



**The impact of mobile technologies on the business models of Small and
Medium Enterprises in Pietermaritzburg**

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A research project submitted to the Gordon Institute of Business Science, University of Pretoria, in partial fulfilment of the requirements for the degree of Master of Business Administration.

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ABSTRACT

The use of mobile technologies has permeated the business arena rapidly over the last decade. Research has been conducted to understand the nature of these mobile technologies and their adoption into business. With the ever growing importance of Small and Medium Enterprises (SMEs) in countries such as South Africa, there is need to better understand the impact of mobile technologies on SMEs.

The objective of this study is to assess the impact of mobile technologies on the business models of SMEs. A theoretical definition of a business model is used to understand the impact of mobile technologies on the customer value proposition, the profit formula, key resources and the value chain of SMEs. The study takes into account some of the challenges that SMEs face, namely limited resources, low levels of productivity and small management teams.

SMEs registered with the Pietermaritzburg Chamber of Business (PCB) are used as a sample to assess the impact of mobile technologies. The results show that mobile technologies have a significant impact on the profit formula and certain aspects of key resources. Specifically, mobile technologies are used to firstly cut costs and then to enhance the utilisation of assets, improve knowledge management while ensuring adequate governance structures. The outcome of this study can be used by SMEs to plan for the adoption of mobile technologies and measure their impact on the business. Mobile technology companies can consider the development of mobile technologies tailored for the SME environment.

Keywords: Mobile technologies, Business models, Small and medium enterprises

DECLARATION

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

Baxolile Mabinya

__9 November 2011__

Date

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1. INTRODUCTION TO STUDY

1.1 Introduction

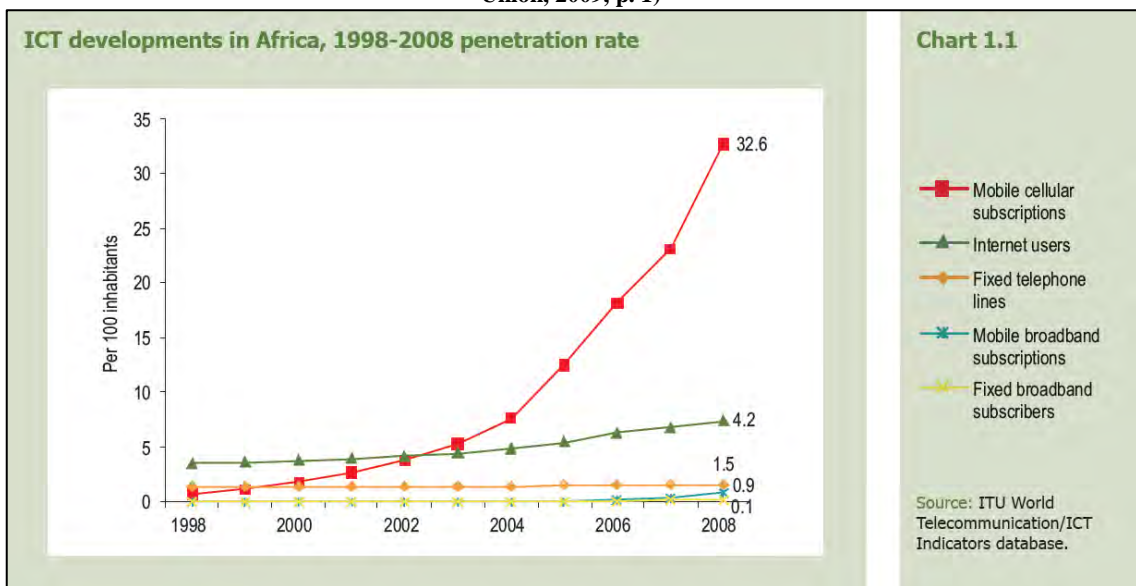
Mobile technologies have become more important for business people in recent times (Fern, 2009, p. 30). The application of these technologies has extended to SMEs around the world (Armstrong & Bennett, 2005; Taylor & Murphy, 2004). The sustained success of SMEs globally is very important in order to create employment, deal with poverty and achieve higher levels of economic growth (Department of Trade and Industry, 2008, p. xxiv). The use of Information and Communication Technologies (ICTs) in SMEs has yielded positive results in as far as communication and productivity is concerned (Liang, Huang, & Yeh, 2007, p. 1155). As mobile technologies become more pervasive, their impact on SMEs needs to be understood beyond productivity and effective communication gains.

1.2 Impact of Mobile Technology

In Africa there are more people who own a mobile device than those with bank accounts (International Telecommunication Union, 2009, p. 18). The lack of traditional telecommunications infrastructure within emerging economies such as the African continent, has led to a significant appetite for the adoption of mobile technologies (International Telecommunication Union, 2009, p. 1). South Africa had more people accessing the Internet through their mobile devices between 2009 and 2011, than personal computers (Kelly & Cook, 2011, p. 27). Not only are these mobile technologies facilitating a mobile workforce, they have also become a source of dependency for many small business owners (Fern, 2009, p. 30).

As depicted in Figure 1.1, mobile technologies have been adopted in emerging markets on a significant level, and particularly in many parts of the African continent (Aleke, Ojiako, & Wainwright, 2011; Mallat & Tuunainen, 2008; Pedersen, 2005; Sarker & Wells, 2003). As household spending on mobile devices increases in developing nations, the overall impact on society will become even more prominent (Lambeek, 2009, p. 26).

Figure 1.1: ICT developments in Africa, 1998-2008 penetration rates (International Telecommunication Union, 2009, p. 1)



Mobile technologies have already been adopted in business (Aguilera, 2008; Chang, Chen, & Zhou, 2009; Gunasekaran, McGaughey, Ngai, & Rai, 2009; Liang *et al.*, 2007). These technologies can impact the business by facilitating better communication that improves productivity and enhances business processes (Liang *et al.*, 2007, p. 1155). Mobile technologies are used in agriculture, healthcare, financial services and are a vital component of many micro-enterprises in the developing nations (Lambeek, 2009, p. 27).

1.3 The existence of firms

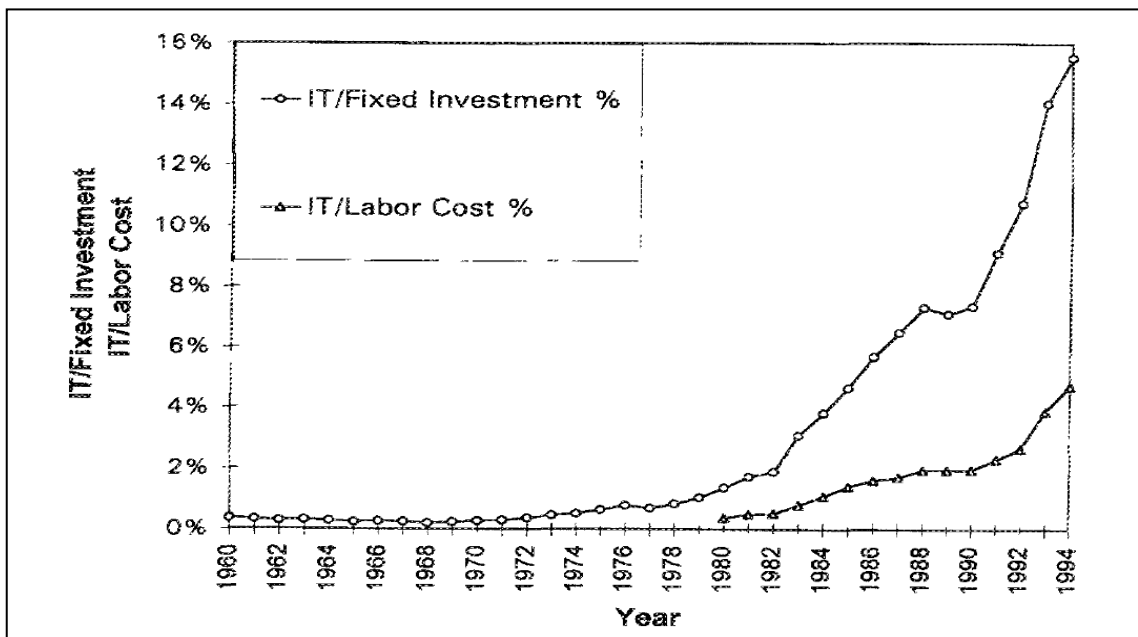
The theory of the firm as a concept traces as far back as the 1930's. Coase (1937) interprets the existence of firms in relation to the minimisation of transaction costs. In his analysis, he makes the point that coordination among resources within a firm reduces the cost of conducting the same transactions in a market system where demand and supply are the dominant mechanism of transacting. The structure of resources as factors of production has informed the evolution of the theory of the firm.

For a long time, recognised factors of production were capital, labour and machinery. The peak of industrialisation and mass production created the platform for the advancement of this view of the firm. In the 1970s, people and human skills became a source of competitive advantage as the consumer needs for products and services became more complex. Human capital became another key factor of production and the behaviour of people within firms was regarded as an important contributor to sustained competitive advantage (Augier & Teece, 2008, p. 1192). More recent theories of the firm recognise the impact of entrepreneurship, in itself a form of human capital, and social capital as essential factors of production. Some academics argue that firms cannot exist in the first place without the entrepreneur as the process of entrepreneurship provides the necessary conditions for the establishment of the firm (Rathe & Witt, 2001, p. 345).

Although technology has been applied within firms for a very long time, information technology (IT) has previously been thought of as an enabler of other factors of production such as labour and capital machinery. All of this has changed as IT components have become cheaper, more accessible and more reliable over the years.

Dewan & Min, (1997) assert that IT has been displacing other factors of production by introducing significant efficiencies to business operations. This view is confirmed in Figure 1.2 where the ratio of IT investment to fixed assets and labour has experienced major growth between 1980 and 1994. This trend is continuing as businesses understand the impact of technology to go beyond cost containments and efficient operations into communications with customers and other stakeholders through services such as mobile advertising (Dutta & Mia, 2011, p. vii). Other intangible benefits such as quicker responses to clients, deeper knowledge of customers, superior product quality and knowledge management are now possible through the use of technology (Sheng, Nah, & Siau, 2005, p. 272).

Figure 1.2: IT investment as a percentage of the aggregate annual fixed investment and labour costs (Dewan & Min, 1997, p. 1661)



1.4 Importance of Small and Medium Enterprises

After the 1970's there was more emphasis placed on small businesses as a source of sustainable economic growth. The shift was driven by changing market conditions,

advancements in technology, increase in labour supply, changing consumer tastes and deregulation (Thurik & Sander, 2004, p. 145). All these changes sparked the shift away from mass production towards flexible specialisation. These changes also meant that there was an increase and a focus on small businesses at both a macro and micro economic point of view. Today, small businesses are the major source of employment, economic development and innovation (Department of Trade and Industry, 2005, p. 42).

Small and medium enterprises are defined, by the Department of Trade and Industry in South Africa, by the firm's number of employees, annual turnover and total gross asset value (National Small Business Act, 1996, p. 15). SMEs are an important part of the economy in as far as employment and poverty alleviation are concerned (Department of Trade and Industry, 2008, p. xxiv). This focus on SMEs is likely to continue in South Africa as the need to create employment and sustainable economic growth intensifies (Gordhan, 2011, p. 17).

Approximately 97.5% of all businesses in South Africa are small, medium or micro enterprises with a 35% contribution to the country's Gross Domestic Product (GDP) (Nieman & Nieuwenhuizen, 2009, p. 3). The majority of these businesses are micro enterprises whose creation is predominantly survival in nature (Department of Trade and Industry, 2008, p. 43).

1.5 Understanding business models

A business model is defined as a way for a firm to create and deliver value through a value proposition, profit formula, key resources and key processes (Johnson,

Christensen, & Kagermann, 2008, p. 52). Organisations make use of business models to create value for a chosen market and to compete in that chosen market.

Mobile technologies have had a significant impact on business models. The Internet, characteristics and constraints of mobile devices and different circumstances under which people use their mobile devices are some of the key considerations that impact the business models of organisations (Tsalgatidou & Pitoura, 2001, p. 225). Context awareness particularly has played a significant role in the development of mobile marketing business models in recent times (Dhar & Varshney, 2011, p. 126).

1.6 Research scope

The purpose of this section is to define the boundaries in which this research will focus. SMEs and mobile technologies are key components that need specific definition in order to make this research practical.

1.6.1 SMEs

Micro enterprises are not included in this research study due to the difficulty of obtaining the relevant information required to complete the study. By definition they are informal sector businesses which fall outside the scope of this research. Due to practical research reasons, the study is limited to Pietermaritzburg SMEs. With hundreds of SMEs registered with the PCB, there is a significant population on which to base the study.

1.6.2 Mobile technologies

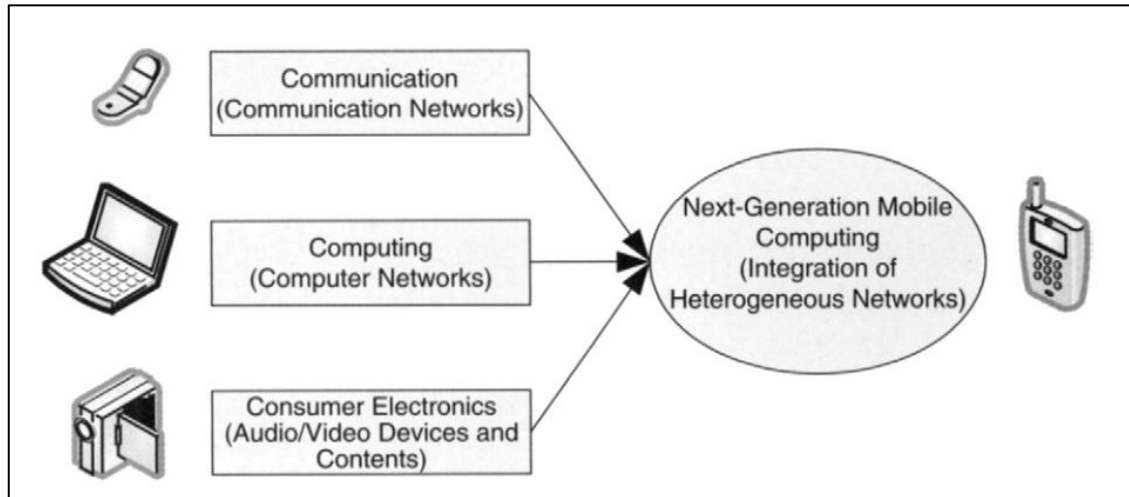
Mobile technologies encompass a wide range of portable devices as well as services that are facilitated by an application on the device. The pager, radio based car phones, mobile phone, Personal Digital Assistant (PDA), laptops, smart phones and iPads, are all examples of mobile devices used as mobile technologies for business. The mobile phone and PDAs have been in use for many years already, with devices such as iPads only entering the market recently. Most of these abovementioned devices are capable of running a range of mobile services such as Internet access and other commercial services such as mobile banking.

Mobile technology is concerned with computing that is specifically suited for a handheld device (Hart & Hannan, 2004, p. 201). Wireless technology is the transmission of data between computing devices using a wireless standard such as Wireless Fidelity (WiFi), Bluetooth and General Packet Radio Service (GPRS) (Hart & Hannan, 2004, p. 202). Whereas mobile communications standards such as 3G and Edge were born in the mobile service provider industry, wireless transmission technologies have a data communications industry background which was borne out of the computer industry (Lehra & McKnight, 2003, p. 359). This study will focus only on mobile technologies where the mobile device is the primary tool. Wireless technologies may be part of the transmission technologies used by mobile devices but this research will not differentiate between the various transmission standards. Most mobile phones and PDAs today are manufactured with 3G and GPRS capability (Atkins, Ali, & Shah, 2006, p. 2).

Mobile phones were traditionally used for voice communication. More recently, mobile phones and PDAs are predominantly used for other forms of communication such as Short Message Service (SMS), email, social media and Internet based communication. Applications are a significant selling point for mobile phones with vendors boasting the best features and applications on their devices. It is obvious that people within SMEs use their mobile devices to partly make voice calls. These calls could be to suppliers or customers and could have some impact on their business model. The impact, however, is not unique to mobile technology and hence this element falls outside the scope of this study.

The focus of this study will be on mobile phones, PDAs and smartphones due to prior research conducted on these devices. There is little research done on the more recent devices and there is currently little to no evidence to prove that these new devices are used in SMEs. No limitation is imposed on the types of applications and transactions that run on the mobile device. Such a limitation can only be imposed in the presence of very specific assumptions about the use of mobile technologies in business. Figure 1.3 illustrates that the same mobile device can be used as a communications device, a computing device or an electronics device. All these uses could have a significant impact on some aspect of a SME business model. For the purposes of this study, it is practical to limit the scope to specific mobile devices while broadly defining the various uses of the device.

Figure 1.3: Digital convergence (Zheng & Ni, 2006, p. 7)



This study is concerned with SMEs that use mobile technology for business purposes. Adoption models and the readiness of the sampled SMEs to adopt mobile technology are outside of the scope of this research. Although adoption models could be used to partially explain some of the results of the study, the scope of adoption models is too broad to consider for this study.

1.7 Research objectives

The objectives of this study are as follows:

- To gain insight into the impact of using mobile technologies on SME business models in Pietermaritzburg;
- To understand how SMEs profitably create and deliver value to customers using mobile technology.

1.7.1 Impact on SME business model

Research has already been conducted on the adoption of mobile technologies in SMEs (Liang *et al.*, 2007, p. 1154). This research focused on how mobile technologies can be

made to fit within a specific context. While other research acknowledges the impact of mobile technology on productivity and enhanced communication with customers and suppliers (Dutta & Mia, 2011, p. vii), none of these studies have aimed at understanding the impact on the entire business model of SMEs. There is no clear evidence to reveal the impact of mobile technologies on small enterprises. This is due to the fact that productivity gains and other benefits from mobile technologies are difficult to measure. The lines between business and personal activity often become blurred (Donner, 2008, p. 146). This study aims to provide insight into the nature of the impact on all aspects of the SME business model.

1.7.2 Using mobile technologies to profitably create and deliver value

It is the intention that the outcome of this study be useful to SMEs through insight on how mobile technologies can impact the business model. This is not to suggest that the outcome of this study will be a blueprint for implementation but rather knowledge that can be applied when making decisions regarding the use of mobile technologies. The use of the mobile device as a service platform has certainly presented more opportunities for firms to develop appropriate customer value propositions by leveraging characteristics such as mobility and reachability of users. Moreover, mobile devices are currently used to deliver value to customers through efficient value chains and delivery mechanisms. This study seeks to provide the insight into how the opportunities to create and deliver value through mobile devices can be identified.

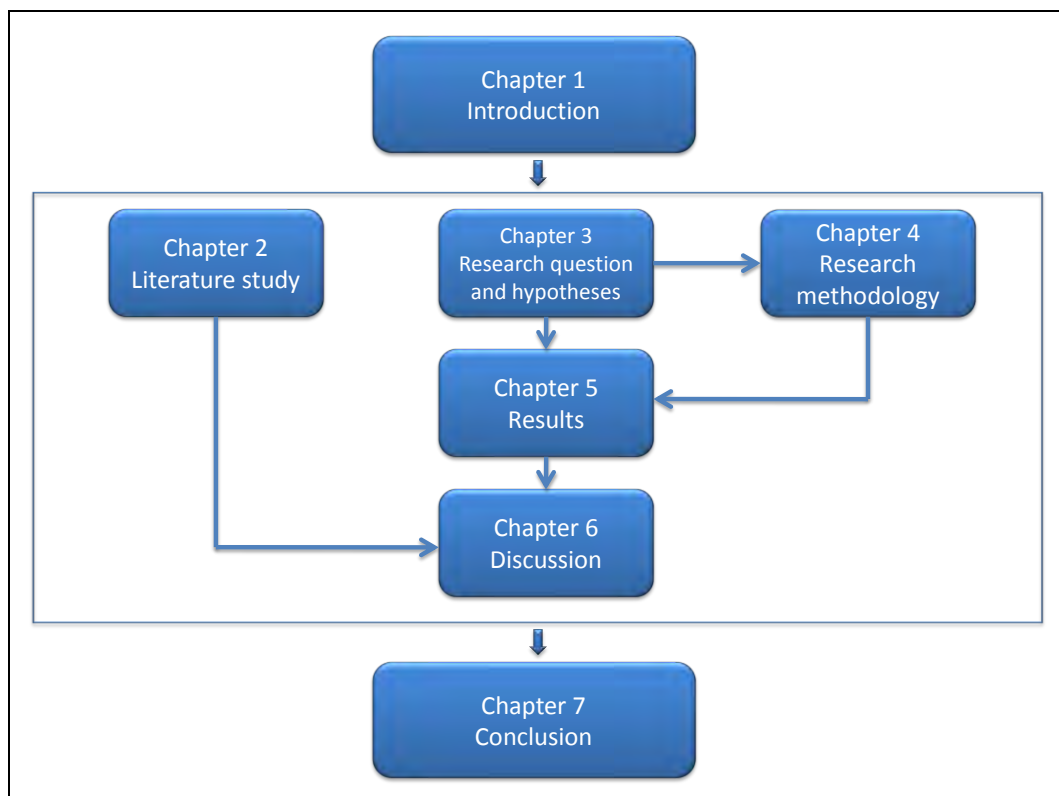
1.8 Summary

This study seeks to understand the nature of the impact of mobile technologies on the business models of SMEs in Pietermaritzburg. The impact of mobile technologies to

society cannot be ignored. The translation of this impact to business, particularly SMEs within a specific territory, is important given the focus on this particular segment within the South African economy and the general trend of small business advancement around the world.

