An exploration of the benefits of information and communications technology for SMMEs in the Construction Industry in Gauteng Province, South Africa

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Research is subject to a confidentiality agreement

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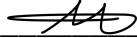**December 2022**

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ABSTRACT

This paper explores the beneficial impact of ICT adoption on the performance of Small, Micro to Medium Enterprises (SMMEs) in South Africa, specifically in the construction sector. The population of the study comprises construction SMME owners and managers in Gauteng, South Africa. The objectives of this study are fourfold as follows. Firstly, it aims to determine the benefits of ICT for SMMEs in the construction industry in South Africa. Secondly, it aims to establish the challenges SMMEs face in ICT infrastructure systems. The third aim is to determine the barriers that impede SMMEs from adopting ICT. And fourthly it aims to recommend an ICT framework for the effectiveness and success of ICT infrastructure systems for SMMEs. The research consisted of data collection from 15 SMMEs in the construction industry in Gauteng Province, South Africa through the means of interviews. The study employed an interpretivist paradigm which necessitated a qualitative approach. The data was then analysed thematically. The study was motivated by a Technology-Organisation-Environment (TOE) framework. The study findings show that SMMEs profit greatly from the adoption of ICT in their battle for survival and expansion. ICT is one of the main resources that may be employed by organisations in this digital age, according to the Resource-Based Theory. The majority of respondents stated that ICT has improved performance and that tasks are completed more efficiently than before. According to the findings, sustained government help to extend broadband access for underprivileged groups, particularly in places underserved by private sector activities, is suggested. Government funding should be made available to assist SMMEs in developing ICT skills. This financing might be linked to organisations like SEDA to guarantee that new SMMEs are ascertained of the importance of ICT skills that will benefit their enterprises. To improve awareness of the benefits of ICT in the construction industry, training providers, NGOs, and government agencies must collaborate more closely.

Key Words: Performance, SMME, Technology, Construction, Adoption

DECLARATION

I , Unathi Klassie, Student Number : **9958347** hereby declare that this dissertation-
AN EXPLORATION OF THE BENEFITS OF INFORMATION AND COMMUNICATIONS TECHNOLOGY FOR SMMES IN THE CONSTRUCTION INDUSTRY IN GAUTENG PROVINCE, SOUTH AFRICA, for the Master of Business Administration in the Business School, submitted to Nelson Mandela University, has not been submitted previously for any degree at this or another University. It is my original work in design and in execution, and all reference material contained therein have been duly acknowledged.

_____   28/10/2022
                                                      _____

Unathi Klassie   **Date**

9958347

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LIST OF ACRONYMS

SA   South Africa

ICT   Information and Communication Technology

SMMEs   Small, Micro and Medium Enterprises

GDP   Gross Domestic Product

SEDA   Small Enterprise Development Agency

SPSS   Statistical Package for the Social Sciences

JSE   Johannesburg Stock Exchange

SARS   South African Revenue Services

DTI   Department of Trade and Industry

Stats SA   Statistics for South Africa

GFCF   Gross Fixed Capital Formation

OECD   Organisation for Economic Co-operation and Development

IDT   Innovations Diffusion Theory

RBV   Resource-Based View

TOE   Technology-Organisation Environment

TCT   Transaction Cost Theory

ANT   Actor Network Theory

TPB   Theory of Planned Behaviour

TAM   Technology Acceptance Model

PU   Perceived Usefulness

PEOU   Perceived Ease of Use

B2B   Business-to-Business

B2C   Business-to-Consumer

ACKNOWLEDGEMENTS

CHAPTER 1

INTRODUCTION AND BACKGROUND STUDY

1. Introduction

This chapter introduces the context of this study presenting the problem statement, scope, objectives, limitations, and questions. It also defines a structure for addressing the study objectives and questions.

1.1 Contextual Background

Data is becoming increasingly important to economies and society in today's highly digitally connected world. ICT poses a critical transforming role in business organisations of all sizes. The fast development and adoption of information and communication technologies (ICT) has altered the terrain in which businesses operate. According to the literature, small firms, which are the subject of this study, make a major contribution to economies in both developed and developing countries (Murithi, 2017). However, in developing economies like South Africa, ICT usage in Small, Micro and Medium Enterprises (SMME) is still low due to a variety of constraints ranging from availability to business financial resources to entrepreneurial culture (Sitharam & Hoque, 2016). Manufacturing and the ICT sector have been designated as priority sectors on which to focus activities in supporting SMME development by the South African Small Enterprise Development Agency (2019).

The purpose of this study is to investigate the advantages of ICT for SMMEs in the construction sector in the Gauteng Province of South Africa. Even though Gauteng is the smallest of South Africa's nine provinces, it has the highest number of SMMEs and plays a vital part in contributing to the country's economic growth (Alkhajeh, & Khalid, 2018). The word SMMEs has a wide range of definitions around the world. SMMEs, according to Hallberg (2017), are firms whose staff, assets, and value are all below specific thresholds. SMMEs, according to the South African Department of Trade and Industry (2020), are a diverse group of businesses that include formally registered, unregistered, and non-value added tax (VAT) registered businesses

Small businesses employ between 21 and 50 people, while medium enterprises employ up to 200 workers, according to the South African Department of Trade and

Industry (2020). SMMEs provide for more than half of all job opportunities in South Africa's economy, and the sector contributes more than 45 % of the country's GDP (Global Entrepreneurship Monitor, 2019).

Figure 1.1 shows how the Small Enterprise Development Agency (2019) categorises business sizes based on their industry. South Africa has one of the lowest rates of successful SMME establishment in the world. Around 70% to 80% of SMMEs fail in the first year, with just around half of those who survive, making it to the fifth year (Department of Small Business Development, 2016).
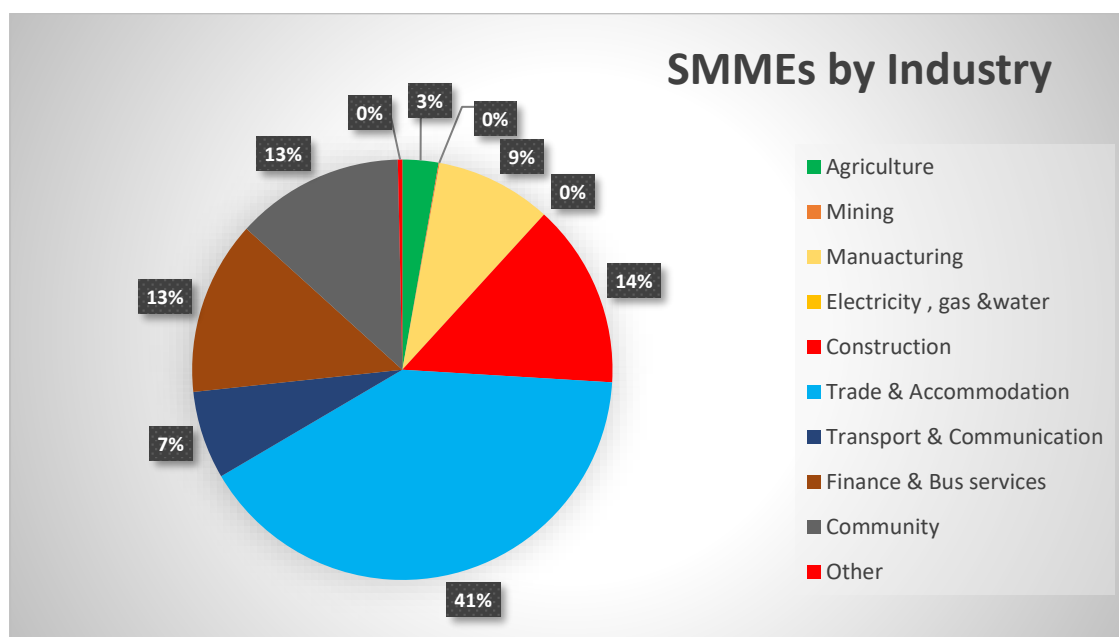
Figure 1.1:SMMEs by Industry in South Africa [Source: SEDA (2019)]

This enquiry entails developing a framework to help SMMEs in the construction industry in Gauteng Province, South Africa, to reap the benefits of ICT. According to the current estimates for SMME construction enterprises in Gauteng, there are around 116 904 formal and informal SMMEs, which represent an estimated average of 31% compared to other provinces as shown in Figure 1.2. The performance and success of an ICT system was examined in a sample of 40 SMMEs in the construction industry. Many information systems have been developed by the ICT industry that can be used to accomplish the analysis. Chapter 2 reviewed numerous theories and models to assist in deconstructing in-depth literature on ICT concerns affecting SMMEs. According to SEDA figures, Gauteng has the largest business sector in South Africa.
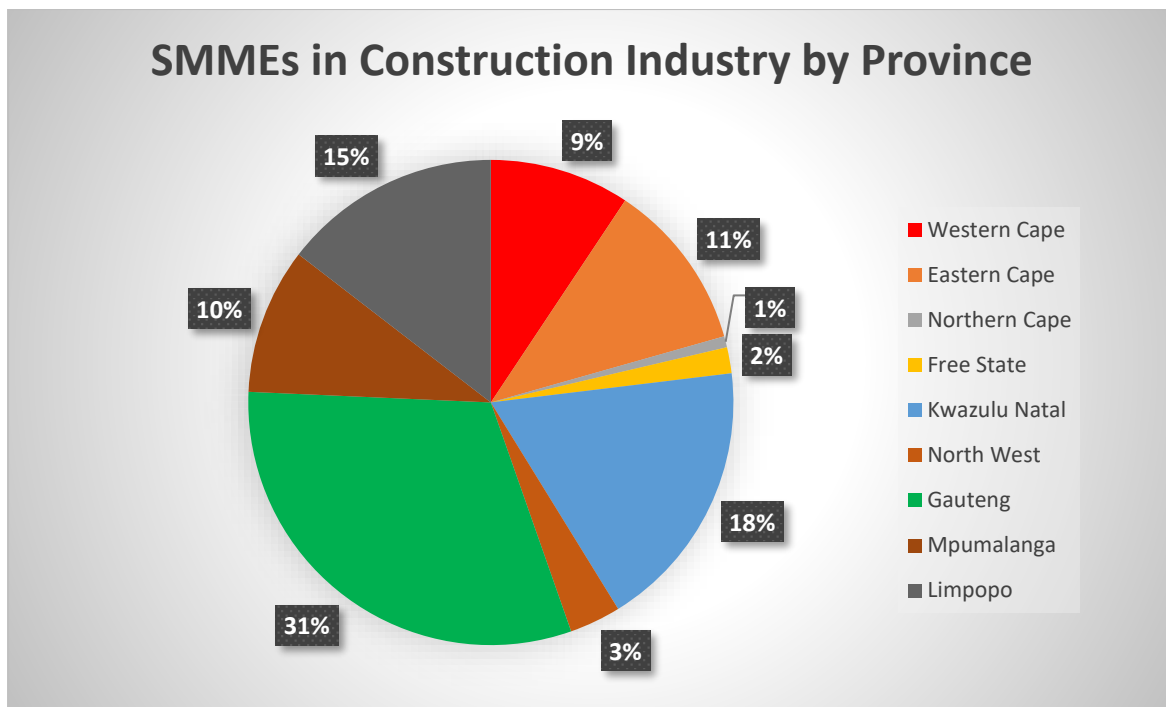
Figure1.2:SMMEs in Construction by Province [Source: SEDA (2019)]

1.2 Problem Statement

Several South African SMME's do not understand the benefits of implementing ICT in their structures. ICT is regarded as one of the most important and critical drivers of SMME competitiveness (Busaidi, Bhuiyan & Zulkifli, 2019). Organisations must invest in technical skills, organisational change, creativity, and budgeting to use and invest in ICT. Making ICT work requires investment in skills, organisational change, and innovation. According to Mumangeni (2018), small business owners and managers in the construction industry have invested in ICT infrastructure to address business needs and opportunities The use of ICT in construction is becoming a priority as the complexity of building projects grows, as well as the myriad issues that surround them, making them difficult to manage (Ndesaulwa, & Kikula, 2017). In contrast to the ease with which traditional approaches to project management may be used, modern construction difficulties necessitate superior systems.

Several success criteria are discovered to be responsible for the effective adoption of ICT in SMEs (Eze *et al.*, 2018). The framework of effectiveness or success of ICT systems in SMMEs, on the other hand, is not being examined. Many SMMEs in South Africa fail to properly adopt and execute ICT due to a lack of understanding of the

benefits of ICT investment (Visser *et al.,* 2016). This presents a barrier to SMMEs attaining their strategic objectives and ambitions. According to a study done by Statistics South Africa, organisations with strong productivity growth are more likely to use modern ICT (Stats SA, 2020).

Baldwin (2018) backs this up, claiming that advanced technology users grow more in terms of productivity and profitability than those who do not. Another study based on data surveys shows that the usage of ICT can help businesses enhance their performance (Yunis, Tarhini & Kassar, 2018). Increased market share, expanded product selection, customised products, and improved consumer reactions are all examples of this performance. The available research has primarily focused on the application of ICT in enterprises in general. ICT and SMMEs in general have been the subject of some research. The benefits of ICT in the construction industry's SMMEs in South Africa, it is suggested in this study, have not yet been adequately studied in academic research.

1.3 Research Objectives

The overarching objective of this study is to establish the beneficial impact of the use of ICT by SMMEs in the construction industry in Gauteng Province, South Africa.

Based on the problem statement discussed, his section outlines the specific objectives of this study, which are stated below:

- To determine the benefits of ICT for SMMEs in the construction industry in Gauteng Province.
- To establish the challenges SMMEs face in ICT infrastructure systems.
- To determine the barriers that impede SMMEs from adopting ICT.
- To recommend an ICT framework for the effectiveness and success of ICT infrastructure systems.

1.4 Research Questions

1.4.1 Primary research question

The primary question which the study seeks to answer is:

What is the beneficial impact of the use of ICT by SMMEs in the construction industry in the South African economy?

1.4.2 Secondary research question

To answer the main question, sub-questions have been formulated as follows.

- What is the level of ICT deployment by SMMEs in Gauteng, South Africa?
- What are the factors influencing the adoption of ICT in the construction SMMEs?
- What are the challenges which SMMEs in construction face with respect to ICT infrastructure and in the adoption of ICT?
- What are the benefits of adopting ICT in the construction SMMEs?

1.5 Contribution of the Study

In recent studies, the degree and character of ICT use in SMMEs has been investigated and explored in more depth. However, there is a significant gap between industrialised and emerging economies and between sectors of the economy. Studies show that research on ICT difficulties for SMMEs in wealthy nations has been explored, but there is not much for developing countries. Surprisingly, studies on this issue in underdeveloped countries like South Africa, have primarily focused on the influence of ICT on the banking sector, ignoring other industries, which prompted the researcher to conduct this research. In South Africa, there are still significant issues in the construction sector that can be addressed by embracing and fully appreciating the benefits of ICT.

