UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

UNDERSTANDING TEACHERS' BELIEFS AND EXPERIENCES OF ICT INTEGRATION IN FIVE SOUTH AFRICAN PAPERLESS HIGH SCHOOLS

By

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A thesis submitted in fulfilment of the requirements for the degree of

Doctor of Philosophy

To

The Faculty of Humanities, University of the Witwatersrand, Johannesburg, South Africa

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July 2019

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

DECLARATION OF AUTHORSHIP

I hereby declare that this thesis is my own independent work. It is submitted for the degree of Doctor of Philosophy in Educational Technology at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at any other university.

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5th day of July 2019

ABSTRACT

There is a scarcity of research on the understanding of teachers' beliefs and experiences around ICT integration and particularly on the views of teachers who are teaching in South African paperless high school classrooms. This study reports the findings of an exploration of beliefs and self-reported experiences of 22 high school teachers implementing the ICT integration pilot project in five high schools in the Gauteng province of South Africa. The aim of the study was to investigate and gain a deeper understanding of the beliefs that teachers hold about and their experiences of integrating ICT in classroom teaching.

The unified theory of acceptance and use of technology (UTAUT) model propounded by Venkatesh, Morris, Davis, and Davis (2003) was adopted as the theoretical basis of the study. The UTAUT model is comprehensive and identifies key constructs in acceptance and use of ICT as determined by the intention to use the technology and the actual usage. According to the UTAUT, performance expectancy, effort expectancy and social influence are indirect determinants of a user's intention to use technology while facilitating conditions are the direct determinants of actual use. UTAUT determines whether a user will accept using the new technologies and the user's ability to use it in an effective way.

The study employed a qualitative exploratory case study design to gain understanding of the phenomenon investigated. Data were generated through semi-structured individual face-to-face interviews and focus group interviews. Additional data were obtained through the researchers' personal journal where I captured some relevant information pertaining to the study from informal conversations with teachers and observations of different scenarios and resources in the five paperless schools. A comprehensive thematic analysis based on Braun and Clark's (2006) steps to thematic analysis was conducted. Five distinct but interrelated themes emerged from the data.

The findings revealed that teachers in paperless schools have divergent understandings of ICT integration in classrooms. Teachers believe ICT is beneficial to teaching because it is flexible, enhances teaching and learning, saves time and promotes effective

interaction between and among teachers and learners in the classroom. The study also found that ICT integration trainings were shallow in some schools, non-progressive, irregular and sometimes facilitated by incompetent trainers. The majority of teachers believe that learners' attitudes to possessing tablets constitute a major challenge to ICT integration; hence, teachers perceived ICT as distractive tools that make classroom management difficult. Other challenges are poor training, unreliable Internet connectivity, irregular electric power supply and inadequate infrastructural facilities. The study found that teachers' age and years of teaching experience, teachers' attitudes, the school timetable, support, and material resources are prominent factors that influence ICT integration in paperless schools.

Some contributions of the study include the provision of empirical data that can guide policy formulation, support, monitoring and evaluation in future ICT integration initiatives. I also designed a technology integration model (TIM) drawing from the original theory of the UTAUT model that foregrounds beliefs as the most significant determinants of ICT integration in schools because adoption and actual integration of technologies in the classroom are influenced by a person's beliefs. Furthermore, the study proposed a sustainable school ICT integration framework for future introduction and implementation of ICT integration projects in South Africa.

The study recommends that policy formulation and decisions to initiate innovation projects in schools should be guided by contextual needs through the outcomes of feasibility studies about the context and major players in the education system.

The findings of the study led to a conclusion that ICT integration in the classroom is not only influenced by explicit factors such as resources, training and context as commonly reported in the literature but also by implicit factors like teachers' understandings or knowledge of ICT integration and teachers' beliefs about and experiences of integrating ICT in classrooms.

Keywords: Affordances, Beliefs, Experiences, Gauteng, ICT integration, Paperless high schools, Teachers, UTAUT.

DEDICATION

This thesis is dedicated to my late elder brother Na-Allah Magana Danware whom God used to lead me on the pathway of light that has brought me this far. May your soul continue to rest in peace, my brother. It is also dedicated to my family and friends.

ACKNOWLEDGEMENT

Firstly, my gratitude goes to God Almighty for giving me grace and favour to embark on this journey. ***Great is thy faithfulness ... lord unto me.***

My sincere gratitude and thanks also goes to my main supervisor Dr Reuben Dlamini. Thank you for having faith in me and for accepting to work with me even when you were not sure of my capabilities to undertake a research of this magnitude. I appreciate every insightful comment you made on the thesis from beginning to the end. Thank you also for supporting me to tell my piece of story at various fora in national and international conferences. God bless you.

My Co-supervisor Dr Thabisile Nkambule: Thank you for your guidance and your immense contribution to the development of this thesis. Your meticulous examination of every word and sentence in this thesis frustrated me at first, but in the end, it has made me a better qualitative reseach scholar. Thank you for looking at my work with a critical eye and with the perspective of an examiner. What I learned from you goes beyond this PhD. May God bless you.

