ADOPTION AND SUSTAINED USE OF M-COMMERCE TO IMPROVE EFFICACY OF CONSTRUCTION SMMES

BY

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ADOPTION AND SUSTAINED USE OF M-COMMERCE TO IMPROVE EFFICACY OF CONSTRUCTION SMMES

By

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Dissertation

Submitted in fulfillment of the requirements for the Degree

Masters of Commerce

In

Information Systems

In the

Faculty of Management and Commerce

of the

University of Fort Hare

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Abstract

E-Commerce can provide companies with improved efficacy thus enabling them to become more competitive. Despite this, adoption of e-commerce by South African construction SMMEs is low due to a variety of challenges. Interactive Voice Response (IVR) systems have been found to be a powerful aspect of m-commerce that can aid in overcoming the challenges of e-commerce adoption. In order for companies to reap the benefits of IVRs they must adopt and utilise them sustainably. This study introduces a model that proposes to enhance the adoption and sustained use of IVR systems. The model is influenced by existing technology acceptance theories, and validated through semi-structured interviews, an online questionnaire and a conversational analysis of discussions held with experts in the field. The proposed model suggests that factors such as free and easy access to the system, reliable infrastructure, portability, available resources, low implementation costs, modest literacy requirements and use by other companies may influence construction SMMEs to adopt an IVR system. Users' expectations must be confirmed through features such as ease of use and usefulness. By employing the proposed model, construction SMMEs can reap the benefits offered by m-commerce sustainably to improve their efficacy and thus become competitive.

Acknowledgements

I would like to express my sincere gratitude and appreciation to my supervisors, Prof. Stephen Flowerday and Ms Naomi Isabirye for their valued advice, guidance, coaching, support and encouragement throughout this study and for ensuring the completion and submission of this dissertation.

I would like to express further gratitude to the Govern Mbeki Research Development Centre (GMRDC) of the University of Fort Hare for their financial support.

I also want to thank Lauren Wainwright and Sheila Hartwanger, for all of their valued time and effort in providing their language editing and proof reading skills. Their contribution is much appreciated.

I am grateful to the construction companies, housing residents, experts and consultants who participated in this study and who contributed to the achievement of its objectives.

I would like to thank my friends, colleagues, family and my fiancé, Lizo Webu, for all their endless support and understanding throughout the dissertation process, and for all their help in ensuring the submission of the final dissertation.

Declaration

I, Zenande Williams hereby declare that:

- The work in this dissertation is my own work.

- All sources used or referred to have been documented and recognised.

- This dissertation has not previously been submitted in full or partial fulfilment of the requirements for an equivalent or higher qualification at any other recognised educational institution.

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1.1 Background

Studies have shown that e-commerce offers numerous benefits such as reduced costs, increased efficiency and effectiveness and better customer and supplier management. E-commerce can enable businesses to market themselves on an international scale thus reaching consumers of a wide spectrum.   Consequently, organisations are adopting and continuing to use the Internet (Al-Qirim, 2004; Cloete, Courtney & Fintz, 2002). This is however not the case with South African Small to Medium Micro Enterprises (SMMEs) as they tend to lag when it comes to adopting e-commerce. Several reasons for the poor adoption will be discussed later in this study. Some argue (Jobodwana, 2009) that e-commerce may be surpassed by mobile commerce as mobile commerce is an emerging discipline.

Mensah, Bahta and Mhlanga (2005, p.1) define electronic commerce (e-commerce) as the "buying and selling of information, products and services via computer networks which make up the Internet." Mobile Commerce (m-commerce) on the other hand refers to the buying and selling of goods and services through wireless/mobile devices such as cell phones, personal digital assistants and wireless computers (Jobodwana, 2009; Mensah, Bahta, & Mhlanga, 2005). Zhang, Yuan, and Archer, (2002 p. 82) provide a brief explanation of the purpose of m-commerce by stating that "m-commerce is about content delivery (notification and reporting) and transactions (purchasing and data entry)." They also emphasise that m-commerce is not a substitute for e-commerce but rather an aspect of e-commerce which is a more powerful method of communicating with customers.

Probably it may not surpass e-commerce but it will become the preferred platform for e-commerce service delivery in the context of this study (Jobodwana, 2009). Anckar and D'Incau (2002) agree that m-commerce is the preferred platform for service delivery, as scholars and industry representatives predict that the real value of e-business will be obtained from m-commerce. Heeks (2009) argues that wireless telecommunication has become a delivery mode of choice to provide connectivity.   He further states that wireless telecommunication reaches more than two thirds of the African population. This is supported by GS1 (2008) who state that mobile phones allow both individuals and organisations to become more connected.   GS1 further argue that individuals have more access to mobile phones than computers. This is confirmed by Kreutzer (2009) who surveyed students in Cape

Town about their use of mobile phones. The results of the survey showed that students have a greater level of access to mobile phones than desktop computers.

However, even though mobile phones are a preferable delivery mode of connectivity, GS1 (2008) claim that in order for m-commerce to become successful in offering its potential benefits, certain technologies such as Wireless Application Protocol (WAP) are required. WAP provides Internet access to wireless devices such as mobile phones and handheld computers (Tarasewich, Nickerson, & Warkentin, 2002). Therefore both businesses and consumers must use mobile phones that are WAP enabled in order to access Internet from a mobile phone. Moreover, these mobile phones with WAP require m-commerce users to become literate and its interface may be unfriendly to some users.

To address these challenges of m-commerce and expand the reach of mobile phones, voice or short message service (SMS) modalities need to be employed since each and every mobile phone has them (Lener, Ward and Amarasinghe, 2010). These authors recommend voice over SMS; they justify this by reporting that the voice has the capability of answering an extended series of questions while the SMS can only be used for very simple questions. Therefore this study recommends the use of an (Interactive Voice Response) IVR system to overcome issues of m-commerce and provide construction SMMEs with enhanced efficacy. The users of an IVR system include illiterate and semi-literate people, and those who cannot afford high cost solutions. Therefore, the interface and literacy are not an issue in the use of an IVR system since it is a voice based technology. Infrastructure and resource requirements for this system are low as it uses existing wired and wireless infrastructure (Argawal, Jain, Kumar, Manwani, Nanavati, Rajput & Seth, 2010) thus decreasing the implementation costs of m-commerce.

Consequently, by employing the IVR system, construction SMMEs can become efficient (save on costs) while providing effective services to meet their customers' needs. This system will enable construction SMMEs to provide business information to their clients just as it is done through a website. The system will enable customers to obtain information about the business anytime even during the absence of the owner i.e. it works as the owner's automated secretary. This information can include area of operation, service charges and work hours (Agarwal *et al*., 2010). Information may also include details of references (customers who have used their services before) as this will enable potential customers to trust their services.

This may enable construction SMMEs to gain loyalty from their customers and this in turn may provide them with a competitive advantage.

The aim of this research project is to provide South African construction SMMEs with a better understanding of how they can adopt m-commerce to improve efficiency and effectiveness in their businesses so as to alleviate the challenges associated with e-commerce. Firstly, the challenges of e-commerce are discussed. In spite of these challenges, construction SMMEs can obtain an added competitive advantage through the adoption of m-commerce.

This study further investigated the benefits that m-commerce can offer to construction SMMEs so as to enhance the adoption and sustained use of this system by these companies in order to improve effectiveness and efficiency of their business processes. This was done by first identifying the problem that exists among these companies; the problem is explained in the next section.

1.2 Statement of the Problem

E-commerce has been said to bring value to businesses by improving business efficiency and effectiveness and thus providing business with a competitive advantage through the potential benefits that it offers (Cloete, Courtney & Fintz, 2002). However, despite the potential benefits that e-commerce can offer, the adoption of B2C e-commerce in South African construction SMMEs is low and this is due to the challenges associated with e-commerce (Vaithanathan, 2010; Uzoka, Shemi & Seleka, 2007; Love & Irani, 2004; Anumba & Ruikar, 2002).

These e-commerce challenges include: high implementation costs, lack or poor infrastructure, inadequate resources, low use of e-commerce by suppliers and consumers, lack of access to e-commerce, computer illiteracy, deficiency in understanding the potential benefits of e-commerce and security concerns (Vaithanathan, 2010; Uzoka, Shemi, & Seleka, 2007; Mensah, Bahta, & Mhlanga, 2005; Cloete, Courtney, & Fintz, 2002).

Therefore, due to these e-commerce challenges, construction SMMEs do not exploit the business advantages that e-commerce offers. In order to assist South African construction SMMEs in their efforts to improve their business effectiveness and efficiency through commercial technologies, this study investigated the following research questions.

1.2.1 Research Question

What could affect the adoption and continued use of m-commerce amongst construction SMMEs?

1.2.2 Sub-Questions

a) **What are the challenges involved in the adoption of B2C e-commerce?**

In this sub-question, the challenges of e-commerce were identified. The aim of this sub-question is to provide a better understanding of the cause of low adoption of e-commerce in SMMEs even though it offers potential benefits. Furthermore, this sub-problem sought to discover if these e-commerce challenges are applicable to construction SMMEs in South Africa.

b) **How can m-commerce address the challenges of e-commerce so as to improve effectiveness and efficiency for South African construction SMMEs?**

In this sub-question the potential benefits of m-commerce that lead to improved effectiveness and efficiency for South African SMMEs were identified.

c) **How can construction SMMEs sustain the adoption and use of m-commerce?**

The aim of this sub-question is to explore mechanisms to support the sustained use of m-commerce by construction SMMEs.

1.3 Objective of the Study

The objective of this study is to develop a model that can be applied to encourage the adoption and sustained use of m-commerce through an IVR system by South African construction SMMEs.

1.4 Significance of the Study

"The promotion of SMMEs has been recognised as one of the key pillars of economic strategies for reconstruction and development... (Khosa, 2001)", this promotion has been active since 1995 (Berry, von Blottnitz, Cassim, Kesper, Rajaratnam, & van Seventer, 2002). Koch and Peet (2007) confirm this by stating that SMMEs have been identified by the Department of Trade and Industry in South Africa as a sector of the economy that deserves to be encouraged and supported in order to assist them to grow. SMMEs are being promoted

with the aim of increasing the growth of the economy through competitiveness as this will lead to job creation and income distribution. Therefore, Koch and Peet (2007) suggest that SMMEs must improve their ability to meet customers' needs in order for them to grow.

It is therefore important for construction SMMEs to improve their efficiency by offering services that are integrated with information through the use of m-commerce. Consumers should be able to obtain the information they need about the business or products that the business offers. According to Aziz, Anumba, Ruikar, Carrillo, and Bouchlaghem (2005), the competitiveness of a business does not come from the production of goods but from the services they offer and the information that the product entails.

To support Aziz et al.'s (2005) statement, GS1 (2008) assert that consumers respond positively to businesses that understand their needs and strive to offer excellent customer service. Through the use of mobile technology, businesses can become more service oriented to better meet the needs of their consumers. Additionally, Cloete (2001) suggests that in order for SMMEs to make their products and services more competitive, they also need to reduce costs both in production and transaction.

1.5 Literature Review

Hofstee (2006) claims that a good literature review should consist of a theory base, a survey of published works that relate to the researcher's investigation as well as the analysis of that work. This study included the Theory of Planned Behaviour (TPB), Task Technology Fit (TTF), Technology Acceptance Model (TAM) and Expectation Confirmation Model (ECM). TPB assisted in identifying factors that influence construction SMMEs' decision to adopt e-commerce. TTF on the other hand assisted in discovering if m-commerce could indeed provide construction SMMEs with improved effectiveness and efficiency.

Even though it can be argued that m-commerce can provide construction SMMEs with a competitive advantage, construction SMMEs need to adopt and actually use m-commerce. Therefore TAM has assisted in identifying the factors that can influence construction SMMEs in adopting m-commerce. Once m-commerce has been adopted, construction SMMEs must continue using the technology as this will ensure improved effectiveness and efficiency in the

long-term. ECM was found as an appropriate model to discover the factors that can influence construction SMMEs to continue using m-commerce.

Applying theories/models to each research question

Recent emergence of the Internet has revolutionised business activities; it generates new products, new production processes, new scope for consumers and new market opportunities, through e-commerce (Al-Qirim, 2004). However, despite the benefits that e-commerce can offer to businesses, construction SMMEs are still not taking advantage of these benefits since there are several factors that influence their decision in regards to the adoption of e-commerce.

These factors can be identified through the use of TPB. Uzoka, Shemi and Seleka (2007) assert that TPB encapsulates three factors namely: attitude, subjective norms and behavioural control. They further state that the purpose of TPB is to provide a comprehensive understanding of the manner in which an individual's attitude, subjective norms and perceived behavioural control can influence his/her intention to use e-commerce.

an investigation of the behavioural factors affecting the adoption of e-commerce in Africa was conducted by Uzoka, Shemi and Seleka (2007). They based their case study in Botswana and applied the TPB. They discovered several factors that influenced the adoption of e-commerce negatively. These factors include: *perceived disadvantages of e-commerce, Internet and complexity, accessibility, implementation costs, lack or poor infrastructure, lack of adequate resources, low use of e-commerce by suppliers and consumers, and computer illiteracy.* Other researchers like Jobodwana (2009); Kshetri (2007); Uzoka, Shemi, and Seleka (2007); Mensah, Bahta, and Mhlanga (2005); Al-Qirim, (2004); Cloete, Courtney and Fintz (2002); Anumba and Ruikar (2002) and Payne (n.d.) also identified or mentioned these factors in their research papers.

Uzoka, Shemi and Seleka (2007) believe that there is still much that needs to be done to convince SMMEs to adopt e-commerce. They suggest that there should be rapid development of human resources, greater attention paid to e-literacy and activities to build capacity so as to provide a skill base among SMMEs for e-commerce in order to eliminate some of the e-commerce adoption barriers. M-commerce can be a more effective tool to address e-commerce challenges since it is the most powerful and preferred aspect of e-commerce. M-

commerce builds on the advances already made by e-commerce and enables businesses to interact with a wider audience in a more personalised manner (GS1, 2008).

Thus, m-commerce can provide construction SMMEs with a competitive advantage. This study will make use of the TTF theory to discover if m-commerce can really benefit South African construction SMMEs. The TTF theory claims that in order for the technology to have a positive impact and be adopted, the technology capabilities have to match business operations (in the context of this study). Therefore it is important that m-commerce's characteristics match with construction SMMEs' characteristics in order for m-commerce to improve SMMEs' effectiveness and efficiency. Once it has been established that m-commerce can improve effectiveness and efficiency for construction SMMEs, these businesses will need to accept and actually use m-commerce.

Although the technology can provide a business with potential benefits which in turn enable the busineness to become more competitive, adopters of the technology must not only be convinced of the usefulness of technology but, they must also have a positive attitute towards it (Cloete, Courtney and Fintz, 2002). It is therefore important to understand the fundamental factors that lead to an individual's acceptance of a technology. TAM is an appropriate tool to identify these factors.

TAM advocates that perceived usefulness and perceived ease of use determine the behavioural intention of an individual to use a system which in turn leads to its actual use (Sjazna, 1996). Sjazna (1996) defines perceived ease of use as the degree to which an individual believes that the use of a particular system will not require any effort. A user needs to participate in a friendly and enjoyable environment in order to easily accept a technology (Koufaris, 2002; Mathieson, 2001). Therefore, construction SMMEs must find m-commerce easy to use as this leads to an intention to use m-commerce which in turn will lead to the actual use of m-commerce.

Furthermore, Thong, Hong and Tam (2006) argue that the capability of Information Technology (IT) depends on an individual's continued usage. If an individual's interest in the adoption of IT diminishes, then IT usage will decrease and eventually fall into disuse. A continued usage decision is therefore essential; it guarantees long term productivity in an organisation. Continued use of IT also provides an organisation with potential benefits such as

substantial reduction in operating costs. Hong, Thong and Tam (2006) state that the success of IT depends on the user's continued usage rather than its initial adoption.

Hence, it is important for construction SMMEs to continue using m-commerce once they have discovered its benefits as this will sustain effectiveness and efficiency. This study will therefore employ ECM to determine the factors influencing construction SMMEs' post–adoption behaviour. ECM claims that expectations together with perceived performance lead to post-purchase satisfaction. Individual expectations are confirmed when the product/service performs as expected; positive confirmation leads to satisfaction while negative confirmation leads to dissatisfaction.

1.6 Research Methodology

According to Hofstee (2006), a research methodology should provide a clear and understandable roadmap of how the researcher arrived at conclusions. The following diagram illustrates a summary of the research design applied in this study:
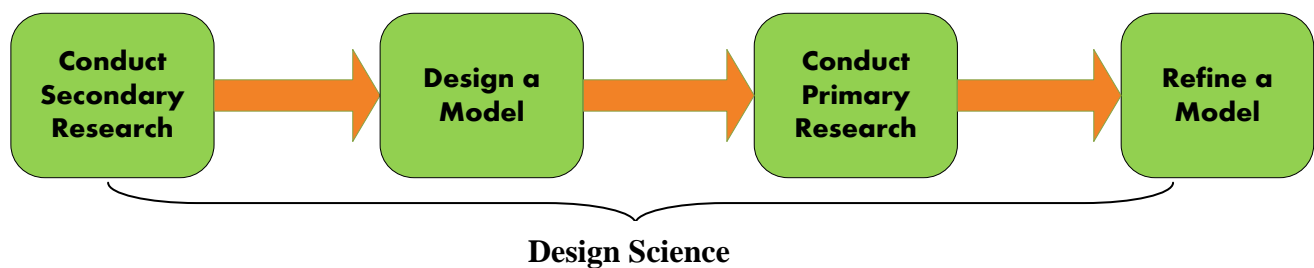
Design Science
Figure1.1: Research Design Summary

Secondary research was conducted in order to support the identified research problem and to find a possible solution to the problem through the investigation of existing models. These existing models influenced the development of a model that was proposed as a solution to the research problem. Primary research was conducted through semi-structured interviews, online questionnaires and conversational analysis. Interviews were conducted with construction SMMEs to discover factors that can influence these businesses to adopt and sustain the use of an IVR system, while questionnaires were distributed to their clients to obtain factors that can influence them to use an IVR system on a long term basis. The conversational analysis was conducted with experts in voice technologies and consultants in the telecommunication industry. This was achieved through the use of multiple teleconferences, telephone calls and

e-mails. The findings of the collected data will be linked back to the model in order to refine it further. This research process was conducted following the Design Science methodology.

1.6.1 Research Paradigm

This research project will adopt the Design Science research approach along with an interpretive epistemology employing the qualitative methods. Design science research concentrates on the creation and evaluation of innovative IT artefacts that enable businesses to address their information-related tasks with the aim of accomplishing utility. The artefact is developed through a construction process. The outcomes of the construction process are constructs, models, methods and instantiations (Cleven, Gubler, & Huner, 2009; Hevner, March, Park, & Ram, 2004). The artefact's construction process covers: problem identification, requirements specification, design, evaluation and communication. Cleven, Gubler, and Huner (2009) argue that in order to achieve utility from the development of an artifact, there are two important requirements that need to be fulfilled, and these are rigor and relevance.

"Relevance is achieved when the artefact actually addresses the business need" (Cleven, Gubler and Huner, 2009, p. 2). Rigor on the other hand is achieved when existing theories and methodologies are applied appropriately. The interpretive epistemology and qualitative techniques were used in this study to evaluate the artefact. Under the interpretive epistemology, "it is assumed that the results of an artefact evaluation highly depend on the individual characteristic of the evaluating subject" (Cleven, Gubler, and Huner, 2009 p. 3). Qualitative techniques are used on a value basis and emphasise the description and understanding of the situation behind the factors (Cleven, Gubler, & Huner, 2009; Offermann, Levina, Schonher, & Bub, 2009).

The research paradigm's positioning is indicated in Figure 1.6 which illustrates the extremes of positivist and interpretive paradigms on a continuum. This research project is positioned towards the interpretive approach where reality is viewed as a realm of symbolic discourse.

Positivist		**Approach to Social Science**			**Interpretive**

Research paradigm
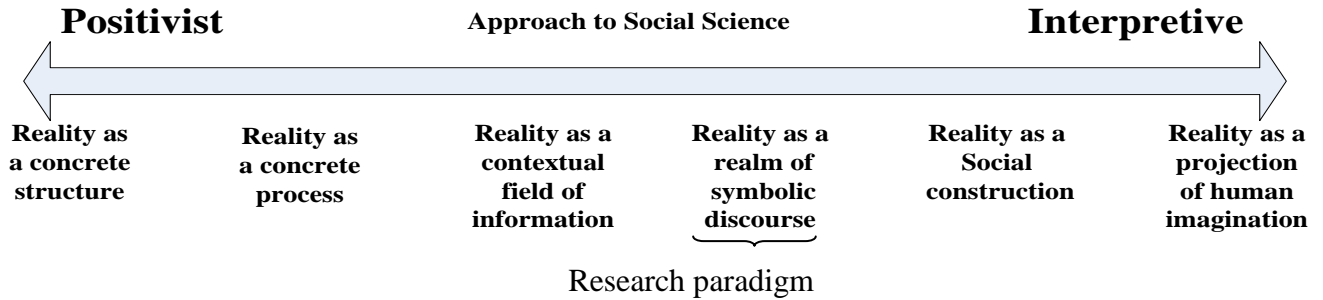
Figure 1.2: Continuum of Core Ontological Assumptions (Collis & Hussey, 2003)

Reality as a concrete structure	Reality as a concrete process	Reality as a contextual field of information	Reality as a realm of symbolic discourse	Reality as a Social construction	Reality as a projection of human imagination

1.6.2 Data Collection Methods

The data collection instruments for this study were semi-structured interviews held with owners or managers of the small to medium micro construction companies of South Africa. The owners/managers of SMMEs were chosen because the ownership and decision making in SMMEs rests with the owner or manager; therefore the adoption of e-commerce/m-commerce in SMMEs depends on that person (Cloete, Courtney, & Fintz, 2002). Online questionnaires were also distributed to the clients of construction SMMEs since they are also going to be the main users of the IVR system; therefore their perceptions about the IVR system are important to ensure sustained use of this system. Another data collection instrument was conversational analysis used for conversations held with experts of voice technologies and consultants in the telecommunication industry.

1.6.3 Sample

The sample used in this study was a convenience sample (non-probability sample technique) (Lancaster, 2005) of 10 construction SMMEs owners, 10 clients of construction SMMEs, 5 experts; 4 from IBM company (India and Israel) and 1 from University of Fort Hare (South Africa) and 5 consultants from the telecommunication industry; 1 from MTN, 1 from Vodacom, 1 from Cell C, 1 from Telkom and 1 from PostNet.

Since the sample size was small, an in-depth data collection and analysis was applied. The questions employed in the interviews and questionnaires were taken from published research and adapted to fit this study. Saunders, Lewis and Thornhill (2003) point out that adoption of questions already used facilitates reliability and efficiency.
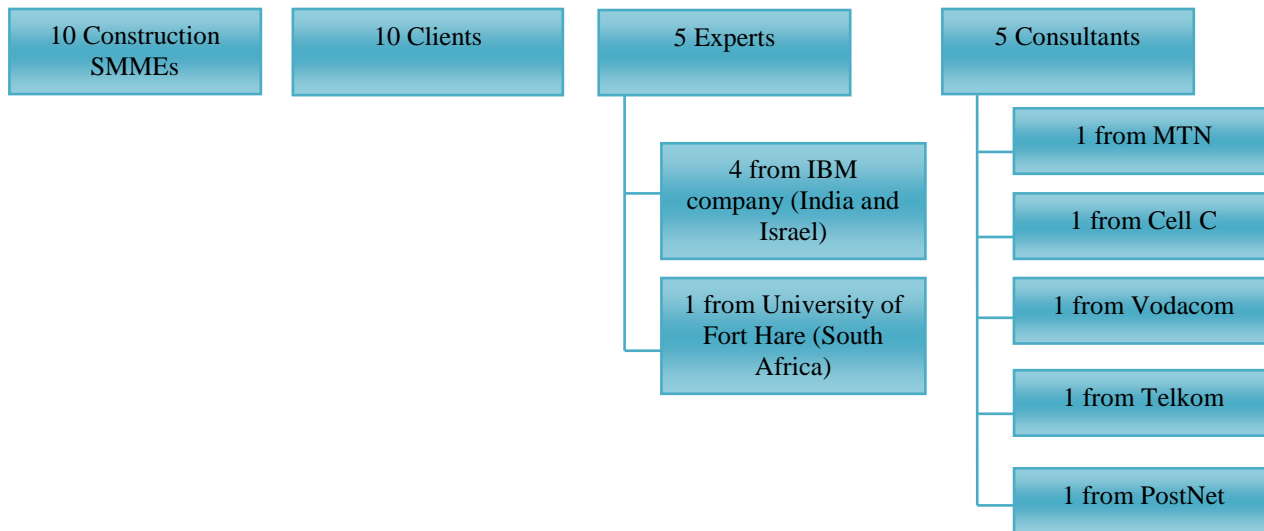
Figure 1.3: Sample

1.6.4 Data Analysis Methods

The data was analysed using an inductive process to determine whether the feedback obtained from primary data is consistent with the findings of the literature. An in-depth analysis of the data collected from the questionnaires and interviews was done using a spreadsheet. An analysis of the conversations held with experts throughout the research process was conducted to further support the findings. The data collected was then grouped and summarised so as to find meaning. Trends were identified through the use of graphs and the findings of primary data were linked back to the model for refinement. The findings of the primary data were found to be largely consistent with the findings of the literature review.

1.7 Delimitation of the Study

This study only investigated one activity of e-commerce which was Business to Consumer (B2C); other activities of e-commerce such as Government to Business (G2B), Business to Business (B2B) and Consumer to Consumer (C2C) are excluded from this study. This study focused on the adoption of mobile commerce to improve efficiency and effectiveness of South African Construction SMMEs. This study also focused on small to medium micro businesses, particularly construction companies such as electricians, plumbers, carpenters and builders in South Africa.

The construction SMMEs were chosen because studies have shown that they lag behind in the adoption of e-commerce (Love & Irani, 2004; Anumba & Ruikar, 2002). The main focus was on construction companies who have/not yet adopted e-commerce and m-commerce as a means of providing information and communicating with clients.

The technical aspect of the IVR system was not considered; this study focused only on the potential benefits that this technology offers. Two challenges of e-commerce namely: security concerns and awareness and knowledge about e-commerce, were not addressed. These can be studied in future research.

1.8 Outline of Proposed chapters

Chapter 1 of this study provides the proposal. This chapter provides an introduction or background to the study area as well as the identified problem and its sub-questions. A brief explanation of the significance and the objectives of the study are also provided. **Chapters 2, 3 and 4** present a broad critical overview of current literature applicable to the topic as well as a refined literature review that focuses on the problem and sub-problems. *Chapter 2* discusses the identified challenges of e-commerce that lead to the adoption of e-commerce by SMMEs. *Chapter 3* identifies and discusses the potential benefits of m-commerce that can lead to improved effectiveness and efficiency for South African SMMEs. *Chapter 4* discusses strategies that can be employed by construction SMMEs in order to ensure the continued use of m-commerce

Chapter 5 presents a model which serves as a proposed solution to the main problem. **Chapter 6** discusses the research methodology. This consists of the research paradigm, Design Science approach, research sample, data collection and analysis methods and ethics considerations. Details of the primary data collected are also provided. **Chapter 7** provides an analysis of the findings and discussion of the data obtained from the empirical research. These results are used to refine the model further. **Chapter 8** presents a brief summary of the entire study, explaining the contribution made by this study as well as suggestions for future research.

CHAPTER 2

CHALLENGES FACING B2C E-COMMERCE ADOPTION IN EMERGING ECONOMIES

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2.1 Introduction

The emergence of the Internet has revolutionised company activities; it generates new products, new production processes, new scope for consumers and new market opportunities. This is called electronic commerce (e-commerce) and is conveyed through the Internet (Al-Qirim, 2004; Kamioka & Yahata, 2006). This is supported by Kapurubandara (2009) who asserts that the Internet boom of the 1990's has enabled companies to not only attain similar efficiency gains at lower costs but also to enlarge the size of their potential markets and find new opportunities for growth. Azam and Quaddus (2009) highlight that e-commerce has become an effective tool for trade and commerce thereby facilitating the marketing and selling of diversified products and services around the world.

Additionally, Small, Medium and Micro Companys (SMMEs) who adopt and use e-commerce in their companies attain significant benefits that enable them to compete with their larger counterparts (Macharia, 2009). Consequently, companies are continuing to adopt e-commerce and the growth of e-commerce is increasing despite the 'dot com' crash of the 2000s (Macharia, 2009). However several studies have highlighted that these benefits are still not being exploited by SMMEs in developing countries (Kapurubandara, 2009; Salwani, Marthandan, Norzaidi & Chong, 2009; Chitura, Mupemhi, Dube, & Bolongkikit, 2008). South African construction SMMEs are no exception from this as they also lag behind in the adoption of e-commerce. Various factors resulting in poor adoption have been identified and are discussed in this chapter.

The aim of this chapter is to provide a better understanding of the causes of the low adoption of e-commerce in construction SMMEs. This chapter provides an overview of SMMEs by assessing their role in the economy with a view to identifying the potential benefits that SMMEs can obtain from adopting e-commerce. The Theory of Planned Behaviour (TPB) identifies the barriers that prevent SMMEs from adopting e-commerce. Lastly, this chapter assesses the level of adoption of e-commerce by South African SMMEs.

2.2 Overview of SMMEs

According to Frempong (2009) there are various definitions of SMMEs. When defining an SMME, the focus is on particular elements such as the number of employees, annual turnover,

industry of company, ownership of company and value of fixed assets. Motjolopane (2006) provides a definition of SMMEs by stating that they are defined according to the size and the number of employees that the company has as well as the total turnover and gross asset value of the organisation. SMMEs are categorised as companies that have between 5 and 200 employees, their total turnover ranging between 0.2 million and 64 million rand and that they have a gross asset value of between 0.1 million and 23 million Rands. This study is employing the South African definition of SMMEs

It has been reported that there is uncertainty with regard to the number of SMMEs in South Africa. The estimations of SMMEs operating in South Africa ranges between 600 000 and 1.6 million but the general estimation is 800 000 (Motjolopane, 2006). Motjolopane further states that this reflects a lack of research into SMMEs in South Africa. South Africa is a developing country faced with a high rate of unemployment, low levels of skilled labour and poverty and yet SMMEs contribute to the total of South African economic activity (Motjolopane, 2006). However e-commerce adoption is low among South African SMMEs and this raises a concern about their survival in this rapidly changing environment (Motjolopane, 2006). Therefore it is important to encourage growth and development among SMMEs as this could contribute towards economic growth and assist in combating, poverty and unemployment (Motjolopane, 2006).

The promotion of SMMEs has been recognised as one of the key pillars of economic strategies for reconstruction and development, and has been active since 1995 (Berry, von Blottnitz, Cassim, Kesper, Rajaratnam, & van Seventer, 2002). SMMEs are being promoted with the aim of increasing the growth of the economy through competitiveness as this will lead to job creation and income distribution (Underwood, 2009; Koch & Peet, 2007; Berry *et al.*, 2002; Khosa, 2001).

SMMEs play a significant role in an economy. Frempong (2009) states that SMMEs assist government in combating poverty by offering opportunities to people who have been excluded from paid employment in large companies due to qualified skills, age and lack of geographic mobility to enter into the productive market. Furthermore, Motjolopane (2006) states that studies report that the former President of South Africa, Nelson Mandela, emphasised three aspects of SMMEs importance within the South African economy. These are their

contribution towards social and economic development, equal distribution of economic power and reducing the rate of unemployment (Motjolopane, 2006). The following table shown below demonstrates the contribution of SMMEs to national economies.

Table 2.1: Contribution of SMMEs to National Economies (Ladzani, 2009)

Country	SMMEs as % of enterpise	Employment	SMMEs contribution to GDP (%)
Developing countries			
Brazil	99.2	66.8	60.8
India	95.0	80.0	40.0
Mexico	98.7	77.7	43.3
South Africa	**97.0**	**38.0**	**25.0**
Developed countries			
Autralia	96.0	45.0	23.0
Canada	99.8	60.0	57.2
Germany	99.7	65.7	34.9
Japan	99.5	73.8	57.0
United Kingdom	99.9	67.2	30.3
United States	99.7	53.7	48.0

From the above table, South Africa's SMMEs contribution to employment and GDP is the lowest compared to other developing countries at 25%. This low contribution is of concern and is one of the motivations for this study. Mensah and Benedict (2010) argue that SMMEs should be provided with entrepreneurship training and other services and facilities (such as finance, infrastructure, premises etc.) in order to manage their companies better as this will provide them with an opportunity to grow which in turn will lead to poverty alleviation and job creation. Motjolopane (2006) on the other hand claims that SMMEs' ability to adopt commercial technologies is of prime importance to ensure their future survival. The potential benefits that SMMEs can obtain from adopting e-commerce are identified in the following section.

