed, that the core business of the organisation is dependent on information technology. It was interesting to note that a very clear message conveyed by all respondents pointed to the fact that IT drives the business and is seen as one of the most important areas, if not the most important. Organisations cannot function without information and all data is embedded on information technology. Organisation F estimates the business value of information technology in terms of Return on Investment (ROI) and Net Present Value (NPV). If a project does not indicate business value, the project will not be approved. Organisation E pointed out that their productivity levels increased dramatically by moving towards the cloud in particular with the hosted IP contact center solution. This is in line with the literature which states that information technology is beneficial to business in terms of improved productivity (Dhar and Sundararajan, 2007). Organisation A sees it as a strategic partner to the business, where organisation B and J mentioned it was more than an enabler as the business could not function without it. The trend is that business has realised that when a disruptive technology is beneficial to the firm, it is important to estimate the business value of the emerging technology (Cooper and Smith, 1992).

5.2.3 *The relation between profitability/competitive advantage and information technology*

This question sought to determine if there was any relation between IT and profitability or competitive advantage.

The results of the research question revealed that the only way to remain competitive was to constantly innovate and implement new technology. Organisations A, B, C, E, F, G, H, I and J perceived IT as the only way of retaining competitive advantage. Organisation D was the only company that did not see IT as a competitive advantage and even went as far as to describe it as the 'necessary evil'. Products and services provided by the organisations, under scrutiny, are very similar to those of their competitors. Therefore, the only difference between an organisation and their competitors is to apply technology in such a way to keep a competitive advantage, with the resultant profitability. Organisation J mentioned that the use of innovative technology is not always measured in terms of profitability. Disruptive technologies are also used to improve the way people work, something which does not have a direct influence on competitive advantage. For example, the hosted contact center is used to enable employees to be in contact with each other across vast geographical locations in South Africa; and other applications on the network from different campuses of the organisation. The hosted contact center do not provide a competitive advantage in the sense of financial gain, but it does make working in the company easier. This is in line with literature which states that any firm has to adapt to be able to incorporate a new technology to maintain a competitive advantage (Jones and Smith, 2005). The idea leading to disruptive technology may either rise from the information technology used by a company's core competencies or from the exogenous input (Walsh and Kirchhoff, 2000:323).

5.2.4 *How does the company perceive new technology, an advantage or a threat?*

The question attempted to explore, from the organisation's perspective, how the organisation perceived the new technology, as a threat or an advantage.

New technologies can be advantageous while others can be a threat. The results from the thematic analysis of the in-depth interviews identified a major theme. All the organisations considered innovative technology advantageous to the organisation except for organisation A. Organisation A was the only one that could not determine whether it was in fact an advantage or a threat. The executive management of organisation F requires that the information technology department provides solutions and satisfactory services to the client. Designated employees are tasked to be aware of new technology and how it can be utilised by the organisation. New technology is perceived as important for the growth of the organisation to keep a competitive advantage and to provide solutions that address requests from the clients. The theme is in line with the literature which states that disruptive technologies provide a growth opportunity to companies that recognise the opportunities offered (McGinn, 2001). If the organisation cannot provide information technology to supply a service, the organisation will search for technology external to the organisation, which will provide the functionality requested by the client.

New technologies such as Wi-Fi ,3G and SaaS can be serious security threats, which is a risk to the company. Firewalls must be in place to ensure that the information of the organization is secure.

5.2.5 *Disruptive technology replacing sustaining technology*

The purpose of this question was to ascertain how easy it is for an organisation to start using a new disruptive technology like cloud computing realising full well that sustaining technology may be replaced.

The results of the research determined that organisations will generally thoroughly evaluate a new technology before it will be considered. Organisations I and C emphasised the extensive process and change management procedures that need to be followed when a request to implement new technology is submitted. Therefore, it is more likely that sustaining technology will be preferred. Organisations B, C, D, F, G and H use systems for different purposes and will use a system that is reliable and cost effective. A new technology that can replace sustaining technology will be thoroughly evaluated before it will be considered as a replacement. Furthermore, organisation F usually will customise or modify an information system software solution to be applicable to the organisation's requirements. Therefore, it is difficult to upgrade these systems because of the customisation. In this case, organisation F will prefer using the sustaining technology. This is in line with the literature which states that "sustaining technologies create innovations that are modifications of, or improvements to, or replacements for existing products" currently used within the firm (Walsh and Kirchhoff, 2000:322). Organisation F runs a number of legacy systems that need to be replaced by new technology. Organisation F will replace older systems if the system becomes unstable, or developers become unavailable or the system cannot interface with other systems. If there is no proof that new technology will be better than the sustaining technology, the new technology will not replace the sustaining technology simply to be faster or provide quicker response-time. At Organisation J, all proposals to implement new technology must be submitted as a business case. If the business case proves that the new technology will add value by replacing the old or current technology, the new technology will be adopted.

5.2.6 *Description of implementation of disruptive technology in the organisation with positive or negative results*

This question sought to explore scenarios when an organisation implemented disruptive technology with either positive or negative results and what those positive or negative results would be.

The results of the research provided significant insight into how organisations using cloud computing have in most of the cases contributed positively to their business, however, in certain cases, implementation of disruptive technology also had a negative effect on organisations.

Organisation C provides a solution to the traffic department by using cloud computing (in this case GPRS), which is an example of disruptive technology. The point-of-sale device enables the public to pay outstanding traffic fines when caught in roadblocks. Organisation C collaborated with a company in France to produce the “point-of sale” machine. This “point-of-sale” device is powered by a car battery and is connected via GPRS to organisation C. The GPRS transfers information to organisation C allowing real-time bank transactions. Another example by organisation C is that they provide an alternative payment solution as a service to the community and KZN Department of Health. This initiative was the solution to a problem, experienced in the rural areas of KZN. Patients need to pay a clinic for services but cash is not readily available in the rural areas of KZN. Paying by cheque is also a problem as cheque fraud occurs frequently. Now, when a person has to pay the clinic for services rendered, the person can request to pay electronically. The request is forwarded to the KZN Health Department in Pietermaritzburg for authorisation. If the person has enough money in his bank account, the transaction is authorised and the amount is paid directly into the clinic’s account. The advantage of this system is that electronic payment is easy, fast and cheque fraud is eliminated.