My research participants, the teachers in the five pilot paperless high schools: I truly appreciate your cooperation and active participation in the study. My gratitude also goes to the deputy principals of the five participating schools, especially Mr Enoch Thango of Sunward Park High School. I truly appreciate your support.

My wife, Mrs Hauwa Danbaba: Thank you for your patience, support and believing in me. Thank you for taking my role and responsibilities while away from home. You have always stood by me and trusted every step I take. God bless you.

My lovely children: Samaila, Salome, Deborah, Samuel and Destiny. Thank you for your ceaseless love. You always asked: “Daddy, when are you coming back?” and I always answer to say: “I’m coming home tomorrow”. Now, I can finally tell you with certainty when I am coming home to be with you.

My sponsors, the Tertiary Education Task Fund (TETFUND), Abuja, Nigeria: Thank you for the funding support. Your expection for me to bring back a PhD degree kept me determined and resolute to succeed.

My employers: Thank you for releasing me to study outside the country, for your support and understanding, and for granting me an extension of study leave beyond the three years you initially approved.

Special thanks to Ali Baba, Thomas Naomi and Nasimu Semeon for your unrelenting support and encouragement on the PhD journey. You have been a source of inspiration to me.

Finally my appreciation goes to all other people who made my stay worthwhile in Johannesburg, South Africa. God bless you all.

PUBLICATIONS

A PhD journey is usually characterised by professional dialogues, storytelling, criticism and feedback from colleagues and senior academics in different forums. In the course of my journey, I participated in such professional dialogues with the sole intent of receiving constructive feedback on various aspects of my study titled: *Understanding Teachers' Beliefs and Experiences of ICT Integration in South African Paperless High Schools*. Consequently, the following peer reviewed papers have been presented at national and international conferences. Some have also been submitted as manuscripts for publication in journals and conference proceedings.

*Note that some parts of this thesis have been published in journals as:

1. Na-Allah D. M. & Dlamini R. (2018). Ascertaining the factors that influence ICT adoption and integration among teachers in South African paperless classrooms. (Manuscript submitted for publication in *Perspectives in Education)*.

**Note that some parts of this thesis have been presented at conferences as:

1. Na-Allah D. M. (2018). Understanding the factors that impact on the integration of new technologies (ICTs) in South African paperless classrooms. A paper presented at the European Conference on Education, ECE2018, Jurys Inn Brighton Waterfront Hotel, Brighton & Hove, UK, 29 June–1 July 2018.
2. Na-Allah D. M. & Dlamini R. (2018). Understanding teachers' beliefs and experiences of ICT integration in classrooms. A paper presented at the 9th Annual Conference on Mathematics, Science and Technology Education, UNISA-ISTE2018. Kruger National Park, Skukuza Rest camp, Limpopo, South Africa. 22–26 October 2018.
3. Na-Allah D. M. (2017). Teachers before technology implementation: Ascertaining teachers' readiness to adopt technology in their classrooms. A paper presented at the South African Education Research Association (SAERA), 5th SAERA Conference, Boardwalk Hotel, Port Elizabeth, South Africa, 23–26 October 2017.

4. Na-Allah D. M. (2016). The missing links in South Africa's quest for ICT integration schools. A paper presented at the SAERA, 4th SAERA Conference, Cape Sun Hotel, Cape Town, South Africa, 23–26 October 2016.

5. Dlamini, R. & Na-Allah, D. M. (2015). Beyond policies and programs: Contextualizing ICT integration in South African schools. A paper presented at the South Africa International Conference on Educational Technologies, Manhattan hotel, Pretoria, South Africa, 19–21 April 2015.

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LIST OF ABBREVIATIONS

CAPS	Curriculum Assessment Policy Statement
C-TAM-TPB	Combined Technology Adoption Model and Theory of Planned Behaviour
DoE	Department of Education
FFI	Face-to-Face Interview
FGI	Focus Group Interview
GDE	Gauteng Department of Education
ICT	Information and Communication Technology
IDT	Innovation Diffusion Theory
IT	Information Technology
LMS	Learning Management System
MEC	Member of Executive Council
MM	Motivation Model
MPCU	Model of Personal Computer Utilisation
NEPAD	New Partnership for Africa's Development
OECD	Organisation for Economic Co-operation and Development
SGB	School Governing Board
TAM	Technology Acceptance Model
TAM2	Technology Acceptance Model 2
TIM	Technology Integration Model
TPB	Theory of Planned Behaviour
TRA	Theory of Reasoned Action
UK	United Kingdom
UNESCO	United Nations Educational, Scientific and Cultural Organization

USA	United States of America
UTAUT	Unified Theory of Acceptance and Use of Technology

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CHAPTER 1

A JOURNEY TO ICT INTEGRATION IN SCHOOLS

"Information and communication technologies are not a panacea or magic formula … but they can improve the lives of everyone on this planet" -Kofi Annan, 2005