2.3 Potential Benefits of e-commerce

E-commerce assists in reducing the gap between large and small companies by reducing the gap; e-commerce provides these SMMEs with a competitive advantage that enables them to compete with the larger companies (Al-Qirim, 2004). To support Al-Qirim's statement, Chege, Coetzee and Mahachi (2001) enlighten a manner in which e-commerce provides efficiency to construction SMMEs by improving their performance. They highlight an example of a system of a project information exchange which allows designers and estimators to exchange documents quickly. Information and documents are exchanged accurately and timeously thereby reducing costs of physically exchanging the documents. E-commerce also allows construction SMMEs to store and archive documents as well as to integrate information so as to allow availability of information to quickly generate alternatives.

More benefits are being identified by Cloete (2001) who also conducted research to identify the potential benefits that are offered by e-commerce. Cloete managed to identify ten benefits from a study conducted to examine the level of e-commerce adoption by SMMEs in the Western Cape province of South Africa. These benefits involve financial aspects and they include: on line banking, speed of communication/response rates, reduction of communication costs, research/gathering of information, improvement of productivity or competitiveness, global reach, improved customer relationship management (CRM), transfer of documents and advertisement.

De Klerk and Kroon (2007) in their study of networking among South African companies found that companies were utilising e-commerce and international trade because of a profit motive (86%), the opportunity to enter strategic markets (64%), to build international associations (61%) and to extend the markets due to local limitations (54%). Therefore it can be concluded that e-commerce offers potential benefits that enable a company to become more competitive. Other benefits that e-commerce can provide construction SMMEs are described below (Corbitt & Al-Qirim, 2004).

Better service quality: e-commerce enables SMMEs to deliver more accurate, timely and complete information of sales or decision making by improving the quality of the marketing, sales and procurement process of SMMEs. Through e-commerce, a service is also delivered over broad geographical areas and anytime.

Reduced service costs: since e-commerce is a self-service based company, it is therefore characterised by relatively low variable transaction costs with increasing cost effectiveness.

Increased revenue: the decrease in transaction costs and improved service quality may lead to increased market share, improved competition among brands and increased revenue.

Reduced time to complete a company transaction; the time required to place an order can be reduced by hours or even days or weeks through electronic communication and shortens the time for product delivery. Chen and Tsou (2007) also agree that through the adoption of information technology, a company's response to customer demands are enhanced with shorter delivery times and customers are also able to monitor their deliveries.

Reduced administrative costs: again since e-commerce is a self-service based company, the cost of processing purchase requisitions, purchase orders and payments can be dramatically reduced.

Due to the above mentioned e-commerce benefits, Asia Pacific governments are encouraging Asian SMMEs to improve their competitiveness and access to new markets through the adoption of e-commerce. However Corbitt and Al-Qirim (2004) point out that even though e-commerce is important for SMMEs, evidence shows that growth in e-commerce is limited to more technically advanced companies. This is supported by Kamioka and Yahata (2006) who state that it is not as easy for small sized companies as it is for large companies to run independent B2C e-commerce as they have limited resources. As a result, their e-commerce adoption efforts rarely succeed. Kamioka and Yahata (2006) further state that small sized companies compensate their limited resources by participating in intermediary organisations such as online shopping malls to which their customers have access and this has been the most effective method for them.

Kamioka and Yahata (2006) conducted a study among small sized companies to develop a model for that would enhance service delivery through Business to Consumer (B2C) e-commerce. They found that, only a few small sized companies who participated in online shopping malls and managed to yield profit through this method. Those who yielded profits, were still not convinced with this method as they have been seeking ways to avoid depending on intermediary sites in recent years. This demonstrate that these small businesses are not convinced by e-commerce and its benefits. Psaila and Wagner (2007) on the other hand

highlight that there are a number of barriers that occur when SMMEs attempt to adopt e-commerce; these barriers often make it more difficult for SMMEs to adopt e-commerce and therefore they do not reap the benefits offered by this technology. The barriers that prevent SMMEs from adopting e-commerce are discussed in the following section.

2.4 Challenges associated with the adoption of e-commerce

Molla and Heeks (2005) argue that even though there are theoretical claims that e-commerce can bring significant benefits to companies, however their empirical evidence illustrates that, little is known about the outcomes of e-commerce implementation. This gap of knowledge was identified through their research findings. Molla and Heeks surveyed 92 South African companies, all of which moved beyond the basic stage of e-commerce. Their findings indicated that more strategic benefits that relate to market access, customer/supplier linkages or cost savings were not found in the majority (more than 80%) of the companies surveyed. They therefore concluded that from their findings there was no evidence that e-commerce delivered the potential benefits to companies operating in a developing country.

They further state that there is a possibility that foreign companies may be able to use the benefits of e-commerce to penetrate markets in developing countries while companies in developing countries may not be able to counter by penetrating industrialised country markets. Unfortunately, e-commerce is still emerging in developing countries. Molla and Heeks (2005) argue that even though there are theoretical claims that e-commerce can bring significant benefits, e-commerce may be viewed as a new technology that tends to increase global inequalities.

This is supported by Warden and Motjolopane (2007) who assert that e-commerce has created a wider gap between information rich and information poor countries and continues to be a problem in developing countries more than in more developed economies. In order to better understand the causes of low e-commerce adoption in developing countries, a theory of planned behaviour is employed as it can assist in identifying the factors that influence SMMEs to adopt e-commerce. The following section discusses the implications of the Theory of Planned Behaviour in e-commerce adoption.

Theory of Planned Behaviour and e-commerce adoption

Uzoka, Shemi and Seleka (2007) assert that the Theory of Planned Behaviour (TPB) encapsulates three factors namely: attitude, subjective norms and behavioural control. They further describe the brief purpose of TPB that it provides a comprehensive understanding of the manner in which an individual's attitude, subjective norms and perceived behavioural control can influence his/her intention to use a technology. This is demonstrated in the Figure 2.1.
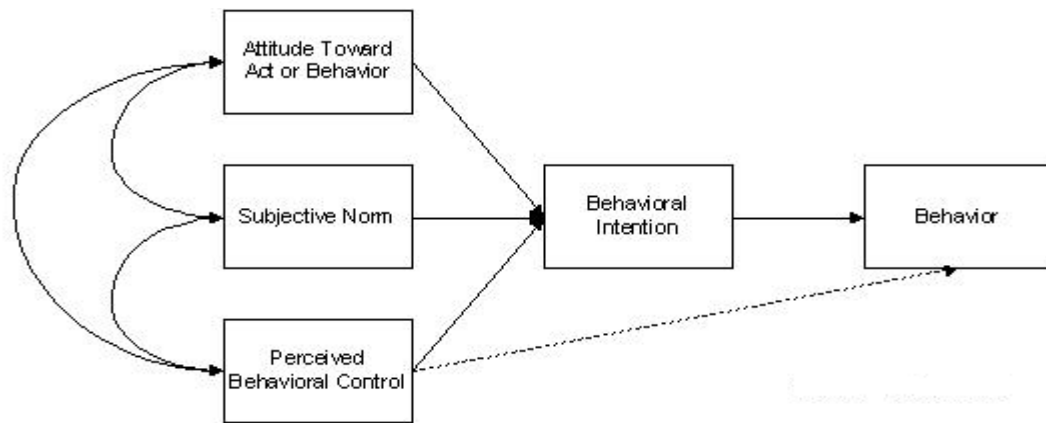
Figure 2.1: Theory of Planned Behaviour (Ajzen, 1991)

The behaviour is determined by the intention to perform a task. A behavioural belief is the subjective probability that the behaviour will lead to a particular outcome. An outcome evaluation is a rating of the desirability of the outcome. The Behavioural Intention on the other hand is predicted by three factors namely: attitude towards the behaviour, subjective norm and perceived behavioural control.

Attitude is a function of the products of behavioural beliefs and outcome evaluations. Aboelmaged (2009) asserts that the attitude towards using a particular system is a major determinant of the intention to use that system. This is based on the argument that individuals make rational and systematic decisions based on the information available to them. Aboelmaged further points out that, several existing studies have indicated that an individual's attitude influences behavioural intention to use a particular e-company application directly and significantly. He makes an example of George (2002) and Gribbins *et al.* (2003) who in their studies have found a strong positive relationship between an individual's attitude towards

purchasing online and the user's behavioural intention. According to TPB, the subjective norm is another element that has a strong influence on an individual's behaviour intention.

Subjective norm is the individual's perception of social pressure to perform the behaviour. It reflects the perceived opinions of other individuals whose beliefs may be important to the individual. A normative belief is the individual's perception of other people's opinion about his/her performance of the behaviour (Mathieson, 2001). In the case of construction SMMEs, they might feel that by employing e-commerce, their clients might approve of them adopting it, and this is the normative belief. According to Aboelmaged (2009), several existing studies have found a strong relationship between subjective norm and behavioural intention in online settings. To support this, Aboelmaged refers to Bhattacherjee (2000), Venkatesh with Davis (2000) and Liao *et al.* (2007) who reported that subjective norm is a strong determinant of behavioural intention towards e-services. Referring to TBP, the last element that has a strong influence on an individual's behavioural intention is the perceived behavioural control.

Perceived Behavioural Control constructs other barriers against the use of the system. Perceived refers to the individual's perception of the presence or absence of the requisite resources and opportunities necessary to perform their behaviour. It depends on control belief and perceived facilitation. A control belief is a perception of the availability of skills, resources, and opportunities. Perceived facilitation is the individual's assessment of the importance of those resources to the achievement of outcomes. The perceived behavioural control is the individual's perception of his or her control over performance of the behaviour. E-commerce requires appropriate infrastructure to run successfully; if the appropriate infrastructure is not available, construction companies may rate perceived facilitation of the infrastructure availability as high (Mathieson, 2001).

Therefore construction companies may not use e-commerce although the behaviour (system use) may achieve a valuable outcome (improved customer service). There would be little social benefit as they do not have easy access to all of the necessary resources. Hence it is important to discover the challenges associated in the adoption of e-commerce through the adoption of TBP. A case where TBP was applied in a developing country to identify e-commerce challenges is discussed below. Uzoka, Shemi and Seleka (2007) conducted an investigation of the behavioural factors affecting the adoption of e-commerce in Africa. They

conducted their case study in Botswana and applied the TPB since it has strong behavioural elements. They discovered several factors that influenced the adoption of e-commerce. These factors include:

Perceived disadvantages of e-commerce: organisational intention to adopt e-commerce is negatively affected by the disadvantages that e-commerce entails. These disadvantages include security and data integrity issues. Internet and complexity factor: The complexity of e-commerce tends to threaten the ability of a company to adopt e-commerce.

Accessibility facto: e-commerce accessibility was also identified as another factor that tends to affect the ability of company to adopt e-commerce. Organisations were concerned about their target customers' level of access to the Internet and the customers' level of computer literacy.

Implementation costs: e-commerce implementation costs were found to be high and this also resulted in low adoption of e-commerce.

Lack of or poor infrastructure: Chen and Tsou (2007) state that a technology infrastructure includes networks, management and provisioning of large-scale computing, electronic data interchange and shared databases. Infrastructure is therefore considered as key to develop e-commerce. Therefore poor infrastructure leads to low adoption of e-commerce.

Lack of adequate resources: in order for e-commerce to bring the successful results such as competitive advantage; SMMEs need to have adequate resources necessary for e-commerce to become effective and efficient so as to gain the potential benefits that it offers.

Low use of e-commerce by suppliers and consumers: research conducted by other scholars shows that there has been low use of Internet by the consumers and suppliers of SMMEs (Vaithanathan, 2010; Mensah, Bahta, & Mhlanga, 2005). As a result, SMMEs do not recognise the importance of having an e-commerce web site for their companies because for them it might be waste of time and money since only a few consumers and suppliers may use it (Vaithanathan, 2010; Mensah, Bahta, & Mhlanga, 2005).

Computer illiteracy; Uzoka, Shemi and Seleka (2007) have found that there is a high rate of computer illiteracy which makes it difficult to use e-commerce.

Uzoka, Shemi and Seleka (2007) concluded that the above factors show some level of agreement with the general factors proposed in TBP namely: attitude, subjective norm and perceived behavioural control. These factors have then determined the Intention to adopt e-commerce which in turn resulted in low adoption of e-commerce in Botswana. Corbitt and Al-Qirim (2004) have also identified barriers to e-commerce adoption from the study that they have conducted among Asian SMMEs and the barriers are as follows:

Lack of awareness among SMMEs about e-commerce: lack of awareness of e-commerce and the availability and access to telecommunication infrastructure at a reasonable price was found as the first and basic obstacle in the adoption of e-commerce by Asian SMMEs. Many SMMEs were unaware of the developments taking place and the role they could play in e-commerce. SMMEs often find it difficult to become involved in e-commerce concepts and implementation. English as the language of use was also found as a barrier for Asian SMMEs as they were used to managing companies using their local languages. The lack of awareness also seemed to be a challenge because SMMEs in Asia Pacific are usually slower in adopting new technologies given the high investment required (Corbitt and Al-Qirim, 2004).

Lack of knowledge of e-commerce: Asia Pacific SMMEs were found to lack extensive knowledge of e-commerce and was one of the major obstacles preventing their participation and engagement in e-commerce. This had led to resistance to change of the benefits among SMMEs. Many SMMEs pointed out that they had limited access to information about the company models and technologies that are a prerequisite of e-commerce success. Furthermore, the unsuccessful stories about e-commerce adoption available in Asia made it even more difficult for SMMEs to adopt this technology (Corbitt & Al-Qirim, 2004).

Information Infrastructure Access, Quality and Cost: even though it is well known that e-commerce reduces company costs, however its implementation represents a costly challenge for most SMMEs in the Asia Pacific region. SMMEs did not have enough money to implement e-commerce. They could not afford the necessary infrastructure to use e-commerce. They were unable to access an appropriate information infrastructure of suitable quality, at a reasonable cost and this was found to be a fundamental barrier to e-commerce

adoption and use. The information infrastructure needed for e-commerce includes reliable telecommunication links and internet services to be available to SMMEs.

E-commerce applications need good bandwidth and the cost of telecommunication infrastructure for a requisite bandwidth was found to be beyond the reach of many SMMEs in Asia Pacific because many Asia Pacific countries suffer from poor infrastructure of electricity and energy. Telecommunication access and usage costs still prohibit SMMEs from adopting and using e-commerce and therefore SMMEs cannot consider engaging themselves in e-commerce (Corbitt & Al-Qirim, 2004).

Trust and Confidence: the security issue is viewed as another obstacle in e-commerce adoption since the majority of SMMEs have a fear of electronics, because of the low level of technology diffusion and awareness among SMMEs; as a result, it is still a psychological barrier and this was confirmed in various reports of Asia Pacific. It was found that many SMMEs did not have a technical background and they were not convinced that technology could protect them. As a result of these security fears, Asia Pacific SMMEs are not willing to use e-commerce as they do not trust this technology. Therefore the security issue was identified as a very important concern of e-commerce adoption by Asia Pacific SMMEs (Corbitt & Al-Qirim, 2004).

In summation, factors that have led to low adoption of e-commerce adoption by SMMEs in developing countries are as follows: *lack of awareness and knowledge about e-commerce, high implementation costs, lack of or poor infrastructure, lack of access to e-commerce, security concerns, inadequate resources, low use of e-commerce by suppliers and consumers and computer illiteracy.* The following section examines the level of e-commerce adoption by South African SMMEs.

2.5 E-commerce Adoption by South African SMMEs

E-commerce adoption trends in South Africa show slow impact. Studies have demonstrated that although the e-commerce sector is showing growth, Internet usage remains low as compared to world standards. This is depicted on table 2.2.

Table 2.2 Population and Internet usage statistics: Comparison of African countries by Usage % in Africa (Warden & Motjolopane, 2007)

Population and internet usage percentage comparison of African regions					
Region	**Total estimated population in 2006**	**Population as % of African (%)**	**Estimated Internet users**	**Usage % of Africa (%)**	**Usage % growth (2000-2005)**
Egypt	71,236,631	7.0	5,000,000	21.1	1,011.1
South Africa	**48,861,805**	**7.4**	**3,600,000**	**15.8**	**50.0**
Morocco	30,182,038	11.6	3,500,000	15.4	3,400.0
Nigeria	159,404,137	1.1	1,769,700	7.8	784.9
Botswana	1,856,800	3.2	60,000	0.3	300.0

To justify e-commerce slow growth in South Africa, Motjolopane (2006) has identified various studies that demonstrate the low use of e-commerce by South African SMMEs.

- De Klerk and Kroon (2005) studied the role and degree of e-commerce adoption in South African companies. They conducted this study by comparing micro and small companies to medium and large companies. Their results showed that SMMEs tend to lag behind when it comes to e-commerce adoption as compared to large companies.

- Cloete (2002) conducted a study from a target population of 253 South African SMMEs operating in the Johannesburg and Pretoria area to determine the level of acceptance and adoption of e-commerce by SMMEs. His results showed that the use of e-commerce by South African SMMEs was limited compared to global standards.

- Cloete, Courtney and Fintz (2002) examined the acceptance and adoption of e-commerce from a sample of 195 SMMEs in the Western Cape province of South Africa. From a response rate of 20% of the population, they concluded that e-commerce was not used to the extent necessary for survival in a rapidly changing environment.

- Signh (2002) also examined strategies for optimal utilisation of Internet from a sample of 295 consumers drawn from a certain tertiary institution in Durban. The study pointed out barriers that prevented optimal Internet usage.

All of the above studies highlighted by Motjolopane (2006) demonstrate low use of e-commerce by South African SMMEs in previous years. Moreover still today SMMEs do not

reap the benefits of e-commerce. The case of South African construction SMMEs is not very different to other industries in the country as they are faced with similar challenges pertaining to e-commerce adoption.

2.6 Conclusion

From the literature reviewed, it was found that the potential benefits offered by e-commerce are exploited mostly by developed countries. The developing countries are still behind when it comes to e-commerce adoption. Researchers such as Warden and Motjolopane (2007) and Molla and Heeks (2005) believe that this could be because e-commerce is not popular in developing countries. Hence Uzoka, Shemi and Seleka (2007) believe there is still much that needs to be done to convince SMME's to adopt e-commerce in developing countries.

This study therefore suggests that construction companies should adopt mobile commerce in order to overcome the challenges mentioned above and start exploiting the benefits offered by other commercial technologies. Motjolopane (2006) states that in order for companies to become competitive, they need a strategy based on low cost, high quality and fast response to customer needs and they can achieve this by utilising the commercial technologies. Chapter 3 discusses the potential benefits that m-commerce can offer to South African construction companies so as to encourage them to adopt this technology in order to improve their efficacy.

M-COMMERCE'S CONTRIBUTION IN IMPROVING CONSTRUCTION SMMES EFFICACY

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                    │   CHAPTER 1:    │
                    │  Introduction   │
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THEORETICAL FRAMEWORK

CHAPTER 2: Challenges involved in the adoption of B2C e-commerce	CHAPTER 3: M-Commerce's contribution in improving efficacy of construction SMMEs	CHAPTER 4: Sustaining the adoption and use of m-commerce

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┌─────────────────┐
│   CHAPTER 5:    │
│ Proposed Model  │
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│   CHAPTER 6:    │
│Research Methodology│
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3.1 Introduction

3.2 Overview of Mobile Phones

3.3 Task Technology Fit (TTF) Model

3.4 Interactive Voice Response (IVR) systems

3.5 Conclusion

3.1 Introduction

Liang, Haung, Yeh and Lin (2007) describe m-commerce as any transactions made either directly or indirectly through mobile devices such as phones or personal digital assistants. They further assert that m-commerce is viewed as a new generation of e-commerce that allows businesses and individuals to engage in services anytime and anywhere through its mobility and portable features. Moreover, Agarwal and Manwani (2008) argue that mobile phone based applications make it possible to reach the Web and are able to overcome several e-commerce challenges. Therefore, this influences businesses to adopt mobile commerce (m-commerce). With this background, this study explores the use of an interactive voice response (IVR) system to support SMMEs in developing countries.

This chapter aims to identify the potential benefits of m-commerce that can overcome the challenges associated with the adoption of e-commerce as this will lead to improved efficacy of South African construction SMMEs. This is done by firstly assessing the role of mobile phones for individuals and businesses. The benefits and challenges of m-commerce are taken into consideration. This chapter also evaluates the use of IVR systems as a means of overcoming the challenges of m-commerce so as to exploit the potential benefits offered by mobile technologies. This is achieved by employing the Task Technology Model. Lastly, three types of IVR systems are discussed and compared based on the cost-benefit analysis and feature set of these IVR systems.

3.2 Overview of Mobile Phones

According to Heeks (2009), half of the world's population has greater access to a mobile device/handset than a personal computer and the growth rates are fastest in the poorest regions. This is supported by Khalil, Dongier and Qiang (2009) who state that there has never been a technology that has grown as fast as mobile phones. They add that by the end of 2008 there were 4 billion phones around the world. In 2002, the number of mobile phones exceeded the number of landlines. Furthermore, de Angoitia and Ramirez (2009, p. 35) state that "in the coming years, there is an expected growth in the number of low-income mobile phone users in developing countries as well as a higher degree of maturity of use among low income consumers."

This is substantiated by a study on mobile phones usage conducted by Kruetzer (2009) in high schools in Cape Town. He found that cell phone usage among low-income earning black South African youth was very high despite their very low income levels. The students have a higher access to mobile phones in comparison to computers. The results showed that 97% of the respondents used cell phones for communication, information seeking and gaming or multimedia activity. The ratings for these activities were as follows: information seeking through internet access for educational purposes was (83%), gaming (53%) and communication was the most common cell phone activity with 91%.

Agarwal, *et al.* (2010) substantiate the above statement by asserting that there is growth in the number of mobile phones in India, Africa and China, and this is due to the rapidly declining price of mobile phones thereby making them affordable even to the poor. According to Agarwal, Kumar, Nanavati and Rajput (n.d.), a mobile phone is significantly cheaper than a personal computer and easier to use a mobile phone than a personal computer especially when the phone is used as a device to communicate in free speech.

Frempong (2009) conducted a study on mobile telephone opportunities in Ghana among micro and small enterprises and found that mobile phones were the most popular communication technology among these businesses. He also stated that mobile phones are the main communication technology for many small businesses in South Africa and the infrastructure to support them is also becoming more widely available (Parikh, 2007). According to Kreutzer (2009), studies have shown that South Africans have high access to mobile phones to the extent that there are people who use multiple phones.

Moreover, Parikh (2007) states that most people are more familiar with the use of mobile devices than personal computers. The usage of mobile phones for information creation and access is one of the strategic plans of the United Nations Educational, Scientific and Cultural Organisation (UNESCO) (2008) and it is included in their Information for All Programme. Their focus is to ensure access to information that can be used to enhance the lives of people. From the facts provided above in this chapter on mobile usage growth, is quite likely that this strategic plan be fulfilled by 2013. This rise in the adoption of m-commerce may be as a result of the benefits it offers.

According to Stair and Reynolds (2010) m-commerce offers businesses several benefits such as:

- Reduced costs of conducting the business: costs can be reduced by eliminating time consuming and labour-intensive steps throughout the order and delivery process consequently, more sales can be completed in the same period with increased accuracy.
- High speed of flow of goods and information: increased accuracy of order processing and fulfilment; clients are allowed to enter their product specifications and order information directly which eliminates human data error on the business side and thus leads to an improved level of client service.
- Improved client service: this is achieved through the consistent ability of meeting clients' needs with high quality services, which eventually leads to increased client loyalty. However, these benefits are closely related to the benefits of e-commerce.

Furthermore Parikh (2007) highlights more enhanced benefits offered by m-commerce. These benefits include, a cost benefit through the reduction staff trips to the office where a personal computer would be normally held thereby reducing the travelling costs since staff can still have access to business information anywhere. Staff can now spend more time in the field allowing them to service more clients. Therefore m-commerce enables access to information anytime anywhere without a physical network connection (Buyukozkan, 2009).

Consequently, construction SMMEs can benefit from adopting m-commerce. M-commerce will allow their clients to order services (they can state when, how and where the service is needed) by themselves. Construction SMMEs staff will not have to go to the office to check an order placed by the client, but can reply to the clients anytime and anywhere.

However, Lener, Ward and Amarasinghe (2010) point out that, for a business to exploit these benefits offered by m-commerce; both the business and its clients need access to a phone that has specific software and a wireless application protocol (WAP). Buyukozkan (2009) states that WAP is highly essential for enterprises interested in adopting m-commerce as it enables high connection speed, low service costs, user satisfaction, personal innovativeness and ease of use. Lener, Ward and Amarasinghe (2010) argue that this limits the usefulness and scalability of mobile phones. Lener, Ward and Amarasinghe (2010) therefore suggest that, to

expand the reach of mobile phones, voice or short message service (SMS) modalities need to be employed since almost each and every mobile phone has them. These authors subsequently recommend the voice rather than the SMS since it has the capability of answering an extended series of questions, the SMS can only be used for very simple questions.

To know which technology will suit the needs of construction SMMEs, this study employs the Task Technology Fit (TTF) Model. TTF argues that, in order for technology to provide a business with competitive advantage, it is important that the technology characteristics are aligned with the business processes otherwise the technology will be useless (Kulkarni & Ipe, 2010). This is supported by Stair and Reynolds (2010) who declare that, just like any other technology, m-commerce can only succeed if it can provide its users with real benefits. Furthermore Junglas, Abraham and Watson (2008) assert that task and technology lead to the success of the information systems with which they interact.

3.3 Task Technology Fit (TTF) Model

TTF represents the degree to which the technology can assist a business to conduct its operations efficiently and effectively (in the context of this study). The Task-Technology Fit Model is depicted in Figure 3.1.
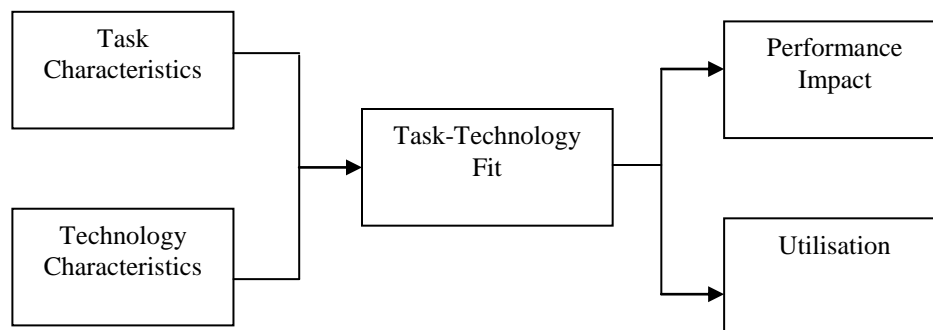
Figure 3.1: Task Technology Fit (Goodhue and Thompson, 1995)

The TTF was introduced and validated by Goodhue and Thompson (1995) since there has been an ongoing concern about the linkage between the technology and performance. The Task Technology Fit has been found as an aid to address this concern as it focuses on understanding the link between technology and performance (Kulkarni & Ipe, 2010). The fit of the technology has a direct impact on the performance and is also a predecessor of

technology utilisation. Furthermore, Keil (1995) in Irick (2008) asserts that researchers found that TTF is more important than the user interface of the technology; this means that no matter how friendly the user interface is, if the technology does not enhance performance then it is useless. Hence, it is crucial to find a link between technology and performance.

Gebauer, Shaw and Gribbin (2010) highlight that in order for technology to impact performance positively, it must be utilized and there must be a good fit with the tasks that the technology supports. Performance can be difficult to measure therefore it would be appropriate to employ user evaluation to measure the technology's success. Junglas, Abraham and Watson (2008) support this by stating that successful technologies are regarded as those ones that harmonise users' needs.   These technologies must support the activities and relationships that enrich the users' experiences. They further assert that "old computing was about what a computer can do and new computing is about what users can do." When users find a technology to be complex or lacking relevance to the individual's needs, then that technology is unsuccessful.

In most cases a user will choose a technology that enables task completion with the greatest performance impact and if the technology is not appropriate to the user's needs, the user will encounter a performance decrease. Mobile technologies must provide the users with information where and when it is needed (Junglas, Abraham & Watson, 2008). Substantially, in the study that was conducted by Goodhue in 1995, Goodhue found that user evaluations are a function of both technology characteristics and task characteristics and in order to predict performance both technology fit and utilisation must be considered. His study also proved that the value of the technology depends on the tasks of the user (Irick, 2008). Therefore, this study needs to determine if the IVR system characteristics match the construction SMMEs' business needs.

3.4 Interactive Voice Response (IVR) Systems

Lustgarten and Cannon (2002) explain that an IVR system is an information network based in the company's database and is used by callers to access information about the company or to check their account balance, stock price quote, and/or execute commercial transactions, such as paying bills or purchasing goods. While King, Terzoli and Clayton (2006) highlight that an

IVR system is used by many organisations to provide voice interfaces to their clients and thus reduce user interaction with human call centre agents or to bring voice services to their clients. Corkrey and Parkinson (2002) enlighten how an IVR system works by asserting that it runs software on an ordinary personal computer in which a voice card has been installed. This voice card is usually connected to one or more telephone lines and allows calls to be made or received entirely automatically, plays or records speech, and responds to keys pressed by the caller. The computer may ask questions to the caller by playing sound files that contain recorded questions and the caller responds to these questions by pressing the keys of the touchphone.

According to Lustgarten and Cannon (2002), the user is prompted to navigate through a menu of options by entering a query either in the form of sequence of a dial tones and pauses produced by pressing keys on a telephone touch pad, computer key board and/or in the form of a voice command. Users are allowed to store frequently used queries on the network so that they do not have to enter the query each time they want information from the system or execute a transaction. Users are also allowed to program when, where and how often the query is executed, and in what form information retrieved from the network or confirmation of the execution of a transaction on the network is delivered to the user.

Garcia, Ruiz and Perez (2010) declare that, in their professional experience the telephone has been the most successful commercial field for voice interaction with plenty of examples of automated speech responses for client services, along with other business or leisure interactive voice response services. They further argue that with the assistance of a Voice over IP (VoIP), software developers have been able to easily integrate IVR systems with other Internet applications, making it possible to provide visual and auditory access to the information by adding voice interfaces to the visual displays.

Garcia, Ruiz and Perez (2010) argue that "an IVR system adds value in a world that is being progressively virtualized and subjected to new pervasive ways of accessing and manipulating information." Furthermore, Digium (2009) also points out the advantages of using an IVR system, that it reduces human resources costs and time in an organisation and thus saves money for the organisation by handling tasks that would have been handled by humans. This also allows employees to concentrate on more valuable tasks. An IVR system also provides

business clients with access to 24 hour automated services and this improves client interactions with the business. Substantially, Murphy 2007 asserts that through the combination of touch-tone-input, speech recognition and text-to-speech capabilities, an IVR system can improve client satisfaction and operational effectiveness of a business. Therefore, this demonstrates that constructution SMMEs can benefit from an IVR system and become compentitive.

There are several IVR systems that construction SMMEs can choose from and therefore, it is important for them to plan and choose an IVR system that best suit their needs. Loudon (2010) highlights that telephony systems are complicated and therefore require specialised hardware and software, reliable server environment and an effective conceptual understanding of digital and analogue voice transmission. Loudon (2010), therefore suggests that a business can use a hosted system if it can obtain a local number and good call quality from its target area; also it is easy to set up a hosted system. A business can also use a Freedom Fone if a business wants to use a mobile number rather than a VoIP or fixed line connection and does not need complex functionality. This study compares three possible IVR systems that construction SMMEs may choose from (in the context of this study) namely, Spoken Web (hosted voicewebsite system), Asterisk (VoIP PBX) and Freedom Fone (BPX without VoIP). It should be noted, the Spoken Web is not an IVR system however, it can provide businesses with funcionality similar to IVR systems, is also more scalable and supports more complex activities.

3.4.1 The Spoken Web

The Spoken Web (also known as the World Wide Telecom Web) has been described by Agarwal, *et al.* (2010) as a new technology introduced by IBM India Laboratory. It is a network of voice applications called Voice Sites and can be accessed over a telephone. This technology acts like websites accessible by voice and situated on a telephony network rather the Internet (Kalam, 2010). These Voice sites are created by the end users through a voice based interface, hyperlinked through Hyper-Speech Transfer Protocol and hosted in a network. A Voice Site is represented by a phone number which can be accessed from any telephone instrument (mobile or land line) through an ordinary telephone call that is made to that number (Agarwal, *et al.* 2010).

The Voice site can belong to and represent either an individual or a group. In a situation where a Voice site belongs to an individual's Voice site, it can be deployed against his phone number. On the other hand, when a voice site belongs to a group, it can be deployed against a telephone number that is accessible to the entire group (Kumar, Agarwal & Manwani, 2010). Moreover, users can create their own voice sites by simply talking to a voice application over a telephone call through the use of a Voigen. A Voigen is described by Kumar, Rajput, Chakraborty, Jindal, and Nanavati (2007) as a voice driven generator of voice-based applications that enables ordinary telephone subscribers to create, deploy and offer customised voice driven applications through a simple voice-based interface accessible from telephony devices. The language used to generate the voice site can be the local language of the voice site's owner (Agarwal, *et al.*, 2010).