Organisation A implemented a hosted service from a key leading service provider with positive results. This allowed the company to focus on their core business. There is a high respect of quality from this specific provider. Cloud computing using satellite technology, used by organisation F, is regarded as a disruptive technology.

Organisation F launched a project specifically developed for the rural areas in South Africa. It is called the “Branch in a box”, because of the box-like structure. Organisation F uses satellites to send data from these branches in the rural areas and all transactions happen in real-time.

Satellite technology is perceived as a disruptive technology which successfully replaced broadband which is dependent on cabling. This satellite technology is cheaper, very reliable and not prone to disruption due to cable theft. Transactions are quicker, it is more convenient for customers because the bank facility is closer to their homes, and the bank gained customers.

Organisation J described how the SMS functionality of cellular telephone technology used in conjunction with a hosted application (as a disruptive technology) is used for banking purposes. Cell phone banking is an example of the implementation of disruptive technology with positive results. The significance of this project was that it was aimed at a young market sector (20 years to 30 years), targeting those who are used to new technology and are cell phone keyboard literate. The project was a success as can be determined in terms of profitability.

Organisation D implemented SaaS with positive results. This was based on two key positive benefits. First, having the ability for the solution to provide indicators on the performance of their hosted contact center and second, the flexibility and scalability of the hosted contact center being able to ramp up or down the agent licenses on a monthly basis. This is in line with the literature which states that disruptive technologies often provide new technologies that can be applied to the benefit of the business, whereby these positive aspects and qualities of disruptive technologies can be used to the advantage of a firm (Evans, 2003).

Organisations C, F and J described the methodology and procedures followed within their respective organisations to evaluate new technology. This is to ensure that the implementation of disruptive technology will not have a negative effect on the systems within the organisation. However, in certain cases, implementation of disruptive technology had a negative effect on the organisation.

Organisation C implemented telephone banking by using fixed line and cellular telephones for banking transactions.

Telephone banking, however, was not successfully implemented by Organisation C. Two different options for telephone banking were described.

Telephone Banking Type 1: phone call center and request money transferral.

A possible reason for failure was that clients may not want to communicate with others about personal matters, people often do not want others, even bank employees, to manage their money.

Telephone Banking Type 2: using SMS functionality to initiate money transferral.

Possible reasons for failure include the fact that SMS banking functionality is very slow, different types of cell phones require different functionality and interfacing. People perceive electronic banking using the cell phone as a risk.

Organisation F described the functionality available via the Internet or 'cloud' as a disruptive technology. Their Capital Section implemented a functionality that allows qualifying customers' access to the Stock Exchange by using the website. This product was originally aimed at a specific sector within the banking industry. However, for various reasons, the product was not successful and did not show profit. The bank changed its strategy and opened the product to other sectors in the banking industry, which made the product profitable within a year. Organisation H described the implementation of Wi-Fi functionality, which is also a disruptive technology. Wi-Fi is used for connectivity between different workstations within the organisation. Shortly after the implementation of the Wi-Fi technology by a particular software provider, a hacker accessed the system and the organisation had to search for another product. Problems were encountered with the security of the business's information network and another software provider was contracted. This is in line with the literature which states that when a new technology is implemented and the technological change destroys the value of competencies, the new technology has a negative impact on the company (Christensen, 2000).

5.2.7 *Investing in information technology*

The purpose of this question was to determine at which stage an organisation invests in new technology.

The results of this research revealed that all the organisations would more than likely begin utilising a new technology as soon as it becomes available on the market. Of all the questions asked, none provided such a unanimous answer: when to invest in cloud computing. It was quite apparent in all the discussions with the interviewees that the dilemma the organisation faces is when to invest and embrace in new technologies that could disrupt the organisational operations as well as how to manage uncertainties in terms of developments in information technology. Organisation B, however, pointed out that being a so-called 'non-profit organisation', they have adopted a wait and see approach to determine if they will be able to afford it or not. Organisation D is sometimes considered not to be leading edge. It is preferred to go with the tried and tested solution when other's have started to utilise the technology. Organisation F, on the other hand, takes a different strategy and will first investigate the functionality of the new product to determine if the organisation will gain a competitive advantage by using the product. Organisation J and E indicated that it is highly unlikely for them to be the first to implement a product before it is available on the market. Organisation C also first examines a new technology when it becomes available on the market. Organisation F, G and H try to implement new technologies before their competitors. If a competitor has already implemented the new technology and gained a number of customers, organisation F will investigate if implementing the new technology could be beneficial to the organisation in terms of profitability. Organisation J will not consider using a product as soon as it becomes available on the market.

Organisation C, F and J will investigate a new product, but will not purchase a product solely on the basis that a competitor has bought the product. The product has to be evaluated to estimate its value before purchasing. Organisation B, D and E evaluates the technology in terms of the current value network.

Organisation C and J indicated that it is not the norm to delay the investigation of a new technology and to wait and see the result of technologies implemented by their competitors. Investigation will be initiated to establish if the product or technology could ensure a competitive advantage. Organisation F used the SMS banking facility as an example, where the organisation watched their competitors, to identify problems encountered when interfacing with cell phone providers.

Pilot programmes are used to test new technology in the organisational environment. Organisation C will not always use the pilot technique, while organisations F and I do not follow the “big bang” approach, but prefers using the pilot technique before the technology is rolled-out.

All the organisations have different viewpoints on when to buy disruptive technology and when to wait until it has been proven as best-practice technology. Organisations C, D, E, F and G will usually not wait until a new technology has been proven as best-practice, because their competitors could gain competitive advantage. Organisation F will anticipate the result of a new technology that will be available (e.g. Microsoft Windows), by proposing to test the technology. By testing the technology, Organisation F can be the first to implement the technology and ensure competitive advantage. Organisation J will investigate the new technology and, with sufficient information, a decision will be made whether or not a technology will be implemented. This is in line with Dhar and Sundararajan (2007) who point out that the dilemma the organisation faces is threefold: when to invest in new technologies that could disrupt the organisational operations; when to embrace an endeavour with uncertain results; and how to manage uncertainties in terms of developments in information technology. Organisations face enormous pressure to stay current in terms of innovative technology and simultaneously to maintain their competitive advantage.