The structure of this dissertation is depicted in Figure 1.4. Chapter 2 provides insights into the existing literature and theories of this study. Whilst Chapter 3 focuses on the specific research questions and hypotheses, Chapter 4 discusses the methodology of this research. Chapter 5 presents the results of the study followed by a discussion of these results in Chapter 6. Chapter 7 provides the conclusion to this dissertation, highlighting the contribution of this research to the body of knowledge, particularly to the domain of SME business models and mobile technology.

Figure 1.4: Structure of dissertation

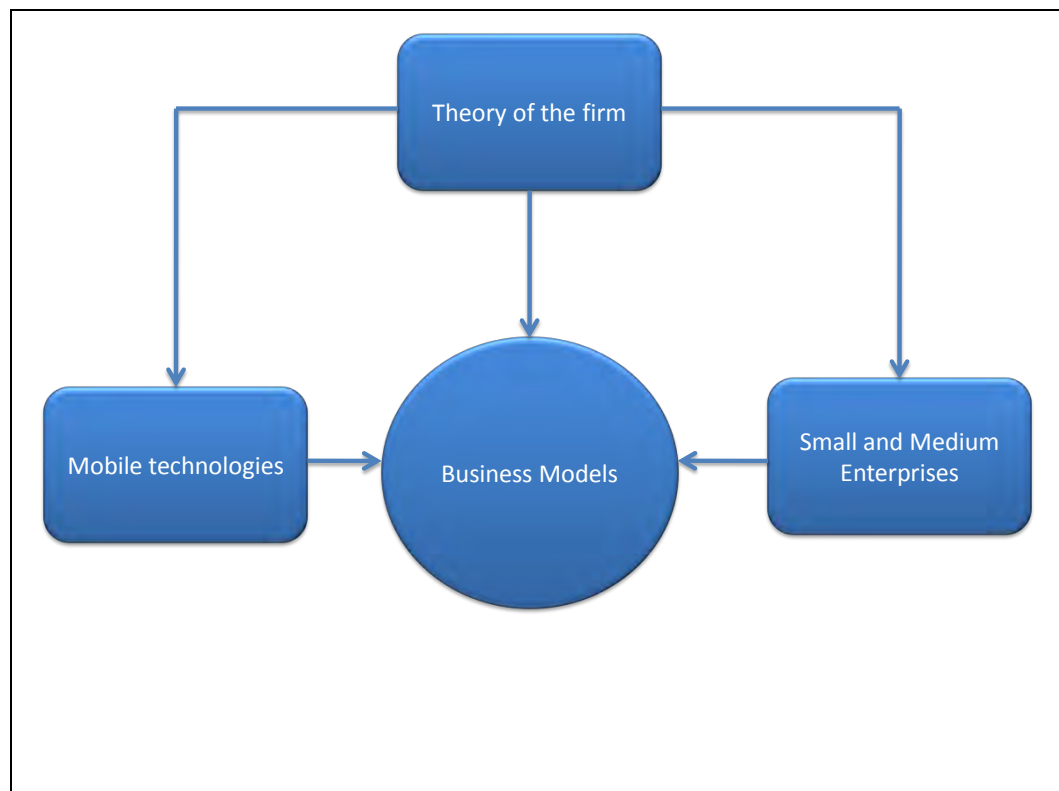


2. LITERATURE REVIEW

2.1 Introduction

The purpose of this section is to review the literature study on the theoretical concepts that are pertinent to this study. The theoretical basis of this study is the theory of the firm which seeks to articulate why firms exist and how they fundamentally function. A thorough definition of SMEs is provided and mobile technologies are discussed. The business model concept directly relates to the nature of the firm and is the key focus of this research. Figure 2.1 illustrates the structure of the literature study.

Figure 2.1: Structure of literature study



2.2 Theory of the firm

Since the 1930s, firms existed to the price of resources on the open market by reducing the cost of using the price mechanism (Coase, 1937, p. 390). This was achieved by

reducing the cost of negotiating prices, the cost of collecting information for every transaction and the cost of concluding separate contracts (Coase, 1937, p. 391). Coase's analysis gave rise to the transaction cost theory of the firm.

The transaction cost perspective of the firm considers bounded rationality, opportunism, small numbers bargaining and information impacted (McIvor, 2009, p. 47). Bounded rationality is the firm's ability to make rational decisions in identifying and exploiting opportunities (Garrouste & Saussier, 2005, pp. 179-180). According to McIvor (2009, p. 47), opportunism relates to the individual's ability to identify and exploit opportunities out of self-interest. Small numbers bargaining refers to the principle where a firm has alternative sourcing options and negotiating power towards meeting its requirements (Gibbons, 2005, p. 214). All these factors provide the underlying argument of the transaction cost theory of the firm which states that a firm exists to minimise the transaction costs of trading in an open market system (Coase, 1937, p. 390).

The theory of the firm extends beyond the reason of existence and also provides insight into the way firms function. The neo-classical view perceives the firm as an entity that needs to optimally manage the various factors of production in order to produce goods and services (Granstrand, 1998, p. 470). A factor of production is an input resource used in the production process whose outcome is a product or a service.

Over time, the neo-classical factors of production were insufficient in explaining the success and failures of firms that apply the same factors of production. Capital initially referred to physical capital such as buildings and machinery (Colander, 2010, p. 211). This definition of capital has changed over the years. More recently, it does not only

mean financial funds or physical capital such as buildings and machinery, but could also mean human capital in the form of intellectual property and social capital in the form of institutional relationships and individual networks that bring value to the organisation (Dean & Kretschmer, 2007, p. 574). A firm in general is taken to be a human system that operates in a given context through business transactions, with the aim of achieving defined goals (Granstrand, 1998, p. 475). Human capital refers to the knowledge, both explicit and implicit, that is embodied in people to add productive value to the firm (Towse, 2006, p. 868).

Behavioural theories of the firm assert that firms are not necessarily dependent on the availability of resources to succeed. Rather, the behaviour of individuals when making decisions is the primary determining factor for a firm to function (Augier & March, 2008, p. 4). Firms are political systems where coalitions both internally and externally change with the dynamics of the environment in which the firm operates (Dew *et al.*, 2008, p. 39). Due to the heterogeneity of firms, the way in which goals are set, expectations created and choice exercised is highly dependent on human actors and their subjective view of the world (Augier & March, 2006, p. 3). Behavioural theories have often placed more emphasis on the role of entrepreneurs and their influence on the firm (Cordes, Richerson, Richard, & Strimling, 2008, p. 130). Numerous studies have been conducted to understand the characteristics of the entrepreneur. As the primary creator and drivers of new business, the entrepreneur needs to be distinguished as an economic actor (Nieman & Nieuwenhuizen, 2009, p. 30).

Technology has long been featured in the theory of the firm. According to Dean & Kretschmer (2007, p. 486) technology is a durable resource that plays a role in

transforming production. For a long time technology was regarded as an accelerator of production but more recent technologies have enabled the development of new and different products (Colander, 2010, p. 211).

Some contend that technology, and specifically information technology (IT), is a partial substitute for other traditional forms of capital and labour (Dewan & Min, 1997, p. 1660). The basis of this argument is that technology, by its very nature, is used to improve the productivity of the work that is already done within firms. Another view of technology, and perhaps a more interesting one, is that technology has recently been used as a standalone factor of production in order to create new products and services. This is what Granstrand (1998, p. 465) refers to as the technology-based firm. He argues that some firms rely on the characteristics of technology to exploit business opportunities through product or process effectiveness and thus accelerating the adoption of firm-based technologies (Granstrand, 1998, p. 466).

The adoption of technology by firms has elevated its importance as a significant factor of production. Technology as a form of capital includes research and development, information and telecommunications infrastructure, as well as intellectual and industrial property such as patents and prototypes (Martín-de-Castro, Delgado-Verde, López-Sáez, & Navas-López, 2011). The use of this technological capital by organisations has been proven to have a positive impact on the performance of the firm (Ortega, 2010, p. 1279).

2.3 Small and Medium Enterprises

There are various approaches to defining SMEs. Entrepreneurship, ownership and management, labour status, informal or semi-formal economy, or the size of entity, are criteria that are often used when defining small businesses (Department of Trade and Industry, 2008, pp. 1-2). The most commonly used criterion for defining small businesses is the size of the entity (Hashim, 2009, p. 127; Nieuwenhuizen & Kroon, 2003, p. 130).

Some definitions use the firm's turnover to determine whether the organisation is small or medium in size. There are other definitions that use the number of employees on the payroll of the firm (Hashim, 2009, p. 127). The Department of Trade and Industry of South Africa incorporates both these views and also includes the total gross asset value with the exception of fixed property assets (National Small Business Act, 1996, p. 15). The definition also takes into account the nature of the industry, resulting in slight variations in the definition figures across different industry sectors. Table 2.1 lists the various figures that define SMMEs as legislated by the Department of Trade and Industry. This study will use these criteria to define SMEs.

Table 2.1: Definition of SMMEs (National Small Business Act, 1996, pp. 15-16)

Sector or sub-sectors in accordance with the Standard Industrial Classification	Size or class	Total full-time equivalent of paid employees <i>Less than:</i>	Total annual turnover <i>Less than:</i>	Total gross asset value (fixed property excluded) <i>Less than:</i>



Agriculture	Medium	100	R 4.00 m	R 4.00 m
	Small	50	R 2.00 m	R 2.00 m
	Very small	10	R 0.40 m	R 0.40 m
	Micro	5	R 0.15 m	R 0.10 m
Mining and Quarrying	Medium	200	R30.00 m	R18.00 m
	Small	50	R 7.50 m	R 4.50 m
	Very small	20	R 3.00 m	R 1.80 m
	Micro	5	R 0.15 m	R 0.10 m
Manufacturing	Medium	200	R40.00 m	R15.00 m
	Small	50	R10.00 m	R 3.75 m
	Very small	20	R 4.00 m	R 1.50 m
	Micro	5	R 0.15 m	R 0.10 m
Electricity, Gas and Water	Medium	200	R40.00 m	R15.00 m
	Small	50	R10.00 m	R 3.75 m
	Very small	20	R 4.00 m	R 1.50 m
	Micro	5	R 0.15 m	R 0.10 m
Construction	Medium	200	R20.00 m	R 4.00 m
	Small	50	R 5.00 m	R 1.00 m
	Very small	20	R 2.00 m	R 0.40 m
	Micro	5	R 0.15 m	R 0.10 m
Retail and Motor Trade and Repair Services	Medium	100	R30.00 m	R 5.00 m
	Small	50	R15.00 m	R 2.50 m
	Very small	10	R 3.00 m	R 0.50 m
	Micro	5	R 0.15 m	R 0.10 m
Wholesale Trade, Allied Services	Medium	100	R50.00 m	R 8.00 m
	Small	50	R 25.00 m	R 4.00 m
	Very small	10	R 5.00 m	R 0.50 m
	Micro	5	R 0.15 m	R 0.10 m
Catering, Accommodation and other Trade	Medium	100	R10.00 m	R 2.00 m
	Small	50	R 5.00 m	R 1.00 m
	Very small	10	R 1.00 m	R 0.20 m
	Micro	5	R 0.15 m	R 0.10 m

Transport, Storage and Communications	Medium	100	R20.00 m	R 5.00 m
	Small	50	R10.00 m	R 2.50 m
	Very small	10	R 2.00 m	R 0.50 m
	Micro	5	R 0.15 m	R 0.10 m
Finance and Business Services	Medium	100	R20.00 m	R 4.00 m
	Small	50	R10.00 m	R 2.00 m
	Very small	10	R 2.00 m	R 0.40 m
	Micro	5	R 0.15 m	R 0.10 m
Community, Social and Personal Services	Medium	100	R10.00 m	R 5.00 m
	Small	50	R 5.00 m	R 2.50 m
	Very small	10	R 1.00 m	R 0.50 m
	Micro	5	R 0.15 m	R 0.10 m

A business can be classified as small, medium or large, depending on the size criterion used and the industry in which the entity operates. A SME can also be defined across a variety of entity types. Figure 2.2 illustrates the enterprise continuum as defined by the Department of Trade and Industry. The diagram shows that small businesses could fall within any enterprise category except large private and public companies. Recent developments in South African Law, specifically the Companies Act number 73 of 2008, have however done away with the Close Corporation as a legal entity.

Figure 2.2: Small Business Continuum (Department of Trade and Industry, 2008, p. 5)



SMEs around the world face similar challenges. There is often a shortage of resources and managerial skills, low productivity and SMEs often face a challenging regulatory environment (Muhammad, Char, bin Yasoaf, & Hassan, 2010, p. 68). Macro-economic

and regulatory factors of a particular region and the impact thereof also play an important role in the survival, development and success of SMEs.

There are other significant challenges that SMEs face globally. The lack of skilled human capital, weak managerial skills, small markets, poor infrastructure and failure to access credit are some of the more common challenges across the globe. These could prevent SMEs from taking advantage of opportunities presented by ICTs (Ongori & Migiro, 2010, p. 95). In South Africa where small businesses are strategically important to the reduction of poverty, the increase in employment opportunities and the reduction of inequality, there is a concerted effort to boost funding for small enterprises, increase the demand for small enterprise products and services as well as reduce the regulatory burden to enable better opportunities (Department of Trade and Industry, 2008, p. 28).

Innovation through technology is an important aspect of SME survival and competitiveness. Access to ICTs is highly advantageous for SMEs as it provides the ability to engage in productive regional and global economic business networks (Chacko & Harris, 2006, p. 1). These business networks could consist of suppliers, partners and customers and offer opportunities to create new products to enhance existing offerings and deliver value to customers. One of the fastest growing ICTs that provide this type of access is mobile technology.

2.4 Mobile technologies

The purpose of this section is to define mobile technologies and discuss the theoretical features that make this technology unique.

2.4.1 Definition

The idea of porting technology on to a miniature device is a concept that began in the 1970s (Hart & Hannan, 2004, p. 201). Porting refers to the transfer of computing from one device type to another, in this case from a personal computer (PC) to mobile devices. Jarvenpaa and Lang (2005, p. 8) define mobile technology as any handheld IT artefact that includes hardware, software and that facilitates communications services. The device, interface and applications cannot be considered as separate from each other. Due to the feature of mobility, applications that typically function on personal computers can be tailored to handheld devices and become mobile applications. The handheld device is therefore central to mobile technology (Barnes & Scornavacca, 2007, p. 159).

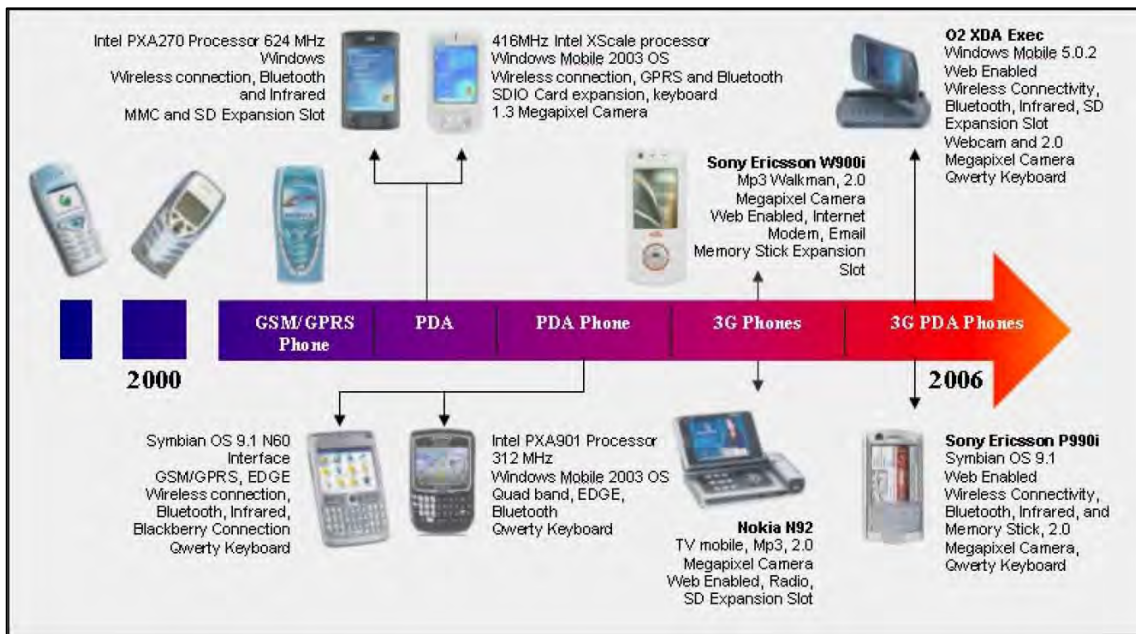
2.4.2 Mobile devices

There are various types of mobile devices and the most common device is the mobile phone (Hart & Hannan, 2004, p. 201). The mobile phone has been traditionally used for voice communication with little emphasis placed on mobile computing before 2000. As illustrated in Figure 2.3, the mobile device was only equipped with computing capability after the year 2000 with some phones using GPRS technology. PDAs also became popular in the mid-2000s although they did not enjoy the same uptake as the mobile phones (Atkins *et al.*, 2006, p. 2).

The first mobile phone was used as a car phone in the United States and operated by AT&T, a global telecommunications company (Dahlman, Parkvall, Sköld, & Beming, Background of 3G evolution, 2007a, p. 3). The analogue mobile devices prior to the 1980's supported only voice transmission until the second generation phones were

developed with increased capacity, as well as data services such as SMS and email. It was only with the introduction of GPRS that mobile devices fully utilised the digitisation of mobile technologies with the introduction of Internet enabled devices (Hart & Hannan, 2004, p. 202).

Figure 2.3: Advancement of mobile devices (Atkins *et al.*, 2006, p. 2)



3G is a technology that is used by mobile service providers to provide high bandwidth digital communications using standards developed by the International Telecommunications Union (ITU) (Lehra & McKnight, 2003, p. 354). The main driver behind 3G technologies was the popularity of the Internet in the 1990's (Tilson & Lyytinen, 2006, p. 572). Mobile service providers wanted to use the same mobile device to provide access to data services in a cost effective manner while still providing traditional voice communication services (Dahlman, Parkvall, Sköld, & Beming, 2007b, p. 18).

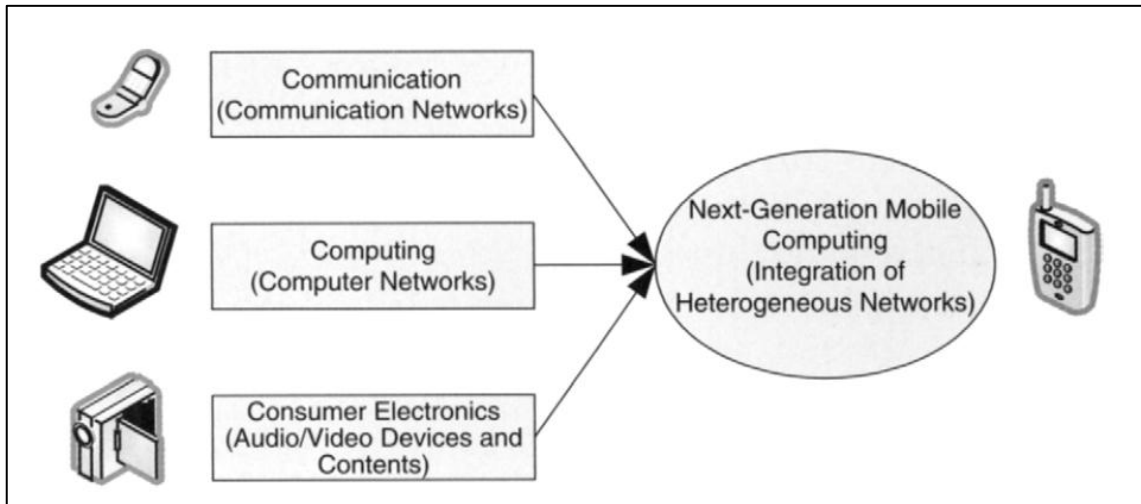
A few years ago handheld devices had limited computing power when compared to desktop computers (Armstrong & Bennett, 2005, p. 513). This limitation caused hesitation in the further uptake of mobile technologies in general and more specifically in business. Since then, the wireless transmission technology standards such as 802.11g and WiMax have emerged to address this limitation (Hart & Hannan, 2004, p. 202).