1.1 Introduction

The beginning of the 21st century witnessed a revolution in society through the evolution of information and communication technologies (ICTs) that are now a critical component of education. The reason is that the ability to use computers and other related computerised devices have become not only an essential part of everyone's education, but also a "determinant of every society's growth and progress in the 21st century" (Adomi & Kpangban, 2010). According to Hew and Brush (2007) the popular "belief that technology can positively impact student learning has led many governments to create programmes for the integration of technology in their schools" (p. 224). Governments have huge budgets to implement ICT in schools, to meet the requirements for success in the global knowledge economy (Prakash, 2018; Buabeng-Andoh, 2012). For example, in the United Kingdom "the government spending on educational ICT in 2008–2009 was £2.5bn, in United States, the expenditure on K-12 schools and higher education institutions was $6 billion and $4.7 billion respectively in 2009, and in New Zealand the government spends over $410 million every year on schools' ICT infrastructure" (Buabeng-Andoh, 2012, p. 136). Notwithstanding all the investments on ICT infrastructure, equipment, and professional development to improve education in many countries, there is still little evidence of ICT adoption and use in teaching and learning, especially in Turkey (Gulbahar, 2007). Similarly, in South Africa an estimated sum of R17 billion was expected to be expended on ICT integration in schools, for a period of five years in the Gauteng province only (Businesstech, 2015).

Although it is clear that nations are striving for 21st century education through ICT introduction and integration in their education systems, it is not clear how various initiatives that are informed by ICT policies, programmes and projects aimed at

improving education meet the pedagogical needs of teachers and learners in schools. UNESCO (2016) has also been concerned about ICTs lack of significant impact on teaching and learning in schools. Given that the ultimate goals of ICTs integration in schools are to support teachers and learners to enhance teaching and improving learning anywhere and anytime, it is essential that every effort to integrate ICT in schools should have pedagogical value. Without pedagogical value of ICT in schools, teachers and learners are not likely to benefit from the teaching and learning affordances of the ICT. Unfortunately, some ICT integration initiatives lack pedagogical value, making it important to investigate and ascertain teachers' perspectives about the implementation of ICT integration in the classrooms.

Without overlooking the concerns, scholars (Noor-Ul-Amin, 2013; Livingstone, 2012; Conole & Dyke, 2004) have reported how ICT possess the potential to improve teaching and support learning if used appropriately and effectively in the classroom. It can enhance teaching and learning by allowing the teacher to communicate and share the content in innovative and diversified ways. Furthermore, they offer learners opportunities to manage and own their learning effectively and to also share knowledge, collaborate, and learn independently anytime and anywhere with minimal teacher interference (UNESCO, 2013; Karsenti, Harper-Merrett, Traoré, Mbangwana, & Touré, 2009). This presents the increasingly important role that ICTs could play in education and the reasons arguments have been presented globally, and especially in South Africa, about the need to integrate ICTs into the education system. For example the South African e-Education White Paper document (DoE,2004) suggested that ICTs play an important role in transforming education and training, and in particular to enable teachers and learners to shift from traditional teaching approaches. Similarly, Livingstone (2012) stated that ICTs are widely seen as enhancing the education process, especially teaching and learning, by facilitating lesson preparation, promoting classroom interaction, and removing barriers to communication between and among teachers and learners. While all the above is important there is little research on teachers' beliefs and experiences about ICT integration in the classrooms in South Africa. This is the reason this study is a significant contribution to the existing literature.

1.2 Background to the Study

There are debates about which area of ICT integration in schools should be prioritised. UNESCO (2013) and Department of Education [DoE] (2004) argue that laudable ICT policies and infrastructure provisioning is critical to ICT integration and adoption, and other scholars think that integration and adoption of ICT in schools can better be achieved when teachers are provided with requisite knowledge and skills for successful ICT integration in the classroom (Karsenti, Collin, Harper-Merrett, 2012; Koehler & Mishra, 2008; Way & Webb, 2007). This on-going debate is connected to the disparity in countries' levels of development that consequently determine their ICT needs and implementation. Nkula and Krauss (2014) observed that some schools in South Africa still do not have access to ICT for teaching and learning purposes, and schools that have access to ICTs use them only at a low level where students learn about computers instead of learning with computers. This means that in some schools learners are still engaged in learning what computers are used for in teaching and learning, which is a descriptive process of knowing the functions of a computer system for communications, storage and retrieval of information. Learning about computers is the basic stage of learning ICTs in schools which is not sufficient to prepare learners for the 21st century skills. On the other hand learning with computers involves practical utilisation of computer hardware and software in the process of learning. Through this practical engagement learners are able to acquire and develop proficiency in both school and work related competencies needed for global competitiveness. ICT integration in education has now become a dominant subject of discussion among scholars across the globe, with research interest shifting from how ICT hardware and software can be acquired and introduced to schools to how ICT can be integrated into schools across the curriculum to enhance teaching and facilitate learning.