5.2.8 Disadvantages of disruptive technologies as experienced in the business environment

The purpose of this research question was to ascertain whether the adoption of cloud computing had a negative influence on both employees and customers.

The results of this research showed a common underlying theme across all the organisations: a direct effect of profitability.

a. Disadvantages of disruptive technologies in terms of customers, clients or employees resisting new technology

To get it right has been costly. Organisations C and J use new technology to attract new customers. Young people are not afraid of new technology and therefore are early adopters of new technology. New technology is seen as a threat by older people, and they usually prefer doing banking in a more traditional manner. However, Organisation C found that new technology provides empowerment to elderly people in rural communities, as they did not have these services previously. Organisation G mentioned that the organisation must establish a trust relationship with their clients. Organisation A specifically highlighted that business units within the organisation are losing more control with the introduction of cloud computing within their environment. Walsh and Kirchhoff (2000) support this statement whereby business could also experience internal problems because of the resistance of the user to use the new technology and change management might be required to change the user's behaviour to incorporate the new technology.

b. Disruptive technology could result in the delay of production and/or influence profitability

All ten organisations emphasised that failure of disruptive technology cannot be tolerated. The change management process or evaluation processes that are in place ensure that disruptive technology will not be allowed to have a negative influence on profitability.

However, organisation A referred to a scenario where disruptive technology caused a delay in agent productivity within their contact center due to certain components of sustaining technology not being able to work together with the newly acquired SaaS. This in turn affected the bottom line profit of the organisation. Organisation E also highlighted that a delay in productivity was experienced due to bandwidth constraints. This is in line with Walsh and Kirchhoff (2000) who state that although disruptive technologies do not focus on profitability, they can provide immediate profitability when used in the relevant environment.

c. ***The negative effect of disruptive technology on change management***

What was common across all the organisations interviewed is that they all use a change management process when implementing new technology to ensure that new technologies or new products will not have a negative effect. It was interesting to note that each organisation follows some or other process when implementing any new type of technology. This is in line with the literature in which Evans (2003) states that disruptive technologies can have an influence on operational procedures of a business and therefore it should be required that the policies and procedures of an organisation are in place to control the impact. When new technology or a new product is implemented, all role players are trained to ensure successful delivery of the system. However, the interviewee of Organisation J indicated that their executive management is reluctant to change because it is often deemed high risk.

d. ***Quantifying the financial investment of disruptive technology***

A common theme from all of the organisations indicated that all technologies to be implemented need to be quantifiable in terms of Rand value to capitalise the product. At the same time, the Return on Investment (ROI) has to indicate the value of the technology, thereby giving an indication if the project will be profitable.

Organisations C and A do not easily invest in disruptive technology, and would rather use external developments of disruptive technology, which will then transfer the relevant data to the organisation. This is mentioned in the literature by Walsh and Kirchhoff (2000) which state that it is hard to quantify the commercialisation of disruptive technologies and therefore difficult to plan for financial investment. Organisation J has derived significant financial advantage from implementing cloud computing in comparison to other companies. Therefore, if a new service or product, properly motivated, indicates financial advantage, the organisation will approve implementing the new technology.

e. ***Exploiting disruptive technology to be profitable***

Most of the organisations provide technological solutions to corporate clients by using cloud computing externally to the organisation. Through these solutions, all of these organisations ensure client retention. Some of the organisations used new technology to reach a designated sector in their specific industry to market products that gave them a competitive advantage. Organisation J will not use new technology to exploit a product to make money from the product. This is in line with the literature whereby Dowd and Walsh (1998) state that it is difficult to commercialise disruptive technologies or to exploit the product for profit, especially when it is difficult to estimate the value of the product or the quality of the product.

5.2.9 The relationship between the value network of the organisation and disruptive technology

The purpose of this question was to determine how the organisation views the relationship between a value network and disruptive technologies like cloud computing.

The concept “value network” as described in the literature was not understood by all the interviewees. Only after the researcher had explained the concept were interviewees able to respond. The result of this research pointed to the fact that organisations interpret value network as value in terms of profitability and advantages to the organisation.

This is in line with Dhar and Sundararajan (2007) who state that value networks have a profound influence on a firm when facing new technologies. Sustaining technologies support the mainstream system architecture to ensure the continuation and growth of a firm.

Organisation F currently runs approximately 160 systems that integrate with in-house as well as external systems. Organisation F does not allow any technology that will negatively influence any of these 160 systems. Organisation F uses Services Orientated Architecture, which ensures that new technologies will interface with all 160 systems.

Within organisations B, E, H and J, different technologies have relationships with each other. If a new technology is under consideration and it is realised that the current system architecture has to change to incorporate the new technology, these organisations may view it favourably. It is the perception of most managers that a new technology has to be able to interact with the mainstream system architecture in order to continuously support the business. However, as Dhar and Sundararajan (2007) point out, that management's recognition of the potential value of disruptive technology and the effectiveness of the technology application will influence the success of the business.

5.2.10 Retaining or Losing customers by providing innovative technology

This question aimed to ascertain whether customers of the organisations have in fact been lost or retained due to the organisation implementing a new technology like cloud computing.

The emerging theme was a positive outcome of retaining and gaining additional customers across all of the organisations. However, organisation A experienced both a loss and retention of customers. Due to the initial outages of the service as provided by the service provider, customers were lost. However, additional functionality like voice recordings offered in the cloud environment has retained certain customers.

Organisation B indicated a good retention of 5%. Organisation F's profile of the business was enhanced. The use (including the benefits) of cloud computing was a selling point for their customers. The reason for this could be that since cloud computing is the new fad in the technological world, customers are proud to be associated with such an organisation. For organisation D it was imperative for them to use the cloud environment. It was highlighted that if they did not react they would have lost clients. A key account was retained due to the implementation of the hosted contact center solution.