Mobile devices were originally meant for voice only communication technology. The power of ubiquity and the advancements in wireless transmission technologies has meant that mobile devices can now be a critical tool in providing data services such as Internet access and more advanced application services that require significant amounts of bandwidth. Features such as cameras and colour displays are also important in ensuring that the mobile device becomes an all-purpose tool for both computing and any form of communication (Dahlman *et al.*, 2007b, p. 18). The convergence of traditional mobile phones and PDAs has given birth to the new smart phones with features such as Global Positioning System (GPS), Radio Frequency Identification (RFID), music players, powerful processors, games, business productivity tools and large displays (Chang *et al.*, 2009, pp. 741-742). These improvements will make mobile computing accessible to more people and easier to use (Hart & Hannan, 2004, p. 204).

The mobile device has seen a convergence of various capabilities such as communication, computing and electronics. Figure 2.4 illustrates this convergence into the new age mobile device rich in a variety of applications. These devices have become affordable, personal, ubiquitous and provide connectivity to social and business networks (Dutta & Mia, 2011, p. xiv). In 2009, data traffic surpassed that of voice traffic on mobile devices around the world (Dutta & Mia, 2011, p. 48). Innovative

applications such as mobile money transfer have completely changed the way small enterprises transact in countries such as Kenya and South Africa.

Figure 2.4: Digital convergence (Zheng & Ni, 2006, p. 7)



Mobile device features vary across brands and model. *QWERTY* keyboards to maintain consistency with personal computers, touch screens, longer lasting batteries, better memory, Bluetooth, WiFi, Global Positioning Systems (GPS), email, web browser, calendar, and multimedia have all become standard features that users have come to expect as part of their mobile devices (Hanson, 2011, pp. 13-17). An example of a modern mobile device is shown in Figure 2.5.

Figure 2.5: Example of a modern mobile device (Hanson, 2011, p. 12)



2.4.3 Mobile communications

Mobile communications is defined as the delivery of content, notification and reporting and transacting on a mobile device (Kumar & Zahn, 2003, p. 517). In other words, any form of communication from and to another person that is facilitated by the mobile device is regarded as mobile communications. It has already been indicated how the communication features of the mobile device have evolved over the years to accommodate the growing needs of consumers and align with the advancements of technology in general.

An example of transacting on a mobile device is mobile banking. This mobile service is used as a channel for users to interact with and consume bank services. Typical mobile banking services include the checking of an account balance, transaction enquiry, and checking credit card information (Barnes & Scornavacca, 2007, p. 169). A more recent

example is the use of MPESA, a mobile money transfer service that has facilitated trade for farmers in Kenya (Dutta & Mia, 2011, p. 71).

2.4.4 Mobile computing

Mobile computing refers to the access and processing of information on a mobile device (Pierre, 2001, p. 118). Mobility presents unique challenges for data management and security. Developments in mobile device hardware and the introduction of operating systems and applications that are suited for conservative device ergonomics have made computing on mobile devices a common business practice (Hanson, 2011, p. 18).

2.4.5 Mobile electronics

Cameras, light torch, character recognition scanners and Current mobile electronics such as digital cameras and character recognition scans will only improve with time. Mitchener (2010, p. 61) predicts that electronics such as cameras will be used to collect and analyse information about the context of the environment in which the user is in and share that information with other electronic devices that the user wishes to use.

2.4.6 Mobile technology characteristics

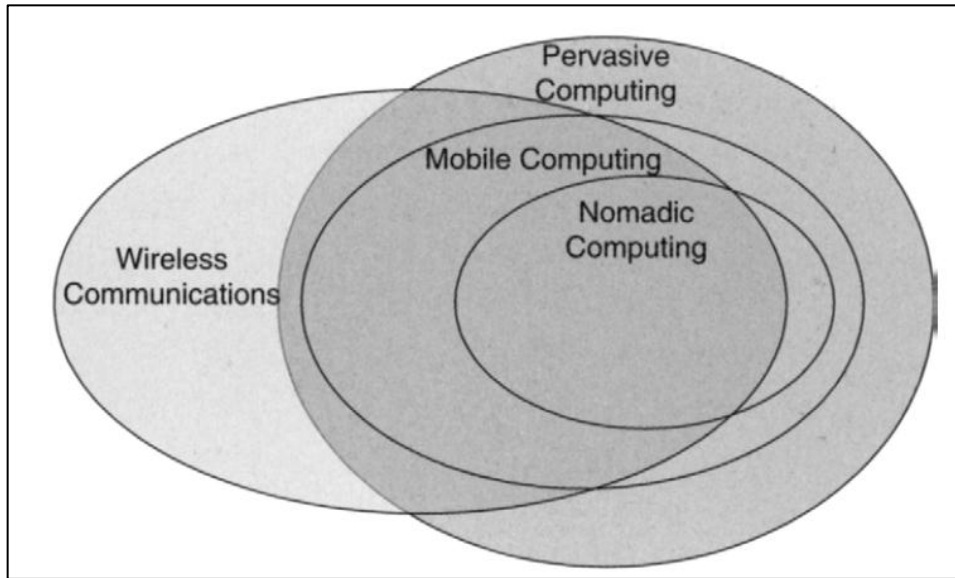
The primary characteristic of mobile technologies is mobility (Saha, 2005, p. 203). This means that a user can access all of the services that one would usually have in a fixed line environment, from anywhere (Pierre, 2001, p. 118). This mobility often comes with certain constraints such as the diminishing weight of the device, limited bandwidth especially in remote areas, variation in network parameters, limited battery awareness and less security (Saha, 2005, p. 204). Despite these constraints, the advantage of

mobility is that communications and computing can take place regardless of the user's location (Barnes & Scornavacca, 2007, p. 162). This could have a positive impact on the productivity and efficiency of staff within a business since users can make better use of time and engage work in real-time (Sheng *et al.*, 2005, p. 273).

Mobility is made possible by a network of interconnected and overlapping base stations whose purpose is to handoff data to other adjacent cells without the user losing connection (Lehra & McKnight, 2003, p. 354). With trends such as the internationalisation of client relationships, inter-firm cooperation, and multiunit companies, mobility in the workplace has become more important (Aguilera, 2008, p. 1110).

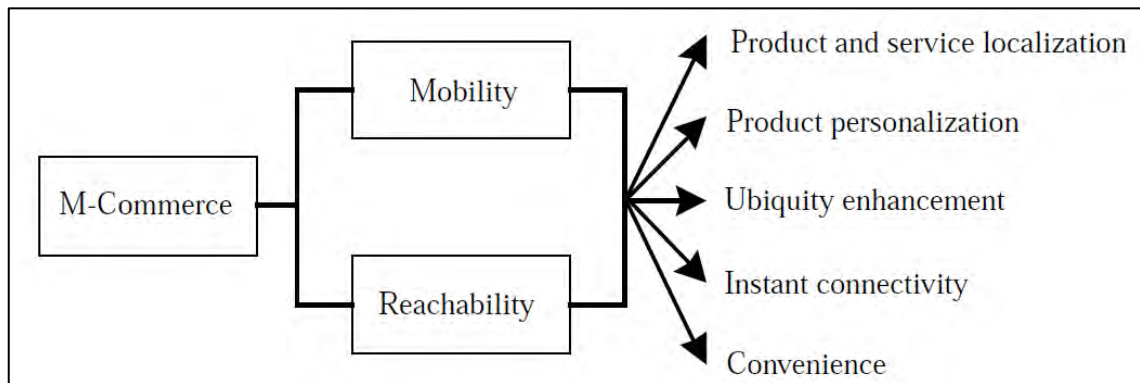
Mobility is an enabler for ubiquitous or pervasive computing where a user can stay connected to a mobile service all the time and everywhere as a result of the continuous sensing of the device and the environment in order to determine the context of the user (Zheng & Ni, 2006, p. 10). Figure 2.6 illustrates the scope of pervasive computing in the context of other types of related computing. Nomadic computing is a unique case of mobile computing where users temporarily connect to wired or wireless networks using devices such as laptops (Zheng & Ni, 2006, p. 10). Mobile computing is a subset of pervasive computing and partly related to wireless communications. Pervasive computing is about providing the user with a seamless computing experience without them realising the technological adaptations happening in the background (Saha, 2005, p. 200).

Figure 2.6: Scope of pervasive computing (Zheng & Ni, 2006, p. 11)



Mobile technology is also characterised by convenience, localisation and personalisation (Barnes & Scornavacca, 2007, p. 162). This means that users of mobile technology are no longer constrained by time and space but has access to relevant applications and information at all times. Localisation implies that the location of mobile technology users is traceable at all times using Global Positioning System (GPS). This presents significant opportunities for location based services. Typically a mobile device is used by only a single user. The device becomes a personal tool through which personalised services can be provisioned. Figure 2.7 illustrates the opportunities brought about by mobile technology in business. The characteristics of mobile technology highlighted by other researchers such as Saha (2005, p. 203) and Barnes & Scornavacca (2007, p. 162), present clear opportunities for businesses to improve the effectiveness of various aspects of the business model.

Figure 2.7: Mobile technology opportunities in business (Liang *et al.*, 2007, p. 1156)



2.4.7 Application in business

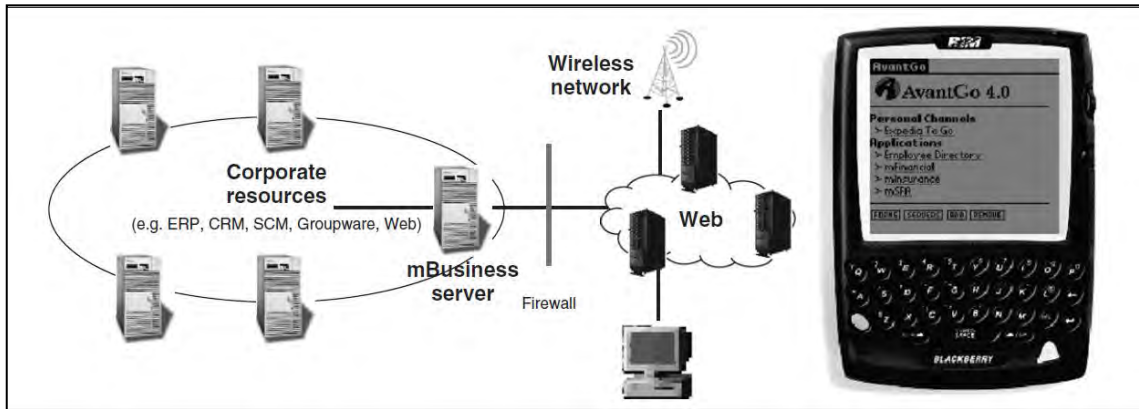
ICTs can influence business in a tangible manner through increased productivity and reduced costs as well as in intangible ways through improved decision making and superior product quality (Sheng *et al.*, 2005, p. 272). The same type of impact can be expected from mobile technologies since many of the existing business applications can already operate on mobile devices.

Mobile technology can impact organisations at a strategic level through the improvement of working processes, improvement of internal communication and knowledge sharing as well as the enhancement sales and marketing through greater reach, accessibility and channel options (Sheng *et al.*, 2005, p. 283). There are various examples of how mobile technologies have been used in business (Atkins *et al.*, 2006, p. 1; Sheng *et al.*, 2005, p. 269; Kumar & Zahn, 2003, p. 515). A study by Molony (2008, p. 175) reveals that mobile technologies are the primary interface with ICTs for the informal construction sector in Tanzania. In another study by Mort & Drennan (2002, p. 9) mobile technology is used in business for mobile marketing.

The adoption of mobile technology in SMEs is typically influenced by factors such as Efficiencies and effectiveness of an organisation's value activities are often derived from the flexibility, interactivity, and location awareness of mobile technologies (Sheng *et al.*, 2005, p. 273). In many instances, the positive impact on an organisation's value chain can be a significant source of competitive advantage. Providing new communication channels to customers and distributing information to staff remotely can be a powerful combination in streamlining the interaction between sales, design and manufacturing functions within an organisation (Kumar & Zahn, 2003, p. 520)

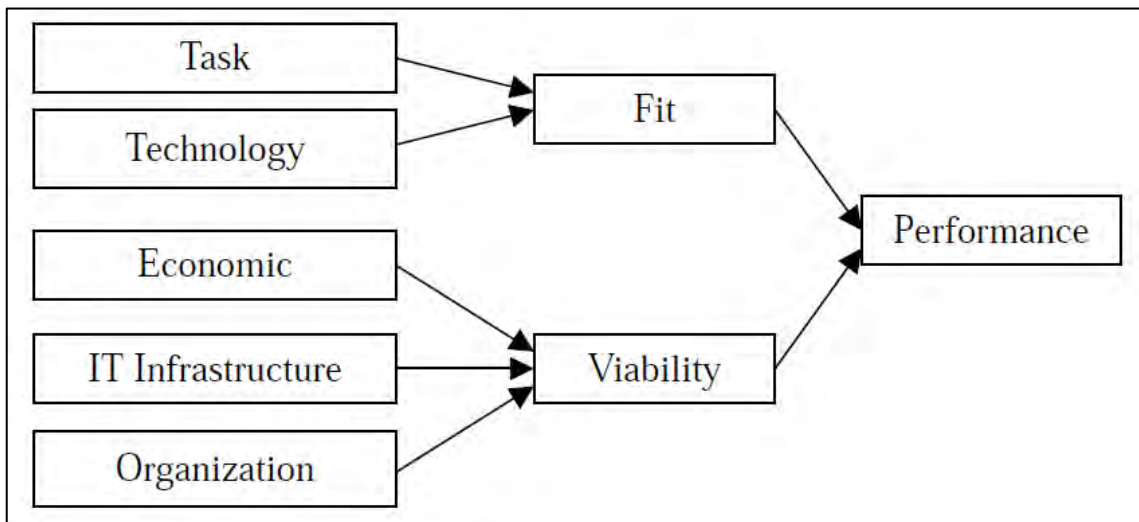
Not so long ago, the adoption of mobile technology in business was hindered by the lack of standardised IT environments, limited bandwidth, high latency and high usage costs (Harker & Van Akkeren, 2002, p. 203). The modern day configuration of mobile technologies in a business is illustrated in Figure 2.8. Users connect to an existing corporate Local Area Network using their mobile devices through the Internet or Virtual Private Networks. Since many businesses already make use of ICTs, mobile computing is typically an add-on to existing network infrastructure to enable mobile computing and communications. Today, the bandwidth capacity, low latency technology and decreasing usage costs have stimulated further adoption of mobile technology in business (Dutta & Mia, 2011, p. 99). It is now conceivable that mobile devices are used for managing customer relationships, processing transactions across functions of the organisation and managing supply chain processes.

Figure 2.8: Mobile technology architecture (Barnes & Scornavacca, 2007, p. 174)



There are various models that explain the adoption of mobile technology in business (Liang *et al.*, 2007, p. 1154; Doolin & Al Haj Ali, 2008, p. 3). These models identify key factors that impact the successful adoption of mobile technology in business. Figure 2.9 illustrates an adoption model by (Liang *et al.*, 2007, p. 1158). Understanding adoption models for mobile technology is important for this research because it could be used to provide insight into the extent to which this technology is used by SMEs.

Figure 2.9: mobile technology adoption framework (Liang *et al.*, 2007, p. 1158)



2.5 Business Models

The purpose of this section is to define a business model and discuss its connection with the theory of the firm, SMEs and mobile technologies.

2.5.1 Definition

Johnson *et al.* (2008, p. 52) define a business model as a way for the business to create and deliver value through a value proposition, profit formula, key resources and key processes. Other studies on business models have identified similar elements for a business model. The work of Shi & Manning (2009, p. 50) also identifies four elements that make up a business model namely, the resource model, financial model, organisation model and the exchange model. On close inspection, the elements defined in both these studies are similar. The financial model in the work of Shi and Manning (2009, p. 52) is similar to the profit model of Johnson *et al.* (2008, p. 53).

There are other studies that define more than four elements for a business model. The study by Eriksson, Kalling, Akesson, & Fredberg (2008, p. 33) defines six elements as follows:

- Offering
- Customer
- Factor market
- Resources
- Activation and organisation
- Competitors

Although different, these elements are also very similar to the work of Johnson *et al.* (2008, p. 54). The only difference is that the factor market and competitors are separate elements whereas Johnson *et al.* have included these within the profit formula and resources elements.

Magretta (2002, p. 87) defines a business model based on Peter Drucker's age-old questions which are:

- Who is the customer?
- What does the customer value?
- How does the organisation make profit in the business it is in?
- What is the underlying economic logic which explains how the organisation can deliver value to customers at an appropriate cost?

This study will consider the definition with four elements (value proposition, profits, resource and value chain) since this is the most consistent view in the literature (Magretta, 2002; Shi & Manning, 2009; Johnson *et al.*, 2008).

2.5.2 Value proposition

A customer value proposition is based on helping the customer get an important job done (Magretta, 2002, p. 52). The job is a business problem that a customer needs to resolve. Once the nuances of the job are understood, an offering can be designed to address the specific business problem. A customer value proposition is built in relation to the organisation's competencies (Shi & Manning, 2009, p. 52).

Any value proposition has a tangible and intangible element to it and the understanding of the customer needs is critical to the perceived quality and uniqueness of the offering (Eriksson *et al.*, 2008, p. 34). The offering needs to be based on either a product or service that will address the customer's need.

A value proposition deals with issues of market targeting, value creation, branding and customer retention (de Reuver & Haaker, 2009, p. 242). Targeting must provide clarity on whether the served market is a niche, a mass market, based on consumers or businesses. Elements of value creation could be speed, accuracy, personalisation and quality.

2.5.3 Profit formula

A profit formula captures how the organisation will create value for itself while addressing customer needs (Magretta, 2002, p. 52). The profit formula captures everything in the other three components of a business model (Shi & Manning, 2009, p. 52). It captures the revenue model, the cost structure, the margin model and the resource velocity.

The revenue model is defined as the price of the product or service relative to the customer perceived value (de Reuver & Haaker, 2009, p. 242). Each product or service will have direct and indirect costs to produce and sell. Economies of scale would also need to be taken into account in the cost structure (Magretta, 2002, p. 52). The firm has to decide whether it will charge high, medium or low margins in order to achieve desired profits (Morris, Schindehutte, Richardson, & Allen, 2006, p. 35). In producing products and services, resources such as inventory and assets get used up. Resource

velocity is the speed at which these resources are completely utilised (Magretta, 2002, p. 52). This partly relates to the capital expenditure of the organisation (Shi & Manning, 2009, p. 53)

2.5.4 Resources

Key resources are the people, technology, products, facilities and other resources that are critical in delivering value to the targeted customer (Magretta, 2002, p. 53). The organisational resource element of the business model is different to the value chain element in that it captures what the organisation has while the latter represents how the organisation does things (Shi & Manning, 2009, p. 52). In order for an organisation to have an effective business model, the resources need to uniquely represent the organisation's core competencies that cannot be easily copied by competitors (Eriksson *et al.*, 2008, p. 34).

According to Morris *et al.* (2006, p. 35), core competencies can fall within the following categories:

- Production;
- Selling and marketing;
- Information management and mining;
- Technology, research and development, innovative capability and intellectual;
- Financial transactions;
- Supply chain management; and
- Networking and resource leveraging.

2.5.5 Value chain

The value chain represents the key processes of an organisation that are used to create value for the targeted customer and the firm (Magretta, 2002, p. 53). It captures the roles and responsibilities of individuals within the organisation, the activity systems, as well as the business processes of the firm (Shi & Manning, 2009, p. 53). Within this business model element, the key drivers of costs must be understood and the productivity, effectiveness and perceived quality of output must be closely tracked (Eriksson *et al.*, 2008, p. 34).

De Reuver & Haaker (2009, p. 242) assert that partner selection, network openness and governance are key elements of the value chain. The right partner needs to be selected when relevant in order to create and deliver the required value to target customers. Network openness refers to the degree to which new business actors can join the value chain.

2.5.6 Business Models and SMEs

All trading firms have a business model. In other words, a firm must have the capacity to create and deliver value to customers. The availability and quality of resources, the packaging and communication of the offering, the internal business processes of delivering value and the revenue and cost structures largely determine success or failure. There is a balancing act that is required and the right mix depends on factors such as the external macro environment, the competitive environment and the internal strategy. It must be a consciously defined business model or it may well fail (Shafer, Smith, & Linder, 2005, p. 204)

It has been established that SMEs are typically short of resources and are not always able to develop comprehensive business models due to a lack of managerial skill. Concepts such as frugal engineering are sometimes relevant to these types of organisations and the need for partnerships is much more necessary.

2.5.7 Impact of Mobile Technologies on Business Models

Mobile technology impacts the business model in various ways across the four dimensions (customer value proposition, profit formula, resources, and value chain). de Reuver & Haaker (2009, p. 242) also define four dimensions to a business model but uses different labels for the dimensions. Instead of a resource dimension, a technology domain is defined and an organisational domain is used instead of a value chain. The descriptions of the service and financial domains can be directly translated to mean the customer value proposition and the profit formula dimensions.