This research will benefit the SMMEs' economic growth, development, and long-term viability. The findings will aid in the development of strategies that will promote the use and benefits of ICT. According to research, a variety of ICT advancements are critical for increasing communication, collaboration, and information management in the construction business (Amusan *et al.,* 2018). This research will also contribute to the creation of an ICT framework that will aid in boosting the adoption of ICT in construction SMMEs.

With a wealth of literature on the benefits of ICT on SMMEs, the findings of this study are expected to benefit SMMEs, policymakers, academic researchers, and ICT service

providers. Another important aspect of this research is that the findings are likely to generate new knowledge and motivate other scholars to explore and investigate any knowledge gaps that may not be addressed.

1.6 Research Methodology

To examine the benefits of ICT for SMMEs in the Construction Industry in Gauteng Province, South Africa, a qualitative research approach based on an interpretivism paradigm was used. When conducting a study, it is critical to have a strategy and method for achieving the research goals and answering the specific questions. The positivist paradigm aids in the deciphering of the cause-and-effect link, which is what this study tries to do (Gray, 2014). The interpretivism paradigm was appropriate for this study since it did not aim to demonstrate a causal relationship but rather an in-depth investigation of the positive influence of ICT for construction SMMEs. The goal of the study is to determine the advantages of SMMEs employing ICT. This study design is applicable to completely address the research problem, and interviews were used as the appropriate research instrument. A research methodology, according to Haradhan (2017), outlines the methods and procedures for gathering data, analysing data, and interpreting data in a study. It directs the systematic and efficient conduct of research. This is handled by identifying current research gaps in terms of ICT efficacy and success, outlining study objectives, and defining research questions. As a result, the researcher is looking for broad-based solutions to improve ICT's impact on small and medium-sized businesses.

1.6.1 Sampling technique

The population is defined by Hammarberg, Kirkman, and DeLacey (2016) as the entire group that the researcher wants to learn more about. Construction industry SMMEs in Gauteng, South Africa, serve as the research's unit of analysis. Sampling is the deliberate selection of a set of study participants, the sample, to give the researcher data from which to draw conclusions about a broader group, the population, that these research participants represent. This kind of sampling is used to lower the expense of examining the complete target population (Baker, 2012), as well as to improve the speed of data collection and the accuracy of the results (Baker, 2012; Rahi, 2017). There are two types of sampling methods: probability and non-probability sampling.

Non-probability sampling includes quota, purposive, snowball, self-selection, and convenience sampling, whereas probability sampling includes simple random, stratified random, systematic, and cluster (Wolf, 2011).

The convenience sample technique was used to pick 15 respondents from the construction industry in South Africa's Gauteng Province. This sampling strategy is intended to select examples that will allow the respondents to best answer research questions in order to satisfy the study objectives. The respondents in this survey are small and medium-sized businesses in the construction industry that use ICT for a variety of purposes.

1.6.2 Data Collection

Semi-structured interviews were used in this study. Semi-structured interviews feature a sequence of key questions that help establish the areas to be studied, but they also allow the interviewer or interviewee to detour to explore an idea or response further (Babbie & Mouton, 2018). By giving respondents an interview guide prepared expressly for this study, the researcher provided them with some guidelines on what to talk about, which was very beneficial in speeding up the data gathering process. A research interview's purpose is to learn about people's perspectives, experiences, opinions, and/or motives on a certain issue (Creswell & Creswell, 2018).

Interviews and other qualitative methods, rather than strictly quantitative ones like questionnaires, are supposed to provide a "deeper" understanding of social issues (Guidita, 2019). Interviews are the most appropriate strategy when little is known about the research phenomena or when complete insights from individual participants are requested. They are also useful for exploring challenging topics that people might be unwilling to discuss in a group context. In order to investigate the favourable influence of ICT in construction SMMEs, the researcher conducted interviews with 15 managers/owners of SMMEs.

1.6.3 Interview process

Interview is an important data gathering technique involving verbal communication between the researcher and the participant and to discover more about a participant's background. Interviews allow the researcher to delve further into a subject (Gray, 2014). To guarantee that the respondent(s) are comfortable, the researcher should conduct interviews in an environment with little or no interruption. Basically, interviews were performed at respondents' workplaces to ensure that they were comfortable, and the researcher properly explained the objective of the interview and acquired respondents' consent. Prior to conducting interviews, the researcher discussed confidentiality and provided the interviewee with an estimate of how long the interview would last. Interviews required between 20 and 30 minutes of respondents' time for this study. The researcher strove not to make the interview too long but not too short to get genuine responses.

1.6.4 Data Analysis and interpretation

Thematic analysis is a qualitative data analysis method that entails examining a data set for recurring patterns, comprehending them, and reporting them (Braun & Clarke 2018). It is a method of describing data that also includes interpretation in the selection of codes and the creation of themes. Thematic analysis is a powerful but flexible tool for analysing qualitative data that can be applied to a variety of paradigmatic or epistemological viewpoints (Gray, 2014).

A theme is a 'patterned response or meaning' that emerges from the data and helps to answer the research question. A theme is a more abstract entity that requires a greater degree of data interpretation and integration than a category, which describes and organises the 'manifest content' of a data collection (Nowell *et al.*, 2017:43). By participating in repeated and active readings of the data, the researcher becomes familiar with the data. Knowing the data will help the researcher to code, which is the process of organising data at a granular, specific level. This is when the researcher begins making mental notes of potential data items of interest and forming connections between them. The researcher next identifies themes, characterises them and gives them names. The researcher then writes up the final analysis and describes the findings using the established themes. The final findings are delivered in the form of

representative data extraction from participants, and the researcher responded to the study questions.

1.6.5 Reporting or synthesis

This study's findings are presented in the form of interpretations, recommendations, and conclusions based on themes. The results are compared, and conclusions and recommendations are documented, using the generated representative data extraction from direct quotations of participants. There are also summaries, overviews, and research plans created. The recommendations for SMMEs will focus on eliminating hurdles and improving ICT deployment. This can be accomplished through investing in staff and management education regarding ICT and its benefits, as well as recruiting or outsourcing knowledgeable ICT specialists. Future study recommendations are also offered. Conclusions might be drawn based on assumptions such as ICT being a commodity that gives SMMEs little competitive advantage, or ICT adding considerable value to enterprises and giving them a competitive advantage.

1.7 Ethical Consideration

Preceding to the interview, key ethical issues such as consent and confidentiality were deliberated with SMME owners/managers. The research purpose was clarified, and the intended outcomes communicated. Ethical clearance was applied for and submitted to the Nelson Mandela University Business School's Ethics Committee before embarking with actual data collection. SMME owners/managers were advised of the consent document, which they had to sign in advance. The consent document included the researcher's contact details.

1.8 Delimitation of the Study

Firstly, the data was only sourced in one province (Gauteng) out of nine provinces in South Africa. This study was also limited to 15 SMME owners/managers from whom data was sourced. It is important to note that Gauteng has the largest population and has the largest business sector in South Africa.

Secondly, the ICT adoption framework was limited to SMME owners/managers as key role players.

Thirdly, the study excludes larger businesses that operate in the Gauteng Province.

1.9 Research Report Layout

This study is structured in five chapters with each chapter commencing with a brief introduction.

Chapter 1 introduces the context of the study defining present research gaps. This chapter defines the study objectives, questions, and methods adopted in addressing the research gaps identified. **Chapter 2** presents a detailed literature search related to the context of the study to have an assessment of what other scholars have done relative to ICT benefits within SMMEs in the construction industry. **Chapter 3** highlights a summary of the study design, methodologies, data collection, analysis, and interpretation. **Chapter 4** outlines the data collection and analysis of the outputs obtained. **Chapter 5** makes inferences on the analysed data, interprets the results, presents implications of the results, and concludes the study.

1.10   Summary of the Chapter

The effective use of ICT has far-reaching effects on the performance of businesses. ICT enhances effective communication internally and externally. This will lead to operational excellence that will enable the achievement of business goals. The achievement of objectives and goals by SMMEs will lead to the development of the South African economy. It has been elaborated that the use of research objectives guides the researcher in the whole research process. The research approach, research design and data analysis should be selected in line with the research problem and research objectives.

CHAPTER 2

LITERATURE REVIEW

2. Introduction

In recent years, information, and communication technology (ICT) has emerged as a critical component and resource in the construction sector. According to the World Bank (2019), ICT integration in SMMEs improves their performance and contributes to the growth of their respective economies. Xiong and Qureshi (2017:53) devise that "ICT has a substantial impact on the operations of SMMEs and is crucial for their survival and growth of nations". The construction industry's ICT study has primarily concentrated on the prevalence and occurrence of ICT, as well as the impact of its use, with little literature on the benefits of ICT to SMMEs. Although many studies have been undertaken on the impact of ICT on SMMEs, very few have been conducted particularly for the construction industry. Given the foregoing, this study will contribute to filling a research vacuum in the under-researched area of evaluating the benefits of ICT to SMMEs in the construction industry, with a focus on Gauteng.

2.1 Background Discussion

The review of previous relevant literature relative to both ICTs and SMMEs was done. The researcher began by providing detailed information on the SMME sector, emphasising its importance to growing economies like South Africa. The relevant ICT adoption models and theories were unpacked to conduct a thorough review of the previous literature on the value and importance of ICT in the construction SMMEs.

The chapter also discussed the challenges of ICT adoption faced by construction SMMEs, as well as the reasons why SMMEs in general are failing to capitalise on technology. The following are some of the reasons why SMMEs do not completely deploy ICT, which will be examined later:

- ICT is unsuited to the sort of business.
- There is a scarcity of understanding about how to use ICT.
- IT skills are either unavailable or insufficient.
- Setting up ICT is expensive.
- The ICT environment is always changing, making adoption challenging.

2.1.1 The SMME sector

2.1.1.1 Definition of SMMEs

The importance and value of SMMEs, according to Moshood, Mahmud, and Adeleke (2020), is not debatable because they assist economies create jobs, generate tax income, and add to the gross domestic product (GDP). Small, medium, micro, and large-scale business categorisation, on the other hand, is highly subjective and based on distinct value judgments. Amusan *et al.,* (2018) in addition to the aforementioned difficulty, believe that there are several challenges surrounding the definition of SMMEs, leaving little place for a universal definition. In terms of SMME definition, different countries use and define SMMEs differently depending on their criteria. "There is no globally accepted definition of SMMEs because they differ depending on the size, location, age, motivation, and method of organisation, among other things criteria"(Gono et al., 2019). The EU defines a small business as one with less than 250 employees and a turnover of less than 40 million euros. When applied to the South African context, the EU's requirements are far too high, implying that many enterprises, including those listed on the Johannesburg Stock Exchange (JSE), are SMMEs.

Furthermore, the definition of SMMEs varies not only from country to country, but also depending on the sector or industry in some cases within the same country (Moshood et al., 2020). When defining SMMEs, however, there are some common characteristics to be aware of, which include the following variables.:

- Maximum or minimum number of employees.
- Maximum or minimum turnover.
- Minimum or maximum amount of capital; and
- Maximum or minimum balance sheet total.

Because the focus of this study is limited to South Africa, it is critical that a definition of SMMEs is created in this country. SMMEs in South are classed and categorised as "small, medium and micro firms, recognised by the term SMME, with varied ceilings for each unique sector," according to SARS (2017:34).

2.1.1.2 Definition of SMMES in the South African context

The South African Revenue Service (SARS) and the National Small Business Act 102 of 1996, revised in 2003, were used to aid define SMMEs in the South African setting

for this study. SMMEs can be defined in a variety of ways, according to SARS (2017), and SMMEs should be any firm that falls into one of the following categories.

- For amnesty purposes, an SMME is defined as any business with a maximum turnover of ten million rand (R10m).
- For income tax purposes, an SMME is defined as any business with a turnover of less than fourteen million rand (R14m).
- For capital gains tax purposes, an SMME is a company with total net assets of less than R5 million.

SMMEs, according to Smit and Walkins (2012), are unique and distinct business entities that comprise non-governmental organisations and cooperative companies in every sector of the economy, controlled by a single owner, or several owners. The National Small Business Act categorises SMMEs based on the industry in which they operate, as shown in the table below (Smit & Walkins, 2012).

Table 2.1:The definition of SMEs according to sector [Source: Smit and Watkin (2012)]

Sector according to standard industrial classification	Size of class	Equivalent full-time employees	Total turnover	Total gross asset value
Agriculture	Small	50	R3m	R3m
	Medium	100	R5m	R5m
Mining and quarrying	Small	50	R10m	R6m
	Medium	200	R39m	R23m
Manufacturing	Small	50	R13m	R5m
	Medium	200	R51m	R19m
Construction	Small	50	R6m	R1m
	Medium	200	R26m	R5m
Retail and motor trade	Small	50	R19m	R3m
	Medium	200	R39m	R6m

Wholesale & commercial agents	Small	50	R32m	R5m
	Medium	200	R64m	R10m
Catering and accommodation	Small	50	R6m	R1m
	Medium	200	R13m	R3m
Finance and business services	Small	50	R13m	R3m
	Medium	200	R26m	R6m

2.1.2 SMMEs and ICT in South Africa
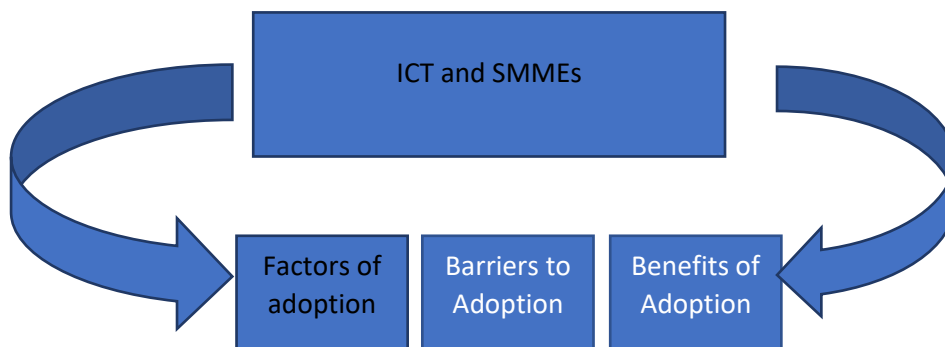
Figure 2.1: ICT and SMME's [Source : Authors' own formulation]

According to SEDA (2019), the ICT sector in South Africa can be divided into three broad categories: information technology (IT), electronics and telecommunications. In South Africa, the electronic sub-sector is dominated mostly by the private sector, which is operated and managed by international corporations. In the field of information technology, the private sector primarily provides software, with only a few contributing hardware (SEDA, 2019).