Some municipalities are customers of organisation C, which provides a payment kiosk service outside a municipality building. This means that people can pay their utility accounts without worrying about cashier hours. Added advantages include: municipalities do not have to handle cash, fewer cashiers are required, people can pay 24 hours per day 7 days a week, municipalities do not have to transport money and the risk of robbery is reduced. These kiosks are an enormous advantage to the municipalities, and ensured that the municipalities were retained as clients of organisation C.

Organisation F was not only able to retain customers but gained new customers by launching the "Drive-Through-Banking" facility. Bank services have been provided by "Drive-Through-Banking" in areas such as Lesotho and Swaziland. Customers simply drive their vehicles into a secured area and complete banking transactions.

Organisation J used the Speed-Point technology as an example where corporate customers were retained. This organisation was the first company to develop and launch the Speed-Point technology. Customers could not get the technology from any other provider, thus the customers were retained.

All these positive responses from the various organisations in retaining and gaining additional customers by implementing new technology is reinforced and in line with the literature which states that, strategically, it makes sense that management will choose to implement technology that will support the needs of their most influential clients. Clients will be retained and the firm will be sure of income and growth (McGrath and MacMillan, 1995).

Organisation F described a scenario where internet banking caused some customers to seek the services of their competitors. The Internet Banking facility provided by organisation F did not provide sufficient functionality in comparison to their competitors. Based on insufficient functionality, some customers were lost. Organisations J and H argued that disruptive technology cannot be the cause of losing customers. The respective companies ensure that customers have the ability to choose between different services to support their banking requirements. What was interesting to note from most of the respondents was the cause of losing customers is not purely because of disruptive or innovative technology; instead they are of the opinion that the main cause of client loss is bad services or bad management.

5.2.11 Using the S-Curve concept when researching disruptive technology

The question attempted to explore whether the organisations use the S-Curve concept when researching disruptive technology or sustaining technology.

The results of the research revealed that none of the organisations are familiar with the S-Curve concept. However, from the previous answers to questions it may be deduced that the different organisations are aware of the fact that available technologies could be used to the benefit of the company or could be a threat to the company. The different organisations are constantly watching out for new technologies and consider the possible impact they can have on the organisation.

Organisation C described that an Innovation Department has been established to identify new technology that could be used to the benefit of the organisation. Organisation D does not employ this method. They use the standard request for proposal (RFP) and request for information (RFI) practise to find out what is available. Most of the organisations however, did indicate that they follow an approach to establish a close collaboration between the divisional units, i.e. IT, operations, sales, admin etc. when a new technology is introduced inside the organisation.

This is validated in the literature by Cooper and Smith (1992), who state that when a disruptive technology is introduced to an organisation, most established firms will follow an approach to establish a close collaboration between organisational units, rather than total separate units. Highly skilled and experienced resources ensure that the implementation of disruptive technology happens within the administrative sections.

5.2.12 The impact of disruptive technology on business strategy

The purpose of this question was to ascertain whether organisations follow an approach or use a business strategy to handle disruptive technology. IT business units should continuously be aware of emerging technologies, be aware of the requirements and business needs of the different business units within the company, changes in needs of customers, other business partners and the industry.

The results of the research conclusively highlighted that a business strategy for information technology is in place for all ten organisations. These business strategies are intended to support the sustaining technologies and provide a road map for the rest of the organisation. A business strategy for new technologies per se does not exist, but organisation J emphasised that any new technology under consideration has to fit into the architectural framework of the organisation.

The emergent theme arose where all the organisations continually meet with vendors and service providers to be made aware and kept abreast of all new technologies. They also make it a point to meet with functional areas of the business on a regular basis to determine the business strategy and IT strategy. This is in line with the literature whereby Evans (2003) highlights that the evaluation and investigation of disruptive technologies is important to ensure that services are improved and productivity is increased and that revenues are increased. Disruptive technology must support the IT governance and business strategy of the organisation.

5.2.13 *The involvement of executive management in terms of disruptive technology*

The purpose of this question was to understand what level of involvement executives and management of the organisation as well as customers have in selecting a disruptive technology.

From the interviews held with all the organisations, it became evident that executive management supports and encourages the concept of innovation in terms of information technology, as this supports the business and is the enabler for competitive advantage. Both organisations C and F confirmed that customers request new solutions for specific requirements. Corporate businesses can be very demanding in their desire for banking services that are easier, safer and quicker to use.

Organisations A, C and D are very conservative in terms of change and enforce a change management process that should minimise any negative impact when disruptive technology is implemented to maintain their competitive advantage.

Organisation A, B, E, G and J mentioned that executive management does not dictate what technology should be used, but encourages systems that are universally used, e.g. e-mail system.

In certain cases, executive management has, however, requested investigations into new technology for possible implementation, for example Blackberry. However, during the investigation phase it was found that the technology does not provide applicable functionality for the specific purposes required by the organisation. The result was the Blackberry was not implemented in organisation I. Organisation J mentioned that executive management or the different service units within the organisation usually will initiate new ideas. Cooper and Smith (1992) mention that the IT business unit should ensure the involvement and buy-in from the executives of the firm to understand the possible impact of emerging or disruptive technologies on the firm. Executives should understand the importance of early detection of disruptive technology and understand the characteristics of these technologies.

To establish any value for competitive advantage and to identify technologies that could be an opportunity to reduce costs or to improve productivity, management must be involved.

5.2.14 *Evaluation processes for disruptive technology*

The purpose of this question was to explore if the organisations follow a process when evaluating disruptive technology.