Table 2.2 shows some of the ways that mobile technologies can impact a business model across the four dimensions. The characteristics of mobile technologies impact the way clients are targeted, how clients are chosen and the client retention strategies applied by organisations. Mobile technology is viewed not to be as reliable as the traditional wireline technology (Tsalgaidou & Pitoura, 2001, p. 223). Security and the quality of the service need to be perceived differently. In the organisational domain, the selection of partners and the ease of joining the value network to provide services to customers. The financial domain needs to consider pricing strategies that are suitable to mobile services and the recognition of value contributions from partners is influenced by the factors such as access to resources.

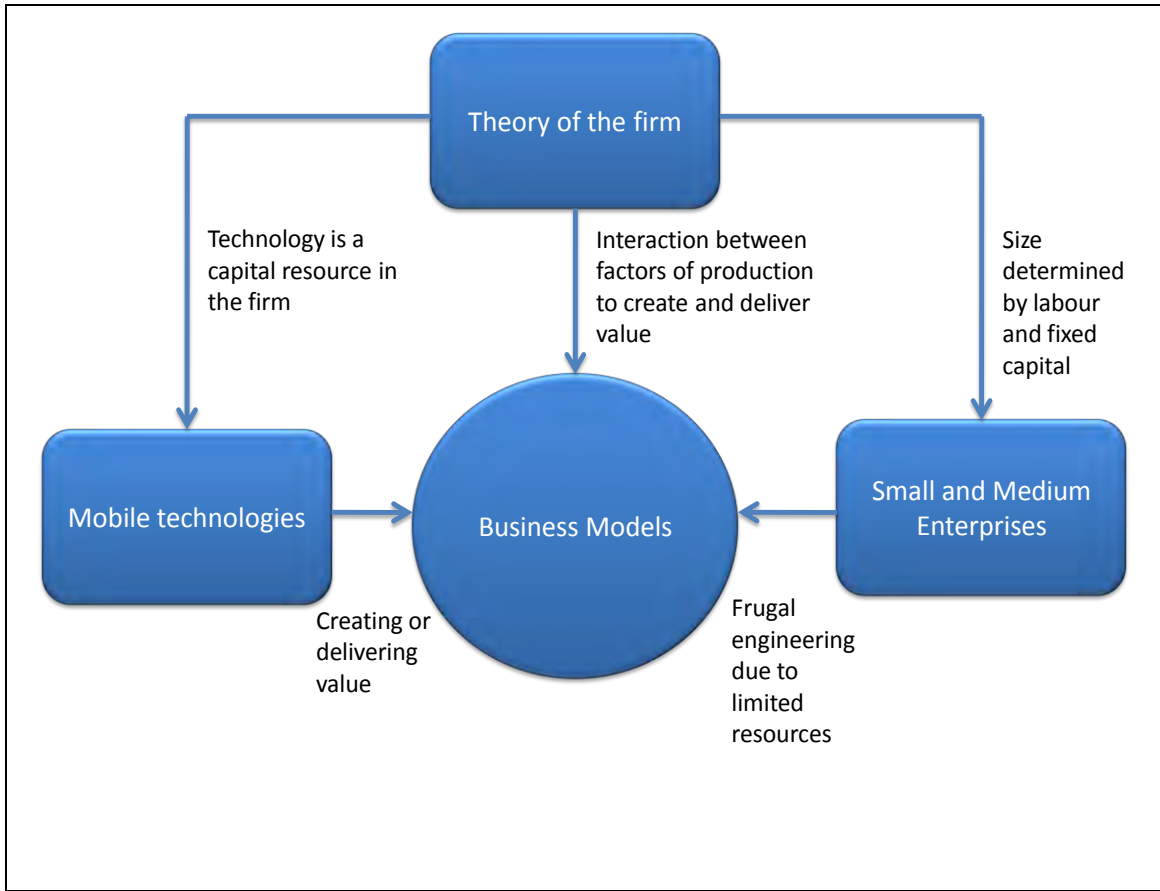
Table 2.2: Generic mobile services' business model design issues (de Reuver & Haaker, 2009, p. 242)

Dimension	Impact factor
Service domain	<ul style="list-style-type: none"> • Targeting • Value-creating elements • Branding • Customer retention
Technology domain	<ul style="list-style-type: none"> • Security • Quality of service • System integration • Accessibility to customers • Management of user profiles
Organizational domain	<ul style="list-style-type: none"> • Partner selection • Network openness • Governance
Financial domain	<ul style="list-style-type: none"> • Pricing • Division of investments, costs and revenues • Valuing contributions and benefits

2.6 Summary

Figure 2.10 summarises the relationships between the theory of the firm, business models, SMEs and mobile technologies. Firms, whether large or small, exist because they want to minimise transaction costs that would otherwise be higher in a price mechanism. In order to achieve this, it is necessary to coordinate the necessary factors of production in order to create and deliver value through a business model. Mobile technologies are one of the key factors of production and have been proven to impact business models across both the creation and delivery of value to customers. The challenges such as limited resources faced by SMEs present an opportunity to take advantage of the characteristics and availability of mobile technologies and the availability thereof to improve both the creation and delivery of value to clients. The purpose of this study is to understand the nature of the impact of mobile technologies on the business models of SMEs.

Figure 2.10: Relationship between components of the literature study



3. RESEARCH FOCUS

3.1 Research question

The primary research question for this study is:

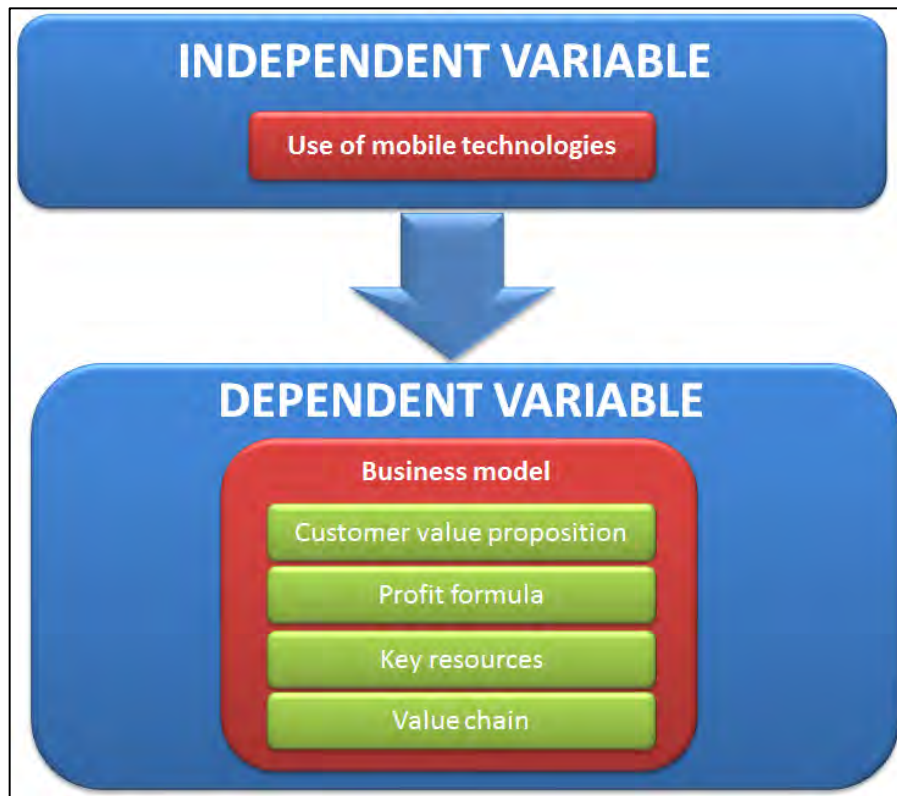
What is the impact of mobile technologies on the business model of SMEs in Pietermaritzburg?

3.2 Dependent and independent variables

Figure 3.1 illustrates the dependent and independent variables of this study. A dependent variable is described as a measured variable that depends on the behaviour of an independent variable (Albright, Winston, & Zappe, 2009, p. 574). In this study the dependent variable is the business model and its components. This will be measured by breaking down the business model into its components according to the theoretical definition in Chapter 2 (Section 2.5).

The independent variable is one that influences the dependent variable and can be controlled in an experiment (Albright *et al.*, 2009, p. 574). It is confirmed in literature that the use of mobile technologies has become part of daily business life. The use of mobile technologies is thus the independent variable for this study. This will be measured by assessing the extent to which various mobile technologies discussed in Chapter 2 (Section 2.4) are used by the various SMEs.

Figure 3.1: Dependent and independent variables



3.3 Hypotheses

Table 3.1 lists the hypotheses of this study and their descriptions. The hypotheses are based on the definitions of a business model. In order to assess the impact of mobile technologies on the business models of SMEs, each business model component needs to be assessed individually in order to determine the areas where the impact is significant.

Table 3.1: Research hypotheses

Hypothesis	Description
Null hypothesis $H1_0$	The use of mobile technologies has a positive impact on the business models of SMEs in Pietermaritzburg
Alternate hypothesis $H1_1$	The use of mobile technologies does not have a positive impact on the business models of SMEs in Pietermaritzburg
Null hypothesis $H2_0$	The use of mobile technologies has a positive impact on the

	customer value proposition of SMEs in Pietermaritzburg
Alternative Hypothesis $H2_1$	The use of mobile technologies does not have a positive impact on the customer value proposition of SMEs in Pietermaritzburg
Null hypothesis $H3_0$	The use of mobile technologies has a positive impact on the profit formula of Pietermaritzburg SMEs to their clients
Alternative Hypothesis $H3_1$	The use of mobile technologies does not have a positive impact on the profit formula of Pietermaritzburg SMEs to their clients
Null hypothesis $H4_0$	The use of mobile technologies has a positive impact on the key resources of SMEs in Pietermaritzburg
Alternative Hypothesis $H4_1$	The use of mobile technologies does not have a positive impact on the key resources of SMEs in Pietermaritzburg
Null hypothesis $H5_0$	The use of mobile technologies has a positive impact on the value chain of SMEs in Pietermaritzburg
Alternative Hypothesis $H5_1$	The use of mobile technologies does not have a positive impact on the value chain of SMEs in Pietermaritzburg

The purpose of this study is to determine whether there is a positive or negative impact of mobile technologies on the business models of SMEs in Pietermaritzburg. The business model is defined across four areas namely value proposition, client base, core profit model and value chain. A bivariate correlation analysis of the relationship between the use of mobile technologies and the various components of a business model will be assessed.



4. RESEARCH METHODOLOGY

4.1 Proposed research method

Studies that have focused on mobile technologies in business have used a combination of both qualitative and quantitative research methods. The work of Sheng *et al.* (2005, p. 274) took a case study approach to investigate the strategic implications of mobile technologies in the business. The purpose was to understand the organisational context and gain insight into the reasons behind the impact of mobile technology. In another study by Schlosser (2007, p. 183), a quantitative and qualitative study was conducted to understand the use of mobile technology to communicate and support staff in a sales environment.

A causal study will be conducted for this research. A causal study typically assesses the causation of one variable on another (Blumberg, 2008, p. 209). Since mobile technologies are already being used in SMEs with specific business models, the assessment intends to determine whether the use of these mobile devices has an impact on the various elements of the business model. The causal study will be conducted in a quantitative manner. The study will be quantitative because of the possible number of SMEs that will be invited to participate in the research. Quantitative research is also useful where a lot of data needs to be collected from a large number of subjects (Blumberg, 2008, p. 192).

The specific statistical test that will be run is a correlation analysis. The purpose of this type of analysis is to describe the strength and the direction of a linear relationship between 2 variables (Albright *et al.*, 2009, p. 105). There are 2 types of correlation tests.



The Pearson product-moment correlation coefficient is typically used for interval level data while the Spearman Rank Order Correlation is used for ordinal level data (Pallant, 2010, p. 128). Due to the continuous nature of the data in this study, the Pearson product-moment correlation coefficient will be used.

4.2 Proposed population and unit of analysis

According to Albright *et al.* (2009, p. 34) a population consists of all entities of interest in a study. For the purposes of this study, the population consists of SMEs that belong to the Pietermaritzburg Chamber of Business (PCB). The PCB is a voluntary association of enterprises in and around Pietermaritzburg and is registered with the South African Chamber of Commerce and Industry (SACCI). Boasting a membership pool of 832 companies, the PCB database was used to draw a viable sample of SMEs for this study.

From the 832 companies in the PCB database, 22 had more than 200 employees. These companies were immediately excluded from the study as they did not qualify as SMEs. Out of the 810 companies left in the database, all government entities, schools, honorary members of the PCB and Non-governmental organisations were removed. This left a population size of 678 SMEs from which to draw a sample.

The unit of analysis for this research is the SME firm. The criteria for an SME to qualify for this study are based on the legislative definition by the Department of Trade and Industry. A profile section in the research questionnaire is therefore necessary in order to qualify participating SMEs.

4.3 Sampling

A sample is defined as a representative subset of a population (Albright *et al.*, 2009, p. 34). A random sample will be used for this study. The rationale is that all population elements must get the same chance of being selected into the study. Since the population is based on the National Small Business Chamber membership, all the SMEs in the database should have been prequalified as small businesses although micro enterprises would still need to be excluded. Furthermore, there is no need to use any further characteristic of the population to identify the most appropriate sample. Due to the central limit theorem, the sample size must be at least 30 at a confidence interval of 95%.

Given the population size of 687, the confidence level of 95% and the confidence interval of 5%, the sample size for this study can be calculated using the sample size formula for estimating the mean (Albright *et al.*, 2009, p. 478). This formula is:

$$n = \left(\frac{z - \text{multiple} \times \sigma_{\text{est}}}{B} \right)^2$$

where n is the sample size, the z -multiple at 95% confidence is 1.96 (Albright *et al.*, 2009, p. 479), σ_{est} is the estimated standard deviation and B is the confidence interval. Given this formula, the sample size for this study is 252. There were 2 criteria employed for businesses to participate. Firstly businesses had to be SMEs as defined by the national small business act. Secondly each business had to be a member of the PCB.

4.4 Data collection and analysis

This research will employ a questionnaire with three main sections. The first section will ascertain the entrepreneurs profile and the context in which they operate. The



second section will aim to establish whether the specific SME makes use of mobile technologies. Lastly, section three will include the specific questions related to the impact on the firm's business model. This section will be further broken into subsections, each representing an element of the business model as defined in Section 3.4.2. A copy of the questionnaire will be emailed to the randomly selected sample of SMEs who belong to the PCB. The rationale for the questionnaire is to reach as many SMEs as possible in order to have a statistically valid study.

A Likert scale will be used to generate quantitative data from the questionnaire. From this data, descriptive statistics such as the mean and standard deviation will be tested on the sample. A bivariate correlation analysis will be used to understand either the positive or negative impact of mobile technologies on the business model elements. Correlation analysis can be used to either understand how the world works or for prediction (Albright *et al.*, 2009, p. 573). Besides observing the scatter plots produced by the data, the least squares estimation, the standard error of estimate and the coefficient of determination will be analysed. These variables are used to understand the nature of the correlation between the dependent and independent variables (Albright *et al.*, 2009, p. 575).

4.5 Limitations

The limitation of the proposed research methodology is that the population cannot be claimed to necessarily be representative of small and medium enterprises in Pietermaritzburg. The implication of this limitation is that the results of this study cannot be generalised to all SMEs within and around Pietermaritzburg. Despite this limitation, the results facilitate a better understanding of the nature of the impact of



mobile technology to SME business models and this can be used as a basis from which to effectively adopt mobile technology.

Another limitation is that the questionnaire is a risky instrument to use since it is prone to response biases (Blumberg, 2008, p. 508). In order to minimise these biases, the questionnaire consisted of a number of questions for each business model component in order to check the consistency of responses.

4.6 Consistency matrix

Table 4.1 shows the consistency matrix for this research.

Table 3.1: Consistency Matrix

Hypothesis	Literature Review	Data Collection	Analysis
Null hypothesis $H1_0$ Alternative Hypothesis $H1_1$	<ul style="list-style-type: none"> (Magretta, 2002) (Jarvenpaa & Lang, 2005) (de Reuver & Haaker, 2009) (National Small Business Act, 1996) (Morris <i>et al.</i>, 2006) (Eriksson <i>et al.</i> , 2008) 	Questionnaire section2	Bivariate correlation, Pearson product-moment correlation coefficient, coefficient of determination
Null hypothesis $H2_0$ Alternative Hypothesis $H2_1$	<ul style="list-style-type: none"> (Magretta, 2002) (Jarvenpaa & Lang, 2005) (de Reuver & Haaker, 2009) (National Small Business Act, 1996) 	Questionnaire section2	Bivariate correlation, Pearson product-moment correlation coefficient, coefficient of determination
Null hypothesis $H3_0$ Alternative Hypothesis $H3_1$	<ul style="list-style-type: none"> (Magretta, 2002) (Jarvenpaa & Lang, 2005) (National Small 	Questionnaire section2	Bivariate correlation, Pearson product-moment correlation coefficient,



	Business Act, 1996)		coefficient of determination
Null hypothesis H_{4_0} Alternative Hypothesis H_{4_1}	<ul style="list-style-type: none">• (Magretta, 2002)• (Jarvenpaa & Lang, 2005)• (National Small Business Act, 1996)• (Morris <i>et al.</i>, 2006)	Questionnaire section2	Bivariate correlation, Pearson product-moment correlation coefficient, coefficient of determination
Null hypothesis H_{5_0} Alternative Hypothesis H_{5_1}	<ul style="list-style-type: none">• (Magretta, 2002)• (Jarvenpaa & Lang, 2005)• (National Small Business Act, 1996)• (Eriksson <i>et al.</i>, 2008)	Questionnaire section2	Bivariate correlation, Pearson product-moment correlation coefficient, coefficient of determination

5. RESULTS

5.1 Introduction

A causal study was conducted to determine whether there is a positive or negative impact caused by the use of mobile technologies on the various components of the business models of SMEs. All respondents to the survey were either owners or employees of a SME. To ensure that all respondents were SMEs, the Pietermaritzburg Chamber of Business database was used as a population from which to collect the required information.

The purpose of this chapter is to present the results of the survey. Descriptive statistics on the mobile technologies used by SMEs are presented. A bivariate correlation test was run to specifically assess whether the use of mobile technologies have a positive or negative impact on various components of the business model. These results are used to either accept or reject the hypotheses of this study. Some qualitative data is also presented to represent the views of some of the respondents.

5.2 Key considerations

There were 22 respondents to the online survey. This is below the desired number of 30 respondents and is considered a limitation of the research. Out of the 22 respondents, one did not complete the online survey. This respondent's data is therefore excluded from the study. All observations were independent of each other. That is, each respondent was not influenced by any other respondent of the survey.

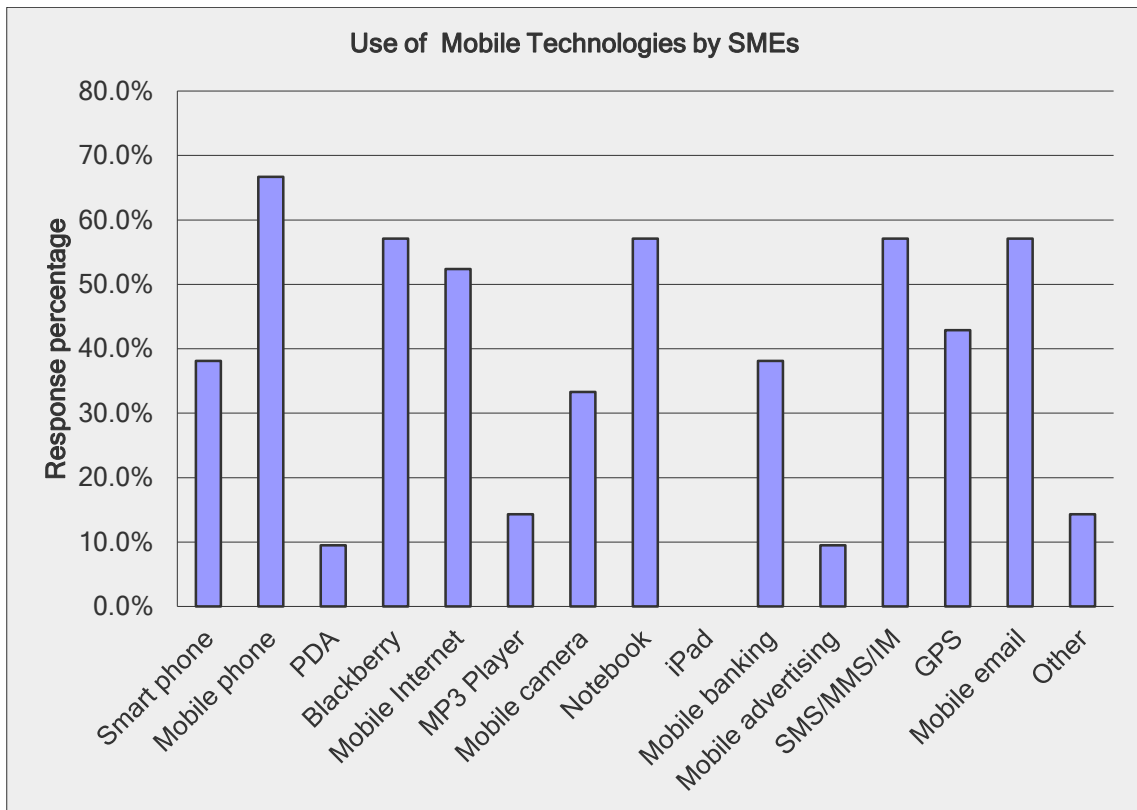
SMEs in this study use a wide range of mobile technologies. Although the questionnaire catered for mobile technology classification, this study does not aim to assess which type of mobile technologies have the most or least significant impact on the business model components. Instead, the purpose of the mobile technology classification section in the questionnaire was to assess the extent to which each respondent uses mobile technology in their SME.