Taking into consideration diverse languages, cultures and varying levels of literacy, the Spoken Web is designated to work with voice as the primary user interface modality (Agarwal, *et al.*, 2010). The Spoken Web requires availability of an ordinary telephone instrument that can make voice calls and accept Dual Tone Multi Frequency inputs and can be offered to users under a hosting model (Kumar, Agarwal, & Manwani, 2010). It relies on the existing telecom infrastructure which is either wired or unwired. All these characteristics of the Spoken Web make it possible for this technology to cater for the needs of the underprivileged in a very simple manner and also keep the acquisition and maintenance costs low (Kumar, Agarwal, & Manwani, 2010).

Since it is easy to create Voice sites, the subscribers are not only information consumers but they can also become information providers. They can easily create and manage their Voice sites (Kumar, *et al.*, 2007). The Spoken Web has knowledge sharing tools which can be used by the underprivileged through a voice based interface (Kumar, *et al.*, 2007). They can use a voice based version of Wikipedia which is presented in the Spoken Web. For instance a village community can have a Voice site portal that creates an ecosystem of a closely knit rural community providing them with a channel for sharing locally relevant information as well as to network socially (Kumar, Agarwal, & Manwani, 2010).

The Village Portal Voice site can be managed by a local resident who will act as the Village Portal Administrator. The community can obtain information and services such as an updated

local bus/train schedule, doctor's visit timings in the local health centre, movies that can be watched in the nearby theatre, new government schemes launched, upcoming events for the village and, classified for jobs and equipment rentals. Figure 3.2 represents a simplified view of a Village Portal:
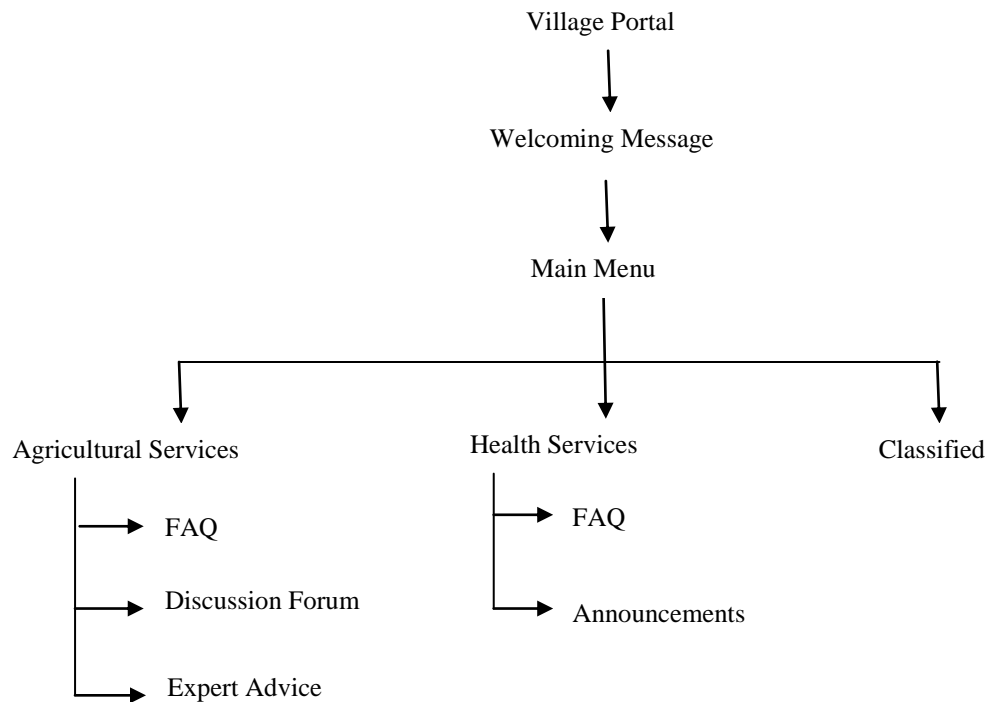
Figure 3.2: A simplified Village Portal Voice Site (Kumar, Argarwal, & Manwani, 2010)

Agricultural Consultancy Service: Here, villagers can browse an agriculture FAQ application for the village and post their questions that can be answered by qualified experts.

Health Center Service: Villagers can obtain announcements related to upcoming health camps, disease outbreak notifications and other health related messages. A locally relevant medical FAQ is also included.

Classified: This is a section that can be used by the villagers to record their professional and personal advertisements posted by other villagers.

Similarly, construction SMMEs can also create a voice site that has similar features to the village portal as it will enable them to find suppliers offering quality products at the lowest prices. It will also give them the opportunity to interact with each other and with experts in their industry. They can use it as a knowledge management system whereby they can share

ideas, knowledge and experiences in order to improve their services and continue offering services efficiently and effectively. The following sub-section depicts studies where the Spoken Web was/can be used effectively to improve a business's efficacy.

3.4.1.1 Field Pilots/Studies of the Spoken Web

This section represents some applications of the Spoken Web either studied or deployed in the field by Agarwal, et al. (2010) and also provides a view of the potential users of the platform in different settings. The following are the various systems of the Spoken Web:

- **VoiKiosk**

This is a Voice site that acts as an information and service portal for a village or a community. This application has been explained in detail in the preceding section.

- **Dial-An-Auto**

This is a type of a system that enables unorganised auto-drivers (taxis) to find the closest passenger any time. Auto-drivers are often hailed from the streets and they find it difficult to have a parking space while waiting for a passenger. From the surveys, it was discovered that there are inefficiencies in the current method of auto-drivers' operations and these inefficiencies lead to several problems such as driver dishonesty and refusal to service non-profitable areas. The Dial-An-Auto system provides a mechanism to organise auto drivers into a virtual community while offering services to passengers. The auto drivers can still decide on fare prices and whether to accept a passenger or not, thus retaining their independence.

- **Avaj Otlo**

This voice site allows farmers to access the latest agricultural information regarding farming practices over the telephone. This system is only available for the farming community of rural Gujarat in India only. It provides them with the opportunity to interact with agricultural experts and other farmers by posting their questions on the voice site. Therefore the questions posted on the voice site can be answered by both farmers and experts and this encourages more peer interaction.

The system administrator who belongs to the local community is responsible for managing the content of the voice site. He manages the content by monitoring the questions posted on the

site, ensuring that information related to farming is available on the site and deleting any irrelevant or inappropriate post. This is done through a voice based interface and this application is currently available only to farmers who are registered for this site.

- **VoiAvatar**

This system allows individuals to create their own personal or business voice sites which act as an online avatar or proxy of those individuals. These VoiAvatars act as the owner's automated secretary; the owner's clients can access the site and obtain information about the owner and the business even in the absence of the owner. In the case of a micro-businessman, this information can encompass area the of operation, service charges and working hours.

- **Folksomap**

This is a community driven map system which is offered as a voice site and a website that influences semantic web technologies to create and manage a community generated knowledge base. It also makes use of web and voice applications to provide access to its services. This system is designed to be populated by the end users for their own consumption.

From the above discussed systems of the Spoken Web, the system that best suits the needs of South African Construction SMMEs is the VoiAvatar system as it enables their clients to obtain information even during the owner's absence. They can integrate other systems into this system in order to obtain maximum benefit from the Spoken Web; this would enable them to become more efficient, since the VoiAvatar will only allow them to post information about the business to their clients and not to obtain information that can assist them in saving costs. In this case, they can integrate the AvajOtlo system to the VoiAvatar in order to obtain information related to their business needs, post questions and interact with the experts in the field of business as well as other business owners. The information that they can obtain from the AvajOtlo can include material or tools prices and available tenders.

Another system that can be integrated to the VoiAvatar is the Floksomap system which will provide their clients with directions to the business in case they want to visit the business. It can also provide these directions to business owner's suppliers when they want to deliver orders. They can also integrate other applications for transactions such as payments, orders, inventory management. The following section discusses the Asterisk IVR system.

3.4.2 Asterisk

Asterisk is a software implemented in a telephone private branch exchange (PBX). Like any other PBX, Asterisk allows the attached telephone to make calls, and to connect to other telephone service including the public switched telephone network (PSTN) and Voice over Internet Protocol (VoIP) services. It consists of several features that are available in a proprietary PBX systems such as voicemail, conference calling, interactive voice response (phone menus) and automatic call distribution (Finnerty, 2009), it also permits users to add new features with minimal effort (Spencer, 2002). There are also several graphical user interfaces (GUIs) included in Asterisk which allow administrators to view, edit, and make changes to various aspects of Asterisk via a web interface (Finnerty, 2009).

Asterisk also supports several telecommunication technologies identified by King, Terzoli and Clayton (2006) as one of the major benefits of using Asterisk. King, Terzoli and Clayton (2006) explain that Asterisk allows more flexibility with regard to interacting with the voice applications. Penton and Terzoli (n.d.) further assert that Asterisk is designed to support several telephony technologies such as VoIP protocols. It connects these telephone technologies from the bottom to telephony applications (which encompass custom IVR scripting) to the to; this enables the creation of a consistent environment for deploying a mixed telephony environment (Penton &Terzoli, n.d.). Its server can be used to replace propriatary PBXs or to provide additional features such as voice mail or voice response menus, or virtual call shops to reduce costs by carrying long distance calls over the Internet (Finnerty, 2009). The subsequent sub-section provides practical scenarios of Asterisk.

3.4.2.1   Asterisk Scenarios

The following practical scenarios adopted from Mahler (2004) provide a clear overview of how a business can use Asterisk to obtain control over every aspect of its communication in different settings.

- **A small office**

In a small office with four telephone lines; each has its own number; ten users; each have an IP telephone, a fax machine and a conference room with an IP telephone. Asterisk can manage calls for the four lines and fax machines by directing any incoming call to the fourth line to

the fax machine. The caller on the first line will hear a voice menu with a variety of choices for either accessing the company's directory, or calling an operator, or contacting sales or dialling an extension directory.   If the caller wants to speak to someone in the sales department, the caller can consult the directory for the sales department's extension, pressing 100 on their telephone keypad which is an extension for all three phones in the sales department so that they all ring at the same time. A distinctive ring will alert sales department staff that this is an incoming call from a potential client. If all three phones are not answered by the fourth ring, the caller will be given a choice of either leaving a message for the sales department (this message will be stored in a separate voicemail box) or of contacting an operator. The message will then be sent to the three users from the sales department in the form of an e-mail to inform them about the new sales call just made.

- **A busy user**

When a caller calls a busy user who travels frequently through Asterisk's system, the system will ask the caller his name; once given, the system will then play him a message asking him to wait for a moment while the called party is located. The system's server will ring the office telephone at the headquarters and branch office, home telephone and cell phone of the user at the same time and if they are all busy, the call will be directed to the voicemail. If the user does not answer any of the telephones, after the sixth ring, the caller will be prompted to leave a voicemail message.   If the user answers one of the phones, the system's server will announce the telephone number of the caller (if the ID is available) and play back the name recorded by the caller. Then the user can press 1 on the keypad of his phone to accept the call or 3 to refuse the call; if the call is refused then the caller is directed to voicemail. A new text message will be sent to the user indicating there is a new voicemail.

Through observing the above scenarios of Asterisk, Mahler (2004) depicted that Asterisk has the ability to provide construction SMMEs with improved effectiveness and efficiency. The plumber/ electrician/ carpenter/ builder can have the option of answering the telephone call or ignore it if they are busy but their clients will still be able to obtain information that they require from the IVR system. Freedom Fone is discussed in the next section.

3.4.3 Freedom Fone

This is a mobile IVR/SMS system that is largely used by Non-Governmental Organisations (NGOs) and advocacy groups (Loudon, 2010). This technology is an open source platform that does not require Internet access and has been designed to connect to mobile networks (GSM) via selected GSM gateway devices; however if a business wishes to connect it to a VoIP service, it is allowed do so. The Freedom Fone encompasses a do-it-yourself (DIY) platform that is accessible, user-friendly, low-cost, scalable, global and does not require any Internet access from its users and callers (Freedom Fone Org, 2009). This technology requires a dedicated computer, GSM device(s) and sim-card(s) depending on the number of call in lines required for the service, an audio recorder and constant power supply (Freedom Fone Org, 2009).

Loudon (2010) claims that Freedom Fone is one of the simplest IVR systems available which is easy to install and configure. Its 1.6 version offers a basic IVR menu (a single menu with up to 10 built-in options), a leave-a-message function and SMS polls and these features are configurable via a web interface. The IVR menu can also employ either pre-recorded audio snippets or Cepstral text-to-speech voice (but is available on purchase of a license). An improvement has been made on the Freedom Fone menu; the 2.0 version of this technology has been introduced and adds more to the features to the 1.6 version.

This version consists of a nested menu which provides more options, multilingual voice menus which provide callers with different language options, multiple leave-a-message menus that allow callers to leave as many messages as they need, and user management which allows users to view and edit details of the callers who interact with the user's IVR system (Freedom Fone Org, 2009). Fone also encompasses official documentation that is clear, well illustrated and easy to follow (Loudon, 2010). It is quick to set up, maintain and does not require a great deal of technical know-how and is easily managed via a user-friendly browser based interface (Freedom Fone Org, 2009).

According to Donner, Verclas and Toyama (2008), Freedom Fone was developed in Zimbabwe with the purpose of accessing information such as health information from a mobile device. Its target market was the general public especially people with limited literacy. It merges an IVR open source application (Asterisk) with an SMS delivery application

(Frontline SMS). Users are permitted to request a call-back with information delivered by voice through an SMS, or they can access voice information through a menu system. It can be employed with any phone that has voice or SMS as the lowest-common denominator and does not require cooperation of an operator. The Freedom Fone can be employed in different projects to serve its main purpose (access to information); this is depicted in the following scenarios.

3.4.3.1 Freedom Fone scenarios

The following practical scenarios which were adopted from Burrell (2009) provide a vision of how the Freedom Fone can be used in different settings/projects.

- **Zimbabwean HIV/AIDS activists and advocacy organisations**

The Zimbabwean HIV/AIDS activists and advocacy organizations can facilitate greater access to relevant information to people affected by HIV/AIDS through using the Freedom Fone dial up information software. They can operate a national toll-free number so as to allow Zimbabweans to access critical information free of charge. The Freedom Fone have the ability to allocate individual channels to different groups and, this allows organizations to collaborate around a single deployment of Freedom Fone to aggregate their content in order to offer a variety of materials on HIV/AIDS prevention, treatment and support.

- **Democracy Radio's Word on the Street project**

This can be a project that educates South Africans about their municipalities using the Freedom Fone software. The project can set up a dialup service and encourage residents to contribute their opinions, news stories and local issues directly to the world on the Street call. The Democracy Radio can mix its own material plus an audio compilation from resident's contributions and its own material to provide self-help materials that can be accessed by the public in both urban and rural areas via cell and landline phones; this creates communities more informed and aware of their rights.

Construction SMMEs could provide their clients with information by employing a simple and cost effective system (Freedom Fone). They could be able provide information to clients with

or without Internet access. Therefore by using the Freedom Fone they could save costs of paying a monthly internet connection.

From the above discussion of IVR systems, one can reasonably assume that the characteristics of an IVR system are aligned with the business needs of the construction SMMEs and therefore has the capability of providing SMMEs with improved efficacy if used properly.

3.4.4 Comparison of the IVR systems

From the above, this study found that the three IVR systems discussed are all capable of providing construction SMMEs with enhanced efficiency and effectiveness. Ramanujam and Goldman (2008) highlight that the IVR system represents the business's website and other client touch points and therefore it is important for a company to focus on the cost-benefit analysis or feauture sets and also evaluate how a system fits into the business's entire client strategy before implementing an IVR system. For the purposes of this study, only one IVR system will be analysed to establish if consruction can really benefit from mobile commerce through the use of voice modality. This will be done by comparing these systems based on the assessment of their feature set and the costs involved in their implementation. Table 3.1 compares Spoken Web, Asterisk and Freedom Fone.

Table 3.1: Comparison of IVR Systems

Factors	Spoken Web	Asterisk	Freedom Fone
Resources/hardware, technology and infrastructure	Telephone (wired or unwired) Personal Computer VoIP connection Bandwidth that supports VoIP VoiceXML (Voice Extensible Markup Language) HSTP (Hyper Speech Transfer Protocol) VoiGen (VoiceSite Creator) VoiHost (VoiceSite Engine) WWTW Browser	Telephone (wired or unwired) Personal Computer Linux software VoIP connection Bandwidth that supports VoIP PSTN service (optional)	Telephone (wired or unwired) Personal Computer Mobigator SIP to GMS Gateway VoIP (optional)

Factors	Spoken Web (World Wide Telecom Web Browser)	Asterisk	Freedom Fone
Usability	Telephone keypad or voice is used. Both literate and semi-literate people can use it. Any language can be used	Telephone keypad or voice is used. Both literate and semi-literate people can use it. Any language can be used	Telephone keypad or voice is used. Both literate and semi-literate people can use it. Any language can be used
Call charges	Can be a toll-free call, a shared call or a client can pay the full amount of a call	Can be a toll-free call or a shared call or a client can pay the full amount of a call	Can be a toll-free call or a shared call or a client can pay the full amount of a call
Licence	Purchased	Free open source software	Free open source software
Implementation Costs	High	Low	Exremely low
Technical support needed	High	Low	Extremely low
Features	Access to information Multimedia element Transactions element Search facility Blogs The system suggests the content loaded Response time is 10 times quicker than the normal time	Access to information Multimedia element Transactions element	Access to information
Client feedback channel	Yes	Yes	Yes
Sophistication	More scalable and supports more complex activities	Less scalable and supports simple activities	Scalable and supports less complex activities

From Table 3.1, it can be observed that these IVR systems have similarities and differences. However businesses can only choose the most affordable and the most appropriate.

3.4.4.1 Similarities

The Spoken Web, Asterisk and Freedom Fone serve the same purpose of allowing literate and semi literate individuals and businesses from developing countries to access and share information. They are used in a similar manner i.e. the callers follow voice prompts and reply by pressing a key in their phone touch pads or use their voices, and the company can choose the language to use. The caller can interact with someone from the company or with the system and can leave a voicemail message. Callers do not need to be computer literate to be able to use the system. Call charges are minimised through the use of VoIP services and the company can use a toll-free number to allow its callers to call in free of charge. A feedback client channel is also provided so as to allow callers' suggestions as this will influence an improvement in client services.

3.4.4.2 Differences

The differences in these IVR systems concern implementation and the features of each one. The PC and the telephone are the primary requirements for these IVR systems, the difference is the software needed. Other primary requirements include, mobigator SIP for Freedom Fone, Linux, VoIP and Bandwidth that supports VoIP for Asterisk and VoIP connection, Bandwidth that supports VoIP, VoiceXML, HSTP, VoiGen, VoiHost and WWTW Browser for the Spoken Web. Technical support required for Spoken Web is high. This technology is still in its infancy stage and it can only be hosted by IBM in India due to the challenges involved in its hosting.

Aditionally, calls made in South Africa will go to India making the phone call charges high since they will be international calls. Asterisk requires low technical support, this technology becomes very challenging if the person who implementing it does not know Linux. Support can be obtained from the Digium organisation, this organisaion which can be reached from the World Wide Web. Freedom Fone requires extremely low support and this can be obtained from the Freedom Fone organisation and can also be reached from the World Wide Web.

Furthermore, Freedom Fone and Asterisk are both a free open source software that can be easily managed and configured with little support from a technician. On the other hand, the Spoken Web's licence can be purchased from IBM, and requires comprehensive support from

the IBM technicians. This results in different implementation costs for these IVR systems. The implementation costs for Spoken Web are expensive as compared to Freedom Fone and Asterisk. Between Asterisk and Freedom Fone, Freedom Fone is cheaper.

In terms of their features, Freedom Fone offers a basic IVR system but can not be used if a company requires sophiscated features. Asterisk offers the basic and multimedia features, transactional features can be added. Spoken Web offers features identical to Asterisk but also offers features not found in other IVR sytems such as: a search engine where users can search for a company that offers the service they need or the company itself can search for the best supplier from the world wide web. Construction SMMEs can interact with each other or with their suppliers, or experts in their field.

The Spoken Web can also provide access to several links to voice sites containing blogs run by people in the business trade; portals are run and maintained by a formed online community in that field. This online community distributes related news and runs debate sites to discuss issues of concern to companies. When a business employs the Spoken Web, the user does not have to be concerned about what information to include in the voice site as the system asks the user about the business and in addition, the user is allowed to add further information that the system did not ask for. The response speed of this system to the caller has been improved to ten times more than the normal speed.

From the above comparison, the Spoken Web has been found to have an excellent feature set. A summary of this chapter is provided in the following section.

3.5 Conclusion

From the above reviewed literature, it has been found that m-commerce has the ability to improve the efficiency and effectiveness of Construction SMMEs through the use of an IVR system. It has also been found that the characteristics of IVR systems are aligned with the business needs of construction SMMEs hence m-commerce can provide construction SMMEs with improved efficacy. There are several IVR systems available, but in order to reap the benefits, it is significant that construction SMMEs choose the IVR system best suited to its needs. They must focus on the cost-benefit analysis and the feature set when choosing an IVR system. Even though an IVR system can provide construction SMMEs with efficacy, they

need to adopt it, actually use it and maintain its use in order for them to continue exploiting the benefits offered by m-commerce. Therefore the following chapter (Chapter 4) provides guidelines on how construction SMMEs can sustain the adoption and use of m-commerce.

CHAPTER 4

SUSTAINING THE ADOPTION AND USE OF M-COMMERCE

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4.1 Introduction

Mathieson (2001) claims that an adopted technology can only be effective and provide a business with efficacy if it is actually used. Therefore, it is important to understand the factors that influence system users to decide whether they want to use a particular technology. Mathieson (2001) argues that the factors influencing a decision to use a technology are likely to vary according to the technology itself, the users and the context. The Technology Acceptance Model is an appropriate tool to identify these factors since it is a widely used and a validated model to identify such factors. Furthermore, Thong, Hong and Tam (2006) argue that in order for the business to continue reaping the benefits from the technology they have adopted, it is important for them to maintain its use. Therefore, it is crucial to also identify the factors that can influence construction SMMEs to sustain the use of m-commerce. The Expectation Confirmation Model will be an appropriate tool to determine these factors; it is also a widely used and validated model to identify such factors.

Al-maghrabi, Dennis and Halliday (2011) highlight that, the decision to continue using a system is an extension of acceptance. Continued use can never be achieved if the users have not accepted the system. Thus, this chapter uncovers the factors that influence users to accept a system and continue using it. This chapter begins by providing the background to these two theories employed to uncover these factors. The background explains the origins of these theories and their purpose. Factors that can influence user acceptance and sustained use of an IVR system are discussed in detail.

4.2 Theoretical Background

Factors that influence construction SMMEs to accept and sustain the use of an IVR system are adapted from existing theories namely, the Technology Acceptance Model and the Expectation Confirmation Model. These factors are supported by the literature reviewed as well as the two most used usability heuristics, that is ten usability heuristics and eight golden rules of user interface design (Singh & Wesson, 2009).

4.2.1 Technology Acceptance Model (TAM)

This model predicts why users sometimes accept or reject a system that is being developed (Szajna, 1996). Mathieson (2001) states that unused systems are ineffective; thus it is

important to understand how users decide whether or not they will use a particular system. Wu, Wang and Lin (2007) highlight that acceptance of a system by users is a primary factor that determines the success of the system. TAM has identified factors that can influence users to accept a system. This model posits that "perceived usefulness and perceived ease of use determine an individual's intension to use a system with intension to use serving as a mediator of actual system" (Szajna, 1996, p. 87). "Perceived usefulness is seen as being directly impacted by perceived ease of use" (Szajna, 1996, p. 87)." This is portrayed in Figure 4.1.
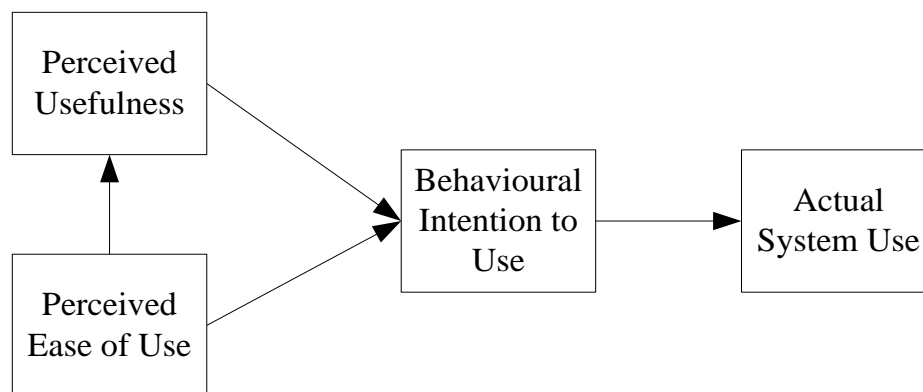

Figure 4.1: Technology Acceptance Model (Davis, 1989)

TAM was originally developed by Davis (1989) who states that perceived usefulness and ease of use represent the beliefs that lead to a system's acceptance. This model explains the relationship between perceived usefulness, perceived ease of use and the intention to use a technology (Teo, Ursavas & Bahcekapili, 2011). TAM is a widely used and validated model. Several studies have employed this model in different contexts such as Wu, Wang and Lin (2007), who have used TAM in the healthcare industry, Zhou (2010) in mobile website adoption, and Teo, Ursavas and Bahcekapili (2011) in education.

Furthermore, Teo, Ursavas and Bahcekapili (2010) have examined and tested the efficiency of TAM factors influencing Turkish pre-service teachers' intention to use technology. Their results demonstrated that TAM is a valid and efficient model to explain the Turkish pre-service teachers' intentions. They state that their study contributed to and built upon existing studies on technology acceptance by presenting the Turkish perspective and following recommendations from previous studies that highlighted the need to validate TAM with different contexts and cultures to enhance its generalisability. This study also employs TAM

to examine factors that can influence acceptance of an IVR system in the construction industry.

Construction SMMEs can only reap the benefits offered by an IVR system if they accept it and sustain its use; Thong, Hong and Tam (2006) point out that the capability of a system depends on an individuals' continued usage. They further state that if an individual's interest in the adoption of a system diminishes, system usage will decrease and the technology will eventually fall into disuse. Thong, Hong and Tam (2006) also highlighted that continued usage decisions are essential as they guarantee long term productivity in an enterprise.

Continued use of IT also provides an organisation with potential benefits such as substantial reduction in operating costs. The success of IT also depends on the user's continued usage rather than its initial adoption (Hong, Tam & Thong, 2006). Hence, it is important for construction SMMEs to continue using m-commerce once they have discovered its benefits as this may sustain effectiveness and efficiency. This study will therefore explore the Expectation Confirmation Model (ECM) to determine the factors influencing construction SMMEs' post–adoption behaviour.

4.2.2 Expectation Confirmation Model

ECM claims that expectations together with perceived performance lead to post-adoption satisfaction. This model was introduced and empirically verified by Bhattacherjee in 2001 as an Information Systems (IS) related model which stemmed its roots from the Expectation Confirmation Theory (ECT) (Hong, Tam, and Thong, 2006; Lee and Kwon, 2011). ECT was primarily used to investigate consumer relationship satisfaction and re-purchase decisions in the consumer behaviour literature. Bhattacherjee (2001) on the other hand developed ECM with the aim of focusing on an individual's continued Information Technology (IT) usage. The results of ECM were also verified by other studies by Hong, Tam, and Thong (2006); Limayem and Cheung (2008) and Lee and Kwon (2011).

According to ECM, users first develop expectations about the system before using it and thereafter, their usage experiences with the system build perceptions about its performance and subsequently, by assessing perceived performance against their expectations, they either confirm or disconfirm pre-usage expectations (Hong, Tam, & Thong, 2006). An individual's

expectations are confirmed when the system performs as expected; positive confirmation leads to satisfaction while negative confirmation leads to dissatisfaction (Hong, Tam, & Thong, 2006). User's satisfaction then determines continued use intention. This is demonstrated in Figure 4.2.
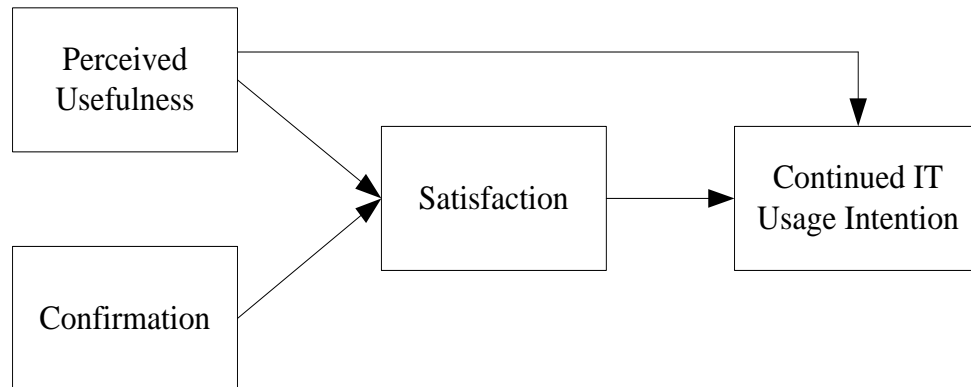

Figure 4.2: Expectation Confirmation Model (Hong, Tam, & Thong, 2006)

From TAM, an individual can accept and use a system when the individual perceives that system as useful and easy to use. However, TAM does not provide an explanation of how ease of use can be achieved. ECM on the other hand claims that an individual can continue using a technology when the individual is satisfied with the technology's usefulness and his/her expectations have been confirmed. Similarly to TAM, ECM is also a widely used and validated model, and has been employed by several studies in different contexts. These studies include Al-magharabi, Dennis and Halliday (2011) who employed ECM to discover the antecedents of continuance intention towards e-shopping and Thong, Hong and Tam (2006) who studied the effects of post-adoption beliefs for information technology continuance.

This study is of the belief that what leads to satisfaction is confirmation; the perceived usefulness element should be encompassed in confirmation just like all other factors that contribute towards confirmation. When construction SMMEs adopt an IVR system, they will expect it to be useful, therefore perceived usefulness is also an expectation. The following section identifies factors that can influence these companies to sustain the use of an IVR system.

4.3 Factors that influence adoption and sustained use of an IVR system

The following factors were adopted from TAM, ECM and the usability heuristics.

4.3.1 Perceived Ease of Use

Perceived ease of use means "the degree to which a person believes that using a particular system would be free of effort" (Sjazna, 1996, p. 85). This is further explained by Lopez-Nicolas, Molina-Castillo & Bouwman (2008) who state that the systems will assist in performing the task more easily, quickly, with quality, productivity and effectiveness. Customers need to participate in a friendly and enjoyable environment when communicating, exchanging or retrieving information (Koufaris, 2002; Mathieson, 2001).

Liao, To, Liu, Kou and Chuang (2011) argue that perceived ease of use does not have a significant impact on the intended use of experienced users. Experienced users often find a familiar system easier to use as compared to their counterparts, therefore an IVR system must be designed in a manner that they will retrieve orders from the system, upload, update and change information easily without wasting any time.

As for their client's, they might be familiar with an IVR system as the South African network providers use it as one of the channels to communicate with customers. Therefore, ease of use may not have a significant impact. However, for inexperienced IVR users, the IVR system should be designed in such a manner that clients find it easy to obtain information and place orders. This can be achieved by following Nielsen's (2008) Ten Usability Heuristics and Shneiderman's (1998) Eight Golden Rules of Interface Design. Ease of use can also be influenced by user involvement during the system development, as well as the necessary training that needs to be provided to the users.

4.3.1.1 Usability Heuristics

The Ten Usability Heuristics and Eight Golden Rules of Interface Design are two of the most used usability heuristics (Singh & Wesson, 2009). These guidelines have been applied in various studies and have demonstrated positive results (Greef, Coetzee, & Pistorius, 2008; Singh & Wesson, 2009; Costa, 2010). They are summarised as follows:

Visibility of system status: the system should inform the user by providing feedback as the user navigates through the system (Nielsen, 2008; Shneiderman, 1998). For example, when the system reads out the main menu to the user and the user chooses the products offered, the system should inform the user that they are now in the services offered.

Match between the system and the real world: the system should use language with words, phrases and concepts that are easily understood by users, rather than the terms oriented to it (Nielsen, 2008). The language used in the IVR system should not be technical; it should be simple. It is much simpler if it uses a language that is spoken by the users.

User control and freedom: the emergency exit from a function chosen by mistake should be included to enable the user to leave the unwanted state without having to go through the extended dialogue; the system should support undo and redo (Nielsen, 2008). This encourages users to explore the unfamiliar options of the system (Shneiderman, 1998). For example, if the user supposed to select option 2 for services offered from the keypad but the user selects 3, the system should allow the user to press a button that will allow them to go back to the previous sub-menu instead of taking them to the main menu.

Consistency and standards: the words, situations or actions should not be ambiguous (Nielsen, 2008). Additionally, the terminology used in prompts and menus should be consistent (Shneiderman, 1998).