ICT is without a doubt recognised as a critical component in South Africa's development because it has a direct impact on the economy's performance. As a result, the ICT sector has had a favourable impact on the South African economy's growth and development over the years. The ICT sector contributed to the national GDP's marginal growth. Between 2014 and 2019, the ICT sector's contribution to South Africa's GDP increased from 2.9 % to 4.2 % (Stats SA, 2020). ICT changes the efficiency and productivity of organisations which adopt technology in a variety of

ways, including enhancing resource allocation efficiency, decreasing costs, and granting technological improvements, as well as creating outward shifting of the production function (SEDA. 2019).

According to the World Bank (2019), a 10 % increase in the use of ICT in the form of broadband in emerging nations will result in a 1.38 % rise in GDP growth. It suggests that the state of South Africa's ICT sector has a stronger impact on the country's competitive edge as a whole and on individual enterprises. According to Modimogale and Kroeze (2019), the quantity and quality of ICT available to businesses determines their production and efficiency.

To reiterate, even though South Africa has a more superior ICT infrastructure than other African countries, SMMEs in South Africa face the same issues as those in other countries, including poor management practices and limited access to technology (Myeko & Iwu, 2019). The problem now is to persuade construction SMMEs to take the next step in incorporating ICT into their business operations.

2.2 The Overview and State of South African Construction Industry

The South African construction industry has been struggling since 2017, according to the DTI (2020). According to reports, the value of the industry has decreased by 3.3 %. Various factors have been blamed for the construction industry's downfall, with some of them validating the study's existence. According to Stats SA (2020), the following factors are contributing to the construction industry's decline: government infrastructure funding has been cut; a recession and a slumping economy; rising material costs; and a lack of ICT and automation adoption.

Stats SA (2020:5) says that "the construction sector contracted by -0.9 % and -2.2 % in the fourth quarter of 2019 and the first quarter of 2020, respectively." At the height of the lockdown in the second quarter of 2020, the downturn increased, resulting in the entire economy contracting. The overall outlook for the construction industry in 2020 was pessimistic, with a 14.3 % contraction predicted (Stats SA, 2020). Furthermore, the gross fixed capital formation (GFCF) declined dramatically, which can be linked to lower building project investments (DTI, 2020). The building industry has seen a massive drop, estimated to be around 76 % (Stats SA, 2020).

Due to the economic slowdown caused by the COVID 19 epidemic, labour shortages, rising material costs and inadequate infrastructure, challenges in the building industry are projected to remain into and after 2021. The construction industry's expected trend for 2022 was a mixed blessing, with both a positive and negative outlook. However, according to the DTI (2020), the effects would be positive if suitable automation, innovative materials, and new technologies are implemented in the construction industry. New creative technology, such as new architectural software, will help the construction industry decrease costs and boost productivity (World Bank, 2020). The researcher was inspired to conduct this study to investigate the benefits of ICT in SMMEs, notably in the construction industry, as reported by DTI and Stats SA.

The significance of the building business is without a doubt undeniable. "The construction business is one of the cannonading industries of today that has a very substantial impact on the growth of economies," according to the OECD (2017:34). The building industry adds to the economy's overall growth. The government of South Africa develops infrastructure through the construction industry. The industry also contributes more to the development of jobs, the gross domestic product, and government revenue via paying taxes (Mohr, 2018). As a result, more research into ICT and SMMEs in the construction industry is needed to recommend ways in which ICT might be used by these businesses to reap the maximum benefits.

2.3 Benefits of Adopting ICT in Construction SMMEs

"ICT can be considered as current digital technologies that are used to organise, collect, store, process, and convey information within and external to an organization" (Ritchie & Brindley, 2018:252). When completely implemented, ICT can fulfil a variety of corporate roles, including operational, strategic, and marketing functions, among others (Ritchie & Brindley, 2018).

The ability of SMMEs to produce, gather, and transmit information is vital for their survival in today's South African knowledge economy. It is well accepted in the literature that ICT functions as a catalyst and ingredient for efficiency and effectiveness since enterprises will be able to collect knowledge in a digital form and readily disseminate this knowledge throughout the world (Okundaye, Fan & Dwyer, 2019). It is widely assumed that organisations with access to ICT and the ability to apply it will be able to send, use, and analyse data using a wide spectrum of technology, from

databases to local area networks. Furthermore, ICT has accelerated the globalisation process, which has raised the complexity of business procedures, as SMMEs are required to be knowledgeable not only about their local fields but also about worldwide trends.

To compete in the knowledge economy, SMMEs in the construction industry must have a strong ICT skillset that allows them to have an inventive capacity that is always ready to adapt to changes. As a result, ICT plays a critical role in reducing the uncertainties and dynamics that exist in South Africa's economy by utilising systems that process and disseminate information more efficiently (Ritchie and Brindley, 2018). ICT allows SMMEs to access information via the internet and other technical platforms, allowing those that use it to succeed (Scupola, 2020).

Shemi (2018) claims that efficient usage of ICT is critical for the development of SMMEs. Furthermore, ICT supports the integration of business operations, while also supporting SMMEs in the construction sector and other sectors in general in making more informed and efficient performance-related decisions. SMMEs that employ ICT are more competitive, inventive, and have a huge potential to expand into larger organisations because of their efforts. According to Venkatesh and Davis (2019), SMMEs rely on ICT systems more than larger organisations. It is necessary to have ICT in place to obtain relevant and rich information in the construction business and to make sensible judgments.

To justify the use of ICT in SMMEs, ICT adoption, according to Ramdani and Chevers (2018), aids in the improvement of knowledge and information obtained in an organisation, as well as the reduction of expenses and the speeding up of decision-making and business-to-consumer (B2C) and business-to-business (B2B) transactions. Even in the construction industry, communication is crucial, and utilising ICT aids in improving the organisation's communication with internal and external stakeholders. To back up their claim, Kohli and Devaraj (2017) claim that ICT allows SMMEs to have reliable and solid information, which helps them improve their organizational effectiveness. Tumolo (2019:67) makes an interesting argument, arguing that ICT tools should not be considered as a "technical service" in today's market, but rather as an "essential resource" that improves SMME competitiveness.

Transaction costs are costs incurred by businesses in the process of establishing, negotiating, and enforcing contracts, according to Venkatesh and Davis (2019). The usage of the internet assists construction SMMEs in screening enterprise environments for acceptable information. As a result, firms will be able to gather information about customers, sellers, and other stakeholders that was previously unavailable due to ICT. Other complementary infrastructures, such as a dependable banking system and transportation, are also necessary for SMMEs to fully realise the benefits of ICT in the construction industry. As a result of the application of ICT, transaction costs will be greatly reduced, allowing the construction sector to realise economies of scale in their projects. Construction SMMEs will be able to develop regionally and internationally if they achieve economies of scale (Moshood et al., 2020).

GROWTH
- Strategic growth
- Productivity growth
- Sales growth

Expansion
- Organisation expansion
- Supply chain improvement
- International communication

Impact of ICT on SMMEs

New Products
- New projects
- Projects' quality
- Clients' satisfaction

PERFORMANCE
- Efficiency, effectiveness, and competitiveness
- Intangible benefits
- Sales growth
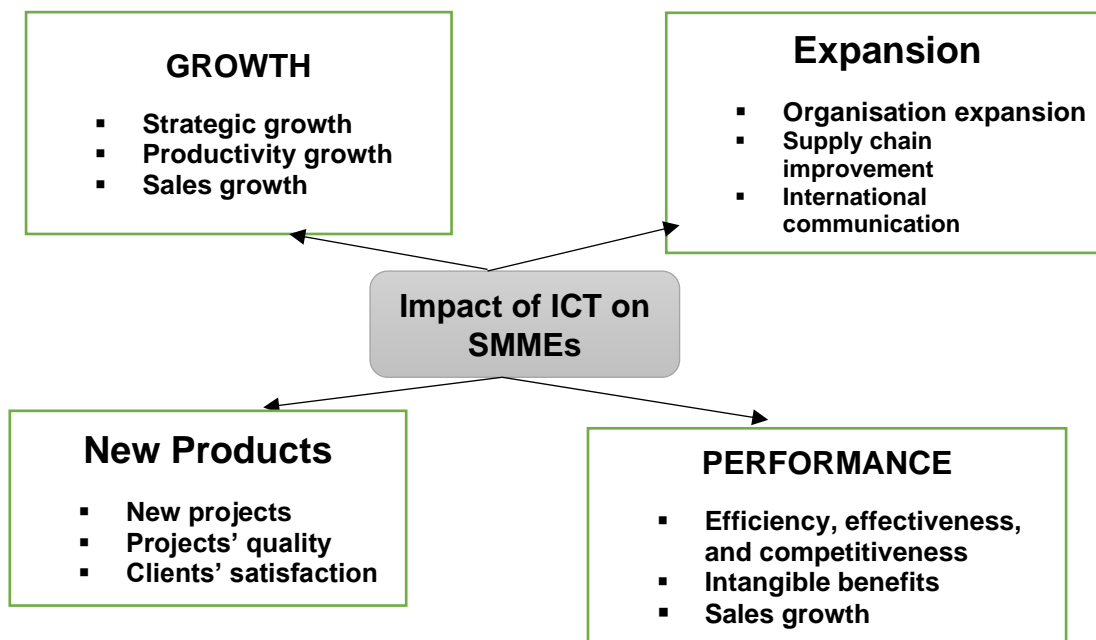
Figure 2.2:Impact of ICT on Construction SMMEs [Source :Consoli (2017)

Consoli (2017) classified the advantages of ICT for SMMEs into four categories: performance, growth, expansion, and new products and services. ICT helps construction SMMEs improve their efficiency, effectiveness and, ultimately, competitiveness. By embracing ICT, SMMEs will become innovative businesses that will reap intangible rewards such as increased customer loyalty. SMMEs will be able to expand into regional and worldwide markets by being subcontracted or hired to execute projects once ICT systems are in place. This is made possible by information

and communication technology (ICT), which provides for the free flow of information between people and organisations from various locations and continents. SMMEs can undoubtedly benefit from ICT solutions in terms of production, strategy, and sales (Consoli, 2017). ICT enables SMMEs in the construction industry to efficiently tackle new projects and achieve high-quality results. The usage of ICT solutions in the construction industry ensures customer goodwill and loyalty (Consoli, 2017).

2.4 Barriers to ICT Adoption by SMMEs

SMMEs in South Africa are exposed to critical hindrances to ICT adoption and use. The barriers to ICT adoption in the construction industry include lack of awareness pertaining to the benefits of ICT adoption, low skills levels, ICT costing too much and being beyond the budget of many SMMEs, and other security concerns regarding the ICT applications. In addition, Lawson (2017) argues that barriers to ICT adoption by SMMEs can be categorised into broad categories; namely internal and external barriers as depicted in figure 2.3 below.
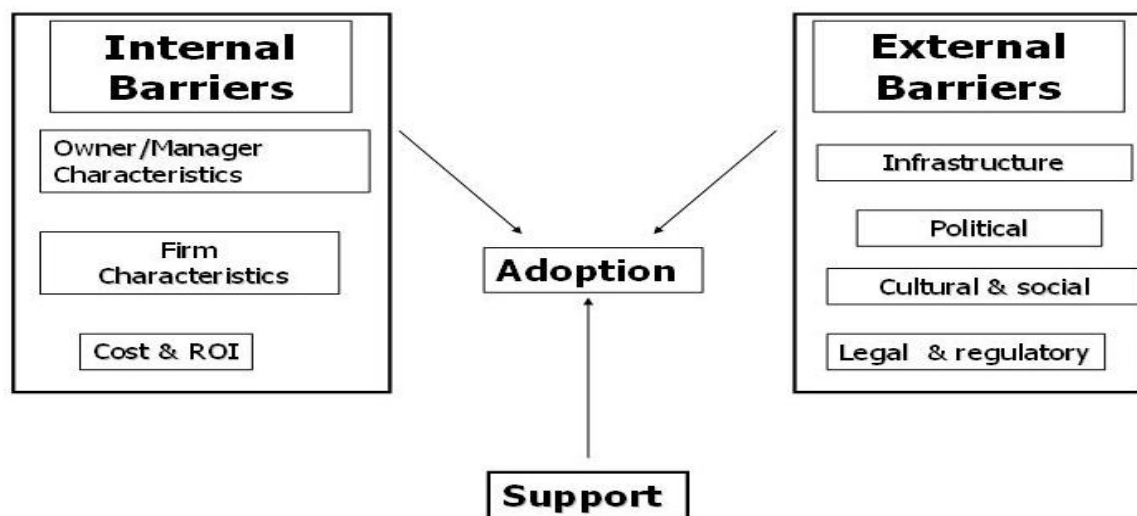
Figure 2.3 Barriers to ICT adoption [Source:Lawson,2017]

Internal obstacles, according to Lawson (2017), are those challenges faced by construction SMMEs where the firm has the capability and ability to modify internal business aspects. Internal impediments to ICT adoption include a lack of awareness of the SMME's owner, as well as a lack of time and resources. Owner/manager barriers can thus be classified as internal barriers to ICT adoption. Organisational impediments, as well as costs and return on investment are another hindrance (Kapurubandara & Lawson, 2019). External barriers are those that are outside of an SMME's control and which they cannot control; instead, they must adapt or operate

within their limited restrictions. Inadequate infrastructure, government policies, and inadequate service providers are among the external impediments to ICT adoption by SMMEs in the construction industry (Lawson, 2017). According to Kapurubandara and Lawson (2019), SMMEs, independent of sector collaboration, can effectively remove external hurdles to ICT adoption. Clusters of SMMEs will be formed with the purpose of pooling resources, facilities, and costs.

As previously said, the benefits of ICT on organisations are undeniable, but not all environments are created equal (Ngwenyama & Morawczynski, 2018). The technological and socio-economic settings have a big impact on how well ICT is implemented. In the case of South Africa, the major impediment is that SMMEs are at a disadvantage in comparison to large corporations because they lack the necessary funds, skills, and time to successfully deploy ICT. The rising expenses of ICT, combined with a lack of supporting infrastructure to handle developing technologies, remains a persistent concern in the South African construction industry (Xiong & Qureshi, 2017).

Following the assessment of literature, the following impediments to SMMEs in the construction industry embracing ICT have been identified:

- **Infrastructure:** SMMEs need supportive infrastructure including energy, supportive government institutions, and reasonable bandwidth to adopt ICT. Electricity continues to be a concern in South Africa, with constant load shedding impeding the successful adoption of ICT. South Africa is rated 148th out of 228 nations in terms of mobile data pricing, according to Gupta (2018). Even while data prices in South Africa are lower than in the United States and Canada, they are still higher than in most African countries (Gupta, 2018).
- **ICT is inappropriate for the following types of businesses**: One of the impediments to SMMEs adopting ICT is the assumption that ICT does not meet their needs and nature of business (Lawson, 2017). This belief that ICT is not appropriate for their business has serious implications for SMMEs who want to use it, because they will not take advantage of, and use, the available technology until the benefits are clearly articulated.
- **Lack of understanding about how to use ICT**: According to Madimogale and Kroeze (2019), SMMEs face major challenges due to a lack of knowledge about

how to utilise and benefit from ICT, as well as a lack of effective adoption methods.