Scholars (Guzey & Roehbrig, 2012; Jhurree, 2005; Pelgrum, 2001) have observed that countries are committing a lot of money and other resources into technology integration in education, because of the inherent potential to transform all sectors of the society. Classroom pedagogical practices, learning processes, resources, and ultimately, the way we conduct the activities of education is giving way to the integration of technology

for utilisation in the business of education. The proliferation of ICT in the education system has led to an increasingly significant use of technology, not only across the school curriculum but also within specific subject disciplines (Bate, 2015). Unfortunately, despite the value of ICT as a tool to transform education and society, Africa is still lagging behind and is labelled a technologically underdeveloped continent (Karsenti et al., 2009). This is due to several factors such as: lack of ICT in education policies, poor funding, poor infrastructure, and teachers' attitudes towards ICT (Mathevula & Uwizeyimana, 2014). In addition to these factors, officials of the education system at various levels have expressed concerns about how ICT can effectively be integrated into schools, especially into teaching and learning (Mathipa & Mukhari, 2014). These cannot be taken for granted because it has influenced the designing and introduction of policies, programmes, projects and infrastructure aiming to facilitate and promote ICT integration in education (George, 2015).

In the context of the study, South Africa began introducing computers in schools during the 1990s through collaboration with private sector telecommunication companies like Vodacom, MTN, and Telkom. The government provided ICT hardware and software (computer laboratories) in schools and the telecommunication companies supplied Internet connectivity to support the government efforts (Farrell & Isaacs, 2007). This collaboration continued until 2010 when the government began to take full responsibility for implementing ICT integration in schools. This implies that while some of these initiatives were championed by the national government, they were funded in collaboration with various provincial governments and private sector. These projects include the Gauteng Online School project in the Gauteng province and the flagship Khanya project in the Western Cape Province. The current paperless schools initiative in Gauteng and similar initiatives in the Limpopo, Mpumalanga, Western Cape and Free State provinces are aimed at achieving the national e-education goal. The e-education policy's strategic goal state that:

> Every South African manager, educator and learner in the general and further education and training bands will be ICT capable (i.e. use ICTs confidently and creatively to help develop the skills and knowledge they need as long life pupils to achieve personal goals and to be full participants in the global community) by the year 2013. (DoE, 2004, p. 17)

Even though the quotation is outdated, considering the year of the current study, 2015–2018, it is assumed that the goal is still relevant as a determinant of schools' ICT policies and programmes in South Africa.

As expected, the e-education policy in South Africa has changed the role of teachers in the classroom (DoE, 2004). In view of the new goals for education that are based on the new aspirations of the country to produce citizens that can compete in the new world economy that is ICT driven, teachers are expected to adopt ICT for pedagogical purposes and not just for occasional use in classrooms. Through these new teaching and learning processes, the government expected that learners will learn with ICTs and get acquainted with ICT tools in preparation for the workplace. Thus, in order to meet the demand of teachers' new roles, both the national and provincial governments engaged in providing enabling environments with infrastructure, facilities and teacher training programmes in schools (DoE, 2004). The commitment and provisions of these infrastructures, facilities and teacher training programmes in schools are more apparent in affluent provinces like the Western Cape and Gauteng. These provinces are financially capable of funding ICT integration projects, even though the private sector is also making reasonable contributions by providing facilities and other forms of support to schools. It is worth noting that the attitudes and beliefs that teachers hold towards their new roles and expectations were not considered before implementing the ICT integration initiatives. Considering that ICT integration is relatively new in South African schools, teachers' experiences with and how they use technology during teaching and learning or tool for teaching is still in its infancy. This background makes this study significant to make contribution to the current existing knowledge.

1.3 The Paperless Schools Pilot Project

This research was conducted in the Gauteng province of South Africa where concerted efforts have been made by the Gauteng provincial government to provide ICT infrastructure, facilities, tools, equipment and human capacity development training for ICT integration in primary and high schools.

Through the political will of the African National Congress's government, South Africa's then Deputy President Honourable Cyril Ramaphosa together with the Gauteng

Premier, David Makhura and the Member of the Executive Council (MEC) for Education Panyaza Lesufi launched a paperless classroom pilot project in seven selected schools in Gauteng in January 2015. The project was an effort to promote a paperless education system that would give learners access to digital educational resources through tablets to make the learning process more exciting, motivating and creative (Dlamini & Na-Allah, 2015). However, it was not clear how the provision of ICT infrastructure alone can ensure ICT integration, given that both human and contextual factors significantly influence classroom processes. To realise success in achieving the aspirations of a true paperless classroom, context and teacher-related constraints must be taken into consideration and addressed before and during implementation. In this case, the training and retraining of teachers to capacitate them with technological and pedagogical content knowledge is imperative.

Panyaza Lesufi is the first MEC to launch the “Wired for Life”, a programme that targets to provide every learner with a tablet, every teacher with a laptop, and every classroom with a smartboard in partnership with VastraTech and Smart Information Technology companies. According to Lesufi, the kick-off programme plans to replace textbooks with computer tablets in public schools within the province. This one tablet per learner project is aimed at all schools in Gauteng.

In Gauteng, Panyaza Lesufi is committed to transform learners’ experience through digital devices. The initial seven schools selected for the pilot project include two primary schools and five secondary schools, where digital technologies are provided and used for classroom instruction by the Gauteng Department of Education (GDE) through the initiative of the MEC. In these paperless schools each learner is provided with a tablet or laptop for learning, chalkboards are replaced with interactive whiteboards, and Internet connectivity and computer laboratories are readily available. Text books and other forms of text materials for classroom instruction are replaced with electronic formats. However, the GDE who introduced the project overlooked the contributions of other stakeholders who will eventually implement it in the schools: most importantly the teachers, the parents, and even the GDE officials at the provincial and district levels. In view of the hasty manner in which the project was introduced in schools, many stakeholders perceived it as politically motivated, and many teachers feel

that the paperless schools project was not conceptualised around contextual and pedagogical needs of the teachers and learners in the schools. This will be discussed in detail in the findings section where participants express their concerns about the introduction and implementation of the project in schools.