Error prevention: errors should be eliminated or the system should be able to check them and present a confirmation to users before they begin an action (Nielsen, 2008). However, if an error has been made by the user, the system should detect the error and offer a simple mechanism for handling the error (Shneiderman, 1998). If the user enters their contact number that is more or less 10 digits in the system, the system should inform the user and ask the user to enter correct contact number.

Recognition rather than recall: the user should not be expected to remember information from one part of the dialogue to the other; instructions on how to use the system should be retrievable whenever appropriate (Nielsen, 2008). Furthermore, the menu should be kept simple and multi menu options should be consolidated (Shneiderman, 1998). A user should not be provided with a long list of options; a search facility is usually helpful as it provides specific information and thus saves time and telephone costs.

Flexibility and efficiency of use: the system should cater for both experienced and inexperienced users, thus allowing users to tailor frequent actions (Nielsen, 2008). The experienced users should be the initiators of actions and the system should be the responder (Shneiderman, 1998). When a user wishes to speak to an operator, the system should transfer the user immediately instead of listing the menu options first. Furthermore, if a system requires input from the user, it should wait for a certain period maybe 10 seconds and if no action has been taken, the system should repeat the requirement to the user.

Aesthetic and minimalist design: information provided by the system should be current and relevant to what the users need (Nielsen, 2008).

Help users recognize, diagnose and recover from errors: error messages should be explained in a language that users will understand; the system should precisely indicate the problem and suggest a solution (Shneiderman, 1998). If the user is required to enter their name and contact number and the user enters a name and address, the system should inform the user and provide an example.

Help and documentation: the system should provide a search facility to allow users to search for the specific information they require, and it should list concrete steps to be carried out when searching for such information (Nielsen, 2008).

The Ten Usability Heuristics include six of the Eight Golden Rules of Interface Design. The two golden rules namely; *enable frequent users to use shortcuts, and design dialog to yield closure* are not included in Nielsen's usability heuristics. This study is of the view that the design of an IVR system interface should apply all these guidelines to make it user-friendly.

A user-friendly interface can also be achieved by providing users with the necessary training. Training and support are amongst the most critical factors in determining user acceptance of a system (Wu, Wang, & Lin, 2007). Users may require technical support from consultants (Wu, Wang, & Lin, 2007). Construction SMMEs may obtain technical support and training from organisations or companies who have developed the IVR system. Training for the IVR systems is an important factor for increasing productivity in an enterprise (McClelland, 2002). However, it will not improve the manner in which they perform their tasks i.e. it will not improve the manner in which a builder lays his bricks, but will increase efficiency as it will enable communication and provide information to clients in a cost and time effective manner.

Improved efficiency will lead to improved productivity as construction SMMEs will spend more time on their core tasks. Even though the interface can be user-friendly, user involvement is very crucial to attaining ease of use of the system.

4.3.1.2 User Involvement

Sifri (2008) argues that it is important that developers of the system have extensive user involvement from the beginning through the implementation so that it is aligned with the users' expectations, thereby improving the success of the system's development. User involvement at the beginning of the project is crucial as it helps to establish a sense of commitment (Anandarajan, Anandarajan, & Wen, 1998). User involvement also assists in identifying and preventing problems and adjusting a system to meet the needs of a user (Glosiene & Manzhukh, 2005).

Systems developed with user participation result in more understandable user requirements and capabilities than systems designed by developers alone. Furthermore, when construction SMMEs and their clients are involved, they will also feel part of the decision making and this may result in commitment of users during the adoption of the system (Mathieson, 2001). User involvement will help construction SMMEs to understand how they can benefit from using an IVR system. Once they understand the benefits of using such a system, they must then be provided with the necessary training enabling them to actually use the web applications.

4.3.1.3 Training

Training is viewed as an important factor for increasing productivity in an organization (McClelland, 2002). Lofstrom and Nevgi (2007) argue that it is necessary to determine the technological knowledge needed for successful use of the system. This is where training may be used in order to assist users to use the technology successfully. Not only does training increase productivity, it also motivates and inspires individuals since it provides them with knowledge of how important their business processes are, as well as all the information they need to increase business efficiency (McClelland, 2002).

Therefore Scott (1998) suggests that training should not only be provided to users of the technology applications, but also to the IT department of an organisation as it is essential to keep IT skills aligned to current needs; i.e. they must ensure the availability of information to

the users when they require it. Training will also enable the IT personnel to cope with maintenance problems such as managing the volume of information, obsolete information and information redundancy.

In the case of an IVR system, the manager or owner of the construction SMME is the person who will act as the IT personnel, therefore requires training in order to update information posted in the voice site. Wu, Wang and Lin (2007) view training and support as one of the critical factors in determining user acceptance of the system and further assert that theories and evidence have shown that it becomes easier for an individual to accept a new system once they recieve training and support. Construction SMMEs may obtain technical support and training from organisations or companies who have developed the same IVR system.

Ease of use deminishes when users gain experience from using a system and pay more attention to the usefulness of the system (Liao, To, Liu, Kou & Chuang, 2011). This is because the more the users use the system the more they gain experience and ease of use is no longer fundamental. Therefore users tend to focus on usefulness and it continues to be a factor that determines the continued usage intention.

4.3.2 Perceived Usefulness

Perceived usefulness has a significant impact on acceptance of a system and its continued use. Perceived usefulness is "the degree to which a person believes that a particular information system would enhance his or her job performance, for instance, by reducing the time to accomplish a task or providing timely information" (Sjazna, 1996, p. 86). Construction SMMEs can perceive usefulness of an IVR system when it allows them to focus on their core tasks by handling tasks such as communication with their customers at low costs. Many service providers implement a system based on an administrator or designer's perspective and fail to address the expectations of the clients.

However, in order to meet client's demands, service providers need to understand clients' expectations (Liao, To, Liu, Kou, & Chuang, 2011). Al-maghrabi, Dennis and Halliday (2011) have confirmed perceived usefulness as a significant factor that has a strong impact on an intention to continue using a system. Once users find a system easy to use and useful, they will have the intention to use it (Sjazna, 1996). Therefore it is important that the design of an IVR system is user-friendly and aims to meet business needs so that construction SMMEs and

their clients perceive it as easy to use and useful. This will make it easier for them to accept and continue using this technology. Even though these companies may perceive an IVR system as useful but they must have a behavioural intention to use it.

4.3.3 Behavioural Intention to Use

The behavioural intention to use a system "is a measure of how much a person is going to employ the application" (Sjazna, 1996, p. 86). Koufaris (2002) and Wang (2008) assert that if the technology is attractive it is more likely that users will use it; hence, users need to perceive ease of use as this can lead to a behavioural intention to use a system. Therefore, it is essential that construction SMMEs have the intention to use the IVR system as this will lead to actual use of it.

4.3.4 Actual System Use

A usable system is one that users find friendly and useful. According to Lederer, Maupin, Sena and Zhuang (2000, p. 271), "TAM proposes that ease of use and usefulness predict applications usage." A user-friendly design of an interface is important as it determines the usability of a system. It is important that construction SMMEs continue using the IVR system so that they continue exploiting the benefits offered by this technology. This can be achieved when the IVR system confirms the expectations of construction SMMEs.

The continued use of the IVR system by construction SMMEs' clients also has a considerable influence on construction SMMEs' decisions to continue using it or not. This is because the IVR system will be adopted with the aim of communicating and providing information to the clients; therefore, if the clients do not use it, the IVR system will be useless and construction SMMEs may lose the loyalty of their clients. Significantly, Chiu, Chang, Cheng and Fang (2009) point out that client loyalty is crucial to an enterprise's success. The IVR system will be continually used by construction SMMEs if their expectations are being met; hence it is important that the IVR system confirms their expectations.

4.3.5 Confirmation

The ease of use and usefulness contribute in confirming whether the system performs as expected. Lopez-Nicolas, Molina-Castillo and Bouwman (2008) claim that the primary

measure of a designed system is the degree to which it meets the purpose for what it was intended. Mathieson (2001) claims that, there are cases in which users' expectations may change as they become more familiar with the system. Therefore, the accepted system may become inadequate, in which case if users require a new system or some functions of the existing system to be changed, the factors mentioned above still apply. Once it has been confirmed that the expectations of construction SMMEs are met, this might lead to satisfaction.

4.3.6 Satisfaction

Zhou (2010) describes satisfaction as a reflection of a gap between perceived performance and expectation. According to Yen, Seo, Desouza, Papagari and Jha (2006), when individuals adopt a product they constantly make satisfaction judgements. They conduct this judgement by using pre-consumption expectations on product performance to compare actual product performance with post-consumption. Studies on consumer satisfaction have demonstrated that satisfaction is one of the most fundamental factors leading to continued use and loyalty (Yen, Seo, Desouza, Papagari & Jha, 2006). This factor is positively associated with an intention of sustained system (Chiu, Wang, Shih & Fan, 2011). Zhou (2010) states that this factor is vital for a system's success. If users are not satisfied using a system, the system will not be used and be regarded as an unsuccessful system. Therefore, it is important that construction SMMEs and their clients gain satisfaction from using an IVR system for its continued use.

4.4 Conclusion

From the above reviewed literature and theoretical explanations provided, factors influencing construction SMMEs to adopt and sustain the use of an IVR system were identified. It was found that in order for these companies to use the system, they need to perceive it as easy to use and useful. Ease of use was found to be influenced by a user-friendly interface which can be achieved by applying the Ten Usability Heuristics and Eight Golden Rules of Interface Design. Furthermore, ease of use is accomplished by involving construction SMMEs during the development of the IVR system and providing them with the necessary training to use the technology.

Once they perceive the system as easy to use and useful, they will actually use it. The decision to continue using the system will depend on whether the system meets their expectation and provides them with improved efficacy. When the system meets their expectations, they will be satisfied from using the system and continued use of the IVR system will be achieved. The following chapter presents a proposed model which serves as a solution to the problem of this study.

CHAPTER 5

PROPOSED MODEL: ADOPTION AND CONTINUED USE
OF M-COMMERCE

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5.1 Introduction

The preceding Chapters 2, 3 and 4 focused on the literature review. They laid the foundation for this study's main objective which is to develop a proposed model that serves as a solution to the identified problem of this study. The proposed model aims at uncovering factors that can enhance and sustain the adoption of mobile commerce (m-commerce) by construction Small Medium and Micro Enterprises (SMMEs) through an Interactive Voice Response (IVR) platform so as to exploit the benefits offered by m-commerce and improve their efficacy. The model has been developed through the influence of the Theory of Planned Behaviour (TPB), Task Technology Fit Model (TTF), Technology Acceptance Model (TAM) and Expectation Confirmation Model.

TPB provides a comprehensive understanding of how an individual's attitude, subjective norms and perceived behavioural control can influence his/her intention to adopt a technology while TTF provides an understanding of how a system can improve performance or provide a business with efficacy. TAM on the other hand explains why users accept or reject a system and ECM provides an understanding of how perceived usefulness, confirmation and satisfaction can influence a user to continue using a system.

Consequently, the TPB is employed in this study to identify factors that can influence construction SMMEs to adopt m-commerce through an IVR platform. The TTF model is used to examine how an IVR system can provide effectiveness and efficiency to construction SMMEs. The TAM and ECM are used to identify factors that can influence construction SMMEs to accept this technology and sustain its use. Additionally, this model is validated through the results of the data that will be gathered from construction SMMEs through semi-structured interviews, clients of construction SMMEs through an online questionnaire and experts in voice technologies through conversational analysis; the findings are presented in chapter 7.

This chapter focuses on the proposed model; it comprehensively discusses elements identified as factors that can address challenges involved in e-commerce adoption by construction SMMEs and also that can influence these companies' decision to adopt and sustain the use of m-commerce. The conclusion of this chapter is then provided.

5.2 Proposed Model

As mentioned previously, this model serves as a solution to the identified problem of this study which is South African construction SMMEs lag behind in the adoption of e-commerce due to the challenges associated in the adoption of this technology and therefore, do not benefi from it. The challenges involved in the adoption of e-commerce comprise: *lack of access to e-commerce, lack or poor infrastructure, inadequate resources, high implementation costs, computer illiteracy, low use of e-commerce by suppliers and consumers and lack of awareness about the potential benefits of e-commerce.*

Thus this study recommends an Interactive Voice Response (IVR) system as an m-commerce aspect that construction SMMEs can adopt to exploit the benefits offered by commercial technologies. The IVR system is a voice based technology built on existing infrastructure, using existing resources, thus decreasing the implementation costs of m-commerce. Therefore e-commerce challenges such as illiteracy, high implementation costs, lack of infrastructure, inadequate resources, lack of access and low use by clients, are addressed. A more detailed explanation of this is provided in the proposed model.

The proposed model was derived through adopting factors from existing models. The model identifies the factors that address the challenges involved in the adoption of e-commerce and that can influence construction SMMEs to adopt m-commerce and sustain its use; it also explains the way in which each factor can influence these companies to adopt and continue using m-commerce through an IVR platform. The model is divided into five phases namely: *behavioural intention to adopt m-commerce, actual adoption and use of m-commerce, confirmed expectation from using m-commerce for construction SMMEs, satisfaction from using m-commerce, and continued use of m-commerce*. The proposed model is portrayed in Figure 5.1.
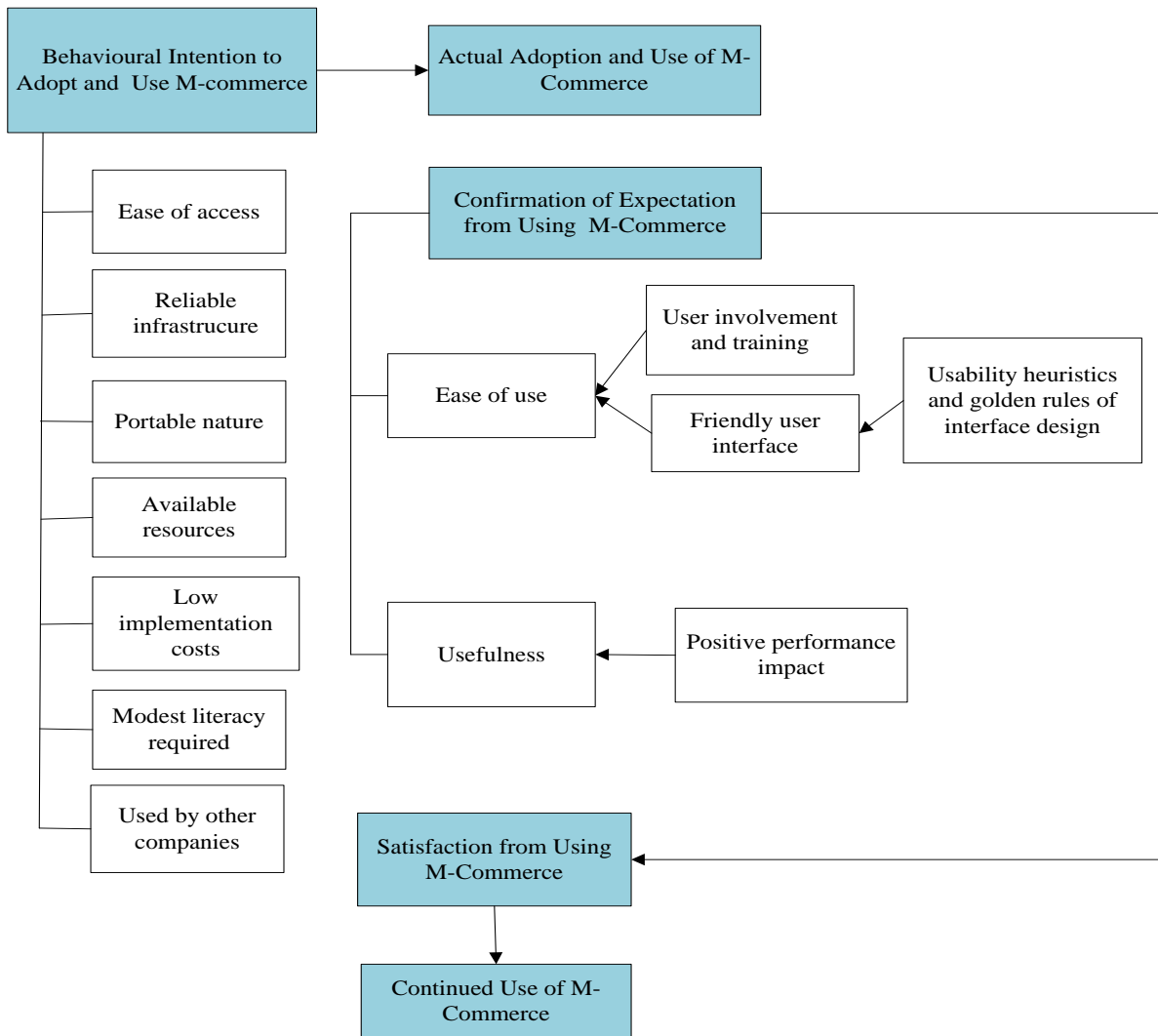
Figure 5.1: Adoption and Continued Use of M-commerce Model

5.2.1 Behavioural Intention to Adopt and Use M-Commerce (Through an IVR System)

This phase consists of seven factors that are essential in influencing construction SMMEs to adopt and use m-commerce. These factors are adopted from TPB; the first six factors fall under the *perceived behaviour control* element and the last one falls under the subjective norm element.

5.2.1.1 Ease of access

Studies such as Agarwal, et al. (2010) and Heeks (2009) have shown that mobile phones are widely accessible even amongst low income groups and exceed personal computers in terms

of accessibility (Kreutzer, 2009). IVR systems do not require advanced features and are accessible using the most basic mobile devices. Therefore, the accessibility associated with IVR systems may influence construction SMMEs to adopt m-commerce as it will allow them to reach clients of all income levels. Ease of access may attract users to use the system as they will have immediate access to information about the services offered by construction SMMEs anywhere and anytime (Lu & Su, 2009). They further point out that easily accessible technologies are more likely to be adopted and used. Their study of factors affecting purchase intention on mobile shopping web sites has confirmed ease of access as a key determinant of a behavioural intention to use a system. The reliability of infrastructure also affects the decision of these companies to adopt and use an IVR system.

5.2.1.2 Reliable infrastructure

Studies have demonstrated that IVR systems function on a reliable infrastructure which is becoming more widely available (Heeks, 2009). It uses existing wired and wireless infrastructure from the telecommunication network companies (Agarwal, et al. 2010; Freedom Fone Org, 2009; King, Terzoli & Clayton, 2006). Therefore construction SMMEs are more likely to trust the infrastructure and have the intention to adopt the IVR system. The decision of these companies to adopt and use this system is also affected by the portable nature of it.

5.2.1.3 Portable nature

Due to the portable nature of mobile phones, construction SMMEs will be able to communicate with clients where and when ever they want. Their clients can also request information from the enterprise where and when they need it. Lu and Su (2009) conducted a study about the factors affecting purchase intention on mobile shopping web sites. Their results demonstrated that the portable nature of mobile phones influences a person's intention to adopt them. Therefore it can be concluded that these companies are more likely to adopt this system. The availability of the resources also influences these companies to adopt and use an IVR system.

5.2.1.4 Available resources

Most of the resources used for the implementation of an IVR system, such as mobile phones and personal computers, are commonly owned by SMMEs. Additionally, there is freely

available and open source applications IVR software. These IVR software include; Freedom Fone, Asterisk and Voicent. Although Voicent is not entirely free but it has a free trial version that can be used for an unlimited period (Voicent, 2009). However, the disadvantage is that trial versions often have limited functionality. Therefore since the resources required for the implementation of this system are commonly owned by these companies and the software is available, these companies are more likely to adopt this system resulting in low implementation costs.

5.2.1.5   Low implementation costs

Since resources are commonly available, implementation costs of an IVR system are minimal. Construction SMMEs can choose a Freedom Fone IVR system as it is one of the cheapest, easy to install and to configure. Freedom Fone can be used without a Voice over Internet Protocol (VoIP) making it even cheaper as there is no Internet bill to be paid to the Internet service provider at the end of the month (Digium, 2009). However Freedom Fone does not support complex activities but a company can choose Asterisk as it supports complex activities. Most importantly, the IVR system that a company can choose depends on the company's business needs; therefore construction SMMEs must adopt an IVR system that will meet their needs. Due to the low implementation costs of an IVR system, these companies are more likely to be influenced by this factor. The level of literacy required to use this system also influences companies to adopt and use this system.

5.2.1.6   Modest literacy required

Mobile phones do not require advanced knowledge or literacy to be used. Semi-literate and illiterate individuals will be able to use it with a minimal learning curve. Since an IVR system primarily requires users to have phone knowledge, studies have reported that the majority of people own mobile phones (Kreutzer 2009; Heeks 2009); this indicates that they already have phone knowledge; therefore it can be reasonably concluded that literacy is not an issue and therfore, construction SMMEs are likely to adopt this system. The use of the IVR system by other companies is also important in influencing these companies to adopt and use this system.

5.2.1.7   Used by other companies

The use of an IVR system by other companies within the construction industry may influence other construction SMMEs to use it as well.   Furthermore, the IVR system in construction SMMEs will be used primarily by their clients to obtain business information; therefore their opinions on the adoption of an IVR system are important to construction SMMEs.   Therefore if other companies are using this system and their clients approve their adoption of an IVR system, therefore these companies will be influenced to adopt the same system. All these elements will influence the behavioural intention of construction SMMEs to adopt m-commerce and enhance the actual adoption and use of it.   Studies conducted by Al-maghrabi, Dennis and Halliday (2011) and Hong, Tam and Thong (2006) have highlighted that in order for construction SMMEs to continue gaining the benefits of m-commerce, they must use it continuously.   The model proposes that construction SMMEs are likely to continue using m-commerce if it confirms their expectations.

5.2.2 Confirmation of expectations from using m-commerce

This phase encompasses two major factors that can meet the expectations of construction SMMEs.   These factors include, ease of use and usefulness.   Ease of use is adopted from TAM and can be achieved through user involvement and training as well as user a-friendly interface.   A user-friendly interface can be achieved by applying the heuristic guidelines of interface design.   Usefulness has been adopted from TAM and ECM and can be achieved if the IVR system has a positive impact on the performance of construction SMMEs that is if the IVR system is aligned with their business needs and can provide them with efficacy.   The performance impact factor was adopted from TTF.

5.2.2.1   Ease of use

Both construction SMMEs and their clients must be able to use the IVR system with minimal effort.   As mentioned previously, ease of use can be achieved through user involvement and training as well as the design of a user-friendly interface.

a) **User involvement and training**: Literature has demonstrated that user involvement is crucial in developing a successful system (Sifri, 2008).   Therefore construction SMMEs must be involved extensively in the development of an IVR system.   Since this system will also be

used by their clients, they also need to be involved in a system that will meet their needs. For training on the use of the system, this study is of the belief that there is no need to train the clients as the system will only require them to follow voice prompts. However, construction SMMEs will need training for a certain period to enable them to upload and update information and reply to clients' queries using the systems administration features. A user-friendly interface is also crucial to ease of use.

b) **Design of a user-friendly interface**: The model proposes that a user-friendly interface for an IVR system can be achieved by applying Ten Usability Heuristics from Nielsen (2008) and Eight Golden Rules of Interface Design from Schneiderman (1998). The system must inform the user of what is going on as the user navigates the system, and makes use of terms that are simple and easy to understand. The terminology used on prompts and menus must be consistent and unambiguous. Prompts must be replayed periodically if no selection has been made, to assist the user to remember where they are and what they are doing. Users must be allowed to navigate between the previous and subsequent menu options and back to the main menu.

The system must strive to prevent user errors; however, when an error is made, the system must inform the user and make a suggestion. The content must be current and relevant to the users' needs so as to encourage the users to ensure the perceived usefulness of the system, and consequently ensure the re-use of the IVR. Through the training that needs to be provided to construction SMMEs and the user-friendly interface design of the IVR system, ease of use of this system can be achieved for both the SMMEs and their clients. The users do not only expect the system to be easy to use but, they also expect it to be useful.

5.2.2.2 Usefulness

Usefulness has been investigated by many researchers and they have confirmed that it is a significant factor influencing a user to continue using a system (Liao, To, Liu, Kou & Chuang, 2011). Liao, To, Liu, Kou and Chuang (2011) have also confirmed that usefulness is an important factor that is related to the user's intention to utilise a system. In the context of this study, usefulness can be achieved if both construction SMMEs are positively impacted from m-commerce.

Performance impact: an IVR system can have a positive performance impact on clients if they obtain the information they want and are able to request services ubiquitously. Confirmation of expectations will be achieved when both the company and its clients are able to minimise the time and costs associated with accessing or delivering services.
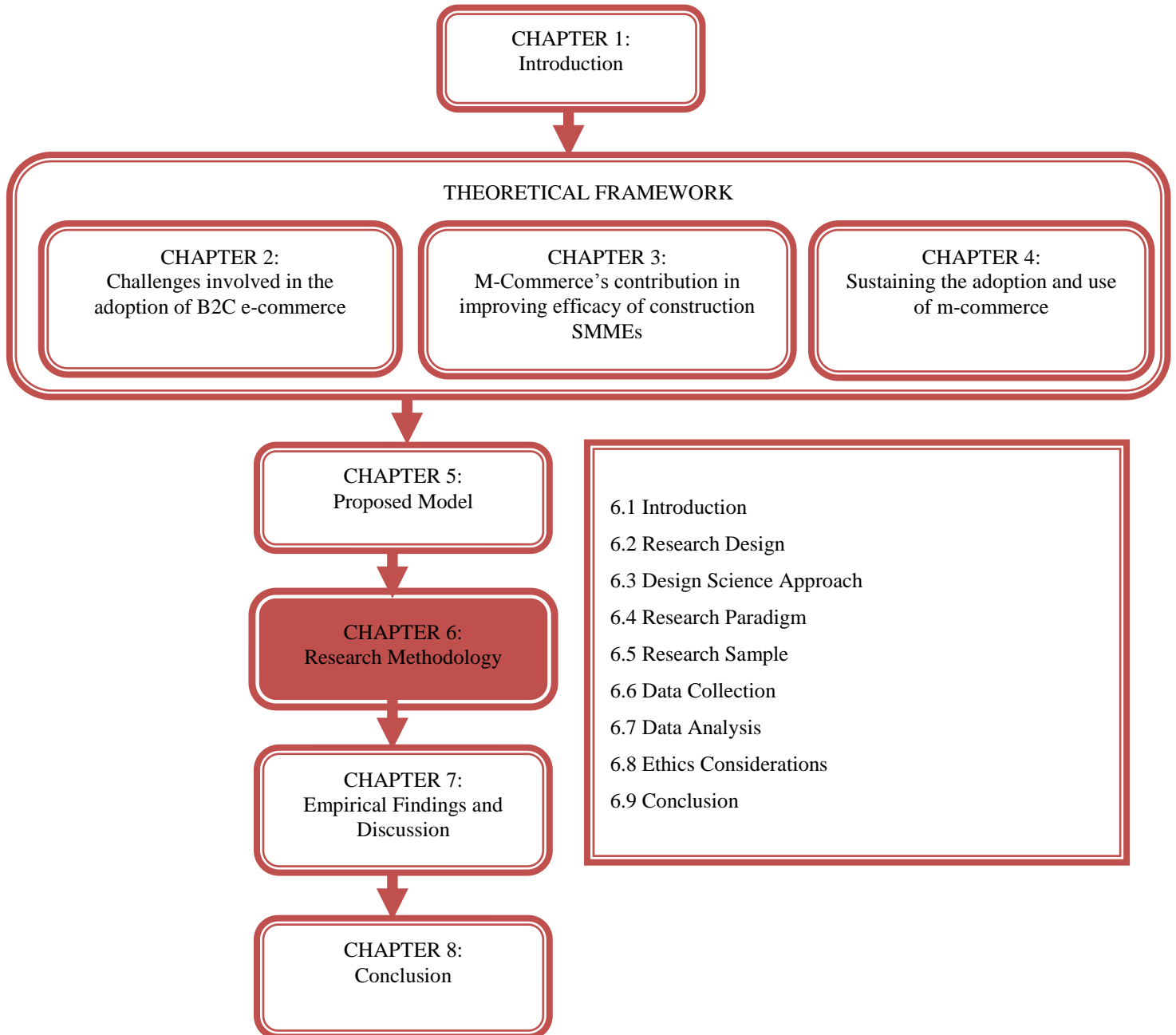
It is important that m-commerce confirms the expectations of both construction SMMEs and their clients. The expectations of clients from the system also need to be considered as the system is developed for their use. Studies such as Al-maghrabi, Dennis and Halliday (2011) and Hong, Tam and Thong (2006) have confirmed that confirmed expectations lead to **satisfaction**. Once they obtain satisfaction from using the IVR system, this will influence construction SMMEs and their clients to **continue using this system**. This way, they will continue reaping the benefits offered by m-commerce through an IVR system.

5.3 Conclusion

The proposed model was developed with the aim of assessing the factors that can influence construction SMMEs to adopt and sustain the use of m-commerce through an IVR system. The proposed model encompasses elements adopted from existing models namely; TPB, TTF, Tam and ECM. It demonstrates that in order for construction SMMEs to obtain the potential benefits offered by m-commerce through an IVR platform, they need to accept/adopt this system and sustain its use. To achieve this, the model argues that these companies must first have the behavioural intention to adopt and use m-commerce which will then lead to the actual adoption and use of this system. The actual adoption and use must confirm the expectations of construction SMMEs as this will lead to satisfaction and thereafter, continued use of m-commerce will be accomplished. The next chapter discusses the research methodology and provides procedures that will be undertaken to refine this model.

RESEARCH METHODOLOGY

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THEORETICAL FRAMEWORK

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│  involved in the │  │  contribution in │  │  adoption and use│
│  adoption of B2C │  │  improving       │  │  of m-commerce   │
│  e-commerce      │  │  efficacy of     │  │                  │
│                  │  │  construction    │  │                  │
│                  │  │  SMMEs           │  │                  │
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6.1 Introduction

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6.1 Introduction

The previous chapters integrated existing models into the development of a proposed model as a solution to this research study's problem. The critically reviewed literature is thoroughly presented in Chapters 2, 3 and 4 where these existing models are discussed in detail. These literature chapters provided the background and solid theoretical basis of this study and were used to build the foundation as well as to present the relevance of this study.

This chapter explains the research methodology adopted in this study to validate the solution (model) proposed for the research problem. The research process that was conducted to validate the proposed solution was done by collecting and analysing data. Careful consideration was given to selecting the appropriate research methods in order to achieve the research objective of this study. This study employed a qualitative approach to improve its reliability and trustworthiness. Research ethics were considered and are also presented in this chapter.

The research design of this study is examined at the beginning of this chapter and is followed by the Design Science methodology and research methods. The research sample is then presented followed by data collection and analysis techniques. The research evaluation is then discussed, followed by the ethical considerations. A summary of this chapter is provided in the conclusion.

6.2 Research Design

The research design provides a roadmap of how the study was carried out. Cooper and Schidler (2008) explain a research design as a plan of collecting, measuring and analysing data. It provides a comprehensive understanding of how the researcher has reached the conclusions of the study (Hofstee, 2006). This study consisted of four major research phases described in **Error! Reference source not found.**.
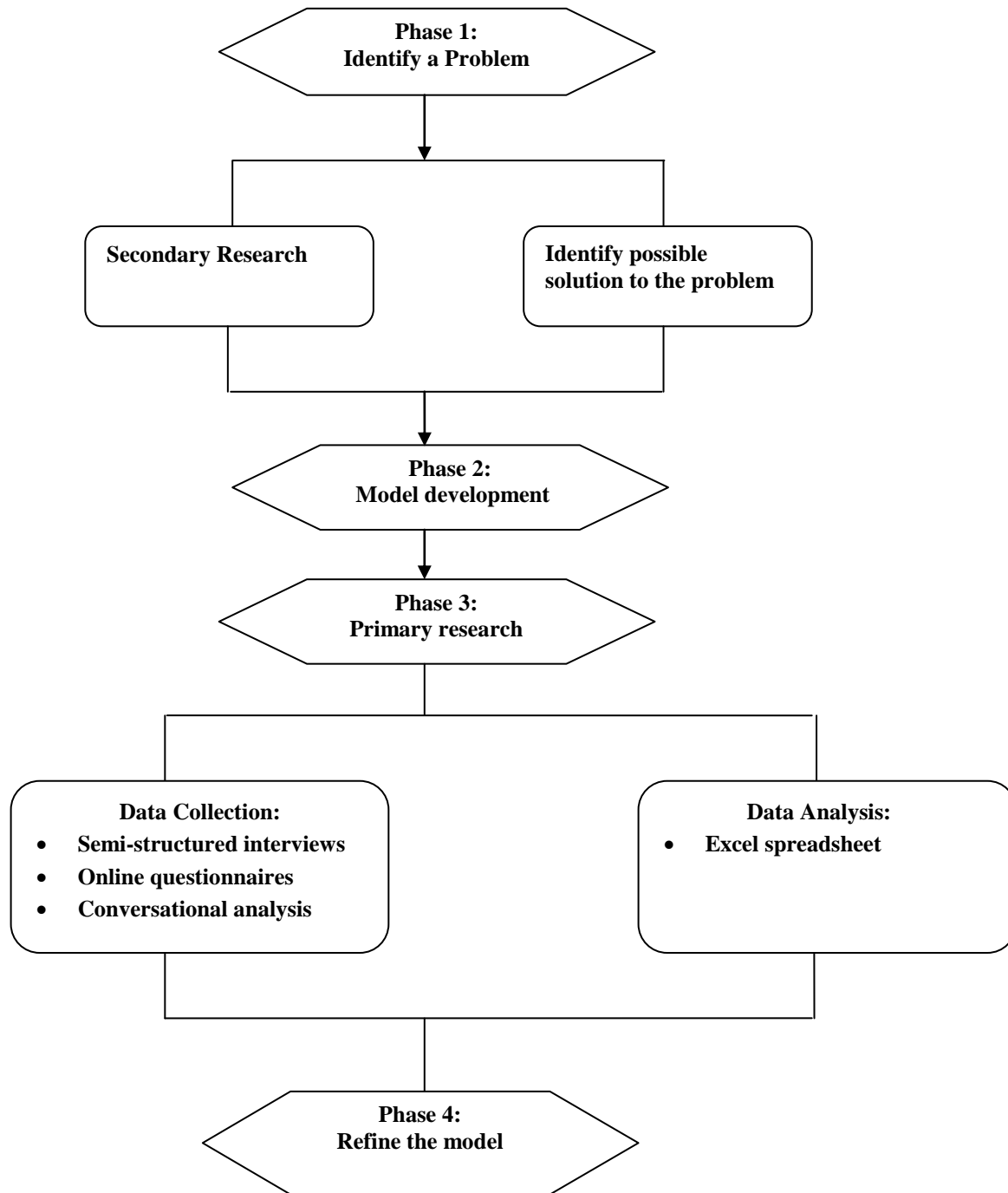
Figure 6.1: Research Design

Phase 1 of this study consisted of identifying a problem of this study and secondary research that was conducted to support the identified research problem as well as the possible solution to the problem. The literature was critically reviewed from books, journals, patents, reports,

web sites, previous studies, conference proceedings and white papers. The proposed solution was obtained from a careful examination of existing models and theories which then influenced the development of this study's proposed model in *Phase 2*.