The results of this research revealed that a change management process is applicable when the implementation of new technology is considered or upgrading of technology is required. The change management process executed in most of the organisations interviewed is time-consuming as different stakeholders and role-players have to approve the new technology. This process can take up to three years in certain cases. The general process was definitely in line with the process presented in the literature by Veryzer (1998:313) during which the disruptive technology is first explored, the “Dynamic Drifting Phase”. This is followed by the “Convergence Phase”, characterised by a person who acknowledges the potential of the technology, motivates the functionality and persuades the organisation to consider the technology. During the “Formulation Phase”, requirements and expectations of the technology are formulated. Then, the “Preliminary Design Phase” and “Evaluation Preparation Phase” follow. The technology is developed during the “Formative Prototype Phase”, which is followed by the “Testing and Design Modification Phases”. The last phase includes the “Commercialisation Phase” during which the product is made ready for marketing (Veryzer, 1998:316). Some of the organisations use outside entities to develop and implement disruptive technology external to the organisation, for their corporate clients. A case in point is organisation J, whereby their clients use the disruptive technology and send data to the organisation, where the transactions are completed.

Organisation J uses technologies in a different manner or in a different combination to provide an innovative way of doing business. From the interview with organisation F, it is derived that the change management process is required before any new or upgrading of technology can be executed. In contrast to organisations I and F, no formal evaluation process for new technology is applicable in organisation C. The business structure of organisation C allows each business unit to implement its own change management processes. However, all changes or additions to information technology have to be submitted to the architectural board for approval prior to the implementation of the technology.

5.2.15 The impact of disruptive technology when integrating with sustaining technology or used in combination with sustaining technology

The purpose of this question was to explore scenarios during which disruptive technology was integrated with sustaining technology or was used in combination with existing sustaining technology.

The emergent theme across all the organisations was that the smooth integration of disruptive technology with sustaining technology is dependent on thorough investigation. An example of this was provided by organisation C when describing the payment solution for the KZN Department of Health. Organisation F indicated that if the new technology is not compatible with the sustaining technology, the new technology will not be implemented. The company is still in the process of integrating with other web-based applications into the hosted contact center service. Organisation J used the Internet Banking project as an example where an implementation between disruptive technology and sustaining technology was successfully executed. Internet Banking is an example where the front end was on a Microsoft web platform that integrated with the organisation's old IBM mainframe back end. The way the integration was done was disruptive and a breakthrough for integration between mainframe and Microsoft web platform was achieved.

This is in line with the findings of Tsui (2001), who state that innovative technologies could be able to integrate with in-use technologies, but it could also be too innovative to integrate with current technologies. From the business perspective it is becoming vital that innovative technologies provide enough detail and information regarding the potential the technology holds for the organisation in terms of increased productivity, performance delivery and adding value to the business and business society (Dhar and Sundararajan, 2007).

Although the question posed was susceptible to respondent bias and was subjective in nature (as each respondent had their own opinion of what was deemed successful), respondents did provide anecdotal evidence as to why they believed their efforts were successful, quoting increases in sales, feedback from customers, invitations to speak at public events, reputation in the marketplace and interviews with the media as common examples of effectiveness.

5.3 Conclusion

The exploratory investigation into the perceptions of cloud computing as a disruptive technology aimed to identify how organisations have incorporated cloud computing or some other disruptive technology into their organisation; and indicated the impact of such efforts. Additionally, the research aimed to identify the challenges faced by these organisations in making use of disruptive technologies such as cloud computing. The main objective for this research was therefore to understand the perceptions of the use of cloud computing as a disruptive technology in industry.

The results showed that cloud computing had been used effectively by a number of organisations in the marketplace and who had overcome their 'liability of newness'. It was found that most organisations follow a change management process that is pre-defined before any new technology is evaluated or eventually implemented.

The involvement of executives in most cases is in the form of support and encouragement. Executives should understand the importance of early detection of disruptive technologies and understand the characteristics thereof. The results of the research also highlighted that the core business of the organisation is dependent on information technology. Most businesses are driven by IT.

Another key theme which arose from the discussions is that the only way for an organisation to remain competitive is to constantly innovate and implement new technology. IT is perceived as the only way of retaining a competitive advantage, even though this raised numerous advantages and threats amongst the interviewees.

New technology needs to be thoroughly evaluated and investigated as this new implementation will either contribute positively or negatively as was highlighted during the discussion. There is no tolerance for failed implementations by any organisation as this impacts profits. Any new technology implemented needs to show a quantifiable return on investment. Finally, what was very evident is that IT business units need to be continuously aware of emerging technologies, hence a business strategy for IT was in place with all the organisations.

The research as documented in this chapter is based on a qualitative research methodology. The approach to the execution of the research was discussed in Chapter 3. An interview guide was used during the interviews for all the ten predefined organisations. This guide helped collect information on the current state of the perceptions of cloud computing as a disruptive technology within the ICT environment in South African organisations. The analysis and interpretation of the interviews was presented and will be used to deduce conclusions and provide recommendations in the final chapter.

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This chapter summarises the findings of the research with reference to its achievement of the original aim, and assesses if the research objectives have been met. The perception of cloud computing as a disruptive technology in designated organisations within the information technology industry in South Africa. The conclusions will be applicable to identified problems and research questions will be answered from information gathered during the interviews. The conclusions will be used to provide recommendations that can be followed by future and further studies.

6.2 Conclusions of the study

The main aim of this research was to establish the impact disruptive technologies has on organisations in South Africa. Answers to stated problems were derived from the information gathered during the interviews with the organisations that contributed to the research.

6.2.1 The awareness of disruptive technology in the business sector and how disruptive technology or innovative technology is handled

Only two organisations interviewed were unaware of the concept disruptive technology. All were aware of cloud computing, even though different terminologies were used by some of the organisations. However, all organisations are aware of new technology or innovative technology that can be utilised to give the company a competitive advantage. Organisations constantly seek ways to improve services to customers (internal users of the information infrastructure as well as external clients), to retain customers, or attract new customers or to be profitable.

Organisations accept that change in terms of information technology is inevitable and are aware that this ensures growth and productivity. Therefore, organisations perceive change in terms of information technology as positive. Organisations will invest in new technology as soon as the product can be utilised to keep a competitive advantage. However, all new technology, under consideration for implementation, requires approval after the change management process has been executed.

6.2.2 *Business value of disruptive technology*

All the organisations acknowledged that information technology provides enormous value to the business as IT supports the core business. Information technology has become one of the most important functions within the organisation.