- **Inadequate skills**: The majority of SMMEs are controlled by people with low abilities who are expected to make all of the company's decisions. As a result, the ability, attitude, and personality of SMME owners to adopt ICT is dependent on their technological skills, attitude, and personality (Madimogale & Kroeze, 2019).

- **High Cost:** One of the most prevalent impediments to SMMEs adopting ICT is the cost of ICT, which in many cases exceeds the SMME budget. The usage of computers, software, and other databases is extremely expensive, which hinders SMME adoption of ICT in its natural state (Lawson, 2017).).

Table 2.2: Barriers to ICT adoption [Source: Empirical Findings (2021)]

Barriers	Empirical Source
Lack of resources	Xiong & Qureshi (2017); Madimogale & Kroeze (2019); Lawson (2017); Ramdani & Chevers (2018)
Lack of skills	Kapurubandara (2019); Madimogale & Kroeze (2019); Mathu & Tlare (2017)
Lack of infrastructure	Moshood *et al.,* (2020); Ramdani & Chevers (2018) and Ritchie & Brindley (2018)
Ineffective management and leadership	Lawson (2017); Moshood *et al.,* (2020); Ramdani & Chevers (2018); Ritchie & Brindley (2018)
Lack of Infrastructure	Ramraj (2018); Mumangeni (2018); Eze et al. (2018) Xiong & Qureshi (2017)
Financial constraints and high costs of adopting	Amusan *et al.,* (2018); Xiong, & Qureshi (2017) Moshood *et al.,* (2020)

Lack of knowledge	Xiong & Qureshi, (2017); Lawson (2017); Gono *et al.*, (2019) Ramdani & Chevers (2018)

2.5 Theoretical Literature Review

There are various innovation theories that have been postulated to explain the adoption, barriers, and benefits of ICT adoption in business organisations. The theories include Innovations Diffusion Theory (IDT), Resource-Based View (RBV) Theory, Transaction Cost Theory (TCT), and The Technology-Organisation-Environment (TOE) framework (Eze, 2019). To answer the research questions the researcher reviews some of the propounded innovations theories. To begin with, a link or a connection between the research questions and a theory or theories that will help answer the research question, will be established.

Table 2.3: Connection between theory and research questions[Source: Author's own formulation]

Research question	Proposed Theory
Research question 1: What is the level of ICT deployment by SMMEs in Gauteng South Africa	• TOE Framework • Resource-Based View
Research question 2: What are the challenges which SMMEs in construction face with respect to ICT infrastructure?	• Innovations Diffusion Theory (IDT). • TOE Framework • TAM
Research question 3: What are the factors (actors) influencing ICT adoption by SMMEs in construction industry?	• Resource Based View • Actor-Network-Theory (ANT) • TOE Framework
Research question 4: What are the benefits of adopting ICT in construction SMMEs?	• Resource-Based View. • TOE Framework

2.5.1 SMMEs' ICT adoption models

According to Neirotti and Raguseo (2017), ICT adoption by a single firm may be understood and described in three stages: pre-adoption, adoption, and post-adoption. People and SMMEs at the pre-adoption stage examine new technologies that they may consider adopting more, especially if they can see immediate benefits and the need to do so (Okundaye., Fan., & Dwyer, 2019). The adoption step entails SMMEs forming an intention and laying out a detailed strategy to adopt the available technology, which they will subsequently purchase and implement. The post-adoption stage is a period in which SMMEs must choose between continuing to use the chosen technology or abandoning it. If the technology is no longer used, the procedure must be restarted by finding a replacement (Tumolo, 2019).

As previously stated, numerous theories and models have been used in the literature to investigate ICT adoption and post-adoption behaviour. "In this specific domain, social psychology and its applied theories and models are the most dominant" (Venkatesh & Davis, 2019:173). These models place a strong emphasis on the desire to adopt as well as the use and benefits of information and communication technology. The Resource-Based View (RBV), Diffusion of Innovations Theory (DOI), Theory of Planned Behaviour (TPB), Technology Acceptance Model (TAM), and Actor-Network-Theory (ANT) are some of the theories (Eze, 2019).

2.5.1.1 Resource-Based View (RBV) Theory

A resource-based viewpoint will aid in analysing the benefits of ICT adoption of SMMEs in the construction industry, as well as answering the study's research questions. RBV theory asserts that enterprises' competitive advantage and chances of survival are determined by the resources at their disposal (Modimogale & Kroeze, 2019). Information and communication technology is one of the most important tools that modern businesses utilise to compete. In support of this, Gupta (2018) claims that organisational resources can only provide a firm with a long-term competitive advantage if they have the following characteristics:

- Valuable: the firm's resources must allow it to improve its efficiency and effectiveness.
- Rare: To provide a desired competitive advantage, resources must be rare or not be found in many enterprises of same quality.

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- It is not easy to replicate. Other resources must not be simply replaced.

ICT is one of the major resources that a corporation in any industry may use to establish a lasting competitive advantage, according to Kapurubandara and Lawson (2019). The value of SMMEs is heavily influenced by resources. ICT resources are seen as complements to other organisational resources, enhancing and boosting their value (Gono *et al.,* 2019). Computers, for example, will have a net beneficial effect on a project manager's overall performance in the construction business. Despite the use of the Resource Based Theory to investigate the impact of ICT on SMME performance, the results of the ICT-performance link are inconclusive. Given this, more research into the theory's relevance to ICT and SMMEs is both justified and necessary.

2.5.1.2 The Actor-Network-Theory (ANT)

This theory will aid in deciphering the elements or actors that influence SMMEs' adoption of ICT in the construction industry. "Traditional theories such as the Technology Acceptance Model (TAM) and the Diffusion of Innovation" used to study ICT adoption in SMMEs, according to Eze (2019:16), only played a deterministic role and failed to capture the true nature of ICT adoption. Traditional ICT adoption theories, according to Barret (2017), lay a lot of focus on the technology side while ignoring the role of human agency.

According to the ANT theory, technological factors cannot be researched in isolation; rather, ICT adoption and advantages in SMMEs must be studied in the context of human-technology interaction (Eze, 2019). Many SMMEs and business organisations in general fail, according to Barret (2017:65), because of their "over-emphasis on technologies," disregarding or underestimating the importance of human agency. Customers, suppliers, and government agencies all have a vital influence in ICT adoption in a society made up of numerous human players. As a result, human and non-human actors must be thoroughly understood for ICT to be properly adopted and the benefits to be fully realised.

"Human and non-human actors are not treated equally" (Eze, 2019:17). Relationships such as technology-organisation, people-organisation, organisation-organisation, and people technology are used to measure their interaction. The Actor-Network-Theory (ANT) is based on these relationships and drawing and analysing the network assists

researcher in determining the true character of ICT adoption (Eze, 2019). In order to analyse the dynamics and relationships of the actors involved in ICT adoption and advantages in SMMEs, researchers must look for them via the lens of ANT. Inscription, framing, stabilisation, and translation are fundamental elements in the ANT theory (Eze, 2019). Figure below depicts these relationships.
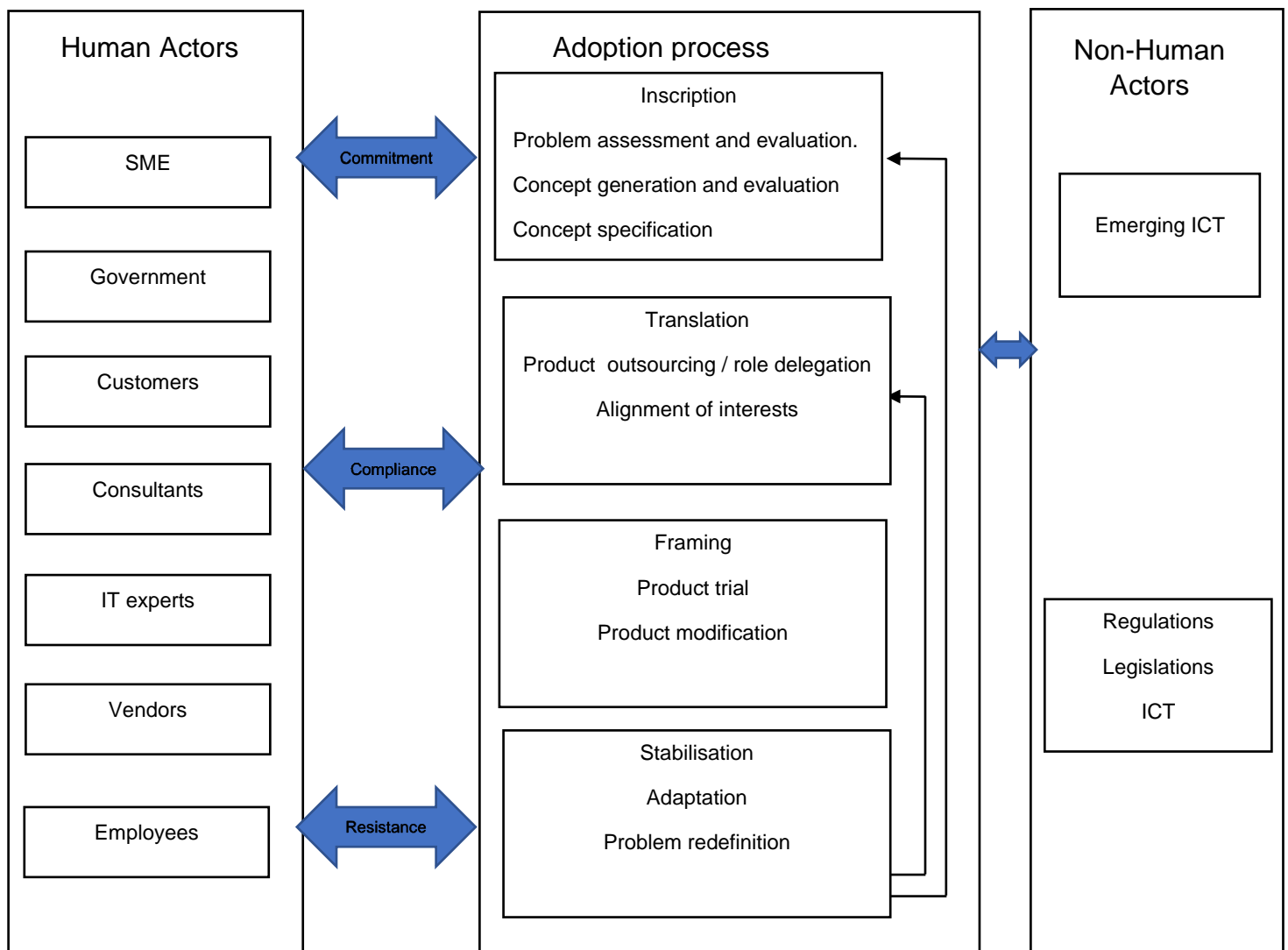
Figure 2.4 :The dynamic process of ICT adoption in SMMEs [Source : Eze (2019)]

Eze (2019) developed a framework to illustrate ICT adoption by SMMEs as a process that is evidenced in stages, with influences from both human and non-human actors and the key activities that are found and involved at every stage. The external factors or actors both human and non-human have a significant influence on the ICT adoption in SMEs.

2.5.1.3 Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) is a valuable tool for analysing the adoption and benefits of ICT in businesses. The TAM model is examined in this study to provide a detailed analysis of why SMMEs in the construction industry are not completely utilising ICT technologies in their operations. The Technology Acceptance model investigates the factors that influence "user acceptance" of different technologies (Ritchie & Brindley, 2018). The TAM proposes two theoretical constructs that influence SMMEs' intention to utilise ICT: perceived usefulness (PU) and perceived ease of use (PEOU), figure 2.5 shows.
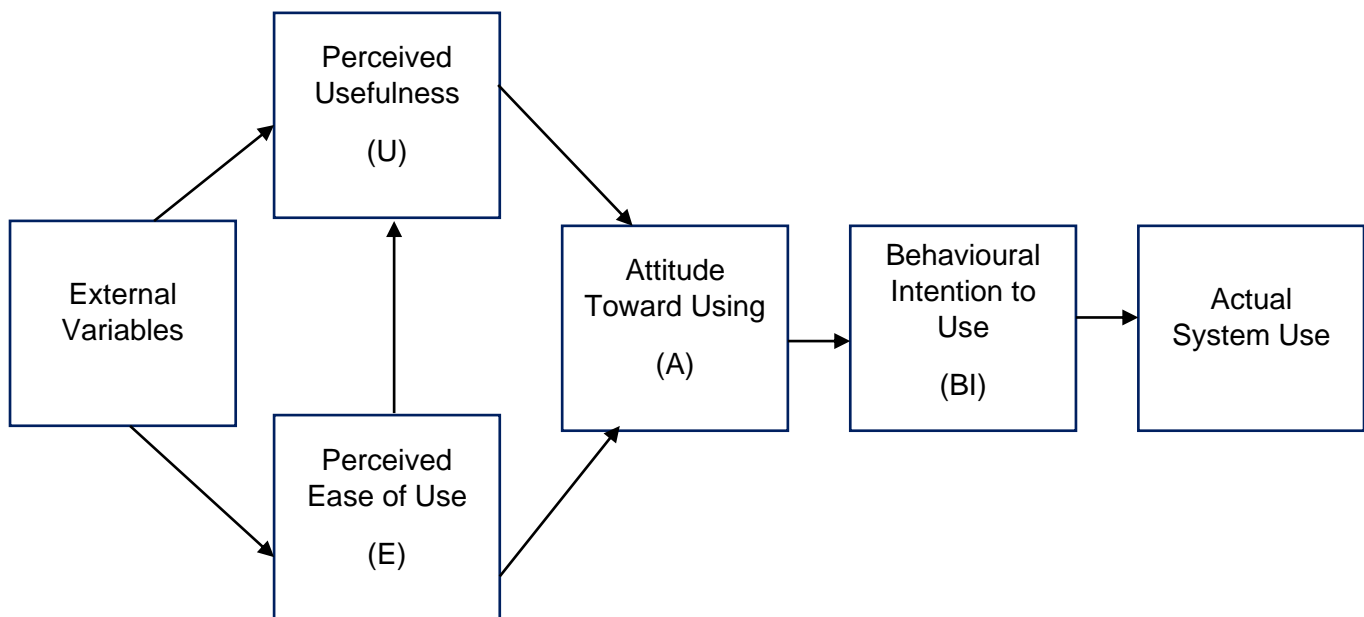
Figure 2.5 Technology Acceptance Model: [Source: Pillay, (2018)]

Pillay (2018:62) defines perceived usefulness as "the degree to which a person or organisation believes that employing a certain system will improve his or her performance." Many SMMEs do not fully deploy ICT systems due to this factor, according to Neirotti and Raguseo (2017). Other researchers discovered a lack of awareness about the systems' benefits as one of the important elements to explain why ICT is not accepted by SMMEs, as will be discussed later. The perceived ease of use, on the other hand, refers to "the extent to which a person or an organisation believes that utilising a certain technology will be painless" (Kohli & Devaraj, 2017:76). Users will become resistant to adoption if they believe the potential ICT is burdensome and complex.