5.3 Use of Mobile Technologies

All the respondents to the survey confirmed the use of mobile technologies. Although the respondents may come from SMEs in different industries, the use of mobile technologies is a common feature of daily business life. Figure 5.1 presents the extent to which mobile technologies are used by the respondents within their SME environment.

67% of all respondents make use of mobile phones as a tool within the SME. There is also significant use of Blackberries, notebooks, messaging and mobile email. Although classified as mobile technology, notebooks are not the focus of this study as they limit the ability of the user to move around as they conduct work on the device. Of the respondents who use only one of the mobile technologies in Figure 5.1, they confirmed the use of a Blackberry. The broadest mobile technology use, from the respondents had a count of 12. None of the respondents used iPads, confirming the view that this technology is relatively new with limited penetration within SMEs. Respondents who selected the ‘_Other’ option confirmed the use of 3G cards or modems as well as SKYPE, the Internet based technology that enables data, voice and video communications.

Figure 5.1: Use of Mobile Technologies by SMEs



The extent to which mobile technologies are used in the respondents' SMEs is measured by the number of mobile technology options selected in the questionnaire. For example, if a respondent confirmed the use of 12 mobile technologies in their particular SME, that would be regarded as more significant use of mobile technologies than a respondent who has confirmed the use of only four mobile technologies. This use of mobile technologies is captured in a single variable (Total) and was used in the bivariate correlation analysis.

5.4 Impact of Mobile Technologies

A total of 15 questions were asked regarding the impact of mobile technologies on the business model. The questions covered all four components of a business model as listed in Table 5.1.

Table 5.1: Breakdown of Business Model Components

Business Model component	Number of questions	Focus areas	Corresponding question
Customer value proposition	4	<ul style="list-style-type: none"> • Availability of offering • Targeting of customers • Product customisation • Customer relationships 	<ul style="list-style-type: none"> • 2.1 • 2.2 • 2.4 • 2.10
Key resources	4	<ul style="list-style-type: none"> • Utilisation of assets • Knowledge management • Mobility of staff • Governance 	<ul style="list-style-type: none"> • 2.7 • 2.8 • 2.9 • 2.15
Value chain	4	<ul style="list-style-type: none"> • Delivery speed • Distribution channels • Sourcing of raw materials • Processes 	<ul style="list-style-type: none"> • 2.3 • 2.11 • 2.12 • 2.13
Profit formula	3	<ul style="list-style-type: none"> • Cost • Margin • Productivity 	<ul style="list-style-type: none"> • 2.5 • 2.6 • 2.14

The average number of mobile technologies selected by the respondents is 5.33. This confirms the significant use of mobile technologies by the respondents. The use of mobile technology is the independent variable while the business model component is the dependent variable.

- Total – the number of mobile technologies selected by each respondent;
- Average – the mean of all the values collected in the business model section of the questionnaire;
- CVP – the mean of the values from the questions relevant to the customer value proposition section of the questionnaire;

- PF – the mean of the values from the questions relevant to the profit formula section of the questionnaire;
- KR – the mean of the values from the questions relevant to the key resources section of the questionnaire; and
- VC – the mean of the values from the questions relevant to the value chain section of the questionnaire.

The hypotheses for this study are shown in Table 5.2. The bivariate correlation tests discussed in this chapter seek to prove the hypotheses.

Table 5.2: Hypotheses

Hypothesis	Description
Null hypothesis $H1_0$	The use of mobile technologies has a positive impact on the business models of SMEs in Pietermaritzburg
Alternate hypothesis $H1_1$	The use of mobile technologies does not have a positive impact on the business models of SMEs in Pietermaritzburg
Null hypothesis $H2_0$	The use of mobile technologies has a positive impact on the customer value proposition of SMEs in Pietermaritzburg
Alternative Hypothesis $H2_1$	The use of mobile technologies does not have a positive impact on the customer value proposition of SMEs in Pietermaritzburg
Null hypothesis $H3_0$	The use of mobile technologies has a positive impact on the profit formula of Pietermaritzburg SMEs to their clients
Alternative Hypothesis $H3_1$	The use of mobile technologies does not have a positive impact on the profit formula of Pietermaritzburg SMEs to their clients
Null hypothesis $H4_0$	The use of mobile technologies has a positive impact on the key resources of SMEs in Pietermaritzburg
Alternative Hypothesis $H4_1$	The use of mobile technologies does not have a positive impact on the key resources of SMEs in Pietermaritzburg
Null hypothesis $H5_0$	The use of mobile technologies has a positive impact on the

	value chain of SMEs in Pietermaritzburg
Alternative Hypothesis $H5_1$	The use of mobile technologies does not have a positive impact on the value chain of SMEs in Pietermaritzburg

5.4.1 Descriptive statistics

Table 5.3 shows the descriptive statistics of the important variables of this study. Positive skewness values indicate that the scores of each variable are clustered towards the lower scores and are positively skewed. Negative values indicate the opposite. From Table 5.3 the only variables that are positively skewed are the Total and PF. This means that both these variables have more scores clustered towards the minimum as opposed to the maximum. The same variables (Total and PF) have Kurtosis values less than 0. This means that the distribution is relatively flat with fewer cases at the centre of the distribution and more towards the extremes.

The mean values of the business model variables (Average, CVP, PF, KR, and VC) are all above the scale median of three, suggesting that the use of mobile technologies have a positive impact on the various elements of the business. The standard deviation values of the business model variables are all within one standard deviation of the mean. For the use of mobile technologies (Total) there is a larger variation of the scores from the mean. This could be caused by the broader range of scores for this variable.

Table 5.3: Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
	Total	21	1	12	5.33	2.972	.450	.501	-.275
Average	21	2.5	5.0	3.667	.6077	-.315	.501	.790	.972
CVP	21	2.0	5.0	3.821	.7165	-.881	.501	1.114	.972
PF	21	2.0	5.0	3.429	.7630	.078	.501	-.567	.972
KR	21	2.9	5.0	3.798	.4876	-.211	.501	1.559	.972
VC	21	1.8	5.0	3.500	.7500	-.307	.501	.474	.972

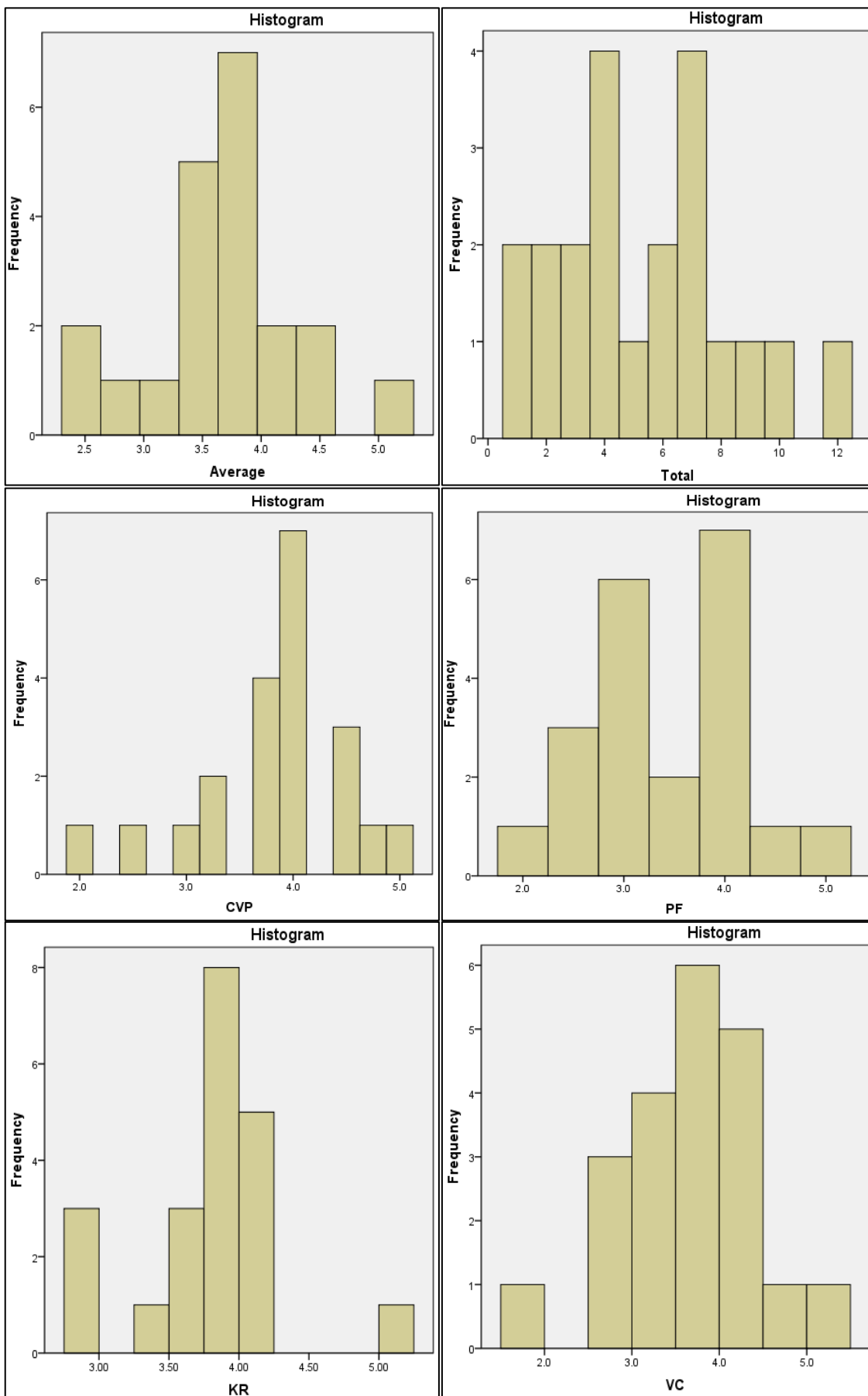
Some of the variables of this research are relatively normally distributed. Table 5.4 shows the normality tests that were run on all the variables. The Kolmogorov-Smirnov statistic represents tests for the normality of the variables. Sig. values above .05 are considered to be non-significant and indicate normality. All the variables have a significance value (Sig.) greater than .05.

Table 5.4: Tests for normality

	Kolmogorov-Smirnov ^a		
	Statistic	df	Sig.
Total	.149	21	.200*
Average	.175	21	.092
CVP	.222	21	.008
PF	.202	21	.026
KR	.202	21	.025
VC	.131	21	.200*

Figure 5.2 confirms the normality of the variables. It is evident from the histograms that the variables have most of the scores occurring in the centre of the histogram and tapering out towards the extremes.

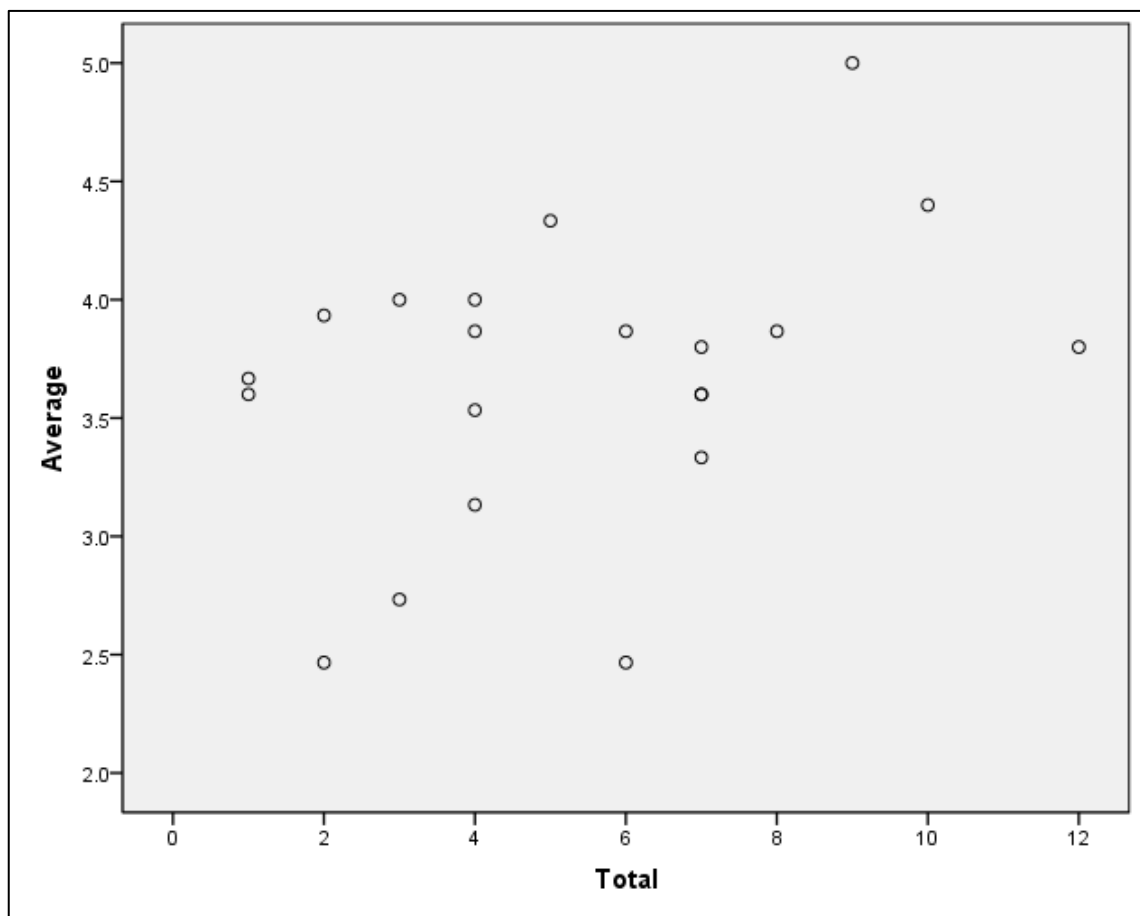
Figure 5.2: Histograms for key variables



5.4.2 Impact on overall business model

Figure 5.3 shows the scatter plot of the relationship between the use of mobile technologies (represented by the variable –Total”) and all the combined components of the business model (represented by the variable –Average”). From the scatter plot there appears to be a positive relationship between the variables. There are no apparent outliers as the scores are fairly spread across the graph area.

Figure 5.3: Scatter plot for use of mobile technologies and business model



The strength of the relationship is determined by value of the correlation coefficient. Stronger relationships are closer to either 1 or -1 (depending on whether the relationship is positive or negative). A correlation of 0 represents no relationship between the

variables. Although there are many ways of interpreting the correlation coefficient, the guidelines in Table 5.5 will be used (Pallant, 2010, p. 134).

Table 5.5: Guidelines for correlation interpretation

Interpretation of strength of correlation	Correlation coefficient
Small	0.10 – 0.29
Medium	0.30 – 0.49
Large	0.50 – 1.0

Table 5.6 shows the results of the correlation analysis. The relationship between the use of mobile technologies (Total) and the business models of SMEs (Average) was investigated using Pearson product-moment correlation coefficient. There was a medium, positive correlation between the two variables, $r=.367$, $n=21$ at a significance level where $p < .05$. There is no support to confirm the hypothesis that the use of mobile technologies has a positive impact on the business models of SMEs in Pietermaritzburg. The significance value of the correlation is 1.01, much greater than the significance level of .05. Based on this result, the null hypothesis H_{10} is rejected. The coefficient of determination measures the variance shared by the measured variables. In this case the coefficient of determination is 0.135. This means that the use of mobile technologies helps to explain nearly 14% of the variance in respondents' scores on the business model scale.

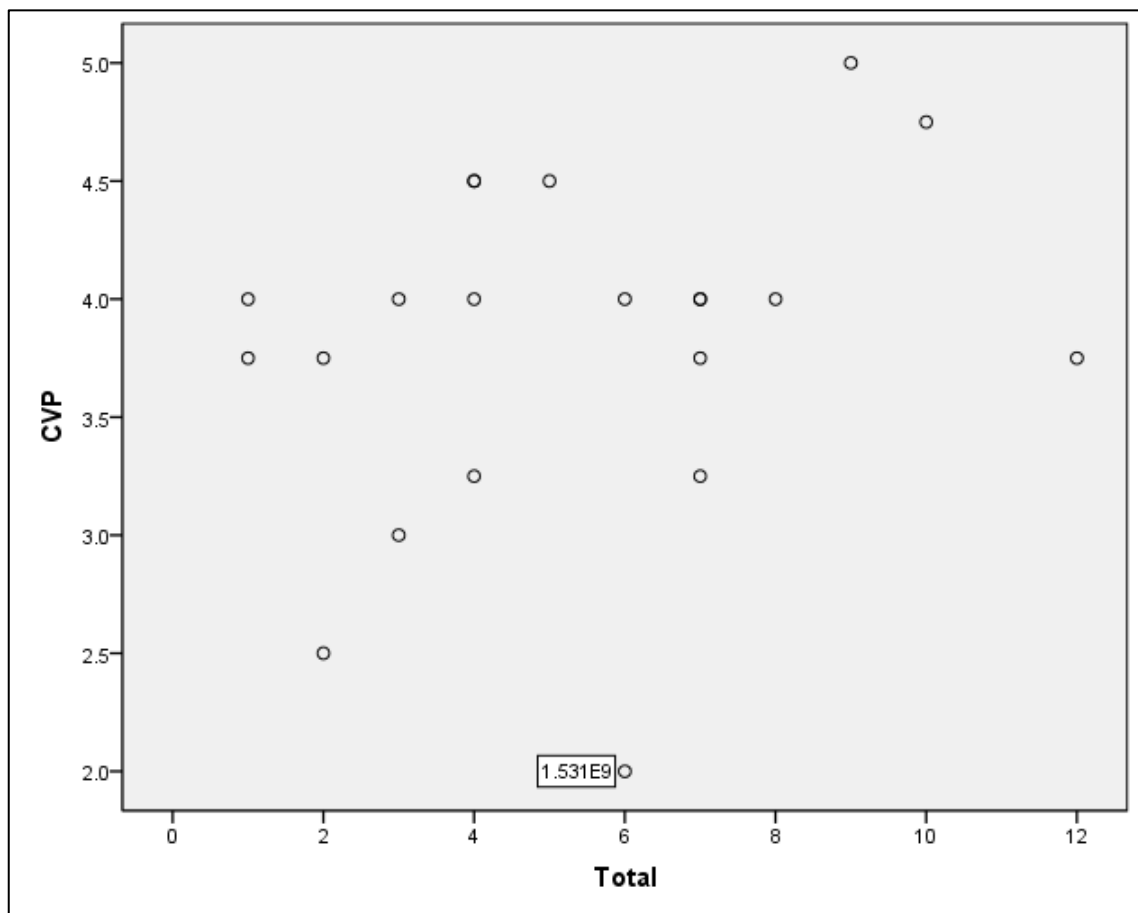
Table 5.6: Correlations between use of mobile technologies and the impact on all components of a business model

		Total	Average
Total	Pearson Correlation	1	.367
	Sig. (2-tailed)		.101
	N	21	21
Average	Pearson Correlation	.367	1
	Sig. (2-tailed)	.101	
	N	21	21

5.4.3 Impact on Customer Value Proposition

Figure 5.4 is the scatter plot showing the relationship between the use of mobile technologies (Total) and the impact on the customer value proposition (CVP). The relationship between the two variables is a positive one since the higher scores of one variable largely correlate with higher scores of the other variable. There appears to be a single outlier represented by case 1.531E9. Investigation of this outlier shows that the specific respondent had an average of 2.5 for all responses in the dependent variables.

Figure 5.4: Scatter plot for use of mobile technologies and customer value proposition



The result of the correlation analysis between the use of mobile technologies (Total) and the impact on the customer value proposition (CVP) is shown in Table 5.7. There was a small, positive correlation between the two variables, $r=.264$, $n=21$ at a significance

level where $p < .05$. There is no support to confirm the hypothesis that the use of mobile technologies has a positive impact on the customer value proposition of SMEs in Pietermaritzburg. The significance value of the correlation is .247, much greater than the significance level of .05. Based on this result, the null hypothesis H_{2_0} is rejected. The coefficient of determination measures the variance shared by the measured variables. In this case the coefficient of determination is 0.07. This means that the use of mobile technologies helps to explain only 7% of the variance in respondents' scores on the business model scale.