Disruptive technology is perceived as an advantage, because if implemented successfully and used before competitors, the organisation will have a competitive advantage.

6.2.3 *Impact of disruptive technology on sustaining technologies*

When an organisation considers implementing new technology, a motivation of the proposed technology has to be presented as a business case. The value of the technology is evaluated taking into consideration sustaining technology, the value network and profitability of the technology. If the new technology does not provide a strong business case, the sustaining technology will not be replaced. Sustaining technology is purposefully kept to minimise risk factors. If it is evident that the sustaining technology will be efficient for a period in the future, sustaining technology will be kept. However, if a business case proves that a new technology will be beneficial to the business, the sustaining technology will be replaced. Sustaining technology is not always replaced by disruptive technology. Each organisation provided examples of information technology solutions where disruptive technology has been successfully combined with sustaining technology.

Organisation F has reached the conclusion that the change management process can delay the required rapid development and implementation of information technology solutions. Organisation F, therefore, uses an alternative method to implement disruptive technology without undue waiting periods for approval. To stay ahead of competitors in terms of information technology development, organisation F tasks outside service providers to develop disruptive information technology solutions to maintain a competitive advantage. Organisation F then updates their systems using the data received from the external information technology solutions. This method of working allows organisation F to use disruptive technology without impacting sustaining technology of the company.

6.2.4 Impact of disruptive technology on current hardware and software architecture

A business case motivating the implementation of new technology has to be submitted to an approval body in the organisation.

The approval body consists of different role-players from the business functions side as well as the information technology section side of the business.

All role-players evaluate the functionality of the new technology and verify if the new technology will fit into the value network. The outcome of the approval body will provide a decision on the implementation of the new technology. However, if the business case indicates that the new technology will be more beneficial to the company and advantages outweigh other considerations, then the current hardware and software will be changed.

6.2.5 Impact of disruptive technology on organisational business processes and procedures

The organisational business processes and procedures are defined by the different business functions of the organisation. During the approval phase of a new technology, changes that impact the business processes under consideration will be made.

During the change management process, the revised or new business processes and procedures are implemented. The change management process includes the testing of the system, the advertising of the system, and the training on the system.

6.2.6 *Impact of disruptive technology on the business strategy*

Research indicated that information technology is very important to the organisations, as IT supports the core business of the organisation. The business strategy of the organisation relies on the information technology department's strategy. In instances where disruptive technology is implemented, the business strategy is changed to incorporate the adapted IT strategy.

Executive management has realised the importance of disruptive technology in maintaining a competitive advantage, and therefore urges the information technology department and other employees to propose new solutions that can be utilised to the benefit of the company.

One interviewee mentioned that the organisations' top management is reluctant to change and perceives change as a risk.

Information technology solutions are developed externally to the organisation to satisfy the requirements of the clients. In this instance, disruptive information technologies are applied in a manner that does not hold a threat to the organisation, but are developed and implemented to the benefit of the organisation. In conclusion, it can be stated that the hypothesis proposed is true in the sense that organisations are aware of the business value of new, innovative or disruptive technology and that organisations can attain and maintain their competitive advantage if the technology is utilised sufficiently.

6.3 Recommendations

Businesses are aware of the value of information technology, but should be made more aware of disruptive technology, particularly, as to how it can be utilised to the advantage of the organisation (Patki, 2006). In most of the organisations interviewed, the services provided by one organisation are more or less the same as the services provided by the next organisation. The organisation that strives to differentiate itself from competitors uses the capabilities of technology to keep a competitive advantage, as described by most of the organisations.

Conceptualising and visualising the potential of disruptive technology can improve enhancement in services and products. Creativity in terms of information technology or the combination of different technologies ensures growth and development of the organisation.

Although disruptive technology claims to have advantageous characteristics, such as ease of use, shorter development time, etc, it is important that organisations evaluate the specific disruptive technology to ensure return on investment (Dhar and Sundararajan, 2007).

Disruptive technology proposes better functionality than sustaining technology and provides functionality that cannot be provided by sustaining technology (Nault and Vandenbosch, 2000).

Emerging technology must be evaluated to determine if the technology is ready for production, how the technology will fit into the value network and how the new technology will be applied to establish a level of confidence within the firm as well as among customers and partners (Evans, 2003).

Indeed, the research showed that disruptive technology must be tested before it is implemented in an organisation. Even if executive management demands rapid implementation of a new technology, the process of controlled change management will ensure that the technology is tested and validated before it is implemented.

Information technology is an enabler for businesses to be competitive but companies should be prepared to reinvent themselves and be able to use disruptive technology; this is the key to survival (Patki, 2006).

Companies should provide an environment in which employees can propose and explore new ideas and new technologies. Organisation C stated that it is the “mavericks” and the “creative thinkers” in the organisation who explore the usability of new technology and provide information technology solutions that will ultimately be beneficial to the organisation. Executive management should value these individuals as their input allows the organisation to maintain its competitive advantage.

Evans (2003) differentiates between two types of organisations, those that are mainstream businesses that prefer using sustaining technology, and those he considers to be early adopters, that are smart movers who do not hesitate to implement disruptive technology in order to keep a competitive advantage.

However, the organisation that can utilise disruptive technology within the right business units, with the right opportunities at the right time, will have a competitive advantage and will be successful. Evans’s argument was supported by individual interviewees from the ten participant organisations.

Organisations J, C, D, G and H mentioned that the different business units are responsible for their own research and development in terms of innovative information technology. Organisation B, F and J pointed out that the organisation will not always implement disruptive technology for the sake of being innovative. The process of change management has to be followed before a new technology will be implemented and replace sustaining technology.

Management is regularly confronted with the issues and problems associated with technology and accommodating innovations. Technology has become a high priority resource in any firm, and requires good management in order to provide a firm with a competitive advantage. Therefore, the management of technology has to be part of a firm’s strategic planning.

The research results showed that the business strategy of the information technology department within an organisation becomes a lodestar for the business strategy of the organisation. The nature of technology is constant change, which enables the firm to keep a competitive advantage. Therefore, the management of a firm has to determine how new technologies and innovations will lever or improve capabilities to support the drive for a competitive advantage.