In *Phase 3*, primary research was conducted by collecting and analysing data. The data collection instruments included semi-structured interviews with construction SMMEs owners/managers to uncover the factors that may influence them to adopt and sustain the use of mobile commerce (m-commerce) through an IVR system; an online based questionnaire for clients of construction SMMEs to identify the factors that can influence them to continue using an IVR system as well as a conversational analysis with experts in voice technologies to find out about the issues related to the development of voice technologies, were also used.

Additional data was obtained from consultants in the telecommunication industry to find ways of allowing clients to access the IVR system free of charge so as to encourage them to use it at minimum cost to construction SMMEs. This data was also collected through conversational analysis. The data analysis instrument used to analyse and interpret the collected data was an Excel spread sheet. The interpreted data assisted in refining the model further and this was carried out in P*hase 4*. This research design process followed the Design Science methodology.

6.3 Design Science Methodology

Saunders, Lewis and Thornhill (2009) make it clear that choosing a research approach is fundamentally influenced by the aims and objectives of the study, availability of time and resources, and philosophical underpinnings. The research approach adopted in this study is the Design Science methodology. Design Sience research focuses on the creation and evaluation of innovative IT artifacts that enable businesses to address their information-related tasks with the aim of accomplishing utility (Cleven, Gubler, & Huner, 2009; Hevner, March, Park, & Ram, 2004). Therefore, Design Science is the appropriate approach as this study aims to develop an innovative Information Systems (IS) artifact to improve construction SMMEs' efficacy.

The artifact is developed through following a construction process to produce outcomes such as constructs, models, methods and instantiations (Hevner *et al.*, 2004). Hevner, March, Park

and Ram (2004) emphasize that the development of these constructs relies upon existing theories that are applied, tested, modified and extended through the experience, as well as creativity and the problem solving capabilities of the researcher. The artifact produced in this study is a model achieved through the integration of existing theories and models. The model is presented in a structured form that was accomplished using Visio application from Microsoft. This artifact aided the understanding and connection between the problem and solution components to enable the exploration of the effects of design decisions and changes in the real world (Hevner *et al.*, 2004). The seven guidelines established by Hevner *et al.* (2004) were applied in this study and these guidelines are presented in Table 6.1.

Table 6.1: Design Science Guidelines (Hevner *et al.,* 2004)

Guideline	Description and relevance to the study
Guideline 1: Design as an Artifact	Design Science research must produce a viable artifact in the form of a construct, a model, a method, or an instantiation.
Guideline 2: Problem Relevance	The objective of Design Science research is to develop technology-based solutions to important and relevant business problems.
Guideline 3: Design Evaluation	The utility, quality, and efficacy of a design artifact must be rigorously demonstrated via well-executed evaluation methods.
Guideline 4: Research Contributions	Effective Design Science research must provide clear and verifiable contributions in the areas of the design artifact, design foundations, and/or design methodologies.
Guideline 5: Research Rigor	Design Science research relies upon the application of rigorous methods in both the construction and evaluation of the design artifact.
Guideline 6: Design as a Search Process	The search for an effective artifact requires utilizing available process means to reach desired ends while satisfying laws in the problem environment.
Guideline 7: Communication of Research	Design Science research must be presented effectively both to research technology-oriented as well as management-oriented audiences.

Applying Design Science guidelines in this study

Design as an artifact: The artifact designed in this study is in the form of a model.

Problem Relevance: The problem identified in this study is that adoption of e-commerce by South African construction SMMEs is low. Consequently, they are not exploiting the benefits offered by e-commerce. This is due to the challenges associated with e-commerce such as high implementation costs, lack or poor infrastructure, inadequate resources, low use of e-commerce by suppliers and consumers, lack of access to e-commerce, computer illiteracy, and lack of understanding of the potential benefits of e-commerce.

Design Evaluation: The proposed model will be evaluated through collecting primary data in the form of semi-structured interviews with construction SMMEs, conversational analysis with voice technologies experts, and questionnaires with clients of construction SMMEs. This is discussed in further detail in section 6.6 (Data Collection).

Research contributions: This study has contributed to the Information Systems field by identifying factors that can influence construction SMMEs to adopt m-commerce through an IVR platform and sustain its use. These factors have been presented in the proposed model which serves as a solution to the problem identified in this study (this has been discussed in detail in Chapter 5).

Research Rigor: The model has been designed through the integration of existing models such as Theory of Planned Behaviour (TPB), Task-Technology Fit Model (TTF), Technology Acceptance Model (TAM) and Expectation Confirmation Model (ECM). These are widely used and validated models (Teo, Ursavas & Bahcekapili, 2010) (this has been discussed in detail in Chapters 4 and 5). Fundamental components of these models have been critically examined by eliciting feedback from the interviews with construction SMMEs, questionnaires from clients of construction SMMEs and conversational analysis with voice technologies experts.

Design as a search process: The first step was to find a problem through reviewing the existing literature from journals, internet, books, conference papers, patents and reports. From the literature reviewed, existing theories that support this study have been found and can be used to establish the solution for the study. These theories were integrated into the

development of the proposed model. Since the model has been developed, data collection and analysis will be conducted to validate and refine it.

Communication of research: The designed model can be implemented or applied in the construction industry to aid in the adoption and sustained use of m-commerce in order to improve the efficacy of construction SMMEs and their clients (this is discussed in detail in Chapter 5).

Design Science has assisted in conducting the research process. The following section examines the research paradigm employed in conducting primary research.

6.4 Research Paradigm

Hofstee (2006) highlights that the success of a study depends on a carefully thought out and appropriate chosen method for the given study. There are two types of research methods, namely; qualitative and quantitative. The difference between these methods is explained by a number of different authors such as Cleven, Gubler, and Huner (2009) and Offermann, Levina, Schonher and Bub (2009). These authors highlight that a quantitative technique assesses the characteristics of the evaluation object on a numerical basis, while the qualitative technique assesses the evaluation object on a value basis. This study has adopted the interpretive research epistemology along with the qualitative research method.

Marshall and Rossman (2010) describe qualitative data as a descriptive and interpretive method of gathering and analysing data. It focuses on finding the meaning of data where the researcher plays the interpreter role (Cresswell, 2007). In interpretive research, knowledge is obtained from the reality of social construction such as consciousness, language, shared meaning, symbols, stories, documents, interviews and other interactions (Klapan, Truex & Wastell, 2004).

Creswell (2007) states that the qualitative research method is primarily applicable to small organisations, communities and description groups. Therefore, since this study focused on SMMEs, qualitative research methods were found to be most appropriate in achieving the objective of this study. Teddlie and Tashakkori (2009) state that there are different types of qualitative research. They are: case studies, ethnography, focus groups, grounded theory and phenomenology. This study conducted a phenomenology qualitative research.

The purpose of a phenomenological approach is to illuminate the specific in order to identify the phenomena through how they are perceived by the actors in a situation (Lester, 1999; Leedy & Ormrod, 2009). Furthermore, Lester (1999) states that in the human sphere, this refers to gathering deep information and perceptions through inductive, qualitative methods such as interviews, discussions and participant observation. This gathered information is represented from the perspective of research participants. The qualitative instruments employed in this study are discussed in detail in section 6.7 (Data Collection). A different sample in each qualitative instrument was used and this is discussed in detail in the following section.

6.5 Research Sample

Parasuraman, Grewal and Krishnan (2004, p. 356) define a sample as "the selection of a fraction of the total number of units of interest to decision makers for the ultimate purpose of being able to draw general conclusions about the body of units." Saunders, Lewis and Thornhill (2007) agree with the definition of the sample established by Parasuraman *et al.* (2004) by stating that the sample represents the population and a conclusion is made from it to achieve the research objective. Limpanitgul (2009) suggests that it is unlikely for a researcher to survey the whole population, due to time and financial constraints. In drawing a sample, this study followed the five-step procedure which is based upon Churchill and Lacobucci (2002) suggestions. This typical method of drawing a sample is illustrated in Figure 6.2.
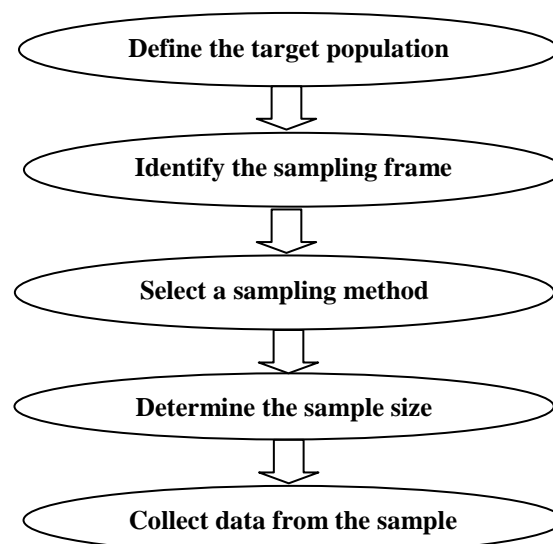
Define the target population

⬇

Identify the sampling frame

⬇

Select a sampling method

⬇

Determine the sample size

⬇

Collect data from the sample

Figure 6.2: Procedure of drawing a sample (Churchill and Lacobucci, 2002)

Step 1: Define the target population.

The group targeted as the population of this study was construction SMMEs as this study's focus was based on assisting them to gain a competitive advantage from m-commerce through an IVR system since it is less expensive to implement and can be accessed by all their clients. The clients were also targeted as a population group as they are the main users of the IVR system. Therefore, obtaining information on designing a user-friendly IVR system based on construction SMMEs' and client's suggestions were important for this study as they would assist the developers in designing a system that meets users' needs and expectations, as well as to check whether the theoretical explanations discussed in the literature chapters could be supported or opposed by the findings of this study. The other target population for this study were experts in voice technologies since this study focused on the adoption and sustained use of mobile commerce through an IVR system to improve efficacy of construction SMMEs.

Step 2: Identify the sample frame.

The sample frame refers to all the elements from which data can be gathered (Cooper & Schindler, 2008). For experts in voice technologies, the sample frame was experts from IBM India and Israel since they were involved in a voice technology development project that was implemented in a study similar to this one. For construction SMMEs, the frame was a subset of construction SMMEs in East London (South Africa) since the study was conducted in East London; therefore, it was easier for the researcher to reach them. The clients came from anywhere in South Africa, had previously made renovations and had used an IVR system before.

Step 3: Select a sample method.

Careful consideration was taken in choosing the appropriate sample technique for this study. Figure 6.3 presents different sampling techniques.
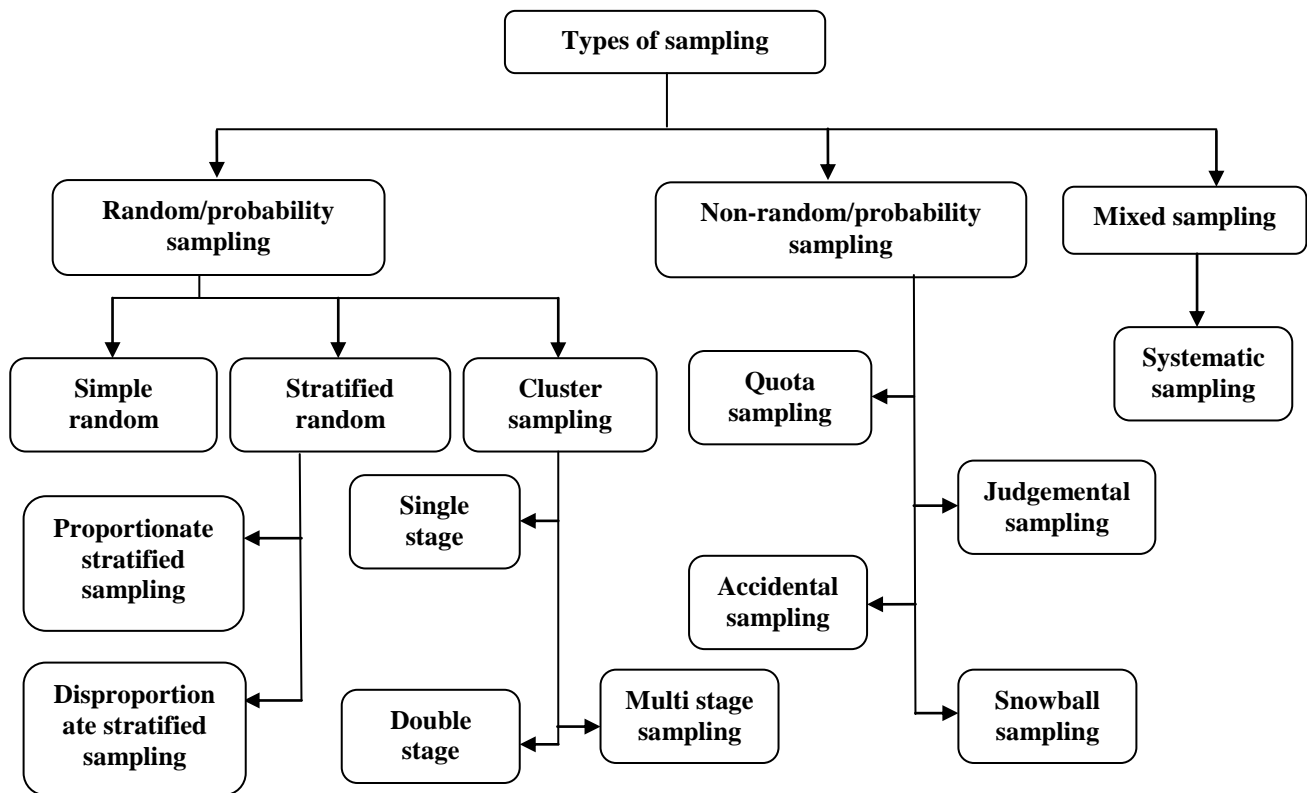
Figure 6.3: Types of sampling (Kumar, 1999)

The above types of sampling that were identified by Kumar (1999) are clarified by Corbetta (2003) in Table 6. 2.

Table 6.2: Sampling Design (Corbetta, 2003)

Probability Sampling	**Simple Random Sampling**	Is obtained when all the units in the reference population have the same probability of being included in the sample.
	Systematic Sampling	It is a procedure that is statistically equivalent to simple random sampling. The only difference lies in the technique of picking out the subjects.
	Stratified Sampling	The sample design is organized in three phases: 1- The reference population is subdivided into subpopulations (called strata) that are as homogeneous as possible. 2- A sample is selected from each stratum by means of random procedure. 3- The sample drawn from each stratum is pooled in order to produce an overall sample.

		Non-Proportionate Stratified Sample	Occurs when we decide to represent over some strata and to represent under others.
		Optimum allocation Stratified Sampling	In this procedure, the size of the sample drawn from each stratum is proportional under examination to the variability of the phenomenon under examination within each stratum.
		Multistage Sampling	In multistage sampling, the population is subdivided into hierarchical levels, which are selected successively through a process of 'narrowing down'.
		Cluster Sampling	This procedure is used when a population can be divided into subdivided into groups.
		Area Sampling	A variant of multistage sampling is area sampling. This approach is adopted when no list of the reference population exists.
Non-Probability Sampling		**Quota Sampling**	To implement the procedure, the population must: 1- Be subdivided into a certain number of strata defined by a few variables of which the distribution is known. 2- The proportional 'weight' of each stratum is calculated – that is to say the overall population that belongs to each group (the sum of these weights must obviously equal 1). 3- The quotas – that is to say, the number of interviews to be conducted in each stratum – are established by multiplying these weights by the sample size.
		Snowball sampling	Snowball sampling involves identifying subjects for inclusion in the sample by referral from other subjects.
		Judgemental Sampling	In this procedure, the sampling units are not chosen in a random manner, but on the basis of some of their characteristics.
		Balanced Sampling	This involves selecting the units in such a way that, with regard to certain variables, the mean of the sample is close to the mean of the population.

The sample method selected in this study was the non-probability purposive/judgemental sample. Purposive sampling is a type of sampling in which "particular settings, persons, events are deliberately selected for the important information they can provide that cannot be gotten as well from other choices" (Teddlie & Tashakkori, 2009, p. 170). The sample had to meet the requirements that needed to achieve this study's objective to solve this study's research problem.

Experts used voice technologies as discussed in Step 1. The construction SMMEs chosen did not have website in their businesses; the problem was that construction SMMEs do not exploit the benefits offered by e-commerce because they do not have websites. Therefore, the purpose of this study was to examine if an IVR system indeed has the capabilities of offering businesses the benefits offered by e-commerce. Clients were supposed to have completed

renovations in their home during the period of this study in order to obtain fresh and current data. Clients should have used an IVR system before to ensure the trustworthiness, dependability and credibility of the information they were providing based on an IVR system.

Step 4: Determine the sample size

Information was obtained from 5 experts; 4 from IBM company (India and Israel) and1 from South Africa. Further information was also received from 5 telecommunication industry clients. The sample size of construction SMMEs was ten owners or managers. The client sample size was also ten people. This number is enough since the data is qualitative and the sample is purposive. This is supported by Teddlie and Tashakkori (2009) who declare that the size of a purposive sample is a relatively small number of units because they can provide particularly valuable information related to the research questions being examined. Furthermore, since this study used phenomenological qualitative research while looking for depth and detail data, Teddlie and Tashakkori (2009, p. 184) point out that the number of participants for this type of research is 6 to 10 but can be larger.

Step 5: Collect data from the sample

Once all the above mentioned steps were undertaken, the researcher began collecting the data from the study's respondents. The data was collected from the experts through conversational analysis several times. The researcher had semi-structured interviews with the construction SMMEs and online questionnaire with the clients of construction SMMEs. Additional data was also collected from South African leading telecommunication companies such as MTN, Vodacom, Cell C and Telkom as well as PostNet. The following section further discusses data collection.

6.6 Data Collection

This study made use of secondary and primary data. Secondary data was collected to establish a problem and its possible solution and primary data was collected with the aim of validating the solution established from the secondary data. Primary data was collected through the following instruments.

6.6.1 Semi-structured interviews

Yin (2009) defines an interview as a form of interrogation that includes the use of oral or verbal conversation between the researcher and the research participants. There are three types of interviews namely: structured, semi-structured and unstructured. This study employed semi-structured interviews with construction SMMEs. Tharenou, Donohue and Cooper (2007) assert that semi-structured interviews are more flexible than structured interviews and more focused than unstructured interviews.

Creswell (2007) notes that a semi-structured interview has a framework that guides a researcher; this framework also allows time for additional information to be obtained and other avenues to be explored. In this framework the first step is to present primary general questions, secondly, concentrate on controlling the session by using certain questions to elicit more information and then proceed to a set of pre-planned questions. Through the allowance of additional time in semi-structured interviews, the respondents were able to expand upon responses and the researcher was able to probe when necessary.

The interview questions were grouped into four sections namely: general section, communication methods currently used in the company, computer and cell phone literacy and behavioural intention to adopt and continue using an IVR system. They were 22 questions in total that were answered by the owner or the manager of the company. The aim of this interview was to identify factors influencing construction SMMEs to adopt an IVR system to improve their efficacy.

6.6.2 Questionnaire

Tharenou, Donohue and Cooper (2007) describe a questionnaire as a data collection instrument that is completed by the respondents themselves and as a result are referred to as self-administered questionnaires. This instrument is relatively easy to use, inexpensive and is often the most reasonable alternative for measuring unobservable constructs such as attitudes, values, and preferences, intentions and personalities (Tharenou *et al.*, 2007). It can be administered by hand or conducted online (Tharenou *et al.*, 2007).

Substantially, Babbie (2008) highlights that these questions can either be open or closed ended questions. Babbie (2008) states that in a closed ended questionnaire, respondents are provided with optional answers to respond to the questions; therefore they do not provide their own views, but are limited to the researcher's responses. Conversely, an open ended questionnaire provides an additional section in which respondents can include their own views (Babbie, 2008). This study found the open ended questionnaire as an appropriate instrument as there were questions that required the respondent to further explain his/her response. The questionnaire was conducted online as the population of this study had access to the internet. This saved the researcher time and costs of travelling.

The questionnaire consisted of 6 multiple choice questions, 5 open ended questions and a Likert scale section with 9 items to be rated from very low to very high. This design assisted in answering the research questions to achieve the objective of this study. The aim of this questionnaire was to identify factors that could influence the clients of construction SMMEs to sustain the use of an IVR system should construction SMMEs implement it as means of communication. Additionally, another aim of this questionnaire was to obtain requirements for developing a user-friendly IVR system.

The questions from the interview and the questionnaire were adopted from published research articles and adapted to fit this study. Saunders, Lewis and Thornhill (2003) highlight that adoption of questions already used allow reliability and efficiency. To obtain data from the experts, the researcher employed conversational analysis through teleconferences and e-mails.

6.6.3 Conversational Analysis

Conversational analysis was used to obtain information from voice technologies experts and from consultants in the telecommunication industry. This study made use of teleconferences, emails and telephone calls to obtain data from experts and consultants.

6.6.3.1   Conversation analysis of experts

This study made use of conversational analysis through teleconferences and e-mails to obtain data from voice technology experts. A teleconference was chosen because the experts were from different geographical areas (two were from India another two from Israel and one from South Africa); this was an available and appropriate technology for everyone involved. This

instrument enabled the researcher and the experts to communicate at the same time and to ask and respond to questions immediately. Gustke, Balch, Rogers and West (2000) highlight that for more than forty years, telecommunication technologies have proven to be an effective tool in overcoming time and distance barriers. As the teleconference included experts from different geographical areas with different English accents, there were misunderstandings between the researcher and the experts as well as between the experts. This study made use of an e-mail to eliminate miscommunication by clarifying and verifying the discussion held over the teleconference calls.

Shachaf (2005) who studied 'bridging cultural diversity through e-mail' suggested that intercultural miscommunication due to language, verbal cues and non-verbal cues is mitigated through the use of an e-mail. Shachaf (2005, p. 53) explains that "because the sender can rehearse by going over the message before it is transmitted, e-mail provides the ability for native and non-native speakers to improve the accuracy of their message." Hence the use of an email was found to be an effective tool to ensure that the researcher and the experts fully understood each other. In summation, e-mails served as a documentary evidence to confirm dialogue.

6.6.3.2 Conversational Analysis of Consultants

Additional data was collected from consultants in the telecommunication industry. The consultants who participated were from MTN, Cell C, Vodacom, Telkom and PostNet. The aim of consulting the telecommunication industry was to obtain information regarding toll free number that construction SMMEs could use to allow their clients to access the IVR system free of charge thus minimising call costs. Since an IVR system is accessed through a phone call, this study finds it necessary to find effective and efficient ways of minimising phone call costs so as to enable construction SMMEs and their clients to use the IVR systems and reap its benefits. The data was collected through the use of telephones, internet and e-mails. These three methods were the only methods used to collect such data.

The conversational analysis was held on a continuous basis and then interviews with construction SMMEs were carried out. Once the teleconference and interviews were concluded, online survey questionnaires were distributed. The online survey questionnaires were self-administered. To reduce ambiguity in the interview and survey questions, the

researchers had three iterations with the supervisor and conducted a pre-testing with colleagues.

Tharenou *et al.*, 2007 state that once data has been collected, it then needs to be analysed with a technique suited to test the research questions and/or if there is support for the solution proposed for the study. The following section discusses the data analyses instruments used to analyse the data collected for this study.

6.7 Data Analyses

The collected data through semi-structured interviews and the online based questionnaire was analysed using an Excel spreadsheet. The researcher found Excel as easy to use and sufficient for the task. The data from the experts and consultants was analysed manually since the data was already simple and organised and there were no comparisons that needed to be made or graphs to be generated.

Data can be collected and inspected thoroughly through deductive and inductive approaches. The inductive approach confirms the support for prior conclusions while the deductive approach leads one to make conclusions based on evidence (Ouma, 2008). The analysis of the data was based on inductive reasoning as qualitative research is inductive in nature (Teddlie & Tashakkori, 2009). This assisted in presenting the findings of this study with an aim of supporting or opposing the theoretical explanations found in this study. The findings of this study were compared to theoretical explanations. They were also used to refine the proposed model of this study and to answer the research questions. The following section provides the ethical considerations of this study.

6.8 Ethical Considerations

Saunders, Lewis and Thornhill (2007) define ethics as norms or standards of behaviours that guide moral choices with regard to individual's behaviours and their relationships with others. Cooper and Schindler (2003) provide examples of unethical issues such as violating non-disclosure agreements, breaking respondent confidentiality, misrepresenting results, deceiving people, and avoiding legal liability. Therefore, ethics are established with the aim of ensuring that there is no physical or mental harm done to the participants of any given study. Campbell

and Groundwater-Smith (2007) view this as respect for the participants of the study. They advise that the researcher must consider his/her research in terms of risk/harm, benefits and consent.

This study has eliminated harm to its participants by clearly explaining the following to its participants: the purpose of the study, requirements and expectations from the participants (their involvement), risks involved, benefits, privacy and confidentiality issues. The questionnaires and interviews conducted with the study participants were anonymous to ensure privacy and confidentiality of the information disclosed by the participants. There were no risks or benefits involved in this study; the participants participated voluntarily and they were given the option to withdraw from the study at any time.
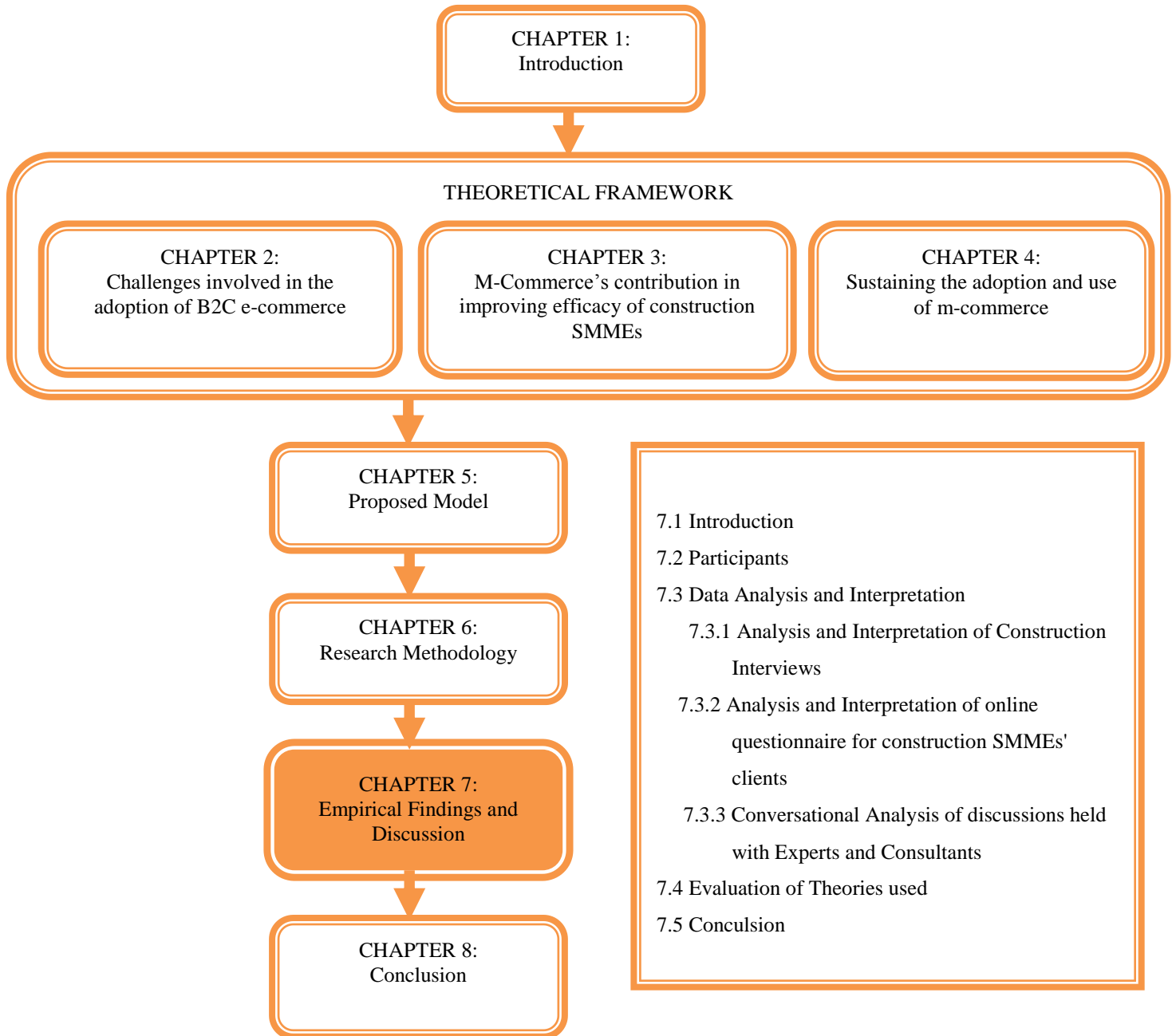
These ethical concerns were stated in the cover letter of the interview questions which was the consent form they needed to sign before participating in the study. For questionnaires, the ethical concerns were asserted in the e-mail sent to the participants requesting their participation in the study. Therefore, it can be reasonably assumed that the participants understood the ethical concerns before participating in the study.

6.9 Conclusion

This chapter outlined the research design, methodology and ethical considerations of this study. Four designed research phases namely: secondary research, model development, primary research and model refinement were applied in conducting this study. This study leans towards the interpretivism philosophy; it has adopted qualitative methods and has followed the Design Science methodology. Data was collected through the use of interviews, questionnaire and conversational analysis. The collected data was analysed through an Excel spreadsheet and manually. Ethical considerations applied in this study are also provided. The next chapter contains empirical findings and discussion of interviews, questionnaires and conversational analysis. It also discusses the evaluation of the theories and models used in this study and a refined proposed model is presented.

CHAPTER 7

EMPIRICAL FINDINGS AND DISCUSSION

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┌─────────────────────────┐
│      CHAPTER 1:         │
│      Introduction       │
└─────────────────────────┘
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THEORETICAL FRAMEWORK

| CHAPTER 2: Challenges involved in the adoption of B2C e-commerce | CHAPTER 3: M-Commerce's contribution in improving efficacy of construction SMMEs | CHAPTER 4: Sustaining the adoption and use of m-commerce |

CHAPTER 5:
Proposed Model

CHAPTER 6:
Research Methodology

CHAPTER 7:
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CHAPTER 8:
Conclusion

7.1 Introduction

7.2 Participants

7.3 Data Analysis and Interpretation

  7.3.1 Analysis and Interpretation of Construction Interviews

  7.3.2 Analysis and Interpretation of online questionnaire for construction SMMEs' clients

  7.3.3 Conversational Analysis of discussions held with Experts and Consultants

7.4 Evaluation of Theories used

7.5 Conculsion

7.1 Introduction

The previous chapter presented the procedures carried out in this study to collect and analyse data. Different data collection instruments were used to obtain primary data that aided in achieving the objective of this study. These included conversational analysis through teleconferences and e-mails with experts in voice technologies and consultants from the telecommunication industry; interviews with construction SMMEs; and a survey questionnaire with clients of construction SMMEs. Secondary data was collected by critically reviewing existing literature. Consequently, this chapter focuses on the analysis of the primary data to evaluate the findings of this study with their relevance to the research problem. This is added to the theoretical base which is built on a critical review of related literature. Primary data was summarised using an Excel spreadsheet; this was achieved by quantifying the qualitative data to represent it in percentages and display it in graphs and tables.