Table 5.7: Correlations between use of mobile technologies and the impact on the customer value proposition

		Total	CVP
Total	Pearson Correlation	1	.264
	Sig. (2-tailed)		.247
	N	21	21
CVP	Pearson Correlation	.264	1
	Sig. (2-tailed)	.247	
	N	21	21

There were four questions that related to the customer value proposition in the questionnaire. The questions focused on the availability of the product, customer targeting, customer relationships and customisation of products. Table 5.8 confirms that none of the elements exhibit a significant correlation with the use of mobile technologies. This further confirms the rejection of H_{2_0} .

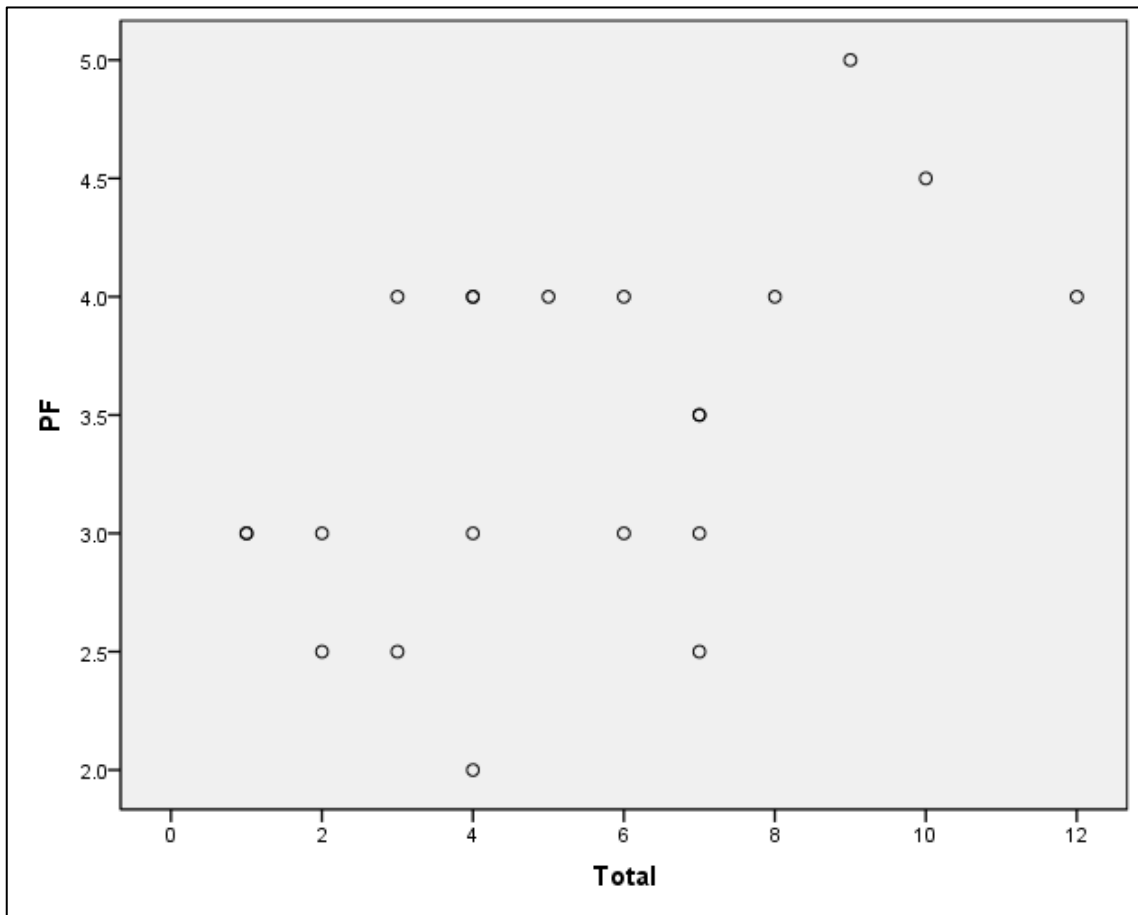
Table 5.8: Results on customer value proposition elements

		Availability	Targeting	Relationships	Customisation
Total	Pearson Correlation	.080	.081	.190	.105
	Sig. (2-tailed)	.730	.728	.409	.650
	N	21	21	21	21

5.4.4 Impact on Profit Formula

The correlation between the use of mobile technologies and the impact on the profit formula is shown in the scatter plot in Figure 5.5. It is evident that the relationship is a positive one with no obvious outliers in the scores.

Figure 5.5: Scatter plot for use of mobile technologies and profit formula



The result of the correlation analysis between the use of mobile technologies (Total) and the impact on the profit formula (PF) is shown in Table 5.9. There was a large, positive correlation between the two variables, $r=.529$, $n=21$ at a significance level where $p < .05$. There is support to confirm the hypothesis that the use of mobile technologies has a positive impact on the profit formula of SMEs in Pietermaritzburg. The significance value of the correlation is .014, which is lower than the significance level of .05. Based

on this result, the null hypothesis H_{3_0} is accepted. The coefficient of determination measures the variance shared by the measured variables. In this case the coefficient of determination is 0.28. This means that the use of mobile technologies helps to explain 28% of the variance in respondents' scores on the business model scale.

Table 5.9: Correlations between use of mobile technologies and the impact on the profit formula

		Total	PF
Total	Pearson Correlation	1	.529*
	Sig. (2-tailed)		.014
	N	21	21
PF	Pearson Correlation	.529*	1
	Sig. (2-tailed)	.014	
	N	21	21

*. Correlation is significant at the 0.05 level (2-tailed).

There were three questions that related to the profit formula in the questionnaire. Since the correlation between the use of mobile technologies and the impact on the profit formula is significant, a more detailed breakdown of the specific profit formula component is required. With reference to Table 5.1, the profit formula focused on costs, margin and productivity.

Table 5.10 presents the correlation coefficients between the use of mobile technologies and the various elements of the profit formula component (cost, margin, productivity). It is evident from the table that the use of mobile technologies has the most significant impact on the cost element with medium impact on the margin and productivity elements. The significance value of the correlation between Cost and Total is .004. The impact on cost is significant even at a confidence level where $p < .01$ and the coefficient of determination is .36. This means that the use of mobile technologies positively helps

SMEs to cut costs and also explains 36% of the variance in respondents' scores on the specific question on cost. The other correlation scores for Margin and Productivity are not significant even at a confidence level where $p < .05$. This implies that the use of mobile technologies has no impact on the profit margins and productivity of SMEs in Pietermaritzburg.

Table 5.10: results on the profit formula elements

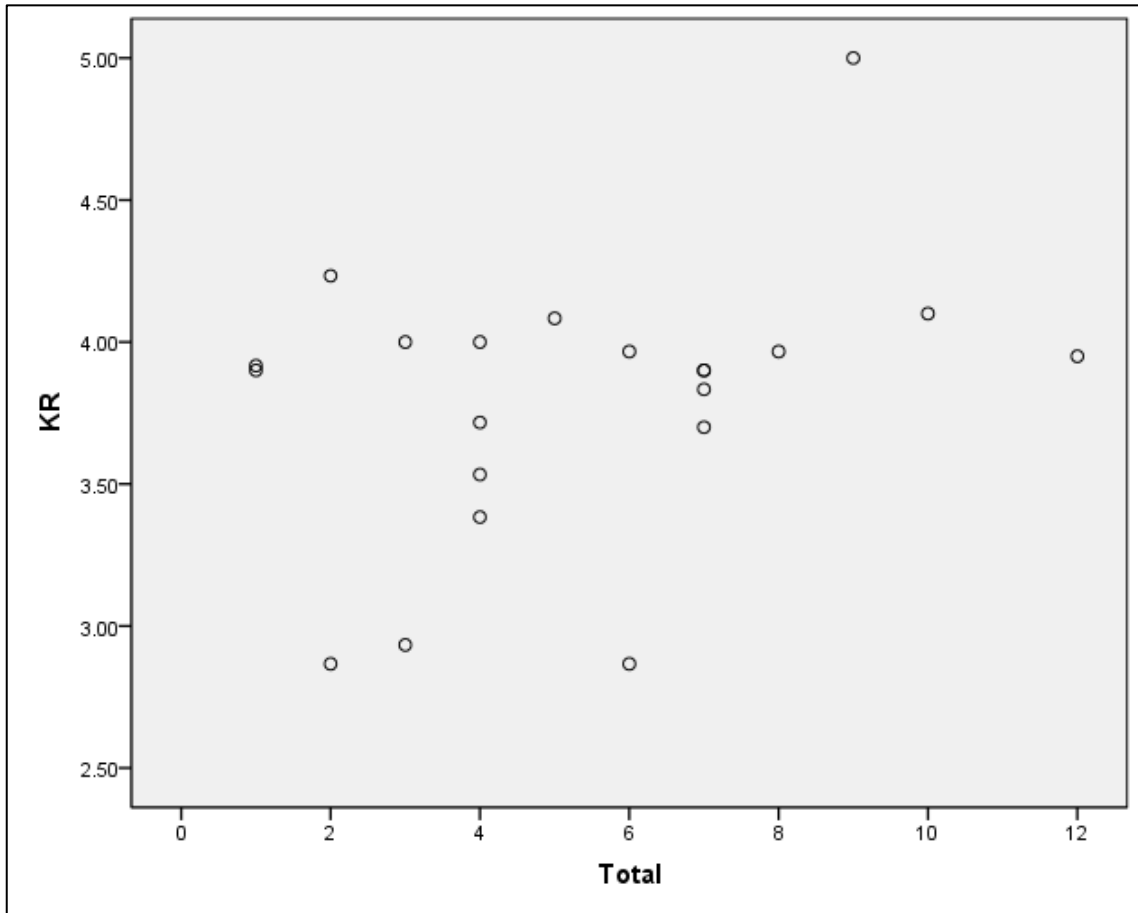
		Cost	Margin	Productivity
Total	Pearson Correlation	.598**	.392	.317
	Sig. (2-tailed)	.004	.079	.162
	N	21	21	21

** . Correlation is significant at the 0.01 level (2-tailed).

5.4.5 Impact on Key Resources

The relationship between the use of mobile technologies and the impact on key resources is shown in the scatter plot in Figure 5.6. Despite the positive relationship there seems to be a weak correlation between the two variables.

Figure 5.6: Scatter plot for use of mobile technologies and key resources



The result of the correlation analysis between the use of mobile technologies (Total) and the impact on the key resources (KR) is shown in Table 5.11. There was a medium, positive correlation between the two variables, $r=.342$, $n=21$ at a significance level where $p < .05$. There is no support to confirm the hypothesis that the use of mobile technologies has a positive impact on the key resources of SMEs in Pietermaritzburg. The significance value of the correlation is $.342$, much greater than the significance level of $.05$. Based on this result, the null hypothesis H_0 is rejected. The coefficient of determination measures the variance shared by the measured variables. In this case the coefficient of determination is 0.117 . This means that the use of mobile technologies helps to explain approximately 12% of the variance in respondents' scores on the business model scale.

Table 5.11: Correlations between use of mobile technologies and the impact on the key resources

		Total	KR
Total	Pearson Correlation	1	.342
	Sig. (2-tailed)		.130
	N	21	21
KR	Pearson Correlation	.342	1
	Sig. (2-tailed)	.130	
	N	21	21

There were four questions that related to the key resources in the questionnaire. The questions focused on the utilisation of assets, knowledge management, mobility of staff and governance. Table 5.12 shows that 3 out of the 4 elements have a significant correlation with the use of mobile technologies. The only element that showed no significant impact was the mobility of staff. The correlation coefficients for utilisation of assets, knowledge management and governance are all significant where $p < .05$. The coefficient of determination for the utilisation of assets variable is 0.296 which means that the use of mobile technologies helps to explain 30% of the variance in respondents' scores on the utilisation of assets question. The coefficient of determination for the knowledge management and governance variables is 0.198 which means that the use of mobile technologies helps to explain 20% of the variance in respondents' scores on the knowledge management and governance questions.

Table 5.12: Results on key resources elements

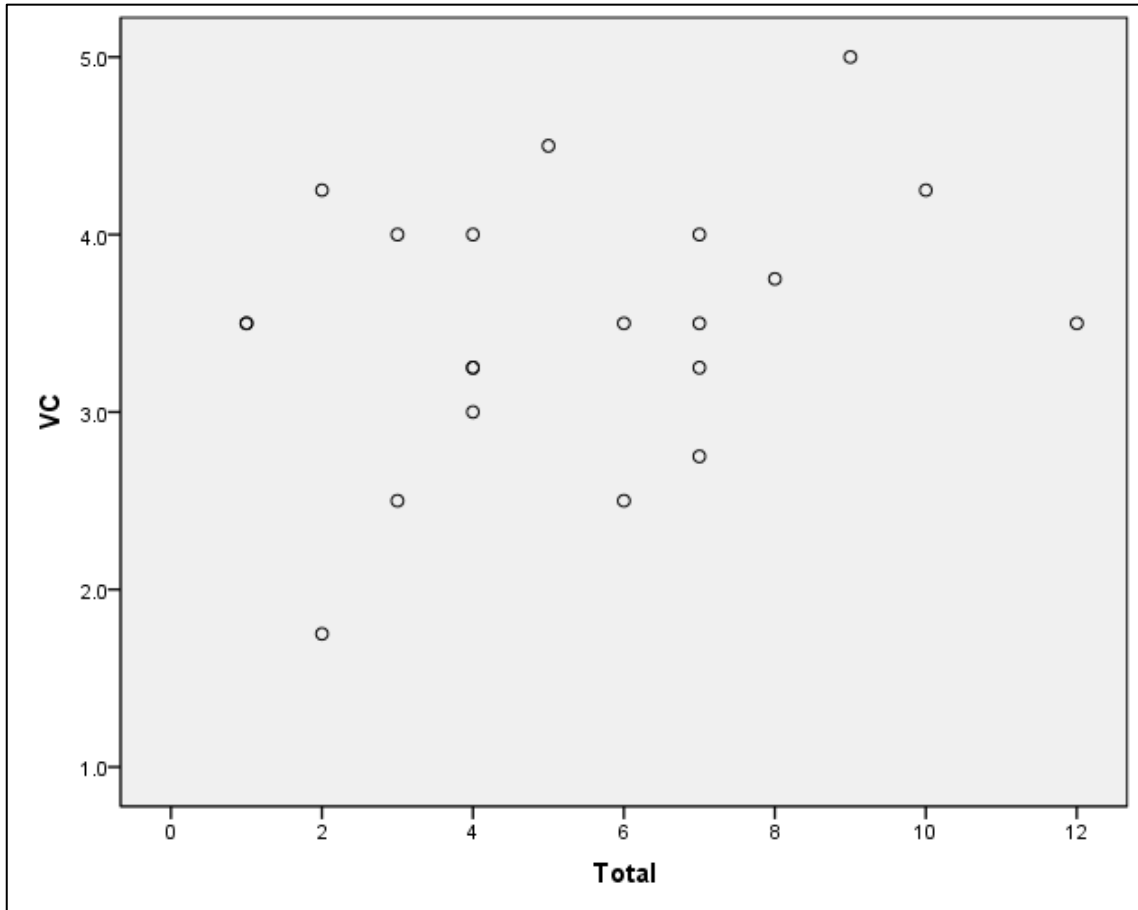
		Utilisation of assets	Knowledge management	Mobility of staff	Governance
Total	Pearson Correlation	.544*	.446*	-.038	.445*
	Sig. (2-tailed)	.011	.043	.881	.043
	N	21	21	21	21

** . Correlation is significant at the 0.05 level (2-tailed).

5.4.6 Impact on Value Chain

The relationship between the use of mobile technologies and the impact on the value chain is shown in the scatter plot in Figure 5.7. The relationship appears to be strongly correlated based on the position of the various cases. There are no apparent outliers.

Figure 5.7: Scatter plot for use of mobile technologies and value chain



The result of the correlation analysis between the use of mobile technologies (Total) and the impact on the value chain (VC) is shown in Table 5.13. There was a small, positive correlation between the two variable, $r=.292$, $n=21$ at a significance level where $p < .05$. There is no support to confirm the hypothesis that the use of mobile technologies has a positive impact on the value chain of SMEs in Pietermaritzburg. The significance value of the correlation is $.292$, much greater than the significance level of $.05$. Based on this

result, the null hypothesis H_{5_0} is rejected. The coefficient of determination measures the variance shared by the measured variables. In this case the coefficient of determination is 0.085. This means that the use of mobile technologies helps to explain only 9% of the variance in respondents' scores on the business model scale.

Table 5.13: Correlations between use of mobile technologies and the impact on the value chain

		Total	VC
Total	Pearson Correlation	1	.292
	Sig. (2-tailed)		.200
	N	21	21
VC	Pearson Correlation	.292	1
	Sig. (2-tailed)	.200	
	N	21	21

There were four questions that related to the value chain in the questionnaire. The questions focused on the delivery speed, distribution channels, sourcing and processes. Table 5.14 confirms that none of the elements exhibit a significant correlation with the use of mobile technologies. This further confirms the rejection of H_{5_0} .

Table 5.14: Results on value chain elements

		Delivery speed	Distribution channels	Sourcing	Processes
Total	Pearson Correlation	-.111	.210	.246	.277
	Sig. (2-tailed)	.632	.361	.282	.225
	N	21	21	21	21

** . Correlation is significant at the 0.05 level (2-tailed).

5.5 Results on hypotheses

Table 5.15 summarises the results against the hypotheses of this study hypotheses. Although the significant of the impact varies, mobile technologies have a positive

impact on the business models and components of the business models of SMEs in Pietermaritzburg.

Table 5.15: Results on the hypotheses

Hypothesis	Description	Result
Null hypothesis $H1_0$	The use of mobile technologies has a positive impact on the business models of SMEs in Pietermaritzburg	Reject
Alternate hypothesis $H1_1$	The use of mobile technologies does not have a positive impact on the business models of SMEs in Pietermaritzburg	Accept
Null hypothesis $H2_0$	The use of mobile technologies has a positive impact on the customer value proposition of SMEs in Pietermaritzburg	Reject
Alternative Hypothesis $H2_1$	The use of mobile technologies does not have a positive impact on the customer value proposition of SMEs in Pietermaritzburg	Accept
Null hypothesis $H3_0$	The use of mobile technologies has a positive impact on the profit formula of Pietermaritzburg SMEs to their clients	Accept
Alternative Hypothesis $H3_1$	The use of mobile technologies does not have a positive impact on the profit formula of Pietermaritzburg SMEs to their clients	Reject
Null hypothesis $H4_0$	The use of mobile technologies has a positive impact on the key resources of SMEs in Pietermaritzburg	Reject
Alternative Hypothesis $H4_1$	The use of mobile technologies does not have a positive impact on the key resources of SMEs in Pietermaritzburg	Accept
Null hypothesis $H5_0$	The use of mobile technologies has a	Reject

	positive impact on the value chain of SMEs in Pietermaritzburg	
Alternative Hypothesis $H5_1$	The use of mobile technologies does not have a positive impact on the value chain of SMEs in Pietermaritzburg	Accept

5.6 General comments

Additional comments were provided by some of the respondents. Some of the comments made reference to the way mobile technologies have improved the management of contract staff who work away from the office. One of the respondents said that the impact of mobile technologies is low due to the nature of their manufacturing business. Another respondent mentioned that excessive use of mobile technologies such as texting has resulted in poor planning and communication in his organisation.

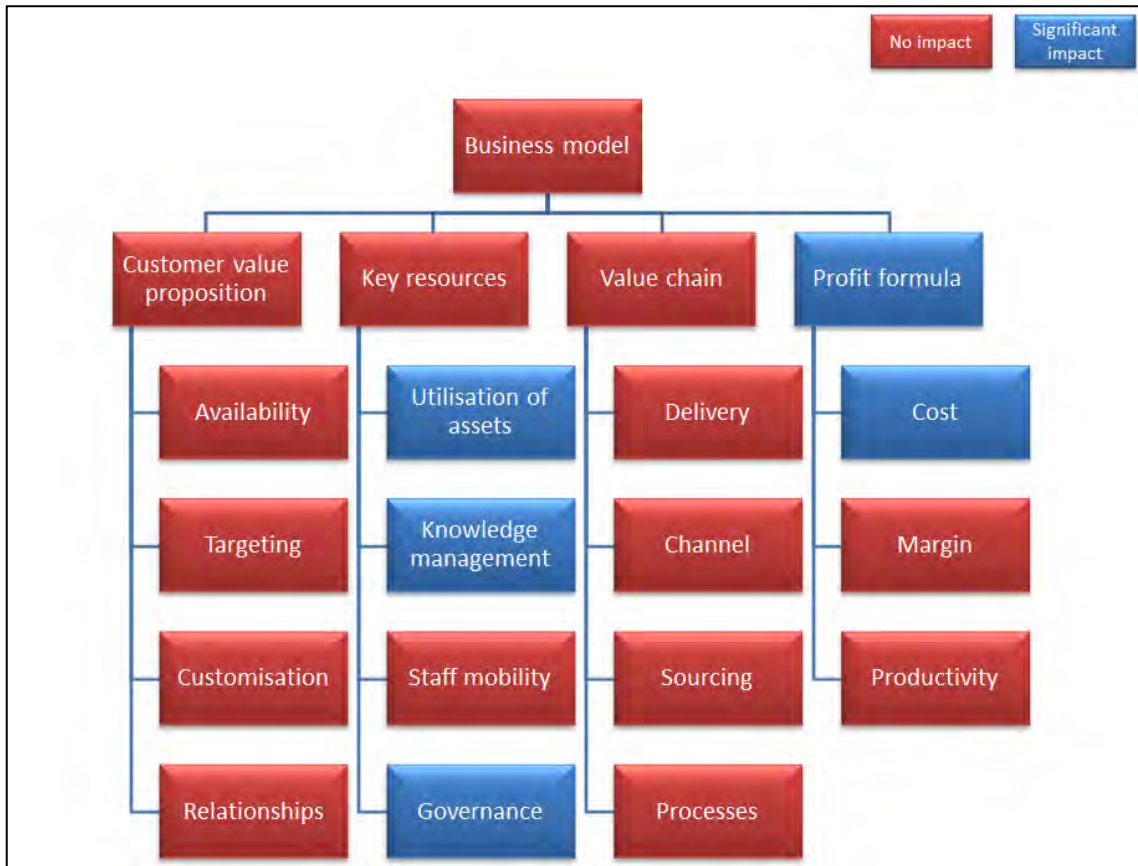
There seems to be contradictory sentiments with regards to the impact of mobile technologies in the sample SMEs. The nature of the business seems to matter for some while others apply mobile technologies sparingly in their businesses.