6.4 Suggestions for further research

The research conducted was aimed at a number of organisations in South Africa from small to medium-sized enterprises to large corporations. The same research can also be applied to organisations in other countries as conducted in the South African context. Disruptive technology is subject to changes, challenges, uncertainties and constraints. The development process of disruptive technology should be studied in conjunction with risk management or strategic management to enable management to make more informed decisions when deploying new technology.

REFERENCES

Anderson, R. (2007) *Thematic Content Analysis: Descriptive Presentation of Qualitative Data*, last accessed 11 October, 2010, from

<http://www.wellknowingconsulting.org/publications/pdfs/ThematicContentAnalysis.pdf>

Braun, V. and Clarke, V. (2006) Using thematic analysis in psychology, *Journal of Qualitative Research in Psychology*, 3, pp. 77-101.

Christensen, C. M. (2000) *The innovator's dilemma*, HarperCollins Publishers, New York.

Christensen, C. M. and Bower, J. L. (1995) Disruptive technologies: catching the wave, *Harvard Business Review*, January / February 1995, pp. 43-53.

Christensen, C. M. and Overdorf, M. (2000) Meeting the challenge of disruptive change, *Harvard Business Review*, March / April 2000, pp. 66-76.

Clark, P. (2003) *Organizational innovations*, SAGE Publications, London.

Clarke, R. (2009) *Computing Clouds on the Horizon? Benefits and Risks from the User's Perspective*, last accessed 28 July, 2010, from

<http://www.rogerclarke.com/II/CCI-0911.html>

Cloud Security Alliance. (2009) *Security guidance for critical areas of focus in cloud computing*, last accessed 06 July, 2010, from

<http://www.cloudsecurityalliance.org/guidance/csaguide.pdf>

Cooper, A.C. and Smith, C.G. (1992) How established firms respond to threatening technologies, *The Academy of Management Executive*, 6 (2), pp. 55-70.

Cornford, T. and Smithson, S. (2003) *Project research in information systems – A student's guide*, MacMillan, London.

Creswell, J. W. (1994) *Research Design: Qualitative, Quantitative and Mixed Methods Approaches*, Thousand Oaks, SAGE Publications, London.

Creswell, J. W. (1998) *Research Design: Qualitative, Quantitative and Mixed Methods Approaches*, Thousand Oaks, SAGE Publications, London.

Creswell, J. W. (2003) *Research Design: Qualitative, Quantitative and Mixed Methods Approaches*, 2nd Edition., SAGE Publications, London.

Daneels, E. (2004) Disruptive technology reconsidered: A critique and research agenda, *Journal of Product Innovation Management*, 21(4), pp. 246-258.

Dhar, V. and Sundararajan, A. (2007) Information technologies in business: a blueprint for education and research, *Information Systems Research*, 18 (2), June, pp.125-141.

Dickson, G. and De Sanctis, G. (2001) *Information technology and the future enterprise: New models for managers*, Prentice Hall Inc., New Jersey.

Dillon, W.R., Madden, T.J. and Firtle, N.H. (1993) *Essentials of Marketing Research*, McGraw-Hill Inc., Boston.

Dowd, M.K. and Walsh, S.T. (1998) Pioneering New Technologies. Management Issues and Challenges in the Third Millenium, *Proceedings of IEMC '98: International Conference on Engineering and Technology Management*, San Juan, Puerto Rico, USA, October 11-13, pp. 442-446.

Evans, N.D. (2003) *Business Innovation and disruptive technology*, Prentice Hall, New York.

Fossey, E., Harvey, C., McDermott, F. and Davidson, L. (2002) Understanding and evaluating qualitative research, *Journal of Psychiatry*, 36, pp. 717-732.

Hartig, K. (2008) *What is cloud computing?*, last accessed 29 July, 2010, from <http://cloudcomputing.syscon.com/node/579826>.

Hosch, W.L. (2009) *Google Inc'*, Encyclopedia Britannica Online, last accessed 29 July, 2010, from <http://search.eb.com/eb/article-9471099>.

Jones, S. and Smith, R. (2005) Disruptive Technology: recognizing and coping with the inevitable, *Metalworking Production Annual Review*, 149 (2004/5), pp.19-20.

Kaplan, S.M. (1999) Discontinuous Innovation and the growth paradox, *Strategy and Leadership*, 27 (2), pp.16-21.

Kassicieh, S.K., Kirchhoff, B.A., Walsh, S.T. and McWhorter, P.J. (2002a) The role of small firms in the transfer of disruptive technologies, *Technovation*, Nov, 22 (2), pp.667-674.

Kassicieh, S. K., Walsh, S.T., Romig, A., Cummings, J., McWhorter, P. and Williams, D. (2001) A Model for Technology Assessment and Commercialization for Innovative Disruptive Technologies, *Portland International Conference Management of Engineering and Technology*, PICMET '01. Jul 29 – Aug 2, 1, pp. 340-344.

Kassicieh, S. K., Walsh, S.T., Romig, A., Cummings, J., McWhorter, P. and Williams, D. (2002b) Factors Differentiating the Commercialisation of Disruptive and Sustaining Technologies, *IEEE Transactions on engineering management*, Nov 2002, 49 (4), pp. 375-387.

Kulkarni, R. (2006) Disruptive Technology, *Computing and Control Engineering Journal*, 17 (1), Feb.-Mar., pp. 32-35.

Lasry, E. and Callahan, J.R. (2004) Customer-led or successful? The implications of end-user involvement in the development of really new products, *Technology and Innovation Management*, Conference Paper, pp. 1-33.

Leedy, P.D. and Ormrod, J.E. (2001) *Practical Research: Planning and Design*, 7th Edition., Merrill Prentice Hall, New Jersey.

Marshall, C. and Rossman, G.B. (2006) *Designing qualitative research*. 4th Edition, Sage Publications Ltd., London.