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TAM believes that the technology that SMMEs will adopt is determined by their purpose to utilise it, and that this intention is based on two important issues: perceived utility and users' attitude toward accepting the offered innovation (Djatikusomo, 2017). Furthermore, according to Bruner and Kumar (2018), perceived simplicity of use and perceived utility are the most important predictors of SMME ICT adoption.

Several research have used the TAM as one of their theoretical texts to explain ICT challenges in SMMEs. Bruner (2018) found that perceived usefulness and adoption intention have a favourable association. After mentioning that ICT adoption includes a post-adoption stage, Djatikusomo (2017) contends that perceived utility has a significant impact on ICT post-adoption, while Bruner (2018) discovered a favourable association between perceived ease of use and SMME ICT adoption.

"Despite TAM's efficacy as a theoretical model or framework for investigating ICT issues in SMMEs, particularly in the area of adoption, it has been criticised for a number of flaws, including the fact that it ignores non-organisational settings and the moderating effects of ICT adoption in various contexts" (Pillay, 2018:37).

2.5.1.4 The Technology-Organisation-Environment (TOE) Framework

TOE, according to Ramdani and Chevers (2018), is an integrative theoretical framework that provides a holistic theoretical and conceptual basis for research in the field of ICT and SMMEs by examining the organisational, environmental, and technological aspects that influence ICT use. TOE, according to Gupta (2018), is a necessary and adequate framework for investigating ICT issues such as adoption, challenges, and advantages at the company level. The prevailing perception is that small and medium-sized businesses (SMEs) are slow to adopt ICT (Levy, 2017). In the context of South Africa, particularly in the unique "post-Apartheid" era, it is critical to comprehend the elements that influence ICT adoption and its impact on SMMEs.
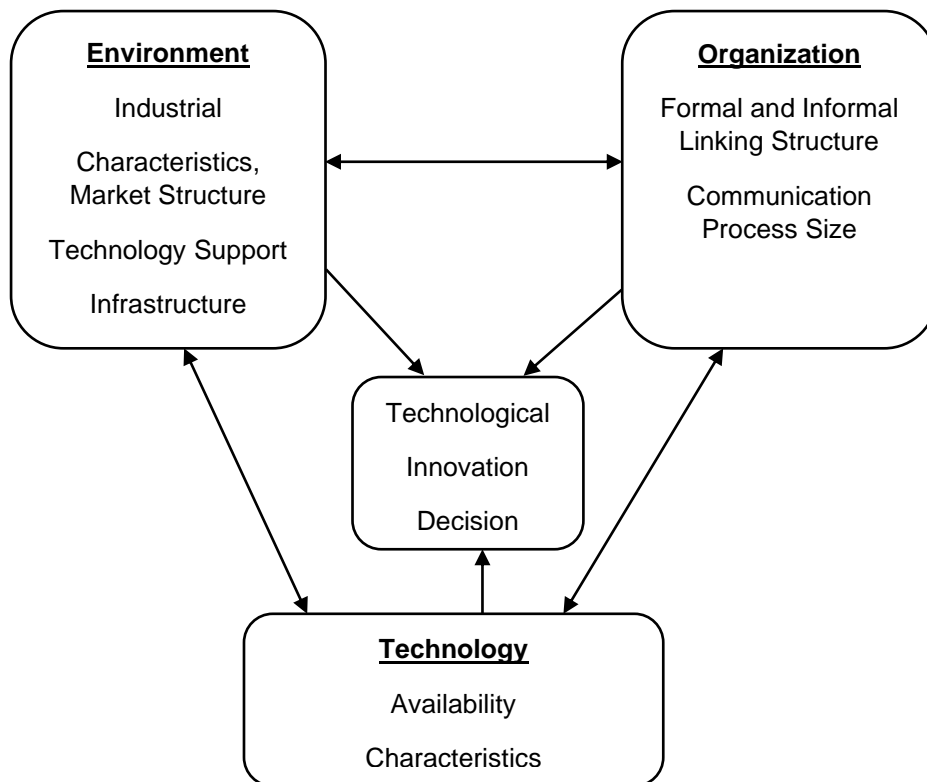
Figure 2.6: TOE Framework [Source: Tornatzky & Fleischer (1990), Arpaci (2019)]

The TOE framework, as shown in the diagram above, incorporates organisational, environmental, and technological aspects that have a substantial impact on managers' and owners' attitudes about ICT adoption in SMMEs (Lawson, 2017). This model covers both the adoption and the impact of ICT on businesses. More ICT literature demonstrates the relevance and importance of the TOE framework for studying and investigating ICT challenges in SMMEs and businesses. Using the TOE paradigm, Venkatesh and Davis (2019) investigated the adoption of ICT by SMEs and discovered that SMEs were influenced more by technological and organisational variables than by environmental factors. (Myeko et al., 2019) used the TOE framework to explore the causes and determinants of e-business adoption by Canadian SMEs and discovered that "management support is the most relevant component."

The TOE framework was used and reviewed in this study to advise the researcher on theoretical lenses that assisted in uncovering a context-based framework as well as understanding the elements that influence ICT adoption and impact it has on SMMEs. This framework will assist SMMEs in grasping critical strategies and competencies for maximising the value of ICT (Mwila and Ngoyi, 2019). The Resource-Based View

hypothesis, which was looked at before, merely assumes that internal competencies and resources are important in boosting organisational competitiveness. However, in a "transactional economy" like South Africa's, numerous factors outside the business have an impact on an organisation's competitiveness (Ritchie and Brindley, 2018:145). As a result, the TOE framework suggests that technological, organisational, and environmental factors all have an impact on an organisation.

2.5.2 Underpinning study framework

It is important to note that the researcher reviewed four different models or frameworks in trying to answer the developed research questions. From the reviewed frameworks which are the Resource-Based View (RBV), The Actor Network Theory (ANT), The Technology Acceptance Model (TAM), and The Technology- Organisation-Environment Framework (TOE) the researcher finds the TOE framework suitable for this study and hence it is the model that is going to be adopted. The justification of adopting this model includes the fact that:

- The TOE framework can relate to all the research questions developed in this study unlike other models which only answer one or two, based on table 2.3 developed earlier.
- The TOE framework can relate to the study data that was collected.
- The framework also helped the researcher in data collection as the research instrument was designed based on this framework.
- Above all, the TOE framework will assist the researcher in the interpretation of data.

2.6 Summary of the Chapter

In this chapter, the research paper explored and reviewed past literature available pertaining to SMMEs, ICT adoption models, ICT's benefits to SMMEs and barriers to the adoption of ICT by SMMEs. To effectively provide SMMEs in the construction industry with information and knowledge regarding the benefits of ICT adoption, it is crucial that the researcher understands and recognises the existing literature on barriers and benefits of ICT. The reviewed literature reflected many barriers that explain why SMMEs in the construction industry and elsewhere are not fully implementing ICT; these include the cost of ICT, lack of knowledge and skills, among

others. A further review of the literature has shown that adopting ICT in SMMEs is beneficial and it is quite well explored, however, there is limited literature on the benefits of ICT for SMMEs in the construction industry specifically for emerging and developing economies.

Notably there is a positive improvement in the ICT sector in Africa; however, more work still needs to be done for construction SMMEs to fully adopt and implement ICT in the construction industry as they are impeded by poor infrastructure and do not get sufficient support structures. Considering the above, it is imperative to carry out a study in this specific area to complement and fill the research gap that exists.

CHAPTER 3

METHODOLOGY

3. Introduction

This chapter of the study will discuss the methodology that was used to conduct this research. The chapter begins by discussing issues on qualitative research, followed by the unpacking of the research design and research instrument suitable for the research problem. The issues pertaining to population, sampling, data collection and analysis will be provided. The chapter ends by discussing the issues of validity, reliability and trustworthiness issues of the research instrument and concludes with a summary of the chapter.

3.1 Research Paradigm

According to Creswell and Creswell (2018), there are three major categories of research paradigms that researchers might use based on the research problem: interpretivism, positivism, and critical theory. In the same vein, McGregor (2018) contends that knowing whether a researcher holds an ontological or epistemological belief is critical for evaluating the study's significance and relevance. "A researcher who is ideologically rooted in one research paradigm and unaware of the theoretical vocabulary and underpinnings of the other research paradigms is not in a strong position to judge research produced under a different tradition," writes Gray (2014:13). In light of the foregoing, the researcher must clearly define the research paradigm that was used in this study.

According to the interpretivist paradigm, reality is multi-layered and complex, with multiple interpretations for a single event. This paradigm is appropriate for qualitative research since it is based on the theoretical perspective that reality is fluid and may be negotiated in social settings, cultures, or interpersonal relationships. The interpretivism paradigm was used to investigate the positive influence of ICT on SMMEs in the construction industry.

3.2 Research Approach

"The choice of research methodology is strongly influenced by the researcher's theoretical perspective as well as his or her attitude toward the manner in which the

data obtained will be employed," Creswell & Creswell (2018:13) assert. In the same vein, this study uses a qualitative research approach to investigate the positive influence of ICT on SMMEs in the construction industry in Gauteng, South Africa. Every interpretivism paradigm, according to Lucas (2019), should be followed by a qualitative research approach.

The participatory action research (PAR) method, which is a qualitative research strategy, was used in this study. This has been agreed to be a fair, freeing, democratic, and life-enriching qualitative investigation. Features of an individual's thoughts, patterns, and sentiments are exposed utilising this method without the researcher's manipulation or control (Babbie & Mouton, 2018). Respondents were involved in making informed judgments throughout the entire study process.

3.3 Research Design

This study is not empirical in nature and relied primarily on qualitative data gathered through interviews conducted in 15 SMMEs around Gauteng. "A research design is a framework of research methodologies and methods that can be implemented by a researcher" (Guidita, 2019:32). It is worth noting that a research design allows researchers from all professions to focus on the specific research methods that are appropriate for their subject matter, ensuring that a study succeeds. Experimental, correlational, survey, descriptive, and exploratory research designs are only a few examples. The research design for this project was exploratory in character, with the goal of exploring and investigating the benefits of implementing ICT in construction SMMEs. The research design is determined by the research problem that the study is attempting to solve. Whichever design is adopted, it will create the least amount of bias in data and maximise the accuracy and trustworthiness of the data collected. In order to explain and investigate the benefits of ICT in construction SMMEs, an exploratory research approach was used in the case of Gauteng SMMEs in South Africa.

3.4 Population and Sample of the Study

3.4.1 Population

In research language, the study's population can be defined as a large group of institutions, items, and people with comparable qualities that the researcher might

want to analyse (Leedy & Ormrod, 2017). It is vital to highlight that the groups' shared traits identify and separate them from one another. The study's population can be finite or endless. After defining what a population is, this study's population includes all managers and owners of construction SMMEs in South Africa's Gauteng Province.

3.4.2 Sample

In most cases, the study's population size renders including all SMMEs in a target area impossible and uneconomical. "In social science and educational research, it is essentially impossible for a researcher to collect or approach all elements in a population for the purposes of data collecting" (Gray, 2014:33), which supports the above argument. Instead of collecting data from all elements, the researcher should approach and select a representative subset of elements from an interested population to gather data on. As a result, the sample will reflect the entire population. This study's sample was chosen via the sampling procedure, which involves creating an accurate representation of a unit (Creswell & Creswell, 2018). A researcher can utilise a variety of sample approaches, including probability and non-probability sampling.

The researcher utilised a non-probability sampling methodology, which means that he or she does not choose respondents based on any pre-set scientific procedure. The researcher's discretion and judgment were used to pick the sample. The convenience sampling method of non-probability sampling was used for the purposes of this investigation. Convenience sampling, according to Glesne (2018), occurs when a researcher chooses and selects population elements solely because they are readily available. Because of a variety of circumstances, including the challenges of obtaining data owing to COVID-19, the researcher chose this kind of sampling. As a result, the researcher gathered information from SMMEs who are readily accessible. The study's target sample included 15 SMMEs' managers/owners in the construction industry (Teer-Tomaselli, 2018). For data collection, 15 managers/owners of SMMEs in the construction industry were interviewed using the research instrument of interviews.

The study sample was collected based on the following criteria:

- **Sector:** - Construction SMMEs
- **SMMEs:** - Data was gathered from SMMEs who in South Africa are firms with less than 250 employees.

- **Area:** - Gauteng province.

3.5 Research Instrument

Semi-structured interviews were used in this study. Semi-structured interviews feature a sequence of key questions that help establish the areas to be studied, but they also allow the interviewer or interviewee to detour to explore an idea or response further (Babbie & Mouton, 2018). By giving respondents an interview guide prepared expressly for this study, the researcher provided them with some guidelines on what to talk about, which was very beneficial in speeding up the data gathering process. A research interview's purpose is to learn about people's perspectives, experiences, opinions, and/or motives on a certain issue (Creswell & Creswell, 2018).

Interviews and other qualitative methods, rather than strictly quantitative ones like questionnaires, are supposed to provide a "deeper" understanding of social issues (Guidita, 2019). Interviews are the most appropriate strategy when little is known about the research phenomena or when complete insights from individual participants are requested. They are also useful for exploring challenging topics that people might be unwilling to discuss in a group context. In order to investigate the favourable influence of ICT on construction SMMEs, the researcher conducted interviews with 15 managers/owners of SMMEs. The interview questions were based on the study questions, objectives, as well as the literature review and TOE framework adopted.

3.5.1 Conducting of interviews

The use of interviews have the ability to interrogate the subject hence they are a helpful tool in learning more about the participant's experience (Gray,2014). In conducting interviews for this study, the researcher selected a setting with little or no distraction to ensure that the respondent(s) were comfortable. Basically, for this study, to make sure that respondents feel comfortable, the interviews were conducted at their place of work and the researcher clearly explained the purpose of the interview and obtained respondents' consent. Prior to the conducting of interviews, the researcher addressed terms of confidentiality as well as indicated to the interviewee how long the interview would take. For this study, interviews took 20-30 minutes of respondents' time. The researcher tried not to prolong the interview but at the same not make it too short to guarantee authentic answers.

3.5.2 The pilot study

Pilot study on three SMMEs manager/owners within the construction sector was conducted prior the actual interview process, to test reliability and help refine the research instrument. The pilot study was very useful in identifying problems with sequence, layout, grammar, emotions, punctuation of the questions and interview length. Following the pilot study, some questions were reworded to improve their clarity and purpose.