1.4 Statement of the Problem

One of the strategies employed by the South African government to offer equal opportunities to its citizens, using education as a tool, was the introduction of ICTs into the educational system to give unlimited equal access to global educational opportunities. Unfortunately, there are discrepancies between government expectations and what is obtainable in schools with regard to ICT integration (Mooketsi & Chigona, 2014). Even though the roll-out of ICT in schools was expected to be in three phases (DoE, 2004), the majority of the schools in most provinces of South Africa are yet to have ICTs in their classrooms. It is acknowledged that the government is committed to integrating ICT in education yet it is still unclear why the uptake and implementation of ICT integration in South African schools are still slow (Padayachee, 2017; Mukhari, 2016; Meyer & Gent, 2016). In addition, despite an increased interest by scholars to investigate ICT integration in schools, there is still a scarcity of empirical research to explore and understand teachers' beliefs about and their experiences of ICT integration in schools.

Currently there are limited, if any, empirical studies focusing on gaining insight to teachers' conceptions and experiences of ICT integration, and especially how these beliefs and experiences affect the integration of ICTs in classrooms in the South African context. Given that ICT integration in schools is a global interest for education stakeholders, scholars have reported theoretical and empirical views about the role of teachers' beliefs on ICT integration in the classroom. For example, in the USA, Ertmer, Ottenbreit-Leftwich, and Tondeur (2014) conceptually examined teachers' beliefs and uses of technology to support 21st-century teaching and learning. Similarly, Sherman and Howard (2012) presented some preliminary findings from a South African study called "Teachers' Beliefs about First- and Second-Order Barriers to ICT Integration". McIntyre (2011) used a mixed method approach to investigate teachers' beliefs and

practices regarding the role of technology in literacy instruction. All the studies acknowledge that teachers' beliefs have a significant influence on ICT integration in the classroom. Despite the critical role of teachers in pedagogical issues and as change agents in schools, arriving at important decisions about the introduction of ICTs across all levels of the education system in South Africa is characterised by the marginalisation of teachers (Samuel, 2014).

The study recognises that ICT integration for teaching and learning is relatively new in South Africa, and of concern are the teachers' beliefs and their experiences around ICT integration in schools. Particularly when it is considered that teachers' ways of thinking about and understanding of a given phenomenon are vital components of their decisions and practice (Kaymakamoglu, 2018; Leem & Sung, 2018; Gilakjani & Sabouri, 2017). There is no doubt that teachers play various important roles in the process of teaching and learning, it is disheartening to note that they are often marginalised when decisions are made that concern their profession (McCourt, 2016). Given the above discussions, I considered it important to conduct this empirical study to gain insight into how teachers' beliefs and their experiences affect actual ICT integration in South African paperless schools. To briefly contextualise the latter, because it will be presented in chapter 4, the Gauteng Premier, David Makhura and the Member of the Executive Council (MEC) for Education Panyaza Lesufi, launched a paperless classroom pilot project in seven selected schools in Gauteng in January 2015. The project was "an effort to promote a paperless education system that would give learners access to digital educational resources through tablets to make the learning process more exciting, motivating and creative" (Dlamini & Na-Allah, 2015, p.165).

1.5 Rationale of the Study

The decision to embark on this particular research study was motivated by three main reasons. Firstly, the South African government's effort to promote ICT integration into the school systems to ensure effective teaching and learning, which eventually led to the Gauteng government committing about R17 billion to infrastructural provisioning, training and facilities(EWN online news July, 2015). Despite the huge financial

allocation, there seems to be no clear evidence indicating sufficient ICT integration in the schools. Secondly, the reviewed literature has revealed that there is apparent low ICT integration and adoption in South African schools and the reasons are not yet determined by empirical evidence (Farrell & Isaacs, 2007; Younie, 2006; Smolin & Lawless, 2007), thereby making the current study important to contribute knowledge. Although research into teachers' beliefs has been ongoing over a long period of time, especially in developed nations such as Australia, Spain, Korea, Malaysia, South American countries, European countries and the USA (see first results from "Teaching and Learning International Survey", Peña-López, 2009), empirical research into teachers' beliefs and experiences around ICT integration in the classroom is a relatively emerging interest in South Africa.

The scarcity of similar studies in an African country is also acknowledged as a gap in the literature. Most studies that investigated ICT integration in Africa and South African schools focused particularly on the availability and accessibility of ICTs in schools (Meyer & Gent, 2016); factors affecting ICT adoption and or integration in schools (Wilson-Strydom, Thomson & Hodgkinson-Williams, 2005 2005) and challenges to ICT integration in schools (Nkula & Krauss, 2014; Mingaine, 2013). Despite evidence of scholastic discourse on the matter (Govende & Dhurup, 2014), there appears to be no empirical studies in the literature about teachers' beliefs and their experiences around ICT integration in schools in South Africa. Even the few South African studies that focused on teachers' beliefs (Ramnarain & Hlatswayo, 2018; Sherman & Howard, 2012; Kriek & Stols, 2010) were conceptual studies that lack empirical evidence to support their claims.