This chapter provides analysis and interpretation of the collected data. Data analysis and interpretation comprise results from the interviews, questionnaires and conversational analysis. Evaluation of theories and models used are then discussed. An inductive approach is followed to compare the findings of this study with previously reported studies in order to draw conclusions about the similarities and/or differences between them and to refine the proposed model for this study. A summary of this chapter is presented at the end in the conclusion section.

7.2 Data Findings and Discussion

Hofstee (2006) highlights that once data has been collected it remains data. To make sense of the collected data one needs to convert it into some sort of evidence; hence, the process of data analysis is significant. Some of the qualitative data of this study was quantified and therefore represented in numerical form, so that graphs and tables could provide more clarity. Additionally, data can be collected and inspected thoroughly through deductive and inductive approaches. An Inductive approach confirms support for prior conclusions while a deductive approach leads one to make conclusions based on evidence (Ouma, 2008). The relevant literature reviewed in Chapters 2, 3 and 4 provides a baseline against which the findings of

this study are compared. This study has adopted the inductive approach to present the findings of this study with the aim of finding whether they are consistent with the theoretical explanations. The next section discusses the findings of construction SMMEs' interviews.

7.2.1 Findings and Discussion of Construction SMMEs' Interviews

Semi-structured interviews were conducted with 10 construction SMMEs. The interview questions were grouped into 4 sections. Section 1 encompassed general questions aimed at obtaining information about the participant's profile (the results are provided from section 7.3.1.1 to 7.3.1.3). Section 2 focussed on the current methods used to communicate with their clients and to find out if there were a perceived need to change current communication (the results are provided from section 7.3.1.4 to 7.3.1.5). Section 3 queried users about their level of computer and cell phone literacy, that is whether they had access to the Internet and what business activities they conducted on the Internet (the results are provided from section 7.3.1.6 to 7.3.1.7). Section 4 asked participants about their awareness regarding an IVR system and its benefits. They were also required to rate the level of influence that each factor had on them towards adopting an IVR system. The aim was to identify the factors that can indeed influence the adoption of a system and sustain its use (the results are provided in section 7.3.1.8).

7.2.1.1   Type of construction company, position held by the participant and gender

The most common type of construction company that participated in the interviews were building contractors; with 8 of the participants fell in this category, 1 electrical contractor and 1 plumber. The interview population of this study consisted of mainly males. Half of the participants (5 out of 10) owned and managed their companies by themselves. When probed, the participants declared that this was because their companies had not yet sufficiently grown to a point where they could employ a manager; hence they chose to manage their companies by themselves. From the other half of the participants, 4 were owners and the remaining 1 was a manager. Although these were also small companies, they could afford to employ managers. The construction industry has traditionally been seen as a male dominated industry. 7 of the participants were male while only 3 were females.

7.2.1.2 Number of employees

The construction SMMEs that participated in this study had a small number of employees. Half of the participants (5 out of 10) did not have full-time employees, but had between 3 and 10 part-time employees. The other half of the participants had between 3 and 15 full-time employees and between 10 and 40 part-time employees. This is depicted in Figure 7.1.
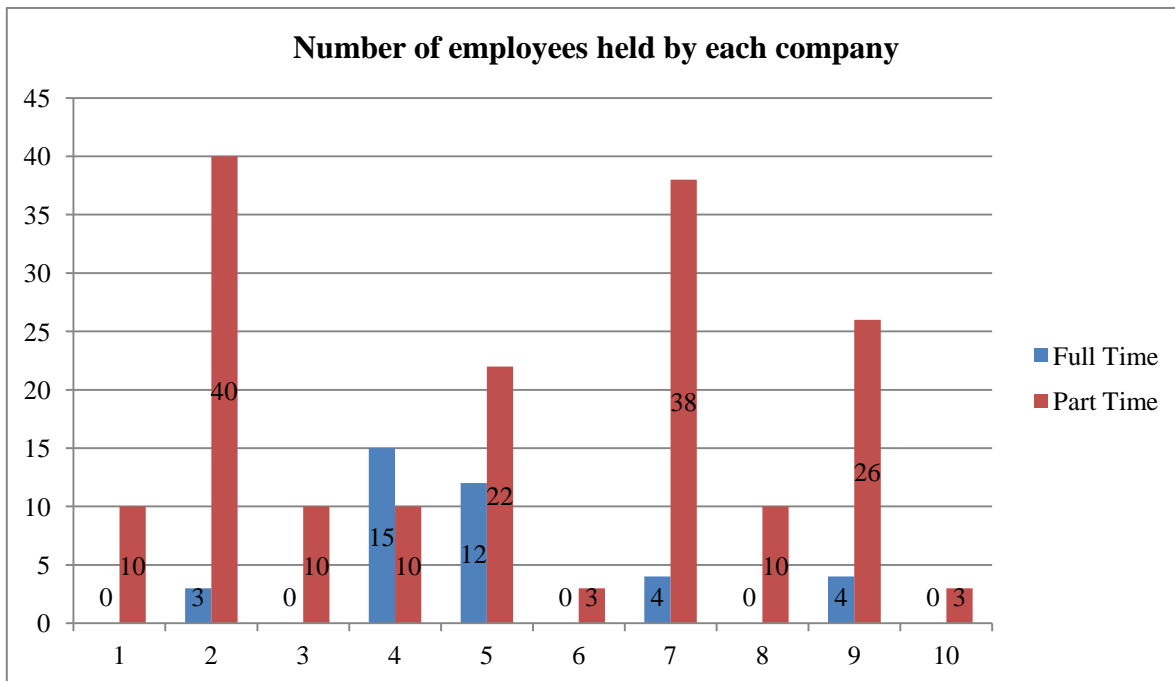

Number of employees held by each company

Figure 7.1: Part-time Employees

It should be noted that the number of part-time employees provided by the participants is the number of current part-time employees working on current or most recent jobs (the number of employees on the most recent job is provided if there is no current job). Some of the construction SMMEs did not have current jobs when the interviews took place; hence they provided the numbers from most recent jobs. The companies with no current jobs did not have full-time employees either. When queried about the exact number of part-time employees, they declared that they could not provide the exact number because this was influenced by the size and location of the job/contract. They obtain jobs from government, private companies and individuals. This highlights that these companies do contribute to the economy's growth through job creation and hence there is a need for these companies to be supported through enhanced competitiveness.

7.2.1.3 Qualifications

The majority of the participants (7 out of 10) held a degree/diploma qualification. 1 had a post graduate qualification and the remaining 2 had a matriculation certificate. All participants had acquired knowledge about the industry from job training and experience. Although a large percentage of the population was qualified in their field, in most cases, engineering studies do not include business management training. When enquired about how they manage their business, the participants declared that the South African government encourages them to undertake short courses in business management. The government pays their tuition fees and provides them with compensation for transport costs.

These courses enable them to survive in the industry for a remarkably long time. However, the government has not yet provided computer literacy training; their courses mainly focused on either construction or business management. When questioned about their computer skills, 8 participants stated that they learnt the skill from their friends and/or family; 1 completed a short course in End User Computing and another held a Diploma in Information Technology. This indicates that these companies have the necessary skills (qualifications, job experience and are computer literate) to become competitive but they are lacking technology expertise to assist them.

7.2.1.4 Communication and advertisement methods currently used

The most commonly used method to communicate with clients was the telephone and SMS; all participants utilised these methods. E-mail was also a common method used to communicate with clients as 9 out of 10 participants confirmed this. Only 3 of the participants advertise their companies in newspapers. Referals (word of mouth) also assisted them with advertising and obtaining new clients; however, this was not a common method of obtaining clients as it only assisted 2 participants to obtain new customers. None of the participants had a website to advertise or communicate with clients. These proportions are presented in Figure 7.2.
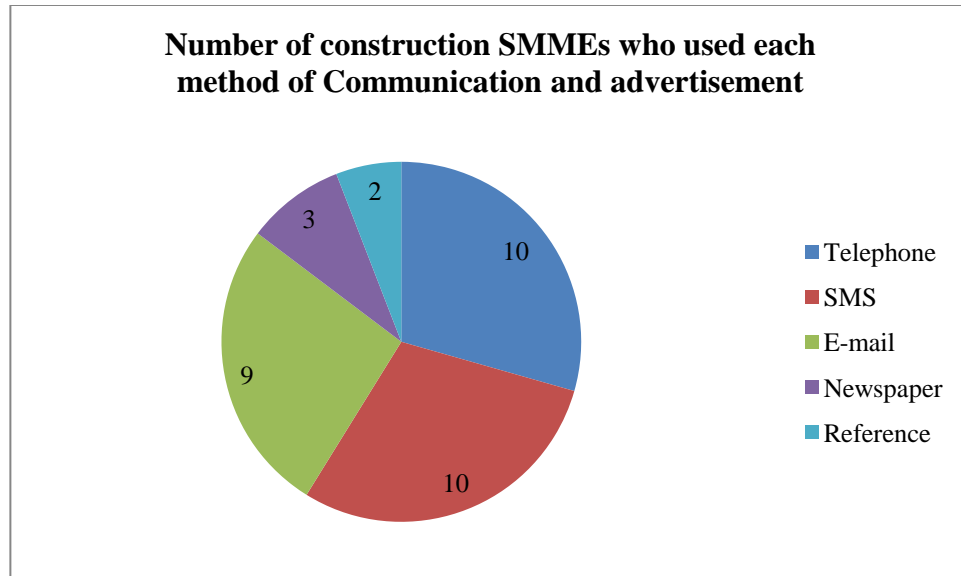
Figure 7.2: Method of Communication with Clients

7.2.1.5 Willingness to change current communication method

Only half of the participants (5 out of 10) stated a willingness to change their current communication methods. Participants willing to change their current communication methods indicated they wanted to try more effective and efficient ways of communicating with their customers so as to improve customer service as this may lead to customer loyalty. They also wanted to reduce communication costs. However, they could not afford to build websites to enable their clients to access their business information such as viewing the projects they had completed, testimonies from their existing clients and allow a client to a quote online.

The other half not willing to change declared that they were comfortable with their current methods of communication as they were reliable and efficient and therefore do not see a need for changing them. Their justification was that commercial technologies that were complicated, expensive to implement and maintain and therefore, they feel that in order for them to keep communication simple they should continue with the traditional methods. It is apparent that these participants are not fully aware of the benefits that commercial technologies such as e-commerce and m-commerce can offer. Consequently, there is a need for these companies to become more informed of the potential benefits offered by commercial technologies.

7.2.1.6 Level of computer literacy

In the context of this study, *basic computer skill* means that participants are able to switch on a computer and shut it down after use, to use a mouse to interact with elements on the screen, to use a keyboard and print, and to use special function keys. *Intermediate computer skill* means that participants are not limited to the basic skills but are able manage their files, use Microsoft applications such as MS Word (e.g. write reports of the work they have done for clients), MS Excel (e.g. plan their project), MS PowerPoint (e.g. present to clients when necessary), MS Visio (e.g. to make drawings) and MS Access (e.g. to store business information) and to use Internet and e-mail (e.g. buy material online and communicate with clients and suppliers). *Advanced computer skill* means that participants are able to install and program computer software, repair hardware, attach and use peripheral devices and to view properties to determine memory size (Schankman, 2009).

The majority (9 out of 10) of the participants have intermediate computer skills and only 1 participant has advanced knowledge of a computer. This means that all participants are computer literate. When they were asked whether they owned computers with Internet access, 9 out of 10 participants stated that they did. Only 1 participant did not own a computer but was computer literate. The participants did not only access the Internet from their computers, but also from their cell phones. The 1 participant with no computer also did not have a phone with Internet access, but did own a cell phone. This shows that almost all the participants had access to the Internet. However, although most of the participants had a computer with Internet, they still did not have their own website due to reasons provided in section 7.3.1.5.

7.2.1.7 Business activities conducted on the Internet

Participants conducted the same business activities on the Internet as they accessed from their computers and their cell phones. These business activities included making and receiving payment, transferring money and checking account balances through Internet banking; comparing suppliers' quotations and services to choose the best suppliers; searching for tenders by visiting clients' websites and search engines; and sending and receiving e-mails from clients and suppliers. These activities are shown in Figure 7.3.

From Figure 7.3 the most common business activity conducted over the Internet was sending and receiving e-mails which was conducted by 9 out of 10 participants. E-mail activity is followed by searching for tenders, with 6 participants. Half of the participants conducted Internet banking whilst the other half did not. The reason stated for conducting Internet banking was that it saved time (as they did not have to stand in queues at banks) for money (as they did not travel to the bank and pay either petrol or taxi fee). The reasoning behind those who do not conduct Internet banking is that they do not trust the Internet due to crime activities (such as phishing and spoofing) involved in that type of service. They believe that banking the traditional way is safer than banking online. Therefore, they still need to be convinced of the danger of carrying cash around and the benefits of Internet banking.
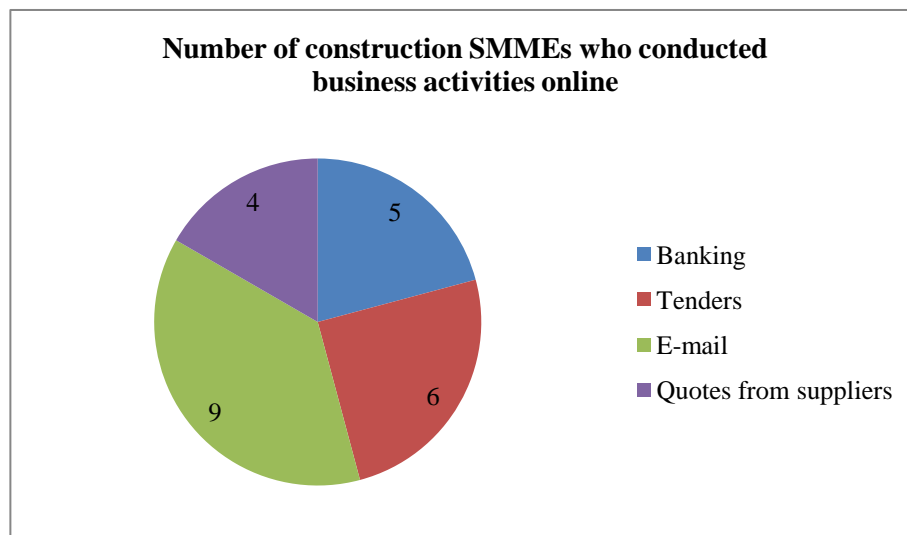

Number of construction SMMEs who conducted business activities online

- Banking
- Tenders
- E-mail
- Quotes from suppliers

Figure 7.3: Business Activities Conducted on the Internet

When participants were asked if they had heard of an Interactive Voice Response (IVR) system before, they all stated that they had; however, they had never thought of adopting it. The reasons were that they never thought it was pertinent to the nature of their business and were not aware of the benefits it could offer. These responses were given to questions 4.1 – 4.2 (cf. Appendix A). This showed that these companies lacked awareness about the potential benefits that such systems could offer them. The researcher then explained to them the potential benefits that these companies could reap from adopting this system and sustain its use. Thereafter, they were asked to rate the level of influence that the identified factors had on them towards adoption of an IVR system.

7.2.1.8 Factors that can influence construction SMMEs to adopt an IVR system and sustain its use

The participants were required to rate the level of influence that each factor had on them towards the adoption of an IVR system and its sustained use. This was indicated on a four point Likert scale in which a rating of 1 presented very low, 2 presented low, 3 presented high and 4 presented very high. This provides a greater understanding of how much influence each factor has on construction SMMEs towards the adoption of an IVR system and its sustained use. The influence of these factors was measured with the aim of examining whether the findings of this study were similar to those in the reviewed literature. The numbers provided in cells portray the number of participants who rated each factor. Table 7.5 below demonstrate the responses obtained from the interview's Likert scale.

Table 7. 1: Factors influencing construction SMMEs

Factor	Very Low	Low	High	Very High
My clients will easily access it	0	1	3	6
It saves time for the business	0	1	4	5
It reduces business costs	0	1	5	4
It is built on reliable infrastructure	0	0	5	5
It uses existing resources	0	0	7	3
Its implementation costs are low	0	1	4	5
It requires modest literacy	0	1	5	4
My clients will actually use it	0	0	6	4
Other companies are using it	1	2	4	3
It is easy to use	0	0	6	4
It is useful	0	0	6	4
It has confirmed my expectations	0	0	6	4

The explanation of the table is provided in the sections below.

- **My clients will easily access the IVR system**

When enquired about whether clients being able to easily access an IVR system would influence participants to adopt it; 6 of them indicated that the influence is very high, 3

indicated that the influence is high and only 1 participant stated that the influence is low. These results indicate that construction SMMEs need their clients to easily access the system in order for them to adopt it. Studies have shown that the majority of the world's population have access to phones (Algarwal *et al.* 2010; Heeks 2009; Kreutzer, 2009). Therefore it can be concluded that these companies are likely to adopt an IVR system because their clients will be able to access the system easily.

- **It saves time for the business**

The critically reviewed literature reported that an IVR system does save time for the business by handling tasks that would have been handled by humans, thus allowing employees to concentrate on more valuable tasks (Digium, 2009). When the respondents were asked how much influence time saving would have on their adoption of the IVR system, 5 declared that it was very high, 4 declared high and only 1 participant declared it as low. This clearly shows that these companies are likely to adopt this system as it has the capability of saving them time when communicating with clients and thus allowing them to focus on their core tasks.

- **It reduces business costs**

4 participants stated that this factor had a very high influence, 5 stated high and 1 stated low. Although there was 1 participant for whom the influence of reduced costs was low, the majority of participants felt that it is crucial that this system reduces their business costs. The IVR system has the ability to reduce business costs by reducing human resources costs since it handles tasks that would have been handled by humans which saves money for the company (Digium, 2009; King, Terzoli & Clayton, 2006). The conclusion is that these companies are likely to adopt this system.

- **It is built on reliable infrastructure**

Half of the participants indicated that this factor had a very high influence and the other half indicated that the influence as high. All participants declared that infrastructure has to be reliable in order for them to adopt this system. Literature has revealed that an IVR system is built on reliable infrastructure since it uses the existing telecommunication networks. Therefore this clearly indicates that this system is likely to be adopted by these companies (Agarwal, *et al.* 2010; Freedom Fone Org, 2009; King, Terzoli & Clayton, 2006).

- **It uses existing resources**

In response, 3 participants highlighted that this factor had a very high influence and 7 highlighted a high influence. The influence that this factor has on construction SMMEs was rated either very high or high meaning all of the participants were more likely to adopt this system if it used existing resources. When the participants were probed about the reasons behind this, they pointed out that since they were small businesses, they could not afford a system that would require them to buy new resources. They further said that however, if the system uses existing resources then they will have more money to save and invest in other business related activities. Since an IVR system uses existing resources (Agarwal, *et al*. 2010; Finnerty, 2009; Freedom Fone Org, 2009), therefore this system is likely to be adopted by construction SMMEs.

- **Its implementation costs are low**

When the participants were enquired about the level of influence that this factor had on their adoption of an IVR system, 5 indicated very high, 4 indicated high and only 1 indicated low influence. The participants emphasised that they were very passionate about a system that would not require much financial outlay, therefore since implementation costs of an IVR system are inexpensive (Loudon, 2010; Finnerty, 2009) this provides a notion that these companies are likely to adopt this system.

- **It requires modest literacy**

In the context of this study, modest literacy is achieved when the system required only basic computer skills. In response to the question regarding the influence of this factor, 4 participants declared the influence of this factor as very high, 5 declared it as high and 1 declared it as low. Therefore, since all participants have basic computer skills, it can be concluded that there is a possibility that these companies can adopt the IVR system.

- **My clients will actually use it**

In response to the question regarding the influence of the actual use of the system by the clients, 4 participants pointed out that the influence of this factor was very high towards the adoption of an IVR system and the remaining 6 pointed to the influence as high. Evidently,

participants found it significant that their clients would actually use the system after the adoption. The explanation is that the aim of adopting this system is to communicate with clients and provide them with all the information they need. This would assist companies to focus on their core tasks and thus become competitive and subsequently, their efficacy would improve. However, if clients do not use the system, then the objective will not be achieved. Mathieson (2001) states that unused systems are ineffective; hence it is important to the companies that their clients use this system in order to achieve their objectives.

- **Other companies are using it**

When responding to the question regarding the influence of this factor, 3 participants indicated that this factor had a very high influence, 4 pointed to a high influence, 2 indicated low influence and 1 declared a very low influence. The majority of participants perceived this influence as very high or high giving the overall impression that construction SMMEs consider it important that other companies use an IVR system.

The majority of participants rated the identified factors influencing their decision to adopt an IVR system as very high or high. This confirms that all of these factors have to be available in order for construction SMMEs to adopt an IVR system. When the participants were required to suggest additional factors that may influence their decision to adopt this system, they suggested 'added business value', an indication that they perceive added business value as a factor preceding business growth. The interviewer also enquired about factors that influencing them to sustain the use of an IVR system because literature has revealed that the success of IT also depends on the user's continued usage rather than its initial adoption (Hong, Tam & Thong, 2006). Hence, this study found it necessary to examine these factors and they are discussed below.

- **It is easy to use**

In response to the question asking the participants about their perceptions on the influence that ease of use has on them towards the adoption of an IVR system, 4 of them pointed out that the influence of this factor was very high and the remaining 6 pointed to the influence as high. This indicates that construction SMMEs will continue using an IVR system if they find it easy to use; i.e. if it is free of effort (Sjazna, 1996). This means that these companies will continue

using this system if it allows them to upload, update and change information and, listen and respond to clients' messages easily.

- **It is useful**

In response to the question regarding the influence of the usefulness of the system by clients, 4 participants indicated this factor as very high towards the adoption of an IVR system and the remaining 6 stated the influence as high. Literature has reported that this system has the ability to improve efficacy of companies by saving them time, reducing business costs and improving customer service thus providing companies with improved efficacy (Agarwal, *et al.* 2010; Digium, 2009; Freedom Fone Org, 2009). Based on the results of this study, if the literature explanation becomes evident when construction SMMEs use the IVR system, then they are likely to sustain its use.

- **It has confirmed my expectations**

It was discussed in literature that if a technology meets a user's expectations, then the user is more likely to continue using the system (Hong, Tam & Thong, 2006). This was confirmed by the results of this study. In response to the question regarding the influence of confirmed expectations, 4 of the participants pointed out that the influence of this factor towards the adoption of an IVR system was very high and the remaining 6 indicated the influence as high. Therefore it can be concluded that construction SMMEs are likely to sustain the use of an IVR system if it meets their expectations.

The participants' responses suggest that usefulness is the most influential factor (when compared to other factors) when construction SMMEs decide to continue using the IVR system as the majority rated it as very high. None of the participants rated the influence of any factor as low or very low which confirms that all of these factors are important for construction SMMEs to sustain the use of an IVR system. When participants were required to highlight other influential factors affecting sustained use of an IVR system, they did not consider any other factors; therefore this study concludes that in order for these companies to continue using this system, they must find it easy to use, useful and it must meet their expectations. A questionnaire was distributed to elicit the views of clients of construction

SMMEs that could become prospective users of the IVR system. The following section presents the results of the questionnaire.

7.2.2 Findings and Discussion of Online Questionnaire for Construction SMMEs' Clients

An online questionnaire was used to gather data from 10 clients of construction SMMEs. These clients must have conducted renovations during the course of this study and must have used an IVR system before. The primary aim of developing this questionnaire was to find out whether these clients were willing to use an IVR system to communicate with construction SMMEs. If construction SMMEs adopt this system, their clients will also be users; hence their views about an IVR system were important.

To achieve this, the questionnaire began with questions aimed at understanding participants demographics (the results are discussed in sections 7.3.2.1 – 7.3.2.3). The current method of communication with a contractor is discussed in sections 7.3.2.4 – 7.3.2.5. This was followed by open-ended questions that enquired about their perceptions regarding their experiences of IVR systems they had used before (the results are discussed in sections 7.3.2.6 – 7.3.2.9). The questionnaire concluded with a Likert scale that required participants to rate the level of influence that each of the given factors had on them towards their use of an IVR system on a long term basis.

7.2.2.1   Type of housing resident

This study focused on clients of construction SMMEs who were individuals and not private companies or government institutions. This question was asked to demonstrate the clientele of construction SMMEs among individuals. The participants were 4 owners and 6 tenants; this is shown in Figure 7.4. Since tenants also participated, this shows that they do not wait for their landlords to do renovations; they are capable of conducting them themselves, thus increasing the clientele spectrum of construction SMMEs.
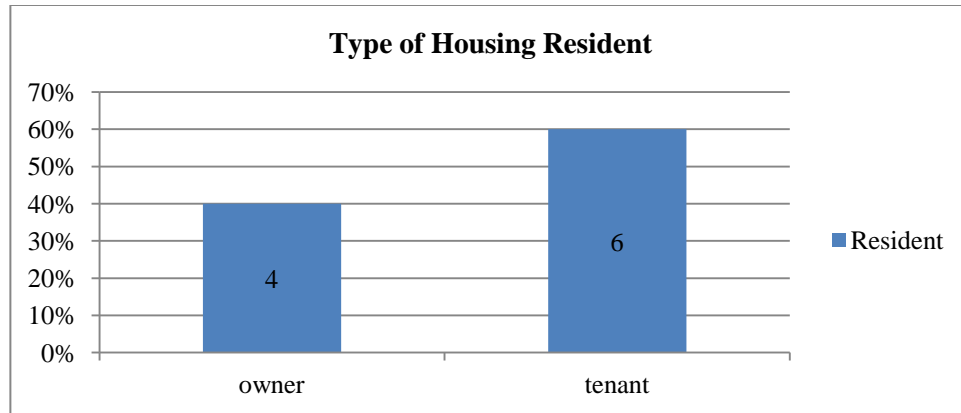
Figure 7.4: Type of Housing Resident

7.2.2.2 The period of conducting renovations

Renovations were conducted between 0-6 months, 6-12 months or 12-18 months. This is the period in which this study was conducted to ensure that the data collected was current. This question was asked in order to find out how often individuals conduct construction services. The majority of the participants (representing 7 out 10) conducted their renovations within the 6 months preceding the questionnaire. 2 of the participants performed their renovations in past 6 to 12 month period. Only 1 participant performed renovation in past 12 to 18 month period. This confirms that the responses provided by the participants are current and are therefore relevant to this study.

7.2.2.3 Type of Construction/Renovation Conducted

The types of renovations that were conducted were electrical, plumbing, carpeting and building or extension. The most common type of construction conducted was plumbing which was carried out by 4 participants, followed by electrical with 3 participants. Building or extension of property was conducted by 2 participants and carpeting was conducted by only 1 participant. This is depicted in Figure 7.5 below.
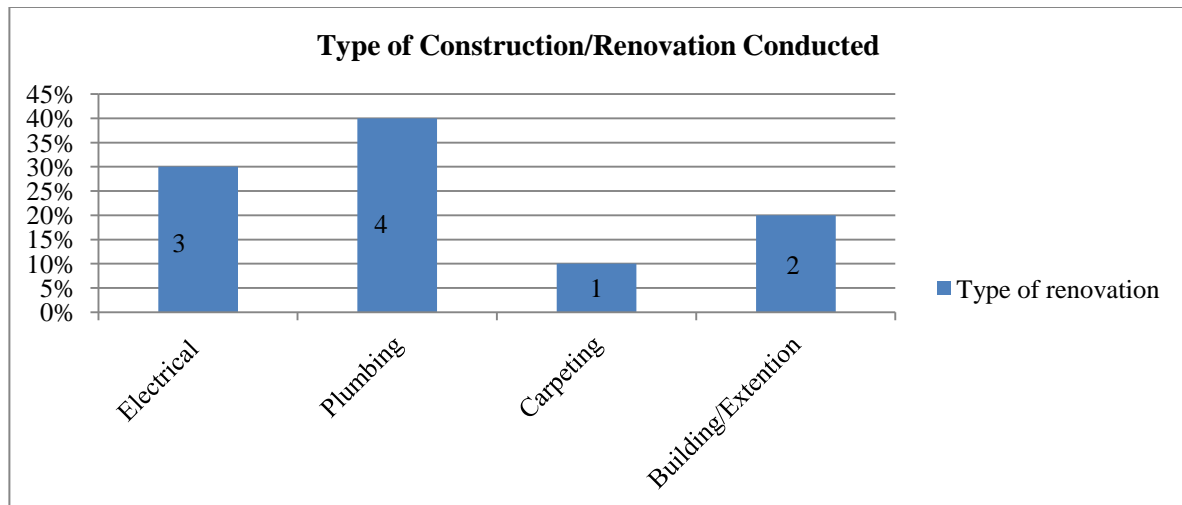
Figure 7.5: Type of Renovation Conducted

7.2.2.4 Method used to find and communicate with the contractor employed

Clients used a phonebook/yellow pages, newspaper or a reference by word of mouth to find the contractor they needed. An overwhelming surprise is that none of them used the Internet to search for contractors although they all had access to the Internet. Finding a contractor through a reference was the most common method as 7 of the participants were assisted by it, 2 participants used a phonebook to find a contractor and only 1 used a newspaper. This is shown in Figure 7.6.
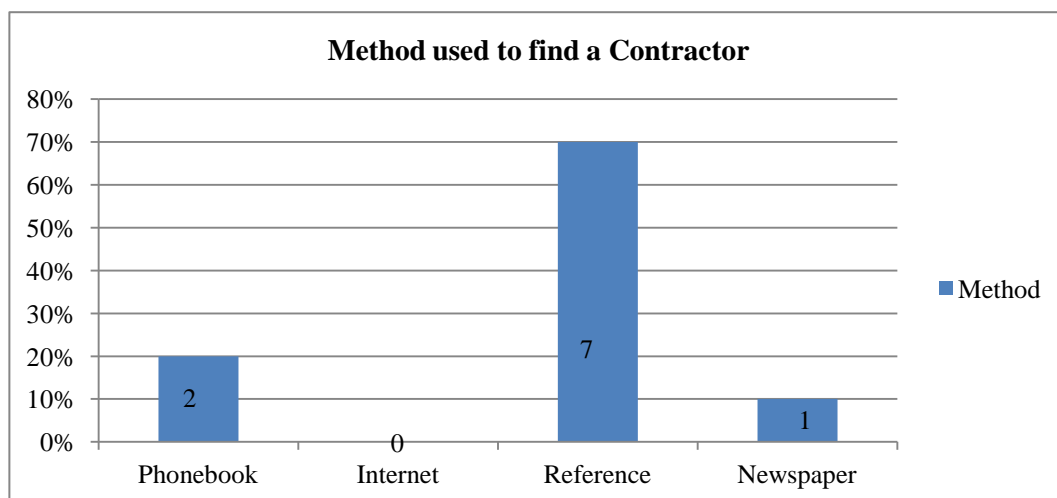

Figure7.6: Method Used to Find a Contractor

7.2.2.5 Method used to reach a contractor

The most common method of communication with the construction SMMEs' was the telephone as it was used by 9 out of 10 participants, only 1 client used an SMS. None of the clients used the Internet to get hold of the contractor. The Internet was not the most effective method of communication either because clients preferred traditional methods or because the contractor did not have a website, as interviews with construction SMMEs revealed.

Table 7.1: Open-ended responses

Respondent	How did you feel after using an IVR system?	Was there anything in particular that you liked or disliked about the IVR system that you have used and why?	What recommendations would you make to improve it?	Are you willing to use an IVR system for construction services and why?	Are there any other factors that may influence you to use the IVR
1	Happy: It was helpful	No	No improvement that need to be made	Yes, because it is user friendly	No
2	Frustrated: Sometimes it is difficult to go back if you selected a wrong choice, unlike the escape or back button when using internet. And sometime your specific query is not addressed by those pre-defined choices.	Disliked: If your query is not addressed by the system you get routed to help desk and get waiting sometimes is just too much.	Group together the choices to that the user doesn't spend too much time, thus wasting airtime.	Yes, to be able to select a wide variety of service providers and price comparison	I think it is all been covered
3	I never felt frustrated. I think it's a good system that provides options for several client needs. It's better than calling an operator and being given another number to call.	Liked: I like the idea of dialling one number and being able to get help on several issues from dialling just one number.	I have no suggestions.	Yes. Because it would enable access to construction companies information anytime even during non working hours.	I cannot think of any other
4	Frustrated: long menu options	Disliked: Having to wait for a long time to get the information I want.	Reduce the amount of waiting time	Yes, provided it meets my requirements of an IVR system, such as clients not having to pay to use the service.	A clever, well designed system that is quick
5	Frustration: Outdated or unavailable options, one option yet it still requires you to select, irrelevant options	Disliked: Too many layers of options	Study what options 80% or 90% of customers would use and put them first. Use artificial intelligence to personalise it and let the system learn and offer suggestions requiring customer to answer yes or no to well crafted options	No. I like a visual interface	No
6	Frustrated: Long menu options it was frustrating	Dislike: Long menu option	Reduce menu options and get straight to the point	Yes because it is helpful as it allows you to get information anytime	No

Respondent	How did you feel after using an IVR system?	Was there anything in particular that you liked or disliked about the IVR system that you have used and why?	What recommendations would you make to improve it?	Are you willing to use an IVR system for construction services and why?	Are there any other factors that may influence you to use the IVR
7	Happy: It is easy to use	Liked: My cell phone problem was solved in few minutes.	None	No. I prefer a visual interface	No
8	Happy: the system was easy to use	Liked: you can phone at any time of the day	None	Yes so that you can be able to understand things better	No
9	Happy: my problem was solved through self service	Liked: I had solved my problem without having to talk with a consultant	None	Yes because it provide all the information you need	No
10	Frustration: The voice was fast and clear when giving the various options	Liked: avoids queuing or travelling to a network provider shop to inquire	The voice should be well standardised in terms of speed	Yes. Can easily pick the best service provide for a particular service, e.g. electrical fault, painting, leakage	No

Table 7.7 provides participants' perceptions after using an IVR system and in which identified points of use they liked or disliked, expressed their recommendations or improving the design of an IVR system and whether they were willing to use an IVR system to communicate with construction SMMEs. It should be noted that these were open- ended questions from the questionnaire.