3.6 Data Gathering

Interviews are very helpful for learning more about a participant's experiences. The researcher with the use of interviews can dig deeper into a subject (Gray, 2014). For this study data was gathered through the means of interviews which took about 20-30 minutes of respondents' time.

3.6.1 Procedure for data collection

The research explored data on the benefits of ICT in SMMEs in the construction industry. As mentioned earlier the evidence was gathered by considering the sector, firm size, and other issues to get a richer picture of the benefits of ICT in SMMEs. The research instrument was interviews which were conducted with various managers and owners of SMMEs, and in which the researcher made use of the recorder to capture participants' responses.

3.6.2 Data analysis and interpretation

Thematic analysis is a method of studying qualitative data that comprises examining a data set for repeating patterns, understanding them, and reporting them (Braun & Clarke 2018). It is a way of describing data, but it also involves interpretation in the selection of codes and the creation of themes. Thematic analysis is a powerful but flexible tool for assessing qualitative data that may be used to gather a wide range of paradigmatic or epistemological perspectives (Gray, 2014).

A theme is a 'patterned response or meaning' derived from the data that informs the research question. In contrast to a category, which describes and organises the 'manifest content' of data collection, a theme is a more abstract entity that requires a greater degree of data interpretation and integration (Nowell et al., 2017). The researcher familiarised herself with the data by participating in repeated and active

reading of the data. Familiarising with the data assisted the researcher in coding, which is organising data at a granular, specific level. This is when the researcher will start taking notes of potential data items of interest and establish connections between data items. The researcher then established themes, defined, and named them. With the established themes, the researcher wrote up the final analysis and described the findings. The final findings were presented in a representative data extract in the form of quotations from participants who answered the research questions.

3.7 Trustworthiness

3.7.1 Credibility

"Credibility refers to whether the participants' perceptions of the setting or events match with the researcher's portrayal of the research report" (Babbie & Mouton, 2018:76). Creswell and Creswell (2018:196), stipulate that "credibility in qualitative research is the extent which data analysis considers the social and cultural context in which it is gathered". The credibility of this study was ensured by investing adequate time to build trust and repeat the procedures central to the data gathering process. Furthermore, credibility of this study is ensured by consulting appropriate documents and preliminary visits to the SMMEs themselves.

3.7.2 Transferability

According to Gray (2014:23), "transferability in qualitative research is the degree to which the results of a research can apply or transfer beyond the bounds of the project." Transferability implies that results of the research study can be applied to similar situations or individuals. Transferability will depend on the readers of this study. The study invites readers of the research to make associations between elements of research and their own experience.

3.7.3 Dependability

Dependability is another criterion to establish the trustworthiness of the study. The researcher verified the findings to ensure they are consistent with the raw data collected. The idea is to make sure that if other researchers looked at the data, they would come up with comparable findings, interpretations, and conclusions. Additionally, an outside researcher undertook an enquiry audit on the research study to confirm its dependability.

3.7.4 Confirmability

In qualitative research, confirmability refers to the degree to which the findings may be confirmed or corroborated by others (Gray, 2014). The researcher documented the technique for reviewing and rechecking the data throughout the investigation to increase the study's confirmability. In addition, the researcher conducted a data audit, which examined the data collecting and processing techniques and made judgments on the likelihood of bias or distortion.

3.8 Ethical Considerations

The rights and interests of anybody affected by the study's conduct was protected for the objectives of this study. In addition, the subjects' informed consent was sought in this study. The researcher guaranteed that the study was carried out in accordance with Nelson Mandela University's ethical guidelines. An annexure including the consent form, in which the respondents were advised of their privacy, is included. The researcher guaranteed that respondents are not duped or damaged, and that they were completely aware of what they were doing. The confidentiality of the SMMEs sampled was preserved; hence, no information about the SMMEs was requested, such as the name of the company, the names of the respondents, or their personal information, but rather their typologies were noted.

3.10 Summary of the Chapter

This chapter covered issues concerning the research methodology, research paradigm, research methods that were adopted. It outlined and discussed the population of the study, method of data collection and analysis of data that was used. The instrument that was used to collect the data, which is interviews and why they were chosen, was also presented. The chapter also presented issues of reliability, validity, trustworthiness, and ethical considerations as they are equally important in carrying out a research study.

CHAPTER 4

DATA PRESENTATION AND ANALYSIS

4. Introduction

The preceding chapter focused on the research methodology in which the researcher clearly indicated the research paradigm, the methodology, the sampling procedure, data collection and the methods of data analysis which this research has employed. This chapter of the study focuses on analysing and interpreting the results that have been obtained from carrying out this study. The researcher in this chapter conducts a question-by-question analysis to richly explain and interpret all the responses associated with each question as presented in the interview guide of this study. Themes and sub-themes were used to analyse the information obtained from the interviews.

4.1 Response Rate

In carrying out research, targeted respondents may not be available and thus not reachable for data collection. It is important to note at this point that the researcher carried out interviews with 15 respondents to obtain the beneficial impact of ICT adoption in Construction SMEs. The guide started by asking general information about respondents, which included their age, position in organisations, highest qualifications, among other things and the results for this are presented in charts and tables below. It was imperative to ask such questions of the respondents to see if their level of education, age, gender, and other demographic variables affect ICT adoption in SMEs.

Table 4.1: Response rate[Source: Authors' own formulation]

Sample category	Count	Total %age (%)
Study Sample	15	100%
Available for interviews	15	100%
Usable Sample	15	100%

Table 4.1 above shows that out of 15 study sample elements, all targeted respondents were available for interviews with the researcher which gives a 100% total of usable sample. The researcher encouraged respondents to fully participate in the study by

giving them a consent form, and fully explained the purpose of the research which helped erase all the doubts respondents might have.

4.2.1 Age of the respondents
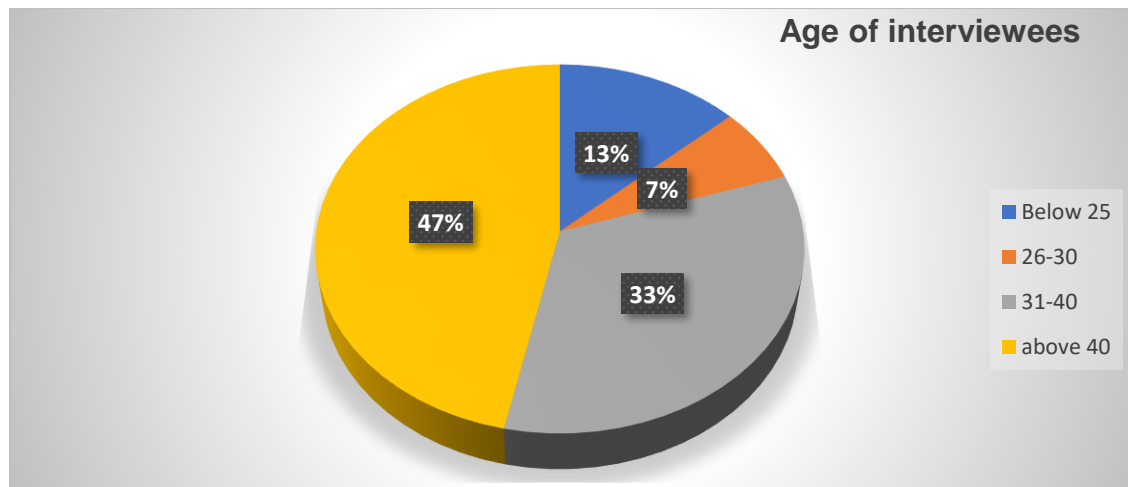
Figure 4.1:Age of respondents

The majority of respondents (47%) are above 40 years of age, followed by the 31-40 age group which constituted about 33 % of the respondents, and the least being the 26-30 age group (7%). This question is important to consider when assessing if ICT adoption in construction SMMEs is determined by managers/owners' age.

4.2.2 Gender of respondents
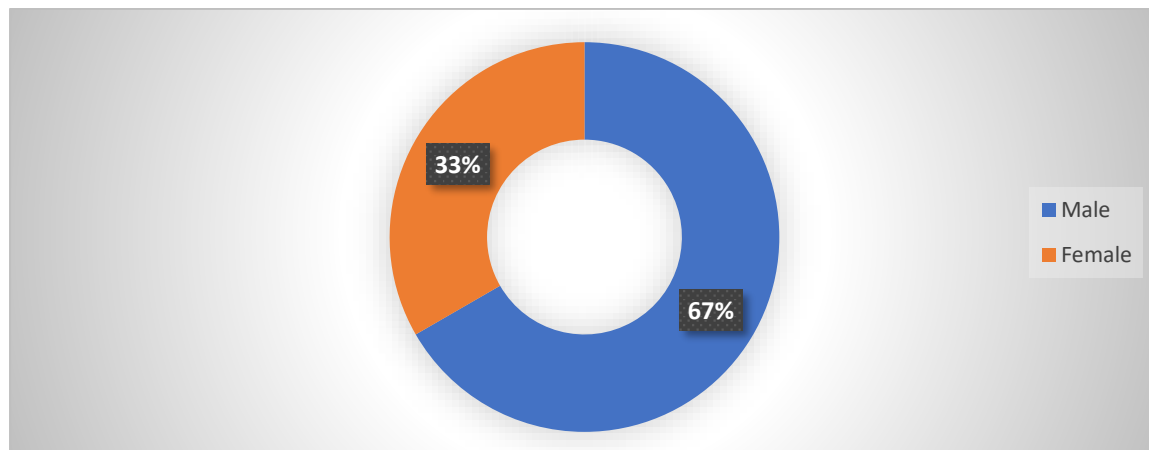
Figure 4.2: Gender of respondents

In this study, 67 % of respondents are males and only 33 % are females. There is still a disparity in terms of gender balance in construction SMME managerial positions with many males assuming those roles.

4.2.3 How many employees are there in your organisation?
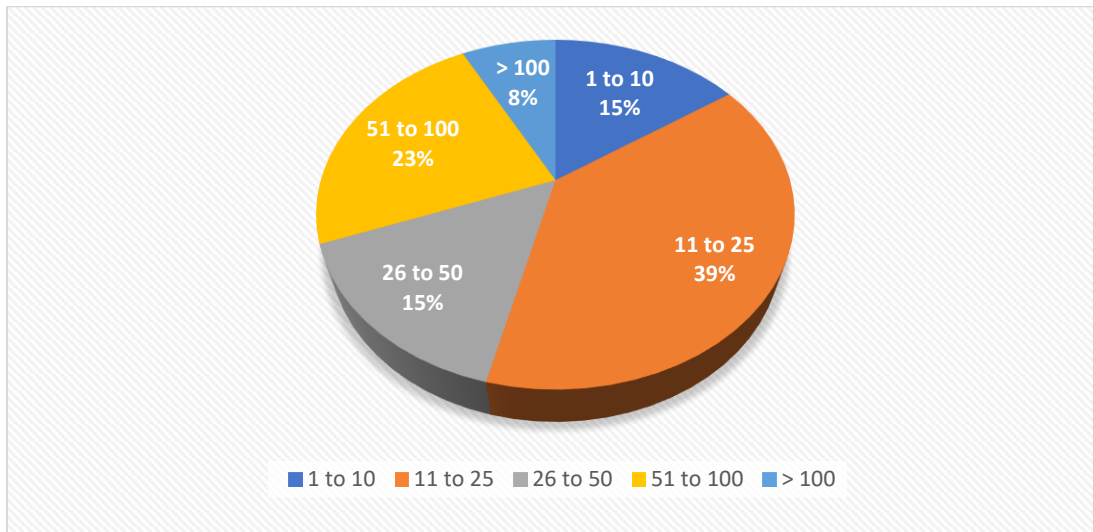
Figure 4.3 Number of employees

This question was necessary to assess if the firms contacted suit the definition of SMMEs according to the South African standards. The majority of SMMEs (39%) have between 11 to 25 employees, the second largest group has 51 to 100 employees (23%), while 15 % have 26 to 50 employees and 1 to 10 employees. Lastly 8% of SMME respondents have more than 100 employees.

4.2.4 Level of Education of the respondents

Table 4.2: Level of education of the respondents

Level of Education	Frequency	Valid %	Cumulative %
Matric	8	53.33	53.33
Certificate/diploma	4	26.67	80.00
Bachelor's degree	2	13.33	93.33
Masters or higher	1	0.067	100
Total	**15**		

Most of the respondents (53%) only have matric as their highest qualification, while 27 % of the respondents have certificates or diplomas, 13 % have bachelor's degree, and only 7 % have masters' qualifications. This question is important to check if the level of education of managers and owners influences ICT adoption in SMMEs.

4.2.5 Current position of the respondent
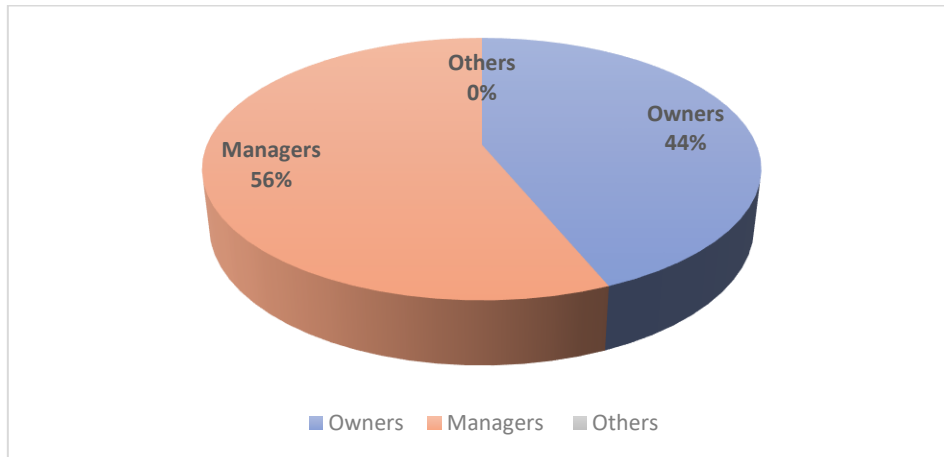
Figure 4.4: Position in the organisation

Of the 15 respondents, 56 % were managers, and only 44 % were owners. In all construction SMMEs, no single company had an ICT officer.

4.2 Qualitative Discussion and Analysis

The interviews conducted were based on and guided by a guide which focused mainly on three important themes: namely technology, organisation and environment (TOE). These three form the main themes of the study and from them sub-themes emerged. Table 4.3 below presents the results from the interviews to illustrate technological, organisational, and environmental contexts of the adoption and impact of ICT by SMMEs in the construction industry in the South African context.