Thirdly, my passion for teacher education and teacher professional development as a crucial segment of the education system has prompted me to investigate the beliefs and experiences of teachers during ICT integration in classrooms, especially in schools where ICT adoption is compulsory for all teachers and learners. My knowledge and ten-year experience of training and professional development of both pre-service and in-service teachers, made me aware that most policies and innovations introduced in schools do not receive input from teachers and other education stakeholders apart from the policy makers. Hence my decision to investigate the introduction and

implementation of the paperless school project aimed at ICT integration into teaching and learning in high schools. Bingimlas and Hanrahan (2010) believed that the investigation of teacher beliefs is a necessary endeavour to embark on ~~in~~ educational research, because the ability to identify and describe the influence of teachers' beliefs on instructional actions will deepen and enrich our understanding of the teaching process. Furthermore, Aguirre and Speer (2000) argued that knowledge about the correlation between teachers' "beliefs and their practice in the classroom can increase both the breadth and depth of our understanding of how teaching proceeds in the classroom" (p. 332), especially in classrooms that use ICT for teaching and learning.

1.6 Aims and Objectives of the Study

The principal aim of this case study is to explore and interrogate teachers' beliefs and experiences of the implementation of ICT integration in classrooms in five South African paperless high schools. The study also wanted to ascertain the factors that influence ICT integration in these schools, based on the views of teachers teaching at the schools.

1.6.1 Objectives of the Study

The following objectives are designed to achieve the main aim of the research.

1. To explore teachers' understandings of ICT integration in the classroom
2. To ascertain teachers' beliefs about the implementation of ICT integration in paperless schools
3. To examine teachers' experiences of ICT affordances in classrooms
4. To critically analyse teachers' views on the factors that influence their integration of ICT in the paperless high schools

1.7 The Research Questions

This research study addresses the following questions:

Main Question: What are the teachers' beliefs and experiences of ICT integration in paperless high schools?

Sub-Question: The following sub-questions are stated to provide answers that may help to respond the main research question.

1. How do teachers conceptualise ICT integration in paperless schools?
2. What are teachers' experiences of ICT affordances during integration in paperless high school classrooms?
3. What are the factors that influence the integration of ICTs in paperless high schools?

1.8 Theoretical Lens of the Study

The evolution of ICT in the last four decades has prompted the development of several theoretical frameworks and models for ICT adoption, use and integration. Scholars have continued to theorise and develop models that can be used to determine the extent of adoption and use of new technological innovations in recent years as technology seem to infiltrate every facet of society. Although most of the theories and models listed in Table 1 are related to human beliefs and may be applicable as lens for this study, I considered it relevant to use the Unified Theory of Adoption and Use of Technology (UTAUT) as a framework for the study. The comprehensiveness of the UTAUT model because of the amalgamation of eight related theories and models listed in the Table 1 make it the most relevant theoretical lens to address the major constructs that are of interest to the study. The UTAUT consist of four core constructs namely performance expectancy, effort expectancy, social influence, and facilitating conditions. The outcome of the four constructs is usually moderated by four other variables: Age, gender, experience and voluntariness of use. However, the UTAUT suggests that these four core constructs are direct causes of technology acceptance and use. A detailed

description and discussion of the UTAUT model as a framework for the study is provided in Chapter 3.

Table 1: Theories and Models for Technology Adoption, Use and Integration

THEORY/MODEL	AUTHOR(S)	YEAR OF PUBLICATION	MAIN CONSTRUCTS
Theory of Reasoned Action (TRA)	Ajzen and Fishbein	1977	•Attitude •Subjective norms
Theory of Planned Behaviour (TPB)	Icek Ajzen	1991	•Attitude •Subjective norms •Perceived behavioural control
Technology Acceptance Model (TAM)	Fred Davis	1985	•Perceived usefulness •Perceived ease of use
Technology Acceptance Model 2 (TAM2)	Fred Davis	1989	•Subjective norms •Image •Job relevance •Output quality •Result demonstrability •Perceived usefulness •Perceived ease of use
Combined-TAM-TPB Model (C-TAM-TPB)	Taylor and Todd	1995	•Perceived usefulness •Perceived ease of use •Attitude •Subjective norms •Perceived behavioural control
Motivational Model (MM)	Davis, Bagozzi, and Warshaw	1992	•Extrinsic motivation: Perceived usefulness; perceived ease of use; and subjective norms •Intrinsic motivation: Perceptions of pleasure and satisfaction
Innovation Diffusion Theory (IDT	Everett Rogers	1995	•Relative Advantage: Compatibility •Complexity: Trialability •Observability
Model of Personal Computing PC Utilisation (MPCU)	Thompson, Higgins, and Howell	1991	•Perceived consequences •Affect •Social factors •Facilitating conditions
Social Cognitive Theory (SCT)	Albert Bandura	1986	•Outcomes expectation
Unified Theory of Adoption and Use of Technology (UTAUT)	Venkatesh, Morris, Davis, and Davis	2003	•Performance expectancy •Effort expectancy •Social influence •Facilitating conditions: Age; gender; moderators; experience; voluntariness of use

1.9 Significance of the Study

This study is significant because it will inform or contribute information for future policy, design and planning decisions for the improvement of the current project or for future ICT integration initiatives, particularly in South Africa. It will also provide the government and policy makers with recent information on what, where, when and how to effectively introduce and implement ICTs in education, particularly in classrooms.