5.7 Summary

The objective of this chapter was to present the results of the study through the descriptive statistics as well as the bivariate correlation. The bivariate correlation looked at the impact of mobile technologies on the business model in general as well as each component of the business model. The profit formula, specifically the cost variable, yielded a significant correlation to the use of mobile technologies. Although the use of mobile technology had no impact on the key resources of the samples SMEs, the utilisation of assets, knowledge management and governance yielded significant

correlations to the use of mobile technology. Figure 5.8 summarises the results of the correlation tests.

Figure 5.8: Summary of results



General comments provided by the respondents provide limited insight into the reasons for the results. Some said mobile technologies had a positive impact while other claimed the impact was negative. A detailed discussion is required to determine the extent to which the results align to existing literature.

6. ANALYSIS

6.1 Introduction

The research question for this research is: *“What is the impact of mobile technologies on the business model of SMEs in Pietermaritzburg?”* In order to answer this research question, the following research objectives are addressed:

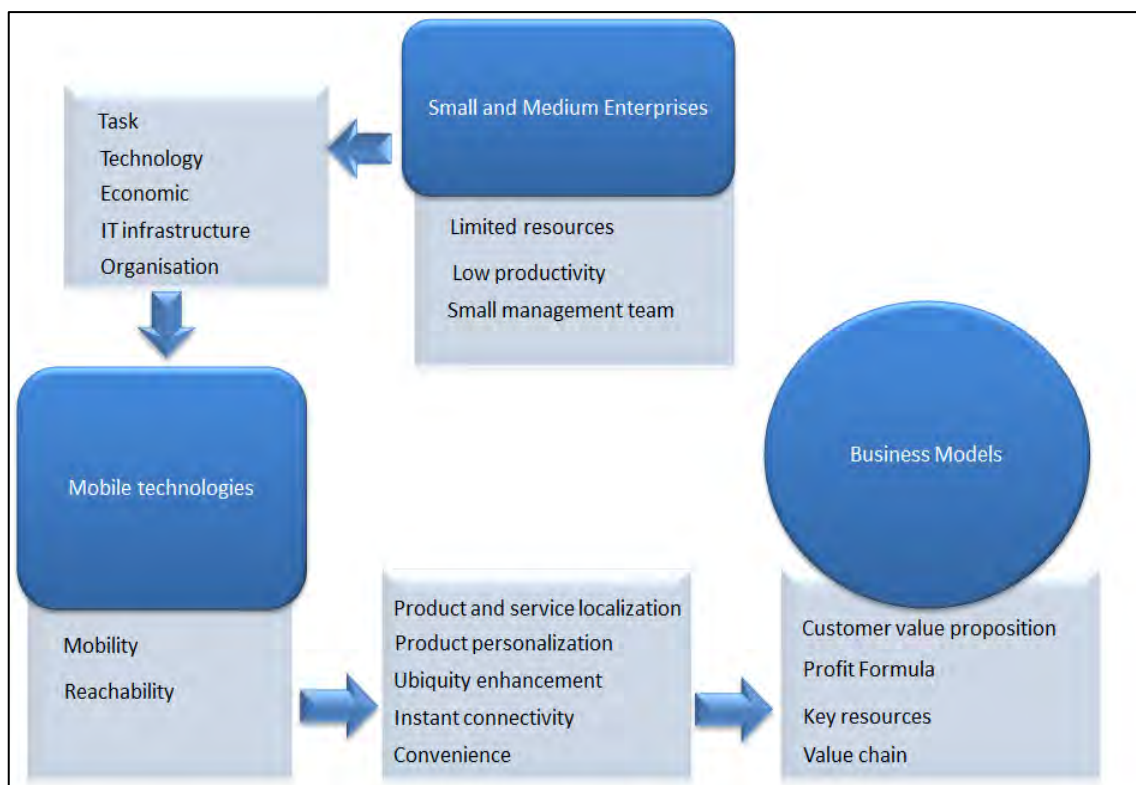
- To gain an insight into the impact of using mobile technologies on SME business models in Pietermaritzburg;
- To understand how SMEs profitably create and deliver value to customers using mobile technologies

The theoretical basis of this study has shown that technology typically has a positive impact on the effectiveness of the business. For general organisations, Colander (2010) asserts that technology also enables the development of new and different products. This implies that technology has an impact on the customer value proposition of an organisation. The results in Chapter 5 proved that there is no significant impact of using mobile technologies on the business models of SMEs. There is, however, a significant impact on the profit formula and specifically the cost structure of an SME. It would seem that managing costs is the biggest driver for the sampled SMEs to adopt mobile technologies in the business.

Figure 6.1 illustrates the interrelationships between the various aspects of this research. It is acknowledged that the characteristics of mobile technologies present unique opportunities for businesses to improve the effectiveness of the business model as a whole. This is particularly relevant for SMEs because the average SME has limited

resources and suffers from low levels of productivity as a result (Muhammad *et al.*, 2010, p. 68). The adoption of mobile technologies by SMEs has an impact on the type of mobile technologies that are used within the business. This in turn will impact the types of opportunities presented to the SME to improve the effectiveness of the business model (Liang *et al.*, 2007, p. 1156).

Figure 6.1: Consolidation of research



The purpose of this chapter is to analyse the nature of the results of Chapter 5 within the context of the theoretical foundations discussed in Chapter 2. Each hypothesis result is compared with prior research and an explanation is provided for all the findings.

6.2 Use of mobile technologies

Literature confirms that SMEs are already using mobile technologies. The types of mobile technologies vary from simple text messages to sophisticated mobile

applications (Balocco, Mogre, & Toletti, 2009, p. 245; Dhar & Varshney, 2011, p. 126). This study has confirmed that mobile technologies are used by SMEs. More importantly, SMEs use mobile technologies for business purposes instead of taking advantage of the wide-spread availability of mobile devices and using them for personal reasons. All 21 respondents highlighted the use of at least 1 mobile technology and a maximum of 12 different mobile technologies.

The variation among the respondents could be explained by the adoption factors identified by Liang *et al.* (2007, p. 1158). Firstly the tasks to be completed using mobile technologies could vary across the various SMEs. Some may use mobile technologies for transacting through a bank while others may use it to communicate with customers. The complexity of the technology, the readiness of the organisation, information intensity, and the competitive environment could all be factors that could explain the variation in the use of mobile technologies by the sampled SMEs. In this study the use of mobile technologies is assumed and is a prerequisite to the qualification of respondents to the survey.

It is no surprise that the mobile phone is the most common piece of mobile technologies among the sampled SMEs. This confirms the exponential growth rate of mobile devices from the study by the International Telecommunication Union (2009, p. 1) which states that mobile device subscriptions grew approximately 8 times faster than Internet users in 2008. The drop in technology prices has also presented an opportunity for SMEs with limited resources to widely use technologies such as Blackberries and mobile Internet.

6.3 Hypothesis $H1_0$

The first hypothesis $H1_0$ states that the use of mobile technologies has a positive impact on the business models of SMEs in Pietermaritzburg. The results of this study have led to the rejection of $H1_0$.

6.3.1 Literature comparison

Various studies (Atkins, *et al.*, 2006, p. 1; Sheng *et al.*, 2005, p. 269; Kumar & Zahn, 2003, p. 515) have confirmed that the use of mobile technologies improves the business model of organisations in general. Sheng *et al.* (2005) confirm that mobile technologies has a strategic impact on organisations through improved work processes, effective internal communication and sharing, as well as enhance sales and marketing to customers. This implies that mobile technologies have positive impact on all aspects of a business model.

Molony (2008, p. 175) conducted a study on the use of mobile technologies in the informal construction sector in Tanzania. The findings of this study showed that the informal construction sector in Tanzania has taken advantage of the pervasiveness of mobile devices and many entrepreneurs solely rely on these devices for survival. This is an example of the positive impact of mobile technologies on SMEs. There are businesses that would not survive if it was not for mobile technologies. This implies that mobile technologies have such an impact on the business model that they even drive the very existence of the firm.

6.3.2 Evaluation from study

The results of this study show that the use of mobile technologies does not have an impact on the overall business model of SMEs. Although the relationship between the use of mobile technologies and the overall business model was positive, the strength of the correlation was not significant enough to confirm the hypothesis. This implies that if mobile technologies are introduced into an SME at an overall business model level there would be no significant impact to the business. It might be more effective to identify the specific business model component and introduce mobile technologies within its narrowly defined scope.

6.3.3 Overall findings

The theoretical foundations of the literature on the impact of mobile technologies on businesses in general cannot be extrapolated to SMEs. The nature of SMEs (low productivity, limited resources) may have an impact on the ability of the SME to adopt mobile technologies that will have a wide impact on the overall business model. Also, the various factors that impact the adoption of mobile technologies may make it more difficult for mobile technologies to have a wider impact. For example, the maturity of the IT infrastructure in some of the sample SMEs is possibly too immature to accommodate a wide-spread adoption of mobile technologies. These SMEs may then choose to adopt mobile technologies in a narrowly defined area such as knowledge management.

The findings from this research do not explain the nature of the business models of the sampled SMEs. There is therefore no way of assessing the quality of the various business models from the 21 respondents. Mobile technologies cannot convert a bad

business model into an effective one but can only enhance one that already works. It may well be that the business models from the sample were not strong enough to begin with; hence there is no impact from the use of mobile technologies. A more optimistic explanation could be that the industry of the SME would set specific boundaries on the impact of mobile technologies based on the characteristics of the industry.

6.4 Hypothesis $H2_0$

Hypothesis ($H2_0$) says that the use of mobile technologies has a positive impact on the customer value proposition of SMEs in Pietermaritzburg. The results of this study have led to the rejection of $H2_0$.

6.4.1 Literature comparison

The ubiquity of mobile devices makes it possible to make mobile services available to the user at any time and from anywhere with little concern for the user's location (Tsalgaidou & Pitoura, 2001, p. 224). There are examples of content providers who make use of mobile technologies to make their content available to customers. Good examples of this are traffic news organisations. In a study by Wang & Cheung (2004, p. 55), travel agencies made use of mobile technologies to make services such as providing directions to nearby restaurants, electronic passenger check in and car rental bookings to customers. Customers are now able to make use of their mobile devices to conveniently access these services from anywhere.

In another study by Eriksson *et al.* (2008, p. 50), mobile technologies was used to provide e-newspapers to consumers. Specific mobile devices with an e-paper reader

were used by customers to access news services from anywhere and at any time. The characteristics of the technology made it possible to even segment the client base and tailor services for the various segments. In a similar study, the pervasiveness of mobile devices in Nigeria has created significant opportunities to provide movie download services to the public (Lambeek, 2009, p. 27).

Due to most people having access to a personal mobile device, there are opportunities for customised services to customers. Harker & Van Akkeren (2002, p. 206) confirm that the use of mobile technologies by SMEs can bring about opportunities to personalise services to individual consumers and possibly align this with differentiated pricing. Context-aware services utilise the information about the user's environment to adapt services to the user needs at any specific point in time (de Reuver & Haaker, 2009, p. 240).

Context-based architectures can be built to predict user preferences and result in effective customer targeting (de Reuver & Haaker, 2009, p. 244). The information gleaned from a user's context is typically used to target specific consumers for advertising and marketing promotions (Dhar & Varshney, 2011, p. 124). The targeting of customers is enhanced through direct mobile marketing by reducing the amount of irrelevant content due to a better understanding of the user's context (Mort & Drennan, 2002, p. 15).

The availability of mobile device users means that businesses can contact customers more regularly, even outside of office hours. Kumar & Zahn (2003, p. 519) in their study confirm that mobile technologies keep the lines of communication open between

design, manufacturing, marketing, the suppliers and the customer. Sales functions particularly, use mobile devices to build better relationships with customers due to quicker responses to queries and a deeper understanding of the customer (Sheng *et al.*, 2005, p. 272).

6.4.2 Evaluation from study

Contrary to existing literature the results of this study showed that the use of mobile technologies has no impact on the customer value proposition of SMEs. All the various elements of the customer value proposition showed very weak correlations. This implies that the sampled SMEs do not use mobile technologies to strengthen their value proposition through convenient access to the product, target specific customer segments, improve the quality of the relationships with customers and customise products to meet specific customer requirements.

6.4.3 Overall findings

Despite the evidence that the use of mobile technologies has a positive impact on the availability of a firm's product, the results of this study showed no such impact for the sampled SMEs. The characteristics of mobile technologies (mobility and reachability) and the opportunities as a result (localisation, personalisation, ubiquity, connectivity and convenience) have not been enough for the sampled SMEs to target, build better relationships and customise products for customers. A possible explanation for this result could be that the majority of the sampled SMEs were not mature enough to integrate mobile technologies into the value proposition, or that the sectors they trade within were not suited to this particular use of mobile technology. Further investigations

into the adoption strategies of the sampled SMEs is required to gain a deeper understanding of why there is no result that confirms what currently exists in the literature. This analysis would need to take into account the characteristics of SMEs.

6.5 Hypothesis 3

Hypothesis H3₀ says that the use of mobile technologies has a positive impact on the profit formula of SMEs in Pietermaritzburg. The results of this study have led to the acceptance of hypothesis H3₀.

6.5.1 Literature comparison

The use of technology typically has a positive impact on the profit formula of a business. The study of Hoyer, Janner, Mayer, Raus, & Schroth (2006, p. 289) showed that automation of certain work processes can achieve higher levels of productivity. This productivity can be re-invested in the business to increase the revenues by engaging in more productive work. Ongori & Migiro (2010, p. 96) extend this notion to SMEs and assert that ICTs reduce the transaction costs of SMEs and broaden market reach. This has positive spin-offs from a profitability point of view. Broadening market reach potentially increases the revenue while the reduction of transaction costs result in the delivery of same value at a cheaper rate.

In the study by Eriksson *et al.* (2008, p. 32) the reduction of production and distribution costs as well as the possibility of expanding market reach was the key drivers for adopting e-newspapers. In another study by Opiyo & K'Akumu (2006, p. 254), the use of ICTs resulted in significant savings in travel costs for businesses within the informal

sector in Kenya. Sheng *et al.* (2005, p. 283) confirmed in their study that the use of mobile technologies by sales representatives resulting in the reduction of printing and information distribution costs.

Aspects of the profit formula are dependent on each other. That is, the profit margins depend on the reduction of costs and an increase in revenues. This result is likely to occur if there are high levels of productivity within a firm. The study by de Mendonca, Freitas, & de Souza (2008, p. 136) confirms that the use of technology results in higher levels of labour productivity.

6.5.2 Evaluation from study

The results of this study showed a significant correlation between the use of mobile technologies and the profit formula of SMEs. This implies that SMEs use mobile technologies for financial gains. There is a clear focus on the reduction of costs as this variable had a significant result whereas the margin and productivity variables had insignificant correlations. This means that the sampled SMEs adopt mobile technologies in order to reduce costs rather than improve profitability and productivity. This is likely to free up scarce resources for re-investment in other productive activities in the business.

6.5.3 Overall findings

Given that SMEs have limited resources and suffer from low levels of productivity it is expected that there be a significant correlation between the use of mobile technologies and the profit formula of SMEs. Moreover, the reduction of costs is likely to be one of

the main drivers for adopting mobile technologies. In order to survive, SMEs adopt mobile technologies for rapid gains that will improve the chances of survival. The results of this study are aligned with the view that the adoption of technology by SMEs is rarely strategic but rather opportunistic

6.6 Hypothesis 4

Hypothesis (H_{4_0}) says that the use of mobile technologies has a positive impact on the key resources of SMEs in Pietermaritzburg. The results of this study have led to the rejection of H_{4_0} .

6.6.1 Literature comparison

Mobile technologies have influenced the way resources are utilised within organisations. Existing technology environments have to be redesigned in order to integrate mobile devices and ensure the way users interface with organisational systems is seamless (de Reuver & Haaker, 2009, p. 245). Adopting the right mobile technologies can enhance the core competencies of an organisation. Aligning technology infrastructure to human resources is often a source of competitive advantage for firms (Wang & Cheung, 2004, p. 45).

ICTs can improve information and knowledge management within a firm (Ongori & Migiro, 2010, p. 95). A study by Sheng *et al.* (2005, p. 279) confirms that the use of mobile technologies can enhance the sharing of knowledge among sales representatives on the product set of the organisation. The characteristics of mobile technologies make it a viable platform on which employees can share knowledge effectively and efficient.

Multi-unit organisations, inter-firm cooperation and internationalisation of markets and client relationships have pushed the mobility of staff higher up the priority list of many organisations (Aguilera, 2008, p. 1110). Mobile technologies are a key facilitator of this mobility. Schlosser (2007, p. 183) in her study proposed that sales managers use mobile devices to support and manage the performance of sales representatives. With advancements in mobile technologies, managing remote employees has become a common aspect of business life.

The introduction of mobile devices introduced complexity to technology architectures in business. Mobile devices typically have to be integrated into an existing technology environment to create a seamless experience for users (Barnes & Scornavacca, 2007, p. 174). New network actors such as payment providers, aggregators and privacy providers make governance through Service Level Agreements important (de Reuver & Haaker, 2009, p. 245). New forms of governance are also emerging as a result of mobile technologies.

6.6.2 Evaluation from study

Although the results of this study show that the use of mobile technologies has no impact on the key resources of SMEs, closer inspection of the various elements of key resources reveal interesting results. The utilisation of assets, knowledge management and governance all showed significant and positive correlations to the use of mobile technologies. This implies that SMEs use mobile technologies for enhancing their core competencies and share knowledge while making an effort to maintain control over business activities. One respondent make a comment that there is a need to better manage mobile devices at a corporate level in his business. The more SMEs use mobile

technologies, the more effective the core competencies and knowledge sharing are. Increased use of mobile technologies increases the complexity of the technology architecture and strengthens the need for governance. There was no significant correlation between the use of mobile technologies and mobile workers. There is therefore no evidence to suggest that SMEs use mobile technologies as a means to enhance the effectiveness of a mobile workforce.

6.6.3 Overall findings

With the advent of knowledge workers and the pervasiveness of mobile devices, businesses need to adopt mobile technologies to improve the effectiveness of key resources. People and technology are key resources in a knowledge economy. The results of this study partially confirm the current literature. On the one hand, there is evidence to suggest that the use of mobile technologies positively impacts the effectiveness of core competencies, knowledge sharing and governance. On the other hand, there is no evidence to prove that mobile technologies improve the effectiveness of mobile workers. This is rather surprising given the various examples of mobile workers in the literature. A respondent also made a comment about the need to use mobile technologies in her business due to having contract workers based in different countries.

It can be argued that the results are influenced by the nature of the particular business. For example, another respondent commented that his firm is a traditional manufacturer and does not need to use mobile technologies extensively. Although hypothesis H4₀ is rejected, the majority of elements for the key resources component of the business model show a significant and positive correlation to the use of mobile technologies.

6.7 Hypothesis 5

Hypothesis (H_{5_0}) says that the use of mobile technologies has a positive impact on the value of SMEs in Pietermaritzburg. The results of this study have led to the rejection of H_{5_0} .

6.7.1 Literature comparison

Mobile technologies create the possibility of capturing and submitting a customer order in real time to ensure the speedy delivery of a product or service. Some services such as mobile banking are delivered efficiently to the user of a mobile device in real time. The ubiquity of mobile technologies makes it possible to deliver services to mobile devices in real time (Tsalgatidou & Pitoura, 2001, p. 224). This is driven by standards such as Wireless Application Protocol (WAP) for delivering Internet services via a mobile device (Barnes S. J., 2002, p. 94).