Table 4.3: Themes and sub-themes

THEMES	SUB-THEMES
Technology	• Compatibility • Relative advantage or usefulness
Organisation	• Owner-manager knowledge and level of education • Management support • Firm size

	• ICT skills and training in SMMEs
Environment	• Supply chain networks
	• ICT consultants/vendors
	• Government support

4.3 The Technology Context

The technological context of the TOE framework has a high impact on SMMEs' adoption of ICT. Relative advantage and compatibility sub-themes on this aspect are found to be significant in determining ICT adoption and impact. Existing technologies in a company have an impact on new technology adoption and use because they impose a broad limit on the extent and pace of technological change that a company can undertake based on familiarity and awareness. The complexity of a technology increases the risk of utilising it because it causes uncertainty about its ability to be implemented successfully.

4.3.1 Compatibility

It may be difficult to justify investment in ICT unless the firm benefits from technology adoption and owner-managers are able to analyse the potential that can be generated from ICT use. Surprisingly, most of the respondents indicated that ICT systems are "compatible" with current organisational systems which advocates for more ICT to be integrated in their business processes and objectives. This is shown from interview quotes below:

"*You know what, we are working efficiently and effectively because of technological innovations, our processes and production have improved significantly*" (Respondent 5, Manager).

"*I feel like we cannot be able to work anymore without technology you know*" (Respondent 2, Owner).

"*We integrated technological innovation into our systems, and its highly compatible. We can now track our construction trucks, we are now able to store our information in computers, this was not possible before*" (Respondent 7, Manager).

"*You ask if it's compatible, I can say highly compatible, what can be incompatible about it?*" (Respondent 4, Manager).

"The question is not on how compatible, the question you can ask is about how willing are we to adopt, because honestly I don't think technological systems are difficult to use" (Respondent 3, Manager).

"Very compatible with our business, sister" (Respondent 7, Manager).

"If I had time, I would explain in detail what we managed to accomplish through technology in this company, but all I can tell you is we benefited a lot" (Respondent 10, Owner).

We can see clearly from the above quotes that ICT is compatible with the business processes of many SMMEs which implies that if adopted, it would result in benefits for construction SMMEs. However, there were a have few (less than 20%) of the respondents who indicated compatibility as an issue in terms of the type of their business:

"Eish… some of these technologies demand high expertise and training, it's not a joke especially those computer software" (Respondent 1, Owner).

*"I only need a phone to call my workers, I do not need all those systems, for what ? They will end up complicating things here" (*Respondent 9, Owner).

4.3.2 Relative advantage or usefulness

Consistent with previous studies on the same issue (Ramdani & Chevers, 2013; Gono *et al., 2019*), it is important to note that relative advantage was found to be a very significant and important factor in firms deciding whether to use or not use ICT. Firms only deploy technology if they believe it is necessary to close a perceived performance gap or capitalise on a commercial opportunity (Roberts, 2014). In the SMMEs investigated, they noted a positive impact of ICT on their processes and day-to-day business that gives them a competitive edge over their competitors. The quotes from the interviews are presented below:

"Clear communication links with various stakeholders have been established because of ICT and therefore efficiency and effectiveness are enhanced, what can I say. Unathi, we are benefiting a lot from ICT" (Respondent 4, Manager*).*

"…. ICT has allowed us to increase a customer base, we can advertise our businesses on website and various sites" (Respondent 10, Owner).

"At first, we looked at cost, compatibility as well as organisational need, and when ICT is worth the investment, we take it. Eventually our costs declined significantly because of ICT because we had to employ less people and chances of errors and wastages were minimised significantly (Respondent 3, Manager).

"Productivity has improved significantly I can say ICT is highly useful in our construction company" (Respondent 13, Owner).

"We are now competitive in the industry because of ICT systems, we are able to order materials online way ahead of time than before" (Respondent 15, Manager).

"Employees are motivated to use ICT systems and they are blending in well" (Respondent 14, Manager).

"We use decision-based ICT applications, web-based ICT applications, tracking-based ICT applications and project management-based ICT applications because often times we get large projects, without ICT it would be difficult to undertake large projects" (Respondent 12, Manager).

"Nowadays, ICT systems are the only way we can do business effectively, if we fail to incorporate them, we will find ourselves out of the business". (Respondent 2, Owner).

However, respondents found ICT systems not to be useful and too costly for their business and this is reflected from the interview quotes below:

"These systems are expensive, their costs will outweigh the benefits, especially considering our business" (Respondent 1, Owner).

"ICT systems complicate things and employees do not feel comfortable using them" (Respondent 9, Owner).

4.4 The Organisational Context

The study identified owner-manager characteristics, top management support, ICT skills and knowledge, firm age and size as major elements impacting ICT adoption and its impacts in the context of the organisation.

4.4.1 Owner-manager level of education and knowledge

Most of the respondents (53%) only have matric as their highest qualification, while 27 % of the respondents have certificates or diplomas, 13 % have bachelor's degree, and

only 7 % have a masters qualification. This question is vital to check if the level of education of managers and owners influences ICT adoption in SMMEs.

The level of education of the owner-manager had a positive link with ICT satisfaction, with most educated owner-managers reporting satisfaction with their ICT. In support of that, Karungu (2019) argues that if the owners or managers of organisations lack ICT knowledge, their organisations will likely miss out on the potential impacts of ICT on their business. Interview responses confirm the above assertions:

"Honestly, I have little knowledge about ICT systems, I assume they are difficult to comprehend" (Respondent 1, Manager).

"No one gave us enough information about why we should adopt ICT systems, I think this contributes to our reluctance to adopt these technologies" (Respondent 9, Owner).

"Knowledge is key in everything; I came across ICT courses and modules in college, and this has prepared me well" (Respondent 12, Manager).

"I have matric as my highest qualification but working with various organisations and people has shown me that ICT is useful" (Respondent 4, Manager).

"To be honest, I don't even know what decision-based ICT applications are; you know what we don't even have a website" (Respondent 1, Manager).

"We understand fully the benefits of ICT from the owner to the lowest person in the hierarchy, that is why we adopt it" (Respondent 13, Owner).

"I have acquired some knowledge from tertiary education and also from experience, and now we are geared to adopt ICT" (Respondent 14, Manager).

"I don't think just having a matric is a limiting factor, we are exposed to an environment that teaches us everyday things that are sometimes not taught in universities, I cannot give my level of education as an excuse" (Respondent 5, Manager).

4.4.2 Top management support

For the successful introduction and usage of new ICT, top management assistance means providing critical involvement and motivational features (Spinelli, 2018). The responses from the interviews on the top management support are noted in the quotes below:

"…decisions are mainly made by the owner, but we often meet together with other senior personnel, and we hold a meeting to discuss new ICT and the potential benefits to be attained" (Respondent 15, Manager).

"…mainly as the manager I make the decision regarding the technologies to be used in consultation with the owner, thank God he is very supportive" (Respondent 12, Manager).

"Without the owner's support nothing moves, and I can honestly say our owner is very supportive" (Respondent 4, Manager).

"I try to give significant support to everyone in the organisation, I often send people to workshops" (Respondent 13, Owner).

"…if by support you mean to invest money towards acquisition of ICT systems, yes, we pump money and we are reaping good results" (Respondent 6, Manager).

"…the idea we have in future is to have a separate IT department in order to fully delegate all the technological responsibilities to this department" (Respondent 12, Manager).

"We support acquisition of ICT as we believe ICT drives our business processes" (Respondent 4, Manager).

"We invest in ICT, we created a website where we market our services" (Respondent 11, Owner).

"As the owner of this company, I fully support the process of adoption and currently we are satisfied with the ICT in place, the good thing is we have people who embrace ICT systems" (Respondent 10, Owner).

4.4.3 Firm size and ICT issues

It is imperative to note that firm size was found to be significantly related to ICT adoption and impact. Normally, the bigger the organisation the more it can adopt ICT systems. This sub-theme sought to find out if firm size limits construction SMMEs from adopting and enjoying the benefits of ICT. Most owner-managers SMMEs contacted indicated concerns with regards to financing of ICT initiatives as shown in the following quotes:

*"We are not well resourced, and do not possess enough skills, to develop our own IT systems and we do not have the ability to implement a lot of IT without external assistance" (*Respondent 1, Owner).

"I think because we are still small, we need significant support from ICT providers and the government so that we can be able to acquire these ICT systems, some of them are way beyond our budget," (Respondent 9, Manager).

"Unlike large firms that are already enjoying economies of scale, we cannot acquire some of the ICT systems that we need in construction business because they are too expensive even though we desire to have them" (Respondent 14, Manager).

"*With the little finance we have, we managed to create a website, as we grow, we wish to adopt more advanced ICT systems especially the project management ICT applications*" (Respondent 5, Manager).

"Some ICT applications are expensive and coupled with COVID-19 which has affected the construction sector and all sectors in general, our firm is very small to acquire some of needed ICT systems, I hope you understand" (Respondent 11, Owner).

"If we were big enough, we could access loans from the bank to acquire some modern ICT applications so basically our size is a limiting factor" (Respondent 8, Manager).

"Sometimes we would want to catch up with modern ICT systems, but we don't have enough finances and resources to do" (Respondent 15, Manager).

4.4.4 ICT skills and training in SMMEs

The lack of ICT skills has been cited as an area of concern and remains a key challenge for construction SMMEs in South Africa. Having internal expertise is critical for ensuring a positive business impact from ICT (Amusan et al., 2018). In all SMMEs contacted, the respondents indicated that lack of training among employees as a major concern:

"…we are not very satisfied with the level of ICT skills in our organisation…. yes, we do not have our own systems in-house. We do not have a staff capable to handle modern ICT systems" (Respondent 1, Owner).

"…we have some employees coming straight from college/university having done 3 years but have no idea what they are doing or ought to do. It just does not work!" (Respondent 9, Manager).

"We have to offer employees training so that they are able to catch up with these demanding technologies" (Respondent 8, Manager).

"Without skills and proper training adopting these ICT systems will be useless because no one will be able to use them, for that reason we try to equip our employees" (Respondent 11, Owner).

"…not only when it comes to ICT but across the organisation, if there is lack of skills and training, nothing really moves" (Respondent 10, Owner).

"*We need proper training from ICT providers specially to use some accounting and project management applications, they are a bit complicated*" (Respondent 7, Manager)

4.5 Environmental Context

The way SMMEs employ ICT is heavily influenced by the business environment in which they operate. Here, these are two sub-themes regarding the aspects of the environment: ICT consultants and vendors leverage their interests and knowhow to shape ICT dissemination, and governments provide essential sources of infrastructure policy and regulation.

4.5.1 ICT vendors

Bessant (2019:161) defines ICT vendors as "the obligatory passage points that are supposed to provide cumulative knowledge." The ICT consultants or vendors can bring various complementary abilities to help SMMEs to innovate. Thus, vendors play a mediating role that assists SMMEs to adopt and benefit from ICT use.

"*We do not have an IT department in place, we just operate from the main office. We are funded internally; and no vendors come to our assistance*" (Respondent 8, Manager).

"*We haven't received any support from external organisations*" (Respondent 15, Manager).

"*…no support at all, we do things on our own*" (Respondent 10, Owner).

"*These days if you wait for the vendors or government to assist you, you will not move forward, these institutions have a lot on their shoulders. From the day we opened our company we did not receive any assistance from anyone*" (Respondent 11, Owner).

"*…support? no, not at all*" (Respondent 1, Owner).

"*I can tell you honestly we have not received any help whatsoever*" *(Respondent 4, Manager).

4.5.2 Government support

The government's role in infrastructure and policymaking is undeniable. After decades of apartheid control, the South African government is expected to take a direct and vital role in supporting infrastructure that allows SMMEs to compete while also allowing the historically disadvantaged black majority to fully engage in the economy. However, the findings show that 90 % of the SMMEs that the researcher contacted did not receive any financial support and assistance from the government in the context of ICT investment as evidenced in the following interview quotes:

"*…no major support apart from the import allowances we get should we wish to import some machinery*" *(Respondent 3, Manager).

"*…only information regarding regulations, compliance and certification. No funding or other initiative assistance was received*" (Respondent 15, Manager).

"*..., our government is silent*" (Respondent 1, Owner).

"*…like I told you earlier, we have not received any external assistance with government included*" (Respondent 4, Manager).

"We would appreciate it if can get any assistance from the government it would go a long way you know, but as of now nothing was received yet" (Respondent 11, Owner).

"…with this COVID-19 pandemic, we are the least of the government's concern" (Respondent 10, Owner).

"Absolutely nothing from the government regarding ICT" (Respondent 5, Manager).

"…. pertaining to ICT investments, we haven't received anything from the government" (Respondent 2, Owner).

4.6 Conclusion of the Chapter

In this chapter the adoption and impact of ICT by SMMEs in the construction industry in South Africa's in Gauteng province was investigated using a qualitative research analysis by using the Technology Organisation Environment (TOE) model. The findings demonstrate that owner-managers' expertise and skills, ICT consultants/vendors involvement, and government policies are the leading factors that shape ICT adoption and thereby constrain and/or facilitate the business impact of ICT deployment in the firm. The next chapter will discuss the findings and relate the findings to previous studies on the same topic.

CHAPTER 5

SUMMARY, DISCUSSION, CONCLUSION & RECOMMENDATIONS

5.   Introduction

The goal of this study was to determine the beneficial impact of ICT adoption on SMMEs in Gauteng Province. It is critical to comprehend this in two ways. First and foremost, it fills a research void in this field. According to a review of the literature on ICT use in developing nations' SMMEs, there is relatively little research in this field. Addressing this gap is critical for research since it shows the strengths and shortcomings of SMMEs and will aid in the creation of tailored solutions for the SMME sector. It also allows relevant policymakers to gain a better understanding of the current state of ICT use in SMMEs, with the goal of enhancing the sector's ICT utilisation.

Second, information and communication technology (ICT) can help SMEs become more productive. Given the government's push in this direction, it would be beneficial to guarantee that ICT is fully utilised by the industry. The creation of successful and sustainable SMMEs is in line with government policy, as enshrined in legislation such as the BBBEE Act. The research also makes a subconscious attempt to address the problem of SMME empowerment.

5.1 Justification of the Underpinning Model

It is important to note that the researcher reviewed four different models or frameworks in Chapter 2 in trying to answer the developed research questions. From the reviewed frameworks which are the Resource-Based View (RBV), The Actor Network Theory (ANT), The Technology Acceptance Model (TAM), and The Technology-Organisation-Environment Framework (TOE) the researcher found the TOE framework suitable for this study and hence it is the model that was adopted. The justification for adopting this model includes the fact that:

- The TOE framework can relate to all the research questions developed in this study, unlike other models which only answers one or two based on Table 2.3 presented in Chapter 2

- The TOE framework can relate to the study data that was collected as presented in Chapter 4 of this study. The gathered data was based on this model which helped the researcher develop themes and sub-themes from TOE main variables of "technology, organisation, and environment".

- The framework also helped the researcher in data collection as the research instrument was designed based on this framework.