The significant gap that this study seeks to fill in the scientific body of knowledge is the limitation of empirical studies about the beliefs that teachers hold concerning the introduction and implementation of ICT integration in classrooms in South Africa. Eventually this will be a significant contribution to literature in the field of educational technology especially in South Africa where limited empirical studies are conducted on teachers' beliefs and experiences of ICT integration in schools.

In addition, consequences of teachers' beliefs on ICT integration in schools are also of particular interest to this study because ICT adoption in the classroom is now mandatory, and because teachers' beliefs exert great influence on their thoughts, decisions, actions and inactions in the classroom (Fives & Buehl, 2012).

This research is important in South African context that recently implemented ICT integration in the selected classrooms and thus creating a knowledge gap on teachers' beliefs about ICT integration in schools. Thus, the current study will make contributions to existing knowledge on teachers' beliefs about classroom ICT integration and the impact of these beliefs on ICT implementation in schools. It is pertinent to note that the paperless school project is relatively new and the first of its kind in South Africa, hence there are no previous empirical studies informing what teachers think of working in such a technology-driven space that is different from the usual classroom environment for teaching and learning in schools. A literature review within the South African research landscape revealed limited studies providing understanding of teachers' beliefs and experience around ICT integration as an innovation in schools. It is for this reason that this study adopted a case study design to understand from teachers' perspectives their beliefs and experiences in paperless schools' classroom context.

1.10 Structure of the Thesis

The thesis consists of seven interrelated chapters that are organised in the following order.

Chapter 1: A Journey to ICT Integration in Schools

This chapter provides an overview of the entire study: Why the study was conducted, how the research questions are conceptually framed, my positionality, and the outline of the chapters. The main purpose of this chapter is to present a general introduction of the thesis by giving the background of the study that captures the genesis of ICT integration in education in the South African context. The chapter shows the way ICT integration is esteemed as a tool for sustainable development of nations and has become a global trend in all facets of the 21st century, with particular reference to the education sector. The chapter discusses the role and significance of teachers' beliefs as an important factor that influence ICT integration in schools that is often neglected during policy formulation decisions and implementation of ICT integration programmes in schools. The chapter also states the research problem in which gaps were identified to justify the need for this study. This is followed by the rationale for the study, and the purpose and objectives of the study were clearly stated. The research questions are also outlined and terms used are clearly defined.

Chapter 2: Teachers' Beliefs and ICT Integration in Schools: A Literature Review

In this chapter, a discussion on different components of literature pertaining to understanding teachers' beliefs and experiences of ICT integration in different contexts is presented. The literature review focuses on significant aspects of ICT integration in education and on teachers' beliefs about ICT integration. The review aims to provide a clear understanding of what previous researchers investigated and their findings, in order to locate this study within the field of study. Literature on various efforts to integrate ICT in classrooms in countries across Asia, Europe, USA, Australia and Africa is discussed. Finally, the chapter identifies gaps in the literature that need to be investigated to further expand the body of knowledge about the phenomenon.

Chapter 3: Theoretical and Conceptual Models

This chapter discusses the theoretical frammeworks and conceptual frameworks used to interrogate and critique the ideological assumptions and discourses in the research texts analysed in this study. The study utilises the UTAUT model as a lens to interrogate the data in order to understand teachers' beliefs and experiences of ICT integration in schools. Given that not all the concepts in the UTAUT model are relevant to the study, a conceptual model was designed to capture and explain the four core concepts that relate to this study only. Therefore, the chapter provides a lucid explanation of the UTAUT model and the modified version of the model for the purpose of the study.

Chapter 4: Pathways to Understanding Teachers' Beliefs and Experiences of ICT Integration in Schools

This chapter provides an overview of the research methodology of the study and the rationale for the choices I made in each case. The entire study is guided by the constructivist paradigm that consequently determined the choice of the research design, methods, and instruments for data generation as well as the analytical approach. I adopted a qualitative research approach to conduct the study in order to gain understanding of the research problem. A case study design and purposive sampling techniques are used to select the schools and participants for the study. My choice of the purposive sampling technique in the selection of the research participants and the methods of data generation are discussed and justified. The chapter also presents a detailed discussion on case study design with the rationale for its adoption to explore the phenomenon in the research context. Furthermore, the thematic analysis approach that I considered appropriate for the data analysis is discussed. Data generation procedure and my experiences of the process are captured in detail. Finally, issues of ethical considerations and research trustworthiness are addressed.