As a channel, mobile devices can be effective provided the device is appropriate for the product sold. The mobile device has been used to provide services such as car rental bookings (Wang & Cheung, 2004, p. 55) and products such as e-newspapers (Eriksson *et al.*, 2008, p. 50). The attractiveness of the mobile device as a viable distribution channel for products and services is its ability to received real time information from anywhere and at any time.

Mobile supply chain management is a relatively new concept that applies mobile technologies to the management of a supply chain. A study by Tserng, Dzung, Lin, & Lin (2005, p. 242) confirms that the use of mobile technologies such as PDAs and bar code scanners to effectively source goods in the construction industry. Successful

implementation of mobile supply chain management can yield positive results in the integration and coordination of the supply chain, the effectiveness of relationship management with suppliers, as well as a clear competitive advantage (Eng, 2006, p. 685).

Technology typically improves the effectiveness of business processes due to automation and real-time processing of data (Hoyer *et al.*, 2006, p. 289). The characteristics of mobile technologies have the potential of driving business process transformation if adopted appropriately (Sheng *et al.*, 2005, p. 273). In a study by Balocco *et al.* (2009, p. 252), mobile technologies was used to optimise processes in the back office, administrative office and sales functions of various firms. Despite this potential, standardisation of processes is often required in order to integrate mobile technologies into the existing architecture of the business (de Reuver & Haaker, 2009, p. 245).

6.7.2 Evaluation from study

The results of this study showed no evidence of a significant correlation between the use of mobile technologies and the value chain of SME. Even when considering the various elements of the value chain (delivery speed, distribution channels, sourcing and processes), the correlations were not significant. The implication of this finding is that SMEs do not use mobile technologies to improve the way they create value for their customers. This contradicts the existing literature that states that the adoption of mobile technologies brings benefits to the value chain of the organisation.

6.7.3 Overall findings

Despite the evidence that mobile technologies can enhance the value chain of an organisation, the SMEs in this study did not see the same benefits in their organisation. Integrating mobile technologies to the core processes of a business can be a challenge for SMEs who have limited resources and skill to do so. This could be a reason to explain the results of this survey. Even for SMEs who operate in environments where processes are critical, there was no evidence of integrating mobile technologies into the value chain. There was a single respondent who stated that they started a business less than a year ago and have successfully integrated mobile technologies into their entire business. It could be argued that the maturity of a firm at the time of introducing mobile technologies is a significant factor in this case. The more mature a business is, the more difficult it would be to change existing core processes to accommodate mobile technologies. A new business, on the other hand, still has the opportunity to define these core processes and can integrate mobile technologies effectively without having to change much.

6.8 Research Question

The research question for this study was: *“What is the impact of mobile technologies on the business model of SMEs in Pietermaritzburg?”* In order to answer this question, two research objectives were pursued.

6.8.1 Research objective 1

This study provided insight into the impact of using mobile technologies on the business models of SMEs. Overall, there is no evidence to confirm that mobile technologies have any impact. When the details of the study are interrogated, however, there is enough evidence to prove that using mobile technologies can help SMEs cut cost, enhance their

core competencies and manage organisational knowledge effectively while ensuring there are adequate controls in place to ensure proper governance.

The research objective has thus been met. There are certain aspects that will require further investigation in subsequent studies. For example, the types of mobile technologies adopted by SMEs could impact the degree to which they positively or negatively impact the business. This requirements, however, falls outside the scope of this particular study.

6.8.2 Research objective 2

A business model is all about creating and delivering value to customers at a profit. This study revealed that the use of mobile technologies is an important aspect of dealing with the challenge of limited resources. The evidence suggests that mobile technologies are employed as a support tool to increase the productivity of resources and cut costs. The key components of creating value (customer value proposition) and delivering the value (value chain) have seen little impact from using mobile technologies. This result may be different for SMEs whose core business is mobile technologies.

Research objective 2 has been met. SMEs use mobile technologies in support of the core activities that create and deliver value to customers.

In summary, the research question has been answered. Mobile technologies positively impact the profit formula as well as certain aspects of the key resources of SMEs. Evidence is provided through the proof of hypothesis $H3_0$ and the detail of hypothesis $H4_0$.

7. CONCLUSIONS

7.1 Introduction

The pervasiveness of mobile technologies has led to their wide spread adoption by businesses of all sizes. Developing regions particularly, have shown exponential growth in uptake of mobile devices due to a lack of traditional ICT infrastructure (International Telecommunication Union, 2009, p. 1). This proliferation presents new opportunities for businesses in continents such as Africa. SMEs could benefit from the opportunities brought about by the ubiquity, personalisation, connectivity, localisation and convenience of mobile technologies.

Understanding the impact of mobile technologies to the business models of SMEs provides insight into the value of these technologies on the creation and delivery of value to customers. This insight is useful to SMEs who wish to adopt mobile technologies into their business. Moreover, the results of this study could also be useful to mobile technology companies by providing insight into the usefulness of mobile devices and application to SMEs. This could eventually lead to a design of mobile technologies specifically for the SME environment.

The purpose of this study was to determine the impact of using mobile technologies on the business models of SMEs in Pietermaritzburg. The quantitative study showed that using mobile technologies has a significant impact on the profit formula and certain aspects of key resources of SMEs. The objective of this chapter is to reflect on the research contributions (Section 7.2), in order to identify limitations of this study (Section 7.3) as well as to make recommendations for future research (Section 7.4).

7.2 Research contributions

The objectives of this research were identified as follows (Section 1.7):

- To gain an insight into the impact of using mobile technologies on SME business models in Pietermaritzburg; and
- To understand how SMEs profitably create and deliver value to customers using mobile technology.

Through the achievement of the research objectives, this study has contributed to both theoretical (Section 7.2.1) and practical applications of mobile technologies in SMEs (Section 7.2.2). Although various studies that focus on mobile technology adoption models exist, they do not attempt to assess the type of impact this adoption could have on the SME as a business. This study is concerned with the relationships between the use of mobile technologies and business models of SMEs.

7.2.1 Theoretical contribution

This research has taken into account the characteristics of SMEs and mobile technologies and the various components of a business model. Although research has been conducted in each of these fields individually, the contribution of this research is in combining the various aspects and providing insight into the impact to SMEs. This study looked at the outcome of adopting mobile technologies on the value creation and delivery aspects of the SMEs.

The results of this study suggest that SMEs look at initially utilising mobile technologies to cut costs. Next, SMEs consider enhancing core competencies by leveraging the advantages of mobile technologies. This suggests that given the

characteristics of SMEs (limited resources, low productivity and small management team); it is advisable for SMEs to initially look at mobile technologies as a support structure to the creation and delivery of value to customers. The findings suggest that generic mobile technologies are likely to have the most impact on cutting costs and enhancing core competencies. Any further impact will require careful consideration of the adoption factors highlighted in the literature as well as possible customised mobile technologies.

Theoretically the outcome of this study provide a useful dimension in understand the impact of mobile technologies. The work of de Reuver & Haaker (2009, p. 245) has proven that the existing technology environments in business need to be redesigned in order to accommodate new technologies such as mobile devices. This introduces a specific level of complexity, especially if the intention is to integrate mobile technologies into the core processes and value proposition of a firm. A model could therefore be developed to assess the level of complexity as well as the impact of introducing mobile technologies into an SME environment.

7.2.2 Practical contribution

This research encourages the extension of the considerations for SMEs when adopting mobile technologies. Instead of considering the adoption factors as suggested by Liang *et al.* (2007, p. 1158), SMEs should also consider the implications of mobile technologies on the business model of the organisation. When practitioners adopt mobile technologies for their SME, they should take into account that it is more practical to adopt the technology with a view of improving the profit formula and key resources of the business. The nature and maturity of the business, however, should also be taken

into account in order to have a significant impact on the creation and delivery of value to customers. This integration, however, comes with the possible complexity of redesigning the existing technology environment.

The creation and delivery of value to customers can be further enhanced by using mobile technologies. It is recommended to practitioners that before mobile technologies are incorporated into the customer value proposition and the value chain, the business case for cutting costs and enhancing core competencies is clarified. It appears to be more difficult to incorporate mobile technologies into a product offering or core processes of an organisation. This requires integration into the existing business and technology architecture. Considering the circumstances of many SMEs, it is recommended that mobile technologies be initially adopted to cut costs and enhance key resources. When the SME is ready to incorporate mobile technologies to the value proposition and core processes, careful consideration of the appropriate adoption models and types of mobile technologies should be applied.

For mobile technology companies, it is recommended that some thought be given to mobile technology solutions for SMEs. Given the lack of resources and the need to boost productivity, mobile technology solutions should come at a low cost with minimal integration requirements into an existing technology environment.

7.3 Limitations

The limitations to this research are as follows:

- The study was conducted on SMEs in Pietermaritzburg. The results may not be applicable to SMEs in other regions or cities, as the Pietermaritzburg Chamber

of Business membership may not be representative of all business in Pietermaritzburg, or elsewhere in South Africa and therefore the results cannot be generalised to SMEs of all types. Furthermore, there may be factors that are specific to Pietermaritzburg that may have influenced the results of this study.

- The use of mobile technologies was assumed for all qualified participants to the survey. The type of mobile technologies was not interrogated. This could have had an impact on the practical application of these technologies in the SME environment and the impact thereof on the various aspects of the business model.
- This study did not aim to understand the business models of the sample SMEs. The various SMEs could have had very different business models resulting in varying impact by mobile technologies.
- The number of respondents to this survey was 21. Statistically, it would have been preferable if 30 responses were received. The implication of this limitation is that the results cannot be generalised to SMEs of all types.
- The results showed that the core business of the firm could have had an impact on the outcomes of this study. For example, SMEs that utilise contract workers in dispersed locations are more likely to use mobile technologies for managing remote workers. The study did not take into account the sectors the respondents traded in and suitability of technology to the sector.

As a quantitative and descriptive study, this research only provided insight into the nature of the impact. This study does not go into detail on the reasons for such an impact by mobile technologies.

7.4 Future research

It is envisaged that future research on this study will entail three aspects. The first is a deeper understanding into the impact of mobile technologies on the aspects of the business model that yielded significant results. Secondly, the types of mobile technologies and the characteristics thereof should be investigated to assess the extent to which they impact business models of SMEs. Lastly, a different context could be considered to replicate the study and determine whether contextual factors will significantly impact the results.

This study proved that mobile technologies have a significant impact on the profit formula and specific aspects of the key resources of SMEs. Further research could be conducted to assess in detail each element of the profit formula and key resources. For example, the impact of mobile technologies on the costs of SMEs could be assessed in detail to include various types of costs. This would provide deeper insight into the specific types of costs that are significantly impacted by mobile technologies.

The sampled SMEs in this study used a variety of mobile technologies. Future studies could look into the impact of different types of mobile technologies on the business models of SMEs. For example, the impact of mobile email on the business models of SMEs would provide the necessary focus and provide an opportunity to go into detailed aspects of this technology. Practitioners would better understand how to adopt mobile email and the potential value to their business.

Some respondents revealed the industry in which they operate. For example, one respondent revealed that his firm was in the manufacturing industry. It would be

interesting to investigate the impact of mobile technologies on SMEs in a specific industry. For example, a study on the impact of mobile technologies on the business models of SMEs in the services sector would reveal whether there are significant differences to this study. A more comprehensive study could focus on comparing the impact of mobile technologies on SMEs across different industries.

7.5 Summary

The purpose of this research was to understand the impact of mobile technologies on the business models of SMEs in Pietermaritzburg. It was found that there is a positive impact on the profit formula and certain aspects of the key resources of SMEs. This outcome adds to the body of knowledge by combining SME characteristics, business model components and mobile technologies to describe the nature of the impact of mobile technologies in Pietermaritzburg. Recommendations for practitioners have been made and further research needs to be conducted in order to work towards a thorough impact analysis model for mobile technologies in SMEs.

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APPENDICES

RESEARCH QUESTIONNAIRE

Consent

The purpose of this study is to understand the impact of mobile technologies on the business models of SMEs in Pietermaritzburg. Participants to this survey must fit the description of an SME as legislated by the Department of Trade and Industry. You will be asked to complete information specific to your firm and its business model. Your participation will not bear any economic costs but will go a long way in solidifying the knowledge about mobile technologies in SMEs.

It would be appreciated if you could complete the following short questionnaire on how mobile technologies impact your company's business model. Although your response is of the utmost importance to us, your participation in this interview survey is entirely voluntary. Information provided by you remains confidential and will be reported in summary format only in a dissertation and scientific articles. You are able to withdraw from the exercise at any point without any penalty should you decide to.

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Signature of Participant _____

Date _____

Signature of Researcher _____

Date _____

Please complete the following as best as you can.

SECTION 1: USE OF MOBILE TECHNOLOGIES

Which of the following mobile technologies do you make use of in your business?

(Please tick)

a. Smart phone	<input type="checkbox"/>	b. Notebook	<input type="checkbox"/>
c. Mobile phone	<input type="checkbox"/>	d. iPad	<input type="checkbox"/>
e. PDA	<input type="checkbox"/>	f. Mobile banking	<input type="checkbox"/>
g. Blackberry	<input type="checkbox"/>	h. Mobile advertising	<input type="checkbox"/>
i. Mobile Internet	<input type="checkbox"/>	j. SMS/MMS/IM	<input type="checkbox"/>
k. MP3 Player	<input type="checkbox"/>	l. GPS	<input type="checkbox"/>
m. Mobile camera	<input type="checkbox"/>	n. Mobile email	<input type="checkbox"/>

SECTION 2: ASSESSMENT OF MOBILE TECHNOLOGY IMPACT

State to what degree you agree with the following statements by ticking the appropriate box. Also provide any comments that may assist in clarifying your choice.

Choices				
Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Statement				
2.1 Mobile technologies have improved the availability of the firm's product/service offering.				
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.2 Mobile technologies have improved the way we target customers				
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.3 Mobile technologies have improved the speed at which products/services are delivered to customers				
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.4 Mobile technologies are used to customise our products/services for our customers				
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.5 Mobile technologies have reduced our cost structures				
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.6 Mobile technologies have improved the gross profit margins of my firm				

2.7 Mobile technologies have increased utilisation of assets				
2.8 Mobile technologies have facilitated better knowledge management in the organisation				
2.9 Mobile technologies have allowed for the use of mobile staff who are not based at the office				
2.10 Mobile technologies have created better relationships with our business partners				
2.11 Mobile technologies have improved management of our distribution channels				
2.12 Mobile technologies have improved management of products and raw material sourcing in our supply chain				
2.13 Mobile technologies have facilitated more effective and efficient processes in the firm				
2.14 Mobile technologies have increased the productivity of the workforce in the firm				
2.15 Mobile technologies have enabled effective governance in the organisation				

SECTION 3: GENERAL COMMENTS

Please include any other information about the impact of mobile technologies on your business that you see as relevant.

SURVEY RESULTS

Section 1

RespondentID	Smart phone	Mobile phone	PDA	Blackberry	Mobile Internet	MP3 Player	Mobile camera	Notebook	iPad	Mobile banking	Mobile advertising	SMS, MMS, IM	GPS	Mobile email	Other	count
1	1	1	1	1	1	1	1	1		1		1	1	1		12
2		1		1				1				1				4
3	1			1			1	1		1			1	1		7
4		1			1					1		1		1		5
5		1			1		1	1		1			1	1		7
6		1	1		1			1		1		1		1		7
7				1												1
8		1			1							1		1		4
9				1												1
10		1		1	1		1	1				1	1	1		8
11		1						1								2
12		1		1										1		3
13		1						1				1	1			4
14		1		1	1		1			1	1	1	1	1	SKYPE	10
15	1	1		1												3
16		1		1	1	1	1	1		1	1	1		1		10
17	1						1									2
18	1				1			1				1	1	1	3G / modem	7
19	1			1		1		1				1	1	1		7
20	1	1			1								1		3G data	5
21	1			1	1			1		1		1				6

Section 2

RespondentID	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
2.1) Mobile technologies have improved the availability of the firm's product/service offering. in what respect perhaps an example	4.0	3.0	4.0	5.0	4.0	2.0	4.0	4.0	4.0	5.0	5.0	3.0	4.0	5.0	4.0	5.0	4.0	5.0	4.0	5.0	1.0
2.2) Mobile technologies have improved the way we target customers	3.0	4.0	3.0	5.0	4.0	4.0	5.0	5.0	4.0	5.0	4.0	3.0	4.0	5.0	4.0	5.0	1.0	4.0	4.0	5.0	1.0
2.3) Mobile technologies have improved the speed at which products/services are delivered to customers	4.0	3.0	4.0	5.0	4.0	4.0	5.0	5.0	5.0	4.0	5.0	4.0	4.0	5.0	4.0	5.0	4.0	4.0	4.0	4.0	1.0
2.4) Mobile technologies are used to customise our products/services for our customers	3.0	2.0	3.0	5.0	3.0	2.0	4.0	3.0	3.0	4.0	5.0	3.0	4.0	5.0	4.0	4.0	1.0	4.0	5.0	5.0	3.0
2.5) Mobile technologies have reduced our cost structures	4.0	2.0	3.0	4.0	3.0	4.0	2.0	4.0	3.0	4.0	2.0	2.0	4.0	5.0	4.0	5.0	2.0	4.0	5.0	5.0	3.0
2.6) Mobile technologies have improved the gross profit margins of my firm	4.0	2.0	3.0	4.0	3.0	3.0	3.0	3.0	3.0	4.0	4.0	2.0	4.0	5.0	4.0	5.0	3.0	4.0	3.0	5.0	3.0
2.7) Mobile technologies have increased utilisation of assets	4.0	2.0	4.0	4.0	3.0	2.0	3.0	3.0	3.0	4.0	2.0	3.0	4.0	5.0	4.0	4.0	2.0	4.0	4.0	3.0	3.0
2.8) Mobile technologies have facilitated better knowledge management in the organisation	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0	4.0	4.0	2.0	4.0	5.0	4.0	5.0	2.0	5.0	4.0	4.0	3.0
2.9) Mobile technologies have allowed for the use of mobile staff who are not based at the office	4.0	4.0	4.0	4.0	4.0	4.0	5.0	3.0	4.0	5.0	5.0	4.0	4.0	5.0	4.0	4.0	4.0	3.0	4.0	4.0	3.0

2.10) Mobile technologies have created better relationships with our business partners	4.0	3.0	4.0	4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	3.0	4.0	5.0	4.0	3.0	3.0	4.0	3.0	3.0	3.0
2.11) Mobile technologies have improved management of our distribution channels	4.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0	3.0	3.0	4.0	3.0	4.0	5.0	4.0	4.0	3.0	4.0	3.0	4.0	3.0
2.12) Mobile technologies have improved management of products and raw material sourcing in our supply chain	2.0	3.0	4.0	4.0	4.0	2.0	3.0	3.0	3.0	4.0	4.0	2.0	4.0	5.0	4.0	5.0	2.0	3.0	3.0	2.0	3.0
2.13) Mobile technologies have facilitated more effective and efficient processes in the firm	4.0	4.0	3.0	5.0	3.0	4.0	4.0	3.0	4.0	4.0	4.0	3.0	4.0	5.0	4.0	5.0	2.0	4.0	4.0	4.0	2.0
2.14) Mobile technologies have increased the productivity of the workforce in the firm	5.0	4.0	4.0	4.0	3.0	3.0	3.0	3.0	4.0	3.0	4.0	2.0	4.0	5.0	4.0	3.0	2.0	3.0	4.0	2.0	2.0
2.15) Mobile technologies have enabled effective governance in the organisation	4.0	3.0	4.0	4.0	4.0	4.0	2.0	3.0	4.0	2.0	3.0	2.0	4.0	5.0	4.0	4.0	2.0	3.0	3.0	3.0	3.0
Customer value proposition	3.5	3.0	3.5	4.8	3.8	3.0	4.0	4.0	3.8	4.3	4.5	3.0	4.0	5.0	4.0	4.3	2.3	4.3	4.0	4.5	2.0
Profit formula	4.0	2.0	3.0	4.0	3.0	3.5	2.5	3.5	3.0	4.0	3.0	2.0	4.0	5.0	4.0	5.0	2.5	4.0	4.0	5.0	3.0
Key resources	4.0	3.3	4.0	4.0	3.8	3.5	3.5	3.0	3.8	3.8	3.5	2.8	4.0	5.0	4.0	4.3	2.5	3.8	3.8	3.5	3.0
Value chain	3.5	3.5	3.5	4.5	3.8	3.5	4.0	3.8	3.8	3.8	4.3	3.0	4.0	5.0	4.0	4.8	2.8	3.8	3.5	3.5	2.3

Section 3

RespondentID	Open-Ended Response
1	We are consulting engineers.
2	
3	As contractors who work away from office - and in other countries e-mail sms and cellular technology has made management much more efficient
4	
5	
6	We are an "old world" manufacturer, so the impact of mobile technology is low.
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	I am 62 years old and started my own business last year Nov..could not have done half as well in my successful business without modern technology
17	Mobile technology has created a culture of inferior planning and poorer communication as a result of excessive and unnecessary calls and text messages.
18	
19	
20	While not relevant to the business referred to in this survey, a clear need exists for better management of company mobile devices on a corporate level.
21	