- Above all, the TOE framework assisted the researcher in the interpretation of data as presented in Chapter 4.

5.2   Discussion of Findings

5.2.1 Demographic findings

The data for this study was carried out on 15 managers/owners of construction SMMEs. The findings also reveal gender disparities in SMMEs as 67% of the respondents are males compared to 33% females. There is still inequality in ownership and managerial positions in SMMEs which favours the male gender above the female gender. The age group of the respondents is mixed. The majority of respondents (47%) are above 40 years of age, followed by the 31-40 age group which constituted about 33% of the respondents, and the least being the 26-30 age group (20%). This question is important to consider in assessing if ICT adoption in construction SMMEs is determined by the managers/owners' age. The majority of SMMEs (39%) are employer to employees numbering between 11 to 25, the second (23%) have 51 to 100 employees, 15% have 26 to 50 employees, 15% have 1 to 10 employees, and lastly 8% have more than 100 employees. Most of the respondents, (53%) only have matric as their highest qualification, while 27% of the respondents have certificates or diplomas, about 13% have a bachelor's degree, and only 7% have a masters qualification. This question is important to check if the level of education of managers and owners influences ICT adoption in SMMEs.

5.2.2 Qualitative research findings discussion

The study's findings show that SMMEs profit greatly from the adoption of ICT in their battle for survival and expansion. ICT is one of the main resources that may be employed by organisations in the digital age, according to the Resource-Based Theory. The majority of respondents stated that ICT has improved performance and

that tasks are completed more efficiently than before. However, there are varied emotions about the influence of ICT on operating expenses, with some respondents claiming that ICT deployment does not result in cost savings. We can extrapolate from the findings that ICT improves service quality because more than half of the respondents perceived it to be significant in their operations. To support this finding, the following quotes from respondents are:

"*You know what, we are working efficiently and effectively because of technological innovations, our processes and production have improved significantly*" (Respondent 5, Manager).

"*I feel like we cannot be able to work anymore without technology you know*" (Respondent 2. Owner).

"*…. ICT has allowed us to increase a customer base, we can advertise our businesses on website and various sites*" (Respondent 10, Owner).

"*At first we looked at cost, compatibility as well as organisational need, and when ICT is worth the investment, we take it". Eventually our costs declined significantly because of ICT because we had to employ less people and chances of errors and wastages were minimised significantly* (Respondent 3, Manager).

"*Productivity has improved significantly I can say ICT is highly useful in our construction company*" (Respondent 13, Owner).

Without a doubt, the findings show that SMMEs have grown more marketable as a result of ICT deployment, and that organisations in general have been more successful and productive.

Furthermore, the findings demonstrate that ICT makes it easier for SMMEs to achieve their objectives, which include profitability and expansion. Because of ICT adoption, the interaction between the firm and its clients, as well as the company and its suppliers has improved. ICT adoption and deployment have resulted in a huge increase in the customer base, customer satisfaction, and earnings. The majority of respondents stated that, as a result of ICT adoption, company materials are always up to date, communication with both internal and external stakeholders has improved

dramatically, and, most importantly, worker morale has risen, resulting in increased productivity and effectiveness.

5.2.3 Barriers to ICT adoption findings

Objective 3 established in Chapter 1 was to find out the barriers to ICT adoption in construction SMMEs. The findings show that there are numerous impediments to ICT adoption by SMMEs, including ICT prices. ICT systems are too expensive to implement, according to some of the respondents and this is another barrier to their adoption. The following quotes from the respondents support this assertion:

"Some ICT applications are expensive and coupled with COVID-19 which has affected the construction sector and all sectors in general, our firm is very small to acquire some of needed ICT systems, I hope you understand" (Respondent 11, Owner).

"If we were big enough, we could access loans from the bank to acquire some modern ICT applications so basically our size is a limiting factor" (Respondent 8, Manager).

"Sometimes we would want to catch up with modern ICT systems, but we don't have enough finances and resources to do so" (Respondent 15, Manager).

"…with this COVID-19 pandemic, we are the least of the government's concern," (Respondent 10, Owner).

"Absolutely nothing from the government regarding ICT" (Respondent 5, Manager).

"…. pertaining to ICT investments, we haven't received anything from the government" (Respondent 2, Owner).

The findings demonstrate that lack of finances is one of the critical barriers to ICT adoption by SMMEs in the construction industry. This finding serves to confirm the findings of Xiong and Qureshi (2017); Madimogale and Kroeze (2019); Lawson (2017) and Ramdani and Chevers (2018) who found ICT costs as the major barrier to ICT adoption.

The skills and experiences of SMMEs' employees are another aspect that works as an impediment to ICT adoption. The majority of SMMEs stated that their employees' ICT levels are insufficient to allow for ICT adoption. Aside from personnel and staff abilities, SMMEs' failure to properly deploy ICT is due to a lack of knowledge. The following respondents' responses support this:

"…we are not very satisfied with the level of ICT skills in our organisation…. yes, we do not have our own systems in-house. We do not have a staff capable to handle modern ICT systems" (Respondent 1, Owner).

"…we have some employees coming straight from college/university having done 3 years but have no idea what they are doing or ought to do. It just does not work!" (Respondent 9, Manager).

"We have to offer employees training so that they are able to catch up with these demanding technologies" (Respondent 8, Manager).

"Without skills and proper training adopting these ICT systems will be useless because no one will be able to use them, for that reason we try to equip our employees" (Respondent 11, Owner).

This support the findings of Kapurubandara (2019); Madimogale and Kroeze (2019) and Mathu and Tlare (2017) who note that the majority of SMMEs are controlled by people with low abilities who are expected to make all of the company's decisions.

5.2 Recommendations

The following recommendations are proposed:
Small businesses should be aided in building and maintaining websites as a marketing tool. These websites aid in increasing the visibility of their organisations on the

internet. They can also expand these websites to allow potential clients to request quotes for their work and submit feedback on their experience to the organisation.

According to the findings, sustained government help to extend broadband access for underprivileged groups, particularly in places underserved by private sector activities, is suggested.

Government funding should be made available to assist SMMEs in developing ICT skills. This financing might be linked to organisations like SEDA to guarantee that new SMMEs are aware of the importance of ICT skills which will benefit their enterprises.

To improve awareness of the benefits of ICT in the construction industry, training providers, NGOs, and government agencies must collaborate more closely. Khuthaza, for example, can help by creating an environment conducive for SMMEs to share knowledge.

5.3 Limitations of the Study

The findings of this study provide light on ICT adoption in SMMEs in Gauteng Province. While the study only looked at 15 SMMEs, a bigger sample size could yield different results. Although a qualitative study strategy was used, a quantitative approach could have yielded more detailed information about the beneficial impact of ICT adoption in SMMEs. The researcher was also unable to get a more meaningful and larger sample size due to financial and time restrictions.

5.4 Conclusion

Finally, it should be mentioned that ICT use has numerous potential benefits for SMMEs when it is integrated with the organisation's overall business plan. The study found that SMMEs have a favourable attitude toward ICT, with the benefits indicated being directly linked to those found in the literature. While this is encouraging news for ICT's future growth in the sector, there is still a gap in the adoption of simple and/or complicated ICT tools among SMMEs. As a result, if one examines basic devices such as mobile phones or basic apps such as e-mails, ICT use in SMMEs is common.

However, the use of more complicated and advanced forms of ICT, such as computerised accounting systems, cloud computing, data management systems, and Enterprise Resource Planning (ERP) systems, has not progressed, and SMMEs will require assistance in acquiring and exploiting these advanced forms of ICT. ICT is useful for boosting communication between the organisation and its internal and external stakeholders, according to this study. As seen by their ratings of ICT as aiding business communication systems and interactions with clients and suppliers, the respondents agree. ICT is also effective for boosting the consumer perceptions of a company, particularly when it is leveraged to facilitate client information sharing.

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APPENDICES

Appendix A

INTERVIEW GUIDE

AN EXPLORATION OF THE BENEFITS OF INFORMATION AND COMMUNICATION TECHNOLOGY FOR SMMES IN THE CONSTRUCTION INDUSTRY IN GAUTENG PROVINCE, SOUTH AFRICA.

Section A: General Information

1. **Age of the respondent**

Below 25 years	◯
26-30 years	◯
31-35 years	◯
36-40 years	◯
Above 41 years	◯

Female	◯	Male	◯

2. **Gender**

3. **How many employees are there in your organization?**

1-10	◯
11-25	◯
26-50	◯
51-100 years	◯
>100	◯

4. **How many years have you been in operation?**

<1 year	◯
1-5 years	◯
6-10 years	◯
>10 years	◯

5. What is your level of education?

Matric	⬭
Certificate/diploma	⬭
Bachelor degree	⬭
Masters or higher	⬭

6.   What is your current position in the firm?

Owner	⬭
Manager	⬭
IT	⬭
Others (specify)	⬭

SECTION B

[TECHNOLOGY]

CURRENT TECHNOLOGY AND ICT BENEFITS TO CONSTRUCTION SMME

Technology: *The following questions relates to the technological issues and benefits ICT brought to your SMME*

1. How do you rate the level of technical infrastructure in your company?………………………………………………………………………………… ……………………………………………………………………………………… ……………………………………………………..

2. Do you have enough technical know-how at your organisation, if yes why do you say so ?
   ……………………………………………………………………………………… …………………………………………………………………………….

3. Do you think by adopting ICT your organisation will become better off or worse off, give reason for your opinion?…………………………………………………… **…………………………………………………………………………………… ……………………………………………………………………………………**

4. Do you believe ICT adoption will increase the competitive advantage of your organisation?………………………………………………………………………… …………………………………………………………………………………………

5. Construction processes are now quicker because of ICT adoption, what is your opinion regarding this?
   …………………………………………………………………………………… …………………………………………………………………………………..

SECTION C

[ORGANISATION]

ORGANISATIONAL CHARACTERISTICS ON ICT ADOPTION AND BENEFITS

1. Does your company's organisational structure support ICT adoption, If yes/no why do you say?...……………………………………………………………………
…………………………………………………………………………………………

2. Our organisational culture support ICT adoption, Do you agree ?
………………………………………………………………………..
……………………………………………………………………………………….

3. Does your organisation have any need for ICT systems ? ……………………
…………………………………………………………………………………………
………………………………………………………………………………………..

4. Are employees in your organisation motivated to use ICT systems ?
…………………………………………………………………………………………
…………………………………………………………………………………………

5. What recommendations can you give for construction SMMEs regarding ICT adoption ?
…………………………………………………………………………………………
…………………………………………………………………………………………
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………………………………………………………………………………................

SECTION D

[ENVIRONMENT]

HOW THE CONSTRUCTION ORGANISATIONAL ENVIRONMENT AFFECT ICT ADOPTION AND BENEFITS IN CONSTRUCTION SMMEs.

1. Does construction environment favours ICT adoption? give reasons for your answer……………………………………………………………………………
……………………………………………………………………………………
……………………………………………………………………………………
……………………………………………………………………………………

2. Does the government give you enough support to adopt ICT ?………….
……………………………………………………………………………………
……………………………………………………………………………………

3. What do you think should be done to assists construction SMMES to adopt ICT?……………………………………………………………………….
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4. What type of ICT systems do you use in construction industry?………….
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……………………………………………………………………………………
……………………………………………………………………………………

Appendix B: Letter of Information

NELSON MANDELA
UNIVERSITY

Business School

Faculty of Management Sciences

Department of Public Management & Economics

Date: 25 July 2022

Dear participant

LETTER OF INFORMATION

Title of the Research Study: An exploration of benefits of information and communications technology for SMMEs in the Construction Industry in Gauteng Province, South Africa

Principal researcher: Unathi Klassie (Student Number: 9958347)

Co-Investigator/s/supervisor/s: Prof. E. Ruhode

Purpose of the Study:

The objective of this study is to establish the beneficial impact of the use of ICT by SMMEs in the construction industry of the South African economy.

Based on the problem statement discussed, this section outlines the specific objectives of this study are stated below.

● What is the level of ICT deployment by SMMEs in Gauteng, South Africa?
● What are the factors influencing the adoption of ICT in the construction SMMEs?
● What are the challenges which SMMEs in the construction face with respect to ICT infrastructure and in the adoption of ICT?
● What are the benefits of adopting ICT in the construction SMMEs?

Ethical Consideration:

Data will be collected by means of questionnaires and they should take between 20-30 minutes. Participation is voluntary and participants can withdraw at any time with no penalty. If participants feel uncomfortable in answering questions they can withdraw from the study without any implications. No remuneration will be given to any participants and there are no costs attached to the study. The questionnaire does not force participants to give their names, therefore participant's confidentiality is guaranteed. All the information will be kept under control system and will be used for the purposes of this study only as in accordance with Nelson Mandela University Institutional Research Ethics Committee requirements.

No participant will be injured during the participation of this study as it will require the answering of questionnaires in a non-violent manner.

Persons to Contact for more information and queries.

Student	Supervisor
Unathi Klassie	Prof.E.Ruhode
Mobile: 072 090 7236	072 802 6329
Email:unathi.klassie@gmail.com	ruhode@gmail.com

Appendix C: Consent Form

NELSON MANDELA
UNIVERSITY

Business School

CONSENT FORM

Statement of Agreement to Participate in the Research Study:

✓ I hereby confirm that I have been informed by the researcher Unathi Klassie about the nature, conduct, benefits, and risks of this study.

✓ I have also received, read, and understood the above written information (Participant's letter of information) regarding the study.

✓ I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be anonymously processed into a study report.

✓ In view of the requirements of research, I agree that the data collected during this study can be processed in a computerised system by the researcher.

✓ I may, at any stage, without prejudice, withdraw my consent and participation in the study.

✓ I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.

_____   **25 July 2022**   **15H30**

Signature of Participant   **Date**   **Time**

I, Unathi Klassie herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

_____   **25 July 2022**   **15H30**

Signature of Researcher   **Date**

Appendix D: Editing Service Letter

Editing Service: Lee Kemp

14 Carlisle St

Mount Croix

Port Elizabeth

6001

05 March 2022

082 723 5408

TO WHOM IT MAY CONCERN

EDITING OF TREATISE: MS UNATHI KLASSIE (Student No: 9958347)

This serves to confirm that I edited Ms Klassie's MBA Treatise, which is to be submitted to the Business School in the Faculty of Business and Economic Sciences at the Nelson Mandela University.

The editing focused on language errors, layout and in-text referencing. I also edited the reference list. In the process I used the Review facility in MSWord. I have no knowledge if the student accepted all the corrections made; thus, I cannot be held responsible for any remaining errors.

Yours faithfully

Ms L. Kemp

B. A. (Hons English); MBA

Member: Nelson Mandela University Editors' Forum

Appendix E: Turnitin Report

UNATHI _KLASSIE_9958347

by Unathi Mathopa

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UNATHI _KLASSIE_9958347