7.2.2.6 Feelings after using an IVR system

Only 3 participants were happy to use an IVR system they had used before but 7 were not. The 3 participants who were happy declared that it was easy to use, helpful and it provided them with several options. It was also a better option than calling an operator and provided information instantly. The remaining 7 participants were frustrated using an IVR system because it had long menu options, no option for returning to the previous menu and the voice was fast and unclear. This indicates that the IVR systems used by these participants lacked a user-friendly interface. The unfriendly interface could be due to lack of user involvement where developers did not understand the needs of the system users resulting in frustration. Likes or dislikes are discussed below.

7.2.2.7 Positive and negative perceptions of using the system

In response to the questions asking the participants about their positive and negative perceptions from using the IVR system, half of the participants (5 out of 10) liked an IVR system and cited the following reasons: only 1 number is dialled to obtain assistance on several issues; issues are resolved in a short period of time; it can be accessed anytime and anywhere; issues are resolved without having to speak to a consultant; and it saves the time of travelling and queuing in network providers' premises.

The other half disliked using the system and their reasons included: the waiting time to resolve their issues or acquire the information they needed from a consultant was too long; it contained an excessive amount of menu options and the voice was unclear. Their dislikes were clearly reflected in their frustration. This clearly stresses a need for a user-friendly interface and thus putting pressure on developers and the companies who have adopted such systems to ensure that the interface of the system is designed in manner that appeals to the user and the information provided meets users' needs.

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7.2.2.8   Recommendations for improving the design of an IVR system

The following recommendations were suggested: options often chosen by users should be grouped together and provided in the first menu; the amount of the waiting time should be reduced especially when waiting for a consultant; menu options should be minimised; the system should be more direct and the voice should be clear.   These recommendations represent users' requirements from an IVR system and therefore should be taken into consideration when designing an IVR system to ensure its success.

7.2.2.9   Willingness to use an IVR system for construction services

In response, 8 participants declared their willingness to use the IVR system for construction services.   They found it user friendly; it provides a wide variety of service options and price comparisons; it is helpful as it enables access to information anytime and anywhere; provides the valuable information without having to speak to a consultant; and one can easily pick the best service provider for a particular service from hearing the services offered by the company.   The remaining 2 participants declared were not willing to use this system for construction services because they preferred a visual interface.   Since most of the participants were willing to use this system for construction services, this indicates positive potential for an IVR system to be adopted by construction SMMEs' clients.

7.2.2.10 Factors that can influence clients of construction SMMEs to use an IVR system on a long term basis

Similar to construction SMMEs, clients were also required to rate the level of influence that each factor had on them towards the long term use of an IVR system.   This was demonstrated on a four point Likert scale which consisted of 1 representing very low, 2 representing low, 3 representing high and 4 representing very high.   The numbers provided in cells portray the number of participants who rated each factor.   This provides a greater understanding of the factors influencing construction SMMEs' clients to use an IVR system on a long term basis.

- **It is free of charge**

This factor had a strong influence on construction SMMEs' clients to use an IVR system on a long term basis.   6 participants indicated that the influence is very high, 3 indicated the influence as high and only 1 participant said the influence is low (as illustrated in Table 7.8).   This demonstrates that it is important for clients to call the system free of charge in order for

them to use it. Therefore, construction SMMEs will need to pay for the costs of calls to the system for the sake of increasing their clientele.

Table 7.3: Call charges

Factor	Very Low	Low	High	Very High
It is free of charge	0	1	3	6

- **It provides all the information needed**

The majority of participants (representing 8 out 10) declared that the influence of this factor was very high and the remaining 2 participants declared it as high. These results indicate that it is crucial that construction companies provide all the information that clients may need. When clients obtain valuable information from the system, they will regard it as useful since this would be the primary reason for accessing the system. Junglas, Abraham and Watson (2008) have highlighted that if the system is not appropriate to the user's needs, the user will encounter a performance decrease, whereas if the system is found to be useful, this will be used continuously (Hong, Tam & Thong, 2006) and will be regarded as successful (Watson, 2008).

- **Information is relevant and current**

This factor had a very high influence and was confirmed by all the participants. Therefore, it is significant that construction SMMEs ensure that the information they provide to their clients is relevant and current by updating it frequently. The importance of relevant and current information was also noted by Greef, Coetzee and Pistorius (2008) when they evaluated the South African National Portal. Their results demonstrated that irrelevant and outdated information discourage users from using a system; hence there is a need to provide relevant and current information.

- **The voice is clear**

5 out of 10 participants revealed that this factor had a very high influence and the other 5 rated the influence as high. If the voice is unclear, users become frustrated and this discourages them from using a system; this is reiterated in literature (Greef, Coetzee & Pistorius, 2008) and has been confirmed in this study in sections 7.3.2.6 and 7.3.2.7.

- **Language used is easy to understand**

When the participants were asked about the importance of understanding the language used in the system, 8 of the 10 participants rated this factor as very high influence and 2 of 10 highlighted it as high influence. This indicates that the system must speak the language that the users understand otherwise, they will discontinue using it.

- **Requires no training or special skill**

In response to the question asking the participants about the level of influence that this factor had on them regarding the use of an IVR system on a long term basis, 6 of them indicated this factor's influence as very high and 4 participants indicated the influence as high. This suggests that it is important to these participants that this system does not require a special skill in order for use on a long term basis. Literature has found that an IVR system as a system that does not require a special skill since it can be accessed over a telephone and most people have phone knowledge since cell phones are so prevalent (Agarwal, *et al*. 2010; Kreutzer, 2009). Therefore, it can be concluded that clients of construction SMMEs are more likely to use an IVR system on a long term basis.

- **It is easy to use**

Ease of use of an IVR system was found to be important for these participants; this is confirmed by 7 out of 10 participants who declared the influence of this factor as very high and the remaining 3 participants declared the influence as high. This demonstrates that these clients can use this system on a long term basis if they can obtain the relevant information they need fairly easily.

- **Improved customer service**

This factor was found to be crucial to the participants. The results demonstrated that the IVR system has to improve customer service in order for them to use it on a long term basis. 7 out of 10 participants declared the influence of this factor as very high and the remaining 3 participants declared the influence as high. Literature has reported that the IVR system has the ability to improve customer service by providing clients with all the relevant adequate information that they need anytime and anywhere (Agarwal, *et al.* 2010; Digium, 2009; Freedom Fone Org, 2009). Therefore these clients are more likely to use this system for a long term period.

- **It is accessible anytime**

In response to this factor, all participants highlighted this factor as very high influence. Agarwal, *et al.* (2010); Digium (2009) and Freedom Fone Org (2009) have reported that an IVR system is accessible anytime which means that these participants are likely to use this system on a long term basis.

The majority of participants rated the identified factors influencing their decision to use an IVR system on a long term basis as very high or high. All responses about these factors confirmed that all of them have to be available in order for construction SMMEs' clients to use an IVR system on a long term basis. The following section presents the conversational analysis of discussions held with experts of voice technologies and consultants from the telecommunication industry.

7.2.3 Conversational Analysis of Discussions held with Experts and Consultants

Discussions were held with 5 experts; 4 from IBM company (India and Israel) and 1 from University of Fort Hare (South Africa), these experts were involved in research and implementation of voice technologies. Discussions were also conducted with 5 consultants in the communication industry. Multiple teleconferences, telephone calls and e-mails were used. The experts are in the process of developing a voice system for a study similar to this. The issues discussed were issues pertaining to the presentation of information, feedback of the system to users, diversity of languages, different user accents and accessing the system.

7.2.3.1 Presentation of Information

How the information is offered to users is usually an issue in most voice systems; the information can be offered through listing items in the menu or providing a search facility. To obtain business information, users have to follow a voice prompt to source the information about the service that they need from the menu. When all or most of the services offered by the company are listed in the menu, this list in most cases is usually long and users become impatient or forget what the system has said earlier. To avoid this, the system can offer a search facility where users can simply say or type in what they want and the system will provide the results. Unnecessary time on interacting with the system will be saved as information will be provided instantly, and thus saving telephone call costs. However,

implementing a search facility in a voice system is a somewhat challenging for the developers; it is complicated but makes things easier for the users. Conversely, listing the items in a menu is easier for the developers but it makes it more costly and time consuming for the users.

It was also recommended that the system should use terms understood by the users, i.e. it should use the same terms used in industry. The experts suggested that the system should have a dictionary of terms emanating from Industry so that the system reflects the users' context.

7.2.3.2 Feedback provided to users

The experts recommended that the user interface must be simple and feedback must be provided to users after each input. For example, if the user searches for the price of installing water pipes, the system should tell the user that 'you are searching for a price to install water pipes' and then the system should require the user to confirm and afterwards provide the results. If the system is listing items in a menu, users must also be able to return to the previous menu and log out when finished. Furthermore, if the user chooses the option of speaking to a consultant, the system should tell the user that the user is now transferred to a consultant and therefore the user must wait. The experts also suggested that the system should play music while trying to source a consultant; this informs that the user is still connected to system.

7.2.3.3 Diversity of languages

The language used by the system was identified as another major issue in voice technologies. It is crucial that the system speaks a language that is understood by the users. South Africa has eleven official languages; therefore if the system is used mainly by people speaking Xhosa, it is recommended that the system should speak Xhosa or alternatively, different languages should be integrated into the system to give users the freedom of choosing the language they are most comfortable with. Integrating different languages into the system can be challenging; therefore, it is recommended that the most common language be provided which in the case of South Africa is English.

7.2.3.4 User Accents

Even when a system speaks a common language to bridge the language diversity, accent can be an issue. Consequently, the system must not only speak users' language but must speak it

with an accent that users can understand. Furthermore, although accent is a challenge from the user perspective, the system itself may experience problems with the user's accent and pronunciation; hence it is recommended that a system be designed such that the user has the option of using a keypad.

7.2.3.5 User Involvement

The developers must understand users' needs as this will aid in developing a system that will meet users' expectations. The understanding of user needs can be achieved by involving users from the initial phase of the system by explaining to them their role in the system development process and how the system will benefit them. Conducting pilot studies to test the system before launching it can also aid in ensuring its success. User training is also important to ensure that users actually use the system to its potential so as to realise its benefits.

7.2.3.6 Accessing the system

A voice system is accessed through a phone by dialling the company's phone number specifically routed to the system. The company decides whether this phone number can be accessed free of charge or callers share the costs with the company or pay the full costs of the call. Offering the service over a toll free phone call will greatly encourage the clients to use the IVR system.

Consultants from leading South African network providers such as MTN, Vodacom, Cell C and Telkom were contacted about obtaining a toll-free number. Providing this toll-free number to clients increases the number of calls from potential and existing clients. Vodacom and Cell C do not currently offer this kind of a service; however MTN and Telkom do. MTN and Telkom offer the service on a contract basis. MTN offers it only on a two year contract and Telkom from three months onwards.

Telkom allows the company's clients with free calls only if the clients access the IVR system from a landline; otherwise clients pay the full cost. MTN on the other hand, will allow construction SMMEs clients to access the IVR system free of charge from any network. However international calls from and to the system are not supported; to overcome this barrier, a network service provider can provide a Voice over Internet Protocol (VoIP) service which maps a local number to a Session Initiator Protocol (SIP). SIP is used to transfer data to achieve voice enriched e-commerce. Logically, the network provider will act as a gateway

for these international calls and route them to the desired destination. High bandwidth also needs to be available to manage concurrent calls.

Alternatively, callers can be provided with calling cards that come with a toll-access number. One of the providers of these calling cards is PostNet stores; these cards entail a voucher number that is loaded into the phone and callers must dial the toll-access number before dialling the actual phone number. The experts have pointed out that these pin numbers should be short because callers may forget them if they are long and consequently, this may hinder the adoption of the IVR system. The disadvantage of providing callers with calling cards is that callers may call other numbers using these cards and PostNet is unable to restrict the cards to only calling one number.

All these factors discussed above affect the adoption and usability of the system. The following highlights were found crucial to the adoption and sustained use of an IVR system: the system should not have long menu options when presenting information to users; a search facility must be included into the system to avoid this; feedback must be given to users after each input, the system must speak a language with an accent that is understood by the users, users must be involved from the initial phase of system development; and to encourage users to use the system, they must be allowed to access it free of charge. The following section evaluates the existing theories and models used in this study and the proposed model is also refined.

7.3 Evaluation of theories and models used

The main aim of this section is to compare what was discovered in the reviewed literature to what has been revealed by the primary data collected in this study. This is achieved by applying inductive logic which enables the researcher to compare the results of the study to the theoretical explanations so as to find whether the results obtained support or oppose the theories and models used. This section also aims at refining the proposed model by using the results of the study.

7.3.1 Theory of Planned Behaviour

The purpose of this theory is to provide a comprehensive understanding of the manner in which an individual's attitude, subjective norms and perceived behavioural control can influence his/her intention to use a system (Uzoka, Shemi & Seleka, 2007). These three factors lead to the behavioural intention to perform a task. Attitude is described as a function

of the products of behavioural beliefs and outcome evaluations and the subjective norm is the individual's perception of social pressure to perform the behaviour (Aboelmaged, 2009; Mathieson, 2001). Perceived behavioural control on the other hand constructs several barriers to the use of the system (Mathieson, 2001). These barriers were found during use of the system are: accessibility factors, implementation costs, lack or poor infrastructure, lack of adequate resources, computer literacy, low use of the system by suppliers and consumers and perceived disadvantages of the system.

All of these above mentioned factors were examined in the interviews with construction SMMEs owners/managers to find out whether they indeed influence construction SMMEs to adopt and sustain the use of mobile commerce (m-commerce) through an IVR system. The results of the interviews demonstrated that these factors do influence construction SMMEs to adopt and sustain the use of an IVR system. These factors were found to be pertinent in this respect and therefore this study fully adopts this theory.

7.3.2 Task Technology Fit Model

This model focuses on understanding the link between technology and performance (Goodhou & Thompson, 2010; Kulkarni & Ipe, 2010). The fit of technology has been found to have a direct impact on its performance and is also a predecessor of technology utilisation (Kulkarni & Ipe, 2010). A technology is found to be useful if it enhances performance, otherwise it is useless (Irick, 2008). In most cases users choose a technology that enables task completion with the greatest performance but if the technology is not appropriate to the user's needs, the user will encounter a performance decrease. Hence it was important for this study to examine whether an IVR system has the ability to improve efficacy of construction SMMEs by enhancing their performance and that of their clients.

The IVR system has been found not to directly improve job performance of construction SMMEs, but contributes to it by improving communication between businesses and their clients. For example, an IVR system will not enable the contractor to fix water pipes more effectively but will enable him/her to focus more on the job while taking care of customer needs regarding business information. In this regard, construction SMMEs will be more effective since they will be focusing on their core tasks and more efficient since they will save time from communicating with the clients personally as the IVR system will be the one that will communicate with clients.

When the clients were asked if they were willing to use an IVR system for construction services, the majority (8 out of 10) replied that they were because the system had the ability to enhance their performance. This system would provide them with current and adequate business information that they could access anytime and anywhere and thus saving time since of waiting for an administrator to answer their calls, ultimately resulting in improved customer service. When customer service is improved, customer loyalty is generated; construction SMMEs may obtain new customers and sustain existing ones and thus business value is increased. This is supported by Chiu, Chang, Cheng and Fang (2009) who highlight that client loyalty is crucial to an enterprise's success and growth.

In summary, the results of the interviews with construction SMMEs and online questionnaires with the clients showed that there is a fit between an IVR system and the task performance of companies and their clients. It was found that the task characteristics of construction SMMEs and their clients are aligned with an IVR system's characteristics which lead to a positive performance impact and system utilisation. Therefore, the model is consistent with the findings of this study.

7.3.3 Technology Acceptance Model (TAM) and Expectation Confirmation Model (ECM)

TAM predicts why users reject or accept a developed system (Sjazna, 1996). The acceptance of the system has been found to be the primary factor that determines its success (Wu, Wang & Lin, 2007). Hence it is crucial to identify factors that can influence users to accept a system. According to this model, perceived usefulness and perceived ease of use leads to behavioural intention to use a system and this in turn leads to the actual use of the system (Teo, Ursavas & Bahcekapili, 2010; Sjazna, 1996). ECM on the other hand claims that an individual can continue using a technology if she/he is satisfied with the technology's usefulness and his/her expectations have been confirmed (Almagharabi, Dennis and Halliday, 2011; Thong, Hong and Tam, 2006).

This study has focused on factors that may influence construction SMMEs to adopt and continue using an IVR system. The results showed that ease of use, usefulness and confirmed expectations can lead to continued use of an IVR system. Perceived usefulness of an IVR system by construction SMMEs can be achieved through improved effectiveness (performance) and efficiency (reduced business costs). For clients, it can be achieved

through relevant and adequate business information provided by the system and improved customer service. Conversely, perceived ease of use can be achieved through the Ten Usability Heuristics of Nielsen (2008) and Eight Golden Rules of Interface Design by Shneiderman (1998).

The usability heuristics and the golden rules are namely: *visibility of system status, match between the system and the real world, user control and freedom, consistency of standards, error prevention, recognition than recall, flexibility and efficiency of use, aesthetic and minimalist design, help user recognise, diagnose and recover from errors and, help and documentation.* These Usability Heuristics also include six of the eight Golden Rules of Interface Design. The additional two Golden Rules are: *enable frequent users to use short cuts and design dialog to yield closure.*

The results showed that construction SMMEs' clients will perceive an IVR system as useful if the language used is easy to understand. Clients also indicated that the voice of the system should be clear and that the time spent when waiting for a consultant should also be reduced. These factors are not covered in the usability heuristics or golden rules because these rules and heuristics are designed for a visual interface where a user can only interact with the system and not the administrator. Therefore these can be considered as additional golden rules or usability heuristics when designing a voice interface.

Additional results about the usability of the system were obtained from the experts of voice technologies. They stated that it is recommended that a voice system should have a search facility rather than having only a menu with listed items as this would assist users in remembering what they are looking for from the system (*help and documentation, recognition than recall, flexibility and efficiency of use and aesthetic and minimalist design*). The language or terms used by the system must be understandable by the users; the experts suggested that the system should have a dictionary of terms from the industry so that the system can reflect users' context (*match between the system and the real world*).

The system must provide feedback to the users after each input and, since this is a voice system, it was recommended that users should be required to use their phone's keypad rather than their voices only. In this way, the system can easily understand user inputs and reduce errors and ensure that it provides the desired results. Additionally, while waiting for a consultant the system should tell the user that s/he is being transferred to a consultant and must play a sound recording to alert users that they are still connected to it while waiting

(visibility of system status and help user recognise, diagnose and recover from errors and error prevention).

From the above therefore, it can be said that the usability heuristics and golden rules are extremely crucial in the development of a system. Whether it is a visual or voice system, all of these heuristics and golden rules are relevant and must be applied to achieve ease of use in a system.

In summary, the results of this study are consistent with the explanation of these models as well as with the usability heuristics and the golden rules for designing a user interface. As mentioned before, the factors of these models were integrated into the development of a proposed model for this study and the results of the primary data were used to refine this model.

7.3.4 Proposed Model (Refined)

The proposed model was constructed from the components of the models discussed above and the results of this study were used to refine the model. The original model is shown in Figure 7.7 and the refined model is shown in Figure 7.8.
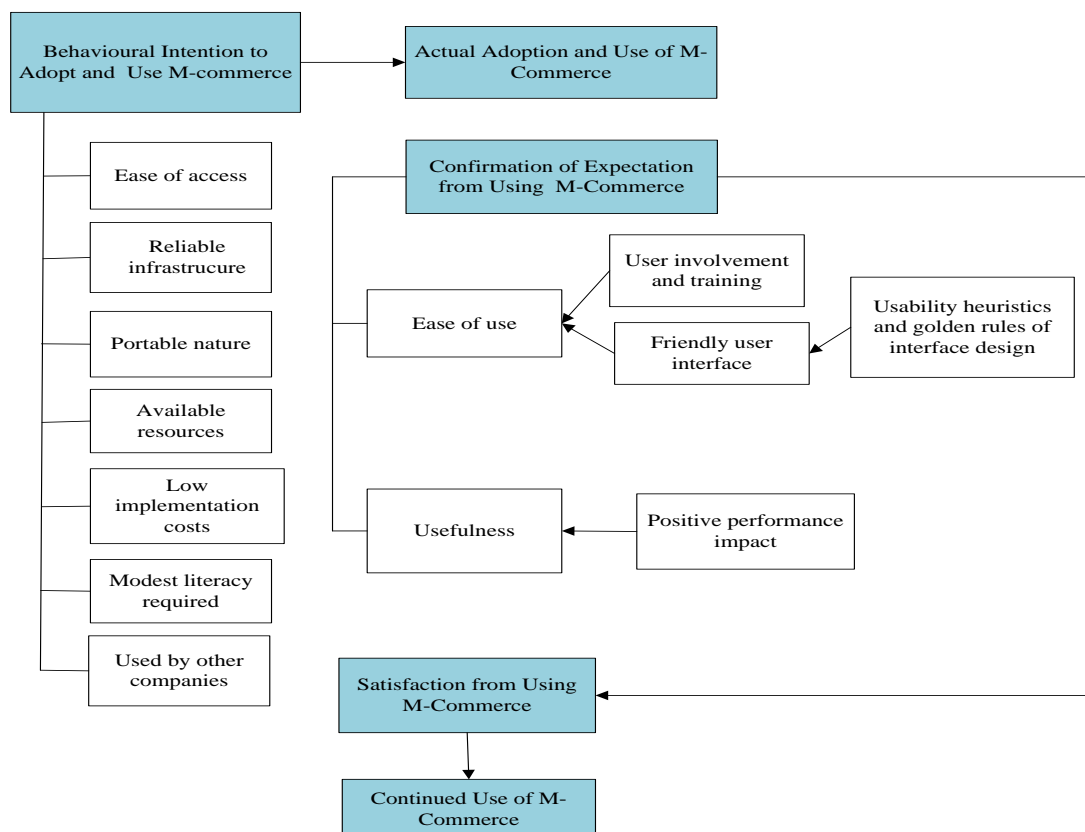

Figure 7.7: Original Proposed Model

Behavioural Intention to Adopt and Use M-commerce

Actual Adoption and Use of M-Commerce

Ease of access

Reliable infrastrucure

Portable nature

Available resources

Low implementation costs

Modest literacy required

Used by other companies

Accessed free of charge

Confirmation of Expectation from Using M-Commerce

Ease of use

User involvement and training

Friendly user interface

Clear voice

Usability heuristics and golden rules of interface design

User language and accent

Minimum waiting time

Usefulness

Improved customer service

Added business value

Positive performance impact

Satisfaction from Using M-Commerce
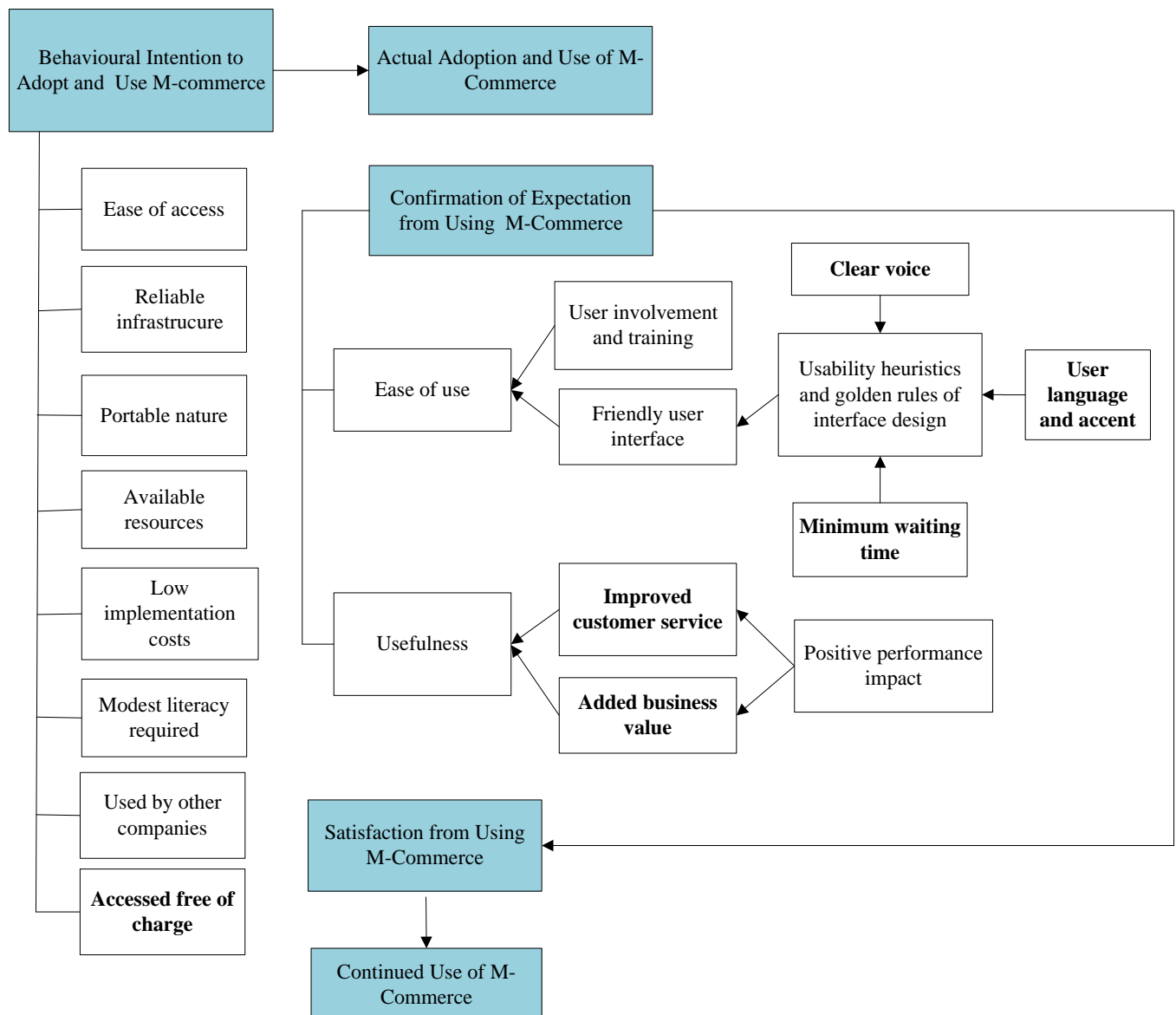
Continued Use of M-Commerce

Figure 7.8: Refined Proposed Model

As the findings of this study supported the explanations of the models and theory used to construct the proposed model, all the factors of the proposed model remained constant. There were five additional factors added to the refined model: *accessed free of charge, user language and accent, minimum waiting period, improved customer service, added business value* and *clear voice.* The major difference between these two models is that, the original model was more focused on construction SMMEs but the refined one focuses also on their clients.

From the primary data, **ease of access** was found to be the most significant factor (when compared to other factors) as the majority (6 out of 10) participants viewed it as having a very high influence in their decision to adopt the system. All of the clients (10 out of 10)

who participated in this study also found ease of access as having a very high influence in their decision to use an IVR system.

On the other hand, the **use of an IVR system by other companies** did not have much significance in the decisions of some participants to adopt an IVR system (when compared to other factors). Although the overall impression is that it has significance for the majority of participants, there were participants who rated it low and very low influence (3 participants rated a very high influence, 4 high influences, 2 low influence and 1 very low influence). All the other factors such as **ease of access, reliable infrastructure, portable nature, available resources, low implementation costs, modest literacy required and used by other companies** were also found to have significance in influencing construction SMMEs to adopt an IVR system; they also comprised the factors leading to behavioural intention to use a system in the refined model. One factor was added, **accessed free of charge.** Clients of construction SMMEs claimed that if the IVR system could be accessed free of charge, this will influence their intention to use it.

The **behavioural intention to adopt and use m-commerce** through an IVR system leads to the **actual adoption and use of m-commerce**, which in turn precedes the **confirmation of expectations from using of the system**. Confirmed expectations from using the system encompasses ease of use and usefulness. **Ease of use** is acquired from a **user-friendly interface and training**. A user-friendly interface can be achieved through applying the usability heuristics established by Nielsen (2008) and eight golden rules of designing a user interface established by Shneiderman (1998) (this was discussed in more detail in section 7.4.3).

Although tese usability heuristics and golden rules are established for a visual interface, they are also important for a voice interface as the results of this study have demonstrated. Significantly, since the IVR system allows a user to speak to a consultant, the **waiting time** should be kept to a minimum as users become frustrated with an extended waiting period, it must have a **clear voice** and must use the **language** with **an accent** that is understood by the users. Therefore this study argues that these factors should be included in the rules of designing a voice interface.

This study argues that **user training** for construction SMMEs is crucial as the results of the primary data demonstrated that all of the participants have never employed an IVR system in their companies, so this technology will be entirely new to them. Lofstrom and Nevgi (2007)

argue that when technological knowledge has been determined as a need for successful use of the system, training must be used to assist users to use the technology successfully. Training can be provided to an administrator who will be responsible for managing the content of the system. However, user training will not be necessary for clients as they already know how to use a phone. Furthermore, literature and the experts highlight that it is important that developers of the system **involve users** extensively from the beginning through to implementation so that the system is aligned with users' expectations, thereby improving the success of the developed system.

This study has confirmed that **usefulness** is achieved through **positive performance impact** (a detailed explanation of this is provided in section 7.4.2). It was noted that perceived usefulness was found to be a factor with the most significance to the continued use of an IVR system (6 participants rated this factor with very high influence) when compared to ease of use (4 participants highlighted this factor as very high influence). Davis *et al.* (1992) explain that ease of use becomes less significant as the user becomes more familiar with the system. This explanation provided is pertinent to this study as the primary data revealed that because all the participants are both computer and phone literate, they find an IVR system easy to use.

Another reason for participants to view usefulness as more significant than ease of use is that usefulness is influenced by a positive performance impact, therefore positive performance impact is more important to these companies. This is supported by Irick (2008) who stated that no matter how user-friendly a system is, if the system does not enhance performance, the system is useless. This study has revealed that positive performance impact leads to **improved customer service** for clients of construction SMMEs and **to added business value for construction SMMEs**.

Construction SMMEs view added business value as a factor that leads to business growth. They believe that if an IVR system adds value to their businesses through performance impact, then they would find it useful. The clients on the other hand will find the system as useful if it enhances their customer service through performance impact. When expectations of construction SMMEs are met, they will acquire satisfaction from using the system and consequently, continued use of the system will be attained.