Mason, J. (2002) *Qualitative Researching*. 2nd Edition., SAGE Publications, London

McGinn, J. (2001) *Disruption is good, ignoring it is bad*, last accessed 24 September, 2010, *CIO Magazine*, from

http://www.cio.com.au/article/46257/disruption_good_ignoring_it_bad/.

McGrath, Rita, G. and MacMillan, Ian. (1995) Discovery-Driven Planning, *Harvard Business Review*, July – August, pp. 44-54.

Mell, P. and Grance, T. (2009) *The NIST definition of cloud computing*, last accessed 29 July, 2010, from

<http://csrc.nist.gov/groups/SNS/cloud-computing/cloud-def-v15.doc>.

Mizoras, A. and Goepfert, J. (2003) *AppSourcing Taxonomy and Research Guide*, in *IDC-Industry Developments and Models*, IDC, Editor.

Moore, G. (2000) *Living on the Fault Line*, Harper Business, New York.

Nault, B.R., Vandenbosch, M.B. (2000) Research Report: Disruptive Technologies – Explained Entry into next generation Technology Information Markets, *Information Systems Research*, Sep, 11 (3), pp.304-319.

Olivier, M.S. (2004) *Information Technology Research, A practical guide for Computer Science and Informatics*, 2nd Edition., Van Schaik Publishers, Pretoria.

Patki, A.A. (2006) Managing Disruptive Technologies [innovative technology], *Engineering Management*, Jun, 16 (3), pp.18-19.

Rayport, J.F. and Jaworski, B.J. (2004) *Introduction to e-commerce*. 2nd Edition., McGraw-Hill, New York.

Rice, P.L. and Ezzy, D. (1999) *Qualitative research methods, a health focus*, Oxford University Press, Melbourne.

Sevastopulo, D. and Taylor, P. (2004) 'A disruptive technology: how the rise of Internet telephony is shaking up Americas communications giants', *Financial Times*, 13 Apr., pp.15.

Stallings, W. (2005) *Business Data Communications*, 5th Edition., Prentice Hall, Upper Saddle River, Pearson.

Tsui, E. (2001) Technologies for Personal and Peer-to-peer (P2P) Knowledge Management. *CSC Leading Edge Forum (LEF) Technology Grant report*.

Vedpuriswar, A.V., Chowdhary, N. and Ghori, A.S.K. (1999) Managing technological innovations, *Harvard Business Review*, Sep/Oct 1999, pp.110 – 122.

Veryzer, R.W. (1998) Discontinuous innovation and the new product development process, *Journal of Product Innovation Management*, 15 (1), pp. 304-321.

Walker, R. (1985) *Applied Qualitative Research*, Gower Publishing Company, London.

Walsh, S. and Kirchhoff, B. (2000) Differentiating market strategies for disruptive technologies, *IEEE Transactions on engineering management*, Nov 2000, 49 (4).

Welman, J.C. and Kruger, S.J. (2001) *Research methodology*, 2nd Edition., Oxford University Press, Oxford.

Yin, Robert, K. (1994) *Case study research: design and methods*, 2nd Edition, Sage Publications, Thousand Oaks, California.

Zhang, Y. (2006) *Content Analysis*, last accessed 09 October,2010, from
http://www.ils.unc.edu/~yanz/Content_analysis.pdf.

Zikmund, W.G. (2003) *Business Research Methods*, 7th Edition., South-Western, USA.

APPENDIX A

Appendix A: Interview Guide

A.1 Interview guide used during interviews with organisations

A.1.1 Purpose of the Research

The purpose of this research is to gather information relevant to the research topic and applicable to South African businesses. Interpretation of the research and information gathered will be documented as research results. The research is conducted to complete the Master of Business Administration degree at the University of Witwatersrand, Faculty of Commerce, Law and Management.

A.1.2 Subject of Research

Perceptions of cloud computing as a disruptive technology in South Africa.

A.1.3 Content of Interview Guide

The following questions were presented to the interviewees during the execution of the research:

Number of Question	Description of Question	Notes and answers to questions
1.	Is your organisation aware of cloud computing and disruptive technologies or are other terms used for the same concept?	
2.	What is the business value of information technology within the company?	
3.	What is the relation between profitability or competitive advantage and information	

	technology?	
4.	How does the company perceive cloud computing (advantage or threat)?	
5.	How easy is it that the company will start using cloud computing, realising that sustaining technology may be replaced?	
6.	Describe when the company has implemented disruptive technology with positive/negative results and what were these positive/negative results?	
7.	At which stage does the organisation invest in new technology when it becomes available? • As soon as the product or service can be utilised (before it's available on the market) • As soon as the product or service is available in the market • If other competitive companies buy or use the product or service, this organisation will also purchase the product • Delay investing in (purchasing or using) the product or service • Wait to see the result of trials done by other companies before purchasing the product • Arrange a pilot project to test new technology in an organisational	

	environment • Never buy disruptive technology, must be proven as best-practice technology	
8.	Describe the disadvantages of disruptive technologies as experienced in the business environment. The following may be used as guidelines: • Customers or clients or employees resist the new technology • The implementation of disruptive technology could result in the delay of production and/or influence profitability • Negative effect on change management • Quantifying the financial investment of disruptive technology • Motivate the value of disruptive technology to exploit the product for profit	
9.	How does the company see the relationship between a value network and disruptive technologies?	
10.	Has it happened that customers have been retained or lost because of implementing new innovative technology like cloud computing (hosted SaaS)?	
11.	Does your company use the S-Curve concept when researching disruptive technology or sustaining technology?	

12.	Does the company follow an approach or use a business strategy to handle disruptive technology? (IT business unit should continuously be aware of emerging technologies, be aware of the requirements and business needs of the different business units within the company, changes in needs of customers, other business partners and the industry.)	
13.	What is the involvement of executives and management as well as customers in selecting a disruptive technology?	
14.	Does the company follow a process when evaluating disruptive technology? The following can be used as examples: • Maturity level of the technology in the market • Unreliable vendor products • Outcome of implementation is too uncertain • Usability of technology in company	
15.	Describe a scenario during which disruptive technology was integrated with sustaining technology or implemented to be used in combination with sustaining technology?	