The major challenge that may hinder the adoption and sustained use of an IVR system by construction SMMEs and their clients is call costs. When construction SMMEs were probed about their willingness to pay for call charges to enhance the use of the system by clients, all

of their responses were negative. Since they are still small business they do not have money to pay for call costs. The majority of the clients on the other hand declared that they would use the system if it could be free of charge; 6 of them rated the influence of this factor (free of charge) as very high, 3 as high and only one rated it as low. Therefore, the overall impression is that they are not willing to pay for the service.
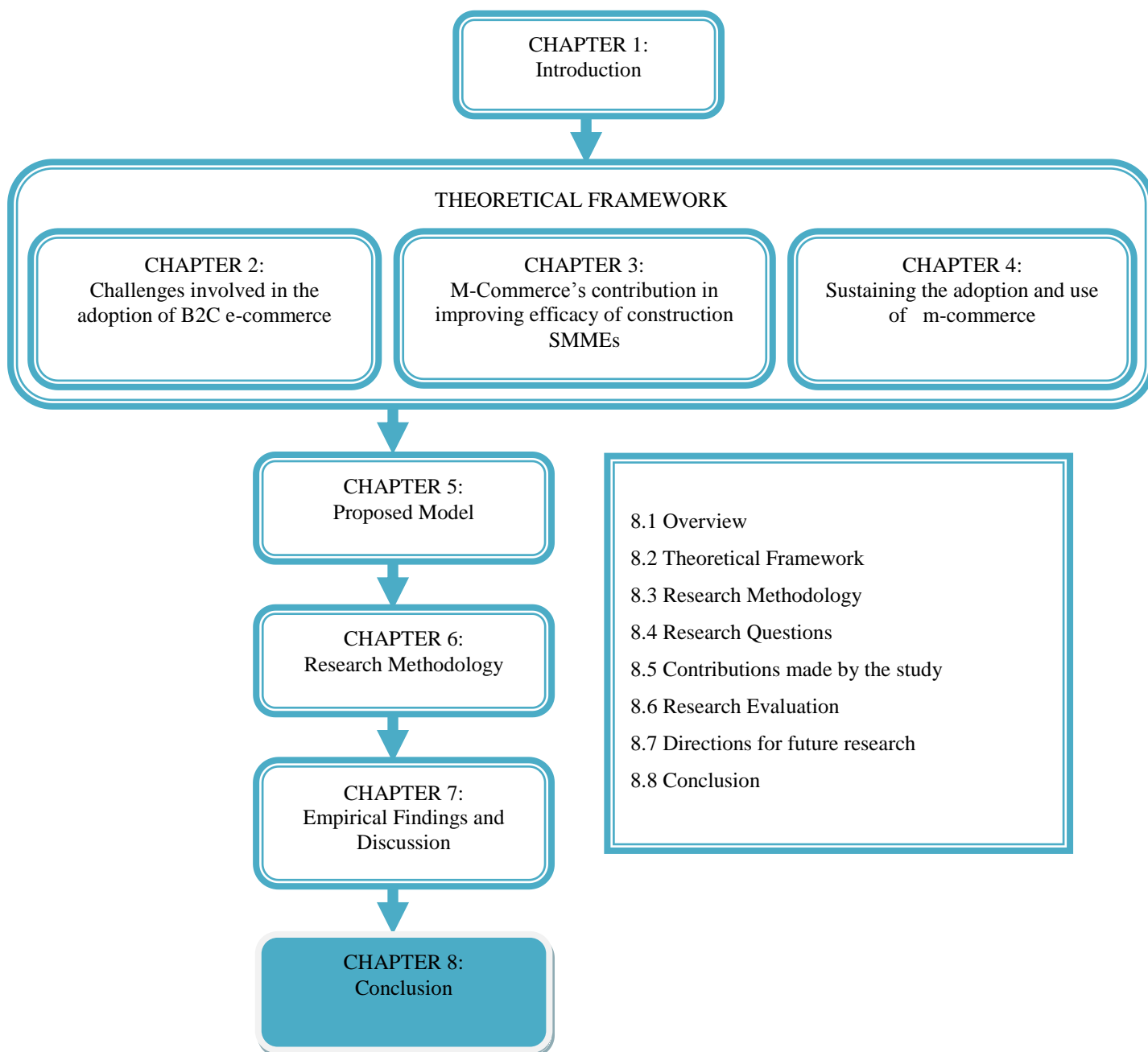
7.4 Conclusion

In this chapter the results from the semi-structured interviews, online based questionnaire and conversational analysis were analysed and discussed. These results were compared to the findings of the critically reviewed literature to find out whether the results of the primary data are consistent with the explanations of the theories and models used. This was achieved through inductive analysis and the results of the primary data are found to be consistent with the explanations of the theories and models use. The results of the interview demonstrated that most of construction SMMEs who participated in this study had cell phones with Internet access and they used the Internet to conduct business activities. They used traditional methods to communicate with their clients but most of them would like to adopt an IVR system to communicate and share information with their clients.

The results of the questionnaire showed that the clients of construction SMMEs also used traditional methods to communicate with construction SMMEs. Although they had access to the Internet, they did not use it to communicate with these companies. However, they were willing to use an IVR system for construction services. From conversational analysis, challenges involved in the development of a voice system were discussed with strategies to overcome them. The next chapter provides a conclusion of this entire study.

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8.1 Overview

The preceding chapters consist of a comprehensive introduction of the study, the reviewed literature, the proposed model, research methodology, empirical findings and discussion. The identified problem and main objective of this study are explained in Chapter 1. Chapter 2 provides an overview of South African construction SMMEs and the level of electronic commerce (e-commerce) adoption among these companies. The potential benefits that can be offered by mobile commerce (m-commerce) to construction SMMEs through an Interactive Voice Response (IVR) system are discussed in Chapter 3. The strategies that construction SMMEs may follow to sustain the use of an IVR system in order to continue exploiting the benefits of m-commerce over the long term, are discussed in Chapter 4. Chapter 5 focuses on the original proposed model developed from the influence of existing models and theories. The procedures carried out in collecting the data are presented in the research methodology in Chapter 6. Chapter 7 presented the findings obtained from the primary data supported by the secondary data.

All these chapters have assisted in addressing the main objective of this study which is to develop a model that would enhance the adoption of mobile commerce (m-commerce) through an IVR platform by construction SMMEs in order to enable them to reap the benefits offered by this technology and improve their efficacy. This chapter provides a summative conclusion of the entire study, beginning with the theoretical framework, the research methodology and thereafter, answers the research questions. The contribution made by this study is subsequently presented followed by the contribution of the study and directions for future research. Lastly, a summary of this chapter is presented in the conclusion section.

8.2 Theoretical Framework

The problem identified in this study is that electronic commerce (e-commerce) has been viewed as bringing value to businesses by enhancing their efficacy through the benefits that it offers, thus providing them with a competitive advantage. However, it is found that e-commerce adoption among South African construction SMMEs is low due to several challenges involved in the adoption of this technology. Therefore, these companies are not exploiting the benefits offered by this technology. To overcome these challenges and assist these companies benefit from commercial technologies, this study has proposed a model (Adoption and Continued Use of M-commerce Model). This proposed model was developed through the integration of existing models namely: Theory of Planned Behaviour (TPB),

Task-Technology Fit (TTF) Model, Technology Acceptance Model (TAM) and Expectation Confirmation Model (ECM) and was explained in more detail in Chapter 5.

TPB provides a comprehensive understanding of the manner in which an individual's attitude, subjective norms and perceived behavioural control can influence his/her intention to use a system (Ajzen, 1991). TPB has therefore assisted in uncovering factors that can influence construction SMMEs and their clients to adopt and use an IVR system. TTF model on the other hand argues that the technology characteristics should be aligned with the business characteristics in order for the technology to improve the performance of the user and achieve technology utilisation (Goodhue & Thompson, 1995). This model has therefore assisted in discovering whether m-commerce through an IVR system has the ability to improve efficacy of construction SMMEs.

TAM and ECM were used to find factors that might influence these companies and their clients to actually use the system and sustain its use. TAM argues that in order for the users to actually use the system, they must perceive it as useful and easy to use (Davis, 1989). ECM on the other hand points out that continued use of a system is achieved when user obtain satisfaction from using the system; satisfaction is attained when the user perceives the system as useful and the system confirms their expectations (Thong, Hong, & Tam, 2006).
A brief discussion including primary data was used to validate the model and is provided in the research methodology section below.

8.3 Research Methodology

This study is interpretive in nature and has employed the qualitative research method. It has followed the Design Science methodology approach which focuses on the creation and evaluation of innovative Information Technology artifacts that enable businesses to address their information-related tasks with the aim of accomplishing utility (Cleven, Gubler, & Huner, 2009; Hevner, March, Park, & Ram, 2004). The artifact that was developed was a model. The model was validated by collecting in depth primary data through semi-structured interviews with 10 construction SMMEs, an online questionnaire with 10 clients of construction SMMEs and conversational analysis with 5 experts in voice technologies as well as 5 consultants from the telecommunication industry and was supported by literature. This shown graphically in Figure 8.1.
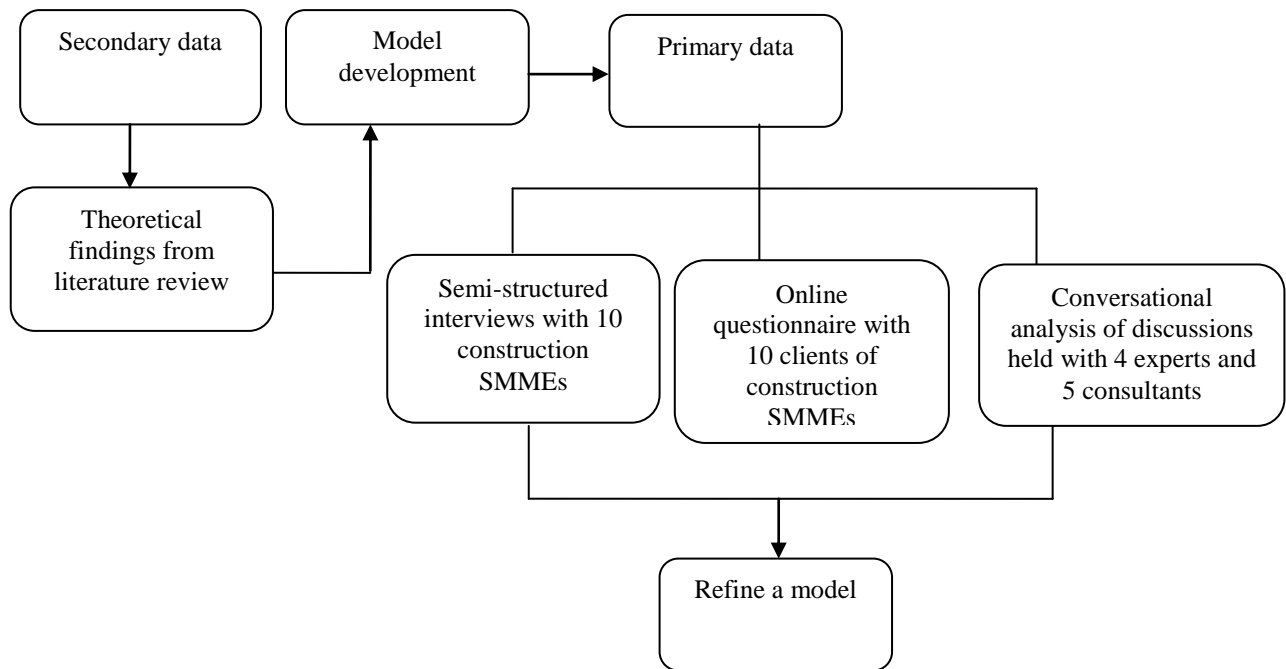
Figure 8.1: Research Process

This study used an excel spreadsheet to present the data numerically and graphically. It has followed an inductive approach to analyse the collected data so as to discover whether theoretical explanations of literature support or oppose the findings of primary data. It was found that the findings of primary data are consistent with the literature findings. The findings of the primary data were also used to refine the proposed model further. The secondary and primary data have assisted in achieving the objectives of this study.

8.4 Research Questions

The main research question investigated in this study was: *What is required by construction SMMEs in the adoption and sustained use of m-commerce to address the challenges of e-commerce?* To answer the main research question, three sub-research questions were identified and investigated:

a) *What are the challenges involved in the adoption of B2C e-commerce?*

The aim of this sub-question is to provide a better understanding of the cause of low adoption of e-commerce in SMMEs despite the potential benefits that it offers. The challenges associated with the adoption of e-commerce are identified and discussed in Chapter 2. They include high implementation costs, low use of e-commerce by suppliers and consumers, lack of or poor infrastructure, inadequate resources, lack of access to e-commerce, computer illiteracy, deficiency in understanding of the potential benefits of e-commerce and security concerns.

Furthermore, this sub-question sought to discover whether these e-commerce challenges were applicable to construction SMMEs in South Africa. The findings of the primary data presented in Chapter 7 found the following results:

High implementation cost: Construction SMMEs disclosed in the interviews that since they had not yet grown sufficiently, they could not afford to implement their own e-commerce websites due to the high costs involved such as hiring a website developer and maintaining the website. They currently use the telephone, short message service (SMS) and e-mail to communicate with their clients and use the newspaper and reference to advertise and promote their companies.

Lack of or poor infrastructure, inadequate resources, lack of access to e-commerce and computer literacy: These factors were never found to be major challenges among South African construction SMMEs since they were conducting business activities online. This therefore indicates that the infrastructure is sufficient; these companies and their clients already had the necessary resources (such as computers and Internet access) to implement and access an e-commerce website, and the empirical results confirmed that these companies and their clients were computer literate.

Low use of e-commerce by consumers: The results of the online questionnaire from clients of construction SMMEs confirmed that they did not use the Internet to communicate or obtain information about construction companies. Although they had access to the Internet, they preferred traditional methods such as the telephone and SMS to communicate as well as the telephone directory, referral by word of mouth and newspaper advertisements to identify these companies.

Deficiency in understanding the potential benefits of e-commerce: The results of the interviews confirmed that these companies lack an understanding of the potential benefits offered by e-commerce. They thought that e-commerce was more appropriate for large companies and did not perceive a need in their own businesses.

Security concerns: Although construction SMMEs conduct activities such as searching for tenders, obtaining quotes from suppliers and e-mails, half of the participants do not make payments online because they do not trust online banking. The other half trust online banking and although security concerns are a challenge, they are not an inhibiting factor.

The major challenges found applicable to South African construction SMMEs were 3 out of the 8 identified from literature. The second sub-question discusses how m-commerce (through an IVR platform) can address these 3 challenges. It should be noted that in the context of this study, m-commerce is not a substitute for e-commerce but rather, an aspect of e-commerce that is more powerful in communicating with clients (Zhang, Yuan & Archer, 2002).

b) ***How can m-commerce address the challenges of e-commerce in order to improve effectiveness and efficiency of South African construction SMMEs?***

In this sub-question the potential benefits of m-commerce (through an IVR platform) that can lead to improved effectiveness and efficiency for South African SMMEs were identified in Chapter 3. The literature emphasised the importance of aligning the characteristics of an IVR system to business characteristics in order for this technology to provide maximum benefits, leading to the utilisation of the system. The findings of the literature and the primary data have confirmed that this is indeed true. In addition, an IVR system can also address the challenges associated with the adoption of e-commerce. Therefore, it is concluded that these companies can indeed reap the benefits offered by this technology and consequently are likely to adopt such a system.

The main aim of this sub-question is to address these challenges involved in the adoption of e-commerce through the adoption of m-commerce so as to enable these companies to benefit from commercial technologies. The results of literature and primary data demonstrating how an IVR system can address these challenges, are provided below.

Overcoming high implementation costs: The literature has revealed that implementation costs of an IVR system are not as expensive when compared to the costs of implementing an e-commerce site. There are IVR systems that are free, open software (such as Freedom Fone and Asterisk) that can be employed by construction SMMEs. These companies can obtain free technical advice and online tutorials on how to use an IVR system. However, they will still need to hire a technician for the initial setup and for maintenance, they can obtain support from software organisations. Therefore, implementation costs are not necessarily overcome, but minimised.

Overcoming low use of the technology by clients: The results of an online questionnaire indicated that the clients of construction SMMEs did not use the Internet to obtain

information, but indicated that they would use an IVR system if it was available. Clients were willing to use an IVR system for construction services; therefore, this indicates that low use by the clients can be overcome.

Overcoming lack of understanding the potential benefits of e-commerce: The findings of the interviews have shown that construction SMMEs were not fully aware of the potential benefits offered by m-commerce, but gained a deeper insight through engaging in the topic during the interviews. Therefore to overcome this challenge, this study proposes that awareness of the potential benefits that commercial technologies can offer construction SMMEs, must be raised.

M-commerce was found capable of addressing the 3 challenges found applicable in the adoption of e-commerce by South African construction SMMEs. However, the findings of this study have demonstrated that in order for these companies to exploit the benefits of m-commerce, they must sustain the adoption and sustained use of an IVR system.

c) *How can construction SMMEs sustain the adoption and use of m-commerce?*

The aim of this sub-question is to explore mechanisms to support the sustained use of m-commerce by construction SMMEs. The results of the interviews indicated that construction SMMEs will adopt an IVR system if their clients can easily access the system and actually use it. Additionally, it saves time for the business, reduces business costs, is built on a reliable infrastructure, uses existing resources, its implementation costs are low, requires modest literacy, other companies are using it and it adds business value. The findings have also indicated that businesses can sustain its use if it is easy to use, is useful and confirms their expectations.

Since it is crucial for construction SMMEs that their clients easily access and actually use the system, the online questionnaire investigated the factors that may influence these clients to use an IVR system on a long-term basis. In the online questionnaire, clients stated that they would sustain the use of this system if it could be accessed anytime and free of charge, provide all the current and relevant information needed, the language used in the system could be easily understood, if the voice of the system is clear, requires no training or special skills and is easy to use, and if it improves customer service.

The findings of the literature revealed that an IVR system has the characteristics that can influence construction SMMEs and their clients to adopt and sustain its use, and therefore it was concluded that adoption and sustained use of this system is possible.

In answering the main research question, the first sub-question identified the challenges associated with the adoption of e-commerce and assessed whether these challenges were applicable to South African construction SMMEs. It was discovered that not all of them were applicable and those challenges that were found applicable were addressed in the second sub-question.

The second sub-question revealed that there was a lack of awareness about the potential benefits offered by commercial technologies among these companies. The third question uncovered mechanisms that facilitated the adoption and sustained use of this system by construction SMMEs and their clients. Therefore, the answer to the main research question is that construction SMMEs can benefit from an IVR system since it has the capability of addressing the challenges involved in the adoption of e-commerce, its characteristics are aligned with the business characteristics of these companies and furthermore, the results of primary data indicated that these companies and their clients are likely to adopt and sustain this system. This is depicted graphically in Figure 7.16 (refined proposed model). The following section discusses the contributions made by this study.

8.5 Contributions made by the study

The reviewed literature was used as a basis of this study to refine a research problem and provide a possible solution to it. It was found that construction SMMEs play a significant role in the South African economy and therefore need to be promoted to increase the growth of the economy by providing these companies with competitiveness leading to job creation and income distribution (Underwood, 2009; Koch & Peet, 2007). The literature reported that e-commerce provides companies with a competitive advantage; however, construction SMMEs do not exploit these benefits due to challenges involved in the adoption of this technology. To overcome this, literature has reported that m-commerce through an IVR system has the ability to address some of the challenges involved in the adoption of e-commerce in order to assist these companies to become competitive through improving their efficacy.

This led to the primary objective of this study of developing a model to enhance m-commerce adoption by construction SMMEs. The model presents factors that need to be in place in

order for these companies to adopt and sustain the use of m-commerce through an IVR system so that construction SMMEs can exploit the benefits offered by this system on a long-term basis and thus improve their business efficacy. In this way, these companies will become more competitive and they will be able to contribute to the economy. The following section discusses the evaluation of this study.

8.6 Research Evaluation

Since an interpretive research differs from positivist research, Lincoln and Guba (1985) in Oates (2006) point out a set of criteria for interpretive research that is an alternative to, but parallel to those for the positivist approach. This criteria is mainly used to ensure the credibility and integrity of a research project These links are presented in Table 6.3.

Table 8.1: Quality in positivist and interpretivist research (Oates, 2006)

Positivism	Intepretivism
Validity	Trustworthiness
Objectivity	Conformability
Reliability	Dependability
Internal validity	Credibility
External validity	Transferability

As this study is interpretive in nature, the interpritivist criteria applied as follows:

- Trustworthiness: This study employed well used and validated models and theories to develop the proposed model. The model was then confirmed using primary data collected from experts and prospective users (construction SMMEs and their clients).
- Conformability: The proposed model was developed using existing models and theories and was confirmed using the primary data. The findings of the primary data were found to be consistent with the theoretical explanations of this study.
- Dependability: Interview and questionnaire questions were adopted from published studies. Dependability of the study was also ensured by using theories and models that are popular and have been validated.
- Credibility: Different data collection instruments (semi-structured interviews, online questionnaire and conversational analysis) were used to elicit data from different

types of populations (construction SMMEs, clients of construction SMMEs, voice technologies experts and telecommunication industry consultants).

- Transferability: Although the study focused on construction SMMEs in East London, the proposed model can be applied to other construction companies in South Africa and to other industries willing to adopt an IVR system; therefore this study is transferable.

Since these five criteria have been applied, this study can therefore be considered credible. A few recommendations for future study are also noted.

8.7 Directions for future research

Further research can be conducted in the following areas:

- A study can be undertaken to address security concerns should payments be involved in the adoption and use of an IVR system.
- The findings of this study have demonstrated that an IVR system is capable of improving a company's efficacy and that construction SMMEs are deficient in understanding how an IVR system can improve their efficacy through the benefits it offers. Therefore, this technology still needs to be made known to companies so that they can exploit their benefits. Thus there is a need to discover mechanisms to market this technology to companies.
- The findings of this study have shown that both construction SMMEs and their clients are not willing to pay for the costs of the call made to an IVR system; this was found to be a barrier to the adoption of this system. Therefore, call costs are a major issue that needs to be addressed to ensure sustained use of this technology.

8.8 Conclusion

The research questions have been answered; the proposed model therefore embodies the fulfilment of the objective of this study. The main objective of this study was to develop a model that would enhance adoption and sustained use of m-commerce through an IVR system by construction SMMEs in order to improve their efficacy. This model was developed through the use of existing models and has been validated through the use of primary data. The study has applied the five criteria namely: trustworthiness, conformability, dependability, credibility and transferability to ensure its credibility and integrity.

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Appendix A: Interview Design

Informed Consent Letter

Research Study Title: Adoption and Sustained Use of Mobile Commerce to Improve Efficacy of Construction SMMEs

Background

I am a Masters student in the Department of Information Systems at the University of Fort Hare in East London. I am currently undertaking a study on using mobile technologies to improve efficacy of construction companies.

You are being requested to take part in my research study. Before you decide to participate in this study, it is important that you understand why the research is being done and what it will entail. The purpose of this is to uncover the factors that can influence construction SMMEs to adopt mobile commerce and sustain its use.

Study Procedure

You are requested to participate in this research study which will take approximately 30-40 minutes. This amount of time will be spent by answering interview questions that are attached for your review so as to enable you to have an understanding of the questions that you will be asked in an interview and decide whether you want to participate or not. The interview session will be conducted at a time and place that is most convenient to you, therefore you will be requested to indicate a day, time and place for the interview that suits you.

Ethical Considerations

There are no known risks to your involvement in this study. Please note that **your responses will be strictly confidential**, and that your participation is completely voluntary. You may refuse to participate or withdraw from the study at any time. Should the results of the study be published, your name will not be used.

Should you have any questions or concerns about this study, please contact Zenande Williams at cell: 0789770505 e-mail: zwilliams@ufh.ac.za or Naomi Isabirye at nisabirye@ufh.ac.za.

Consent

By signing this consent form, I confirm that I have read the information about this study and have been given an opportunity to ask questions, and they were answered to my satisfactory. I am satisfied with the ethical concerns. I have freely volunteered to participate in this study and I am aware that I have a right to withdraw consent and to discontinue participation at any time, without prejudice to my future treatment. I voluntarily agree to take part in this study.

Name (please print)…………………………………………………………………..

Signature…………………………………………………………………………..

Date……………………………...

Section 1: General information

1.1 What type of Construction Company are you? *Mark with X*

Electrical Contractor ☐   Building Contractor ☐

Plumbing Contractor ☐   Carpeting Contractor ☐

1.2 What position are you holding in the company? *Mark with X*

Owner ☐   Manager ☐

Owner/Manager ☐   Supervisor ☐

1.3 What is your gender? *Mark with X*

Female		Male	

1.4 How many employees do your company you have?

Full-Time		Part-Time	

1.5 What are your qualifications? *Mark with X*

Matric ☐   Degree/Diploma/FET certificate ☐

Formal Trade ☐   Job training and experience ☐

Post graduate ☐   Other ☐

Section 2: Communication and advertisement methods currently used

2.1 What are the current methods of communication that you are using to communicate and provide business information to your clients?

Examples of methods used to communicate: Telephone, SMS, Internet, E-mail, Newspaper, Magazine adverts, etc.

_____
_____
_____
_____

2.2 Are you planning to use another method of communication that will improve your communication with clients or are you happy with current one, and why?

_____
_____
_____
_____

Section 3: Computer and Cell Phone Literacy

3.1 What is the level of your computer skills? *Mark with X*

No skills	☐	Basic skills	☐
Intermediate skills	☐	Advanced skills	☐

3.2 Do you own a computer? *Mark with X*

Yes		No	

3.3 Does your computer have Internet access? *Mark with X*

Yes		No	

3.3.1 If yes, what type of services relating to your business do you use the Internet for?

Examples of business activities; Internet banking, quotes from suppliers, tenders, e-mails, etc.

_____
_____
_____
_____

3.4 Does your cell phone have Internet access? *Mark with X*

Yes		No	

If yes, then:

3.4.1 Do you use the Internet from your cell phone? *Mark with X*

Yes		No	

3.4.2 What type of services relating to your business do you use the Internet for?
Examples of business activities; Internet banking, quotes from suppliers, tenders, e-mails etc.

_____
_____

Section 4: Behavioural Intention to adopt and continue using an Interactive Voice Response (IVR) system

What is an IVR system and how does it work?

An IVR system acts like a website but is accessible over a voice call. The business and its clients need a cell phone or land line to communicate or access information from this technology. This is more suitable for companies who cannot afford to develop a website. Clients will be able to get information from a business by listening to the options over a phone. To access the information, the clients will dial the business phone number as normally done, but instead of speaking to an administrator, the client will communicate with the system. If you are a plumber and you are fixing pipes, you don't have to worry about your clients as the systems will provide them with the information that they need. It saves time and money as it is cheaper to implement it when compared to the Internet website. Furthermore, you don't have to hire a secretary as it acts as the company's secretary or if you do have a secretary, the secretary can focus on other tasks saving her/him time. This provides a company with improved effectiveness and efficiency.

4.1 Have you heard of an IVR system before? *Mark with X*

Yes		No	

If yes, then:

4.2 Have you ever thought of using it to communicate with your clients and why?

_____
_____
_____
_____

The following questions measure the influence of factors determining a decision to adopt a technology on a scale of 1 to 4. The scale rating is as follows:

1 - very low, 2 - low, 3 – high and 4 – very high.

4.3 To what extent would the following factors influence your decision in adopting a technology?

My clients will easily access it	1	2	3	4
It saves time for the business	1	2	3	4
It reduces business costs	1	2	3	4
It is built on a reliable infrastructure	1	2	3	4
It uses existing resources	1	2	3	4
Its implementation costs are low	1	2	3	4
It requires modest literacy	1	2	3	4
My clients will actually use it	1	2	3	4
Other companies are using it	1	2	3	4

4.4 Are there any other factors that may influence you to adopt a technology? *Mark with X*

Yes		No	

If yes, then:

4.5 Please name them and state why.

_____
_____
_____
_____

4.6 To what extent would the following factors influence you to continue using an IVR system?

It is easy to use	1	2	3	4
It is useful	1	2	3	4
It has met my expectations	1	2	3	4

4.7 Are there any other factors that may influence you to continue using the IVR system? *Mark with X*

Yes		No	

If yes, then:

4.8 Please name them and state why.

_____
_____
_____
_____

Appendix B: Questionnaire Design

To whom it may concern

I am a Masters student in the Department of Information Systems at the University of Fort Hare in East London. I am currently undertaking a study on using mobile technologies to improve efficacy of construction companies.

You are being requested to take part in my research study. The purpose of this is to uncover the factors that can influence clients of construction SMMEs to use mobile commerce through an Interactive Voice Response (IVR) platform and sustain its use.

Your requested time commitment for this research study is estimated between 10-15 minutes. This amount of time will be spent by answering a survey questionnaire provided on the following link:

http://www.zoomerang.com/Survey/WEB22DLE4BVBHV

Please note that **your responses will be strictly confidential**, and that **your participation is completely voluntary**. You may refuse to participate or withdraw from the study at any time. Should the results of the study be published, your name will not be used.

Should you have any questions or concerns about this study, please contact Zenande Williams at e-mail: 200506366@ufh.ac.za
It will be greatly appreciated if you could also forward this e-mail to someone who might be willing to participate.

Kind regards,
Zenande Williams

Information Systems Masters Student
University of Fort Hare
East London

Use of an IVR system in Construction Industry

1   What type of housing resident are you?

- ○ Owner
- ○ Tenant

2   When was the last time you made renovations in your house? In the past...

- ○ 0-6 Months
- ○ 6-12 Months
- ○ 12- 18 Months

3   What type of construction/renovation did you conduct?

- ☐ Electrical
- ☐ Plumbing
- ☐ Carpenting
- ☐ Building/Extention
- ☐ Other, please specify

4   Where did you hear about the company/micro-businessman that you employed?

- ☐ Phonebook
- ☐ Internet
- ☐ Reference
- ☐ Newspaper
- ☐ Other, please specify

5 What communication method did you use to reach the contractor that you employed?

☐ Telephone
☐ SMS
☐ Internet
☐ Other, please specify

[   ]

6 *"Welcome to MTN customer service. The main menu: if you want your PUK number; press 1. If you want a voicemail or MTN banking press 2 or if you want a consultant, please hold on."*

The above is an axample of an IVR system, it is used by the telecommunication companies such as MTN, Vodacom, Cell C etc. and other private companies. An IVR system can be also applicable in a construction industry.

Have you ever used an IVR system before?

○ Yes
○ No

7

If your answer is YES to question 6 then; how did you feel after using it? *Please explain what frustrated you or satisfied you.*

Examples of frustration: unclear voice, long menu options, ambiguous terminology, aitime costs etc.
Examples of satisfaction: Gets straight to the point, the voice is clear, is easy to use, etc .

[   ]

8 Was there anything in particular that you liked or disliked about the IVR system that you have used and why?

[   ]

9 What recommendations would you make to improve it?

[   ]

10 Are you willing to use an IVR system for construction services and why?

[   ]

11 To what extent would the following factors influence your decision to use an IVR system on a long term basis?

	very low	low	high	very high
It is free of charge	◉ 1	◉ 2	◉ 3	◉ 4
It provides all the information needed	◉ 1	◉ 2	◉ 3	◉ 4
The information is relevant and current	◉ 1	◉ 2	◉ 3	◉ 4
The voice is clear	◉ 1	◉ 2	◉ 3	◉ 4
The language used is easy to understand	◉ 1	◉ 2	◉ 3	◉ 4
It requires no training or special skill	◉ 1	◉ 2	◉ 3	◉ 4
It is easy to use	◉ 1	◉ 2	◉ 3	◉ 4
Improved customer service	◉ 1	◉ 2	◉ 3	◉ 4
It is accessible anytime	◉ 1	◉ 2	◉ 3	◉ 4

12 Are there any other factors that may influence you to use the IVR system and sustain its use?

Submit

List of Acronyms

B2C e-commerce – Business to Consumer Electronic Commerce

ECM – Expectation Confirmation Model

FAQ – Frequently Asked Questions

GDP – Gross Domestic Product

GUI – Graphical User Interface

IT – Information Technology

IVR – Interactive Voice Response

M-commerce – Mobile Commerce

PBX – Private Branch Exchange

PSTN – Public Switched Telephone Network

SIP – Session Initial Protocol

SMMEs – Small, Micro and Medium sized Enterprises

SMS – Short Message Service

TAM – Technology Acceptance Model

TPB – Theory of Planned Behaviour

TTF – Task Technology Fit

VOIP – Voice over Internet Protocol

WAP – Wireless Application Protocol

WWW – World Wide Web

Glossary

Avaj Otlo - this voice site allows farmers to access the latest agricultural information regarding farming practices over the telephone.

Design Science – refers to the creation and evaluation of innovative IT artefacts that enable businesses to address their information-related tasks with the aim of accomplishing utility (Cleven, Gubler and Huner, 2009).

Dial-An-Auto - this is a type of a system that enables unorganised auto-drivers (taxis) to find the closest passenger any time.

E-commerce – refers to the buying and selling of information, products and services via computer networks which make up the Internet (Mensah, Bahta and Mhlanga, 2005).

Folksomap - this is a community driven map system which is offered as a voice site and a website that influences semantic web technologies to create and manage a community generated knowledge base.

IVR system - an information network based in the company's database and is used by callers to access information about the company or to check their account balance, stock price quote, and/or execute commercial transactions, such as paying bills or purchasing goods (Lustgarten and Cannon, 2002).

M-commerce - refers to the buying and selling of goods and services through wireless/mobile devices such as cell phones, personal digital assistants and wireless computers (Jobodwana, 2009).

SMMEs – refers to a broad range of firms, from established traditional family businesses employing over a hundred people (medium-sized enterprises), to the self-employed (informal micro enterprises) (Berry, von Blottnitz, Cassim, Kesper, Rajaratnam, & van Seventer, 2002).

VoiAvatar - this system allows individuals to create their own personal or business voice sites which act as an online avatar or proxy of those individuals

VoiKiosk - this is a Voice site that acts as an information and service portal for a village or a community. This application has been explained in detail in the preceding section.