Chapter 5: Data Analysis, Interpretation and Presentation of Findings

This chapter focuses on the analysis, presentation and interpretation of the data generated from schools through individual face-to-face and focus group interviews with research participants. A qualitative research approach was solely used in the study to analyse teachers' understanding of ICT integration, their beliefs and experiences of ICT

integration in the classrooms, the nature of ICT integration training, contextual challenges associated with ICT integration in paperless schools and the factors that teachers consider to influence ICT integration in schools. The chapter pays particular attention to teachers' beliefs and self-reported experiences in paperless schools.

Chapter 6: Thematic Discussion and Synthesis of Findings

The focus of this chapter is the thematic discussions and synthesis of findings derived from the previous chapter. The discussion is divided into five major themes that emerged from the data analysis and in accordance with the research questions stated in Chapter 1. This implies that each theme seeks to address a particular research question, however, the discussion goes beyond the themes and deeper into the content of the findings. Themes and sub-themes are discussed in detail and linked the theoretical frameworks and supported with relevant literature. The chapter also presents and discusses the relationships among and between the five themes with UTAUT constructs, which is the theoretical model that served as a lens in the study.

Chapter 7: Overview, Recommendations and Conclusion

This chapter concludes the thesis report with a summary of key findings and implications of the study. This concluding chapter also presents the limitations of the study and recommendations for further studies in the field of discourse.

1.11 Definition of Key Operational Terms

ICT: In this study, "ICT is a combination of networks, hardware and software as well as the means of communication, collaboration and engagement that enable the processing, management and exchange of data, information and knowledge" (DoE, 2004, p. 15).

ICT adoption: This is teachers' decision to accept and utilise ICT as a culture in and out of the classroom for everyday tasks. Adoption implies changing from the norm to something new.

ICT integration: The deliberate, conscious and regular application of ICT devices by both teachers and learners for the facilitation and enhancement of all aspect of teaching and learning processes.

ICT pedagogical integration: is "the appropriate, consistent and sufficiently regular use of ICT that produces beneficial changes in educational practices and improves students' learning. This type of integration implies the routine use of ICTs in the teaching and learning processes" (Karsenti et al., 2009, p. 66).

E-Education: "In the South African context, the concept of e-education revolves around the use of ICTs to accelerate the achievement of national education goals. E-education is about connecting learners and teachers to each other and to professional support services and providing platforms for learning. It supports larger systematic, pedagogical, curricular and assessment reforms that will facilitate improved education and improved use of educational resources such as ICT" (DoE, 2004, p.14).

Innovation: "An idea, practice or object that is perceived as new by an individual or other unit of adoption" (Rogers, 2003, p. 11). Technologies like tablets, smart boards are also a form of innovation.

Beliefs: are "premises or suppositions about something that people feel are true assumptions". Beliefs arise from experiences resulting from the cultural and environmental situations we have faced in the past; therefore, beliefs are contextual (Hew & Brush, 2007; Richardson, 1996).

Experience: I adopted the definition of experience as presented by Mukhari in 2016. Experience "refers to knowledge or skills gained through being involved in or exposed to something over a period of time. It also refers to personal perceptions that arise from a complex interplay among physiological, cognitive and situational variables, which bring about diverse expression of behaviour. It is the purported wisdom gained in the subsequent reflection on those events or interpretation of them" (Mukhari, 2016, p.16).

Teachers' beliefs: In this study it refers to the personal philosophies or theories that teachers hold about education and technology (Ertmer, 2005; Windschitl & Sahl, 2002).

Teachers' experiences: The knowledge or understanding that teachers obtained through practical involvement in or exposure to activities or events while teaching with ICTs in classrooms. These experiences naturally influence teachers' beliefs about the application of ICT in the classroom.

Paperless schools: A concept popularly used within the South African context to denote schools with digital classrooms. It implies a school where the traditional teaching and learning approaches with chalk, chalkboard and physical textbooks in confined classroom spaces have been replaced with electronic digital formants providing unlimited learning opportunities and spaces.

Township schools: "In South Africa, these are schools located in underdeveloped segregated urban areas. Township residential areas in South Africa originated as racially segregated, low-cost housing developments for black labourers to remain closer to their places of employment which are mainly in cities" (Mampane & Bouwer, 2011,p.114).

Urban schools: I adopted the definition of urban schools suggested by Mukhari (2016). In this study "Urban schools refer to schools established for learners living in Gauteng urban areas, mostly in the cities of Johannesburg and Pretoria which are largely inhabited by whites and the affluent. These schools were established as a result of the Bantu Education Act of 1953, which widened the gaps in educational opportunities for different racial groups. Most black urban schools are characterised by lack of facilities, lack of funds, low pass rates and poorly trained teachers" (Mukhari, 2016, p.16)

1.12 Summary of the Chapter

In this chapter I presented a general introduction to the thesis with a detailed background of the study. The background explicitly discussed the need for ICT integration in the schools because of global competitiveness and as a tool for 21st-century development. An account of the South African efforts to follow the global trends for integrating ICT in education that culminated to the publication of the e-education White Paper in 2004 was also discussed. The chapter also gave the reader a broad

perspective of ICT in education so as to gain a general understanding of ICT and its benefits to society and the education system in particular. The various contestations about the area of priority when introducing ICTs into school systems were discussed in the chapter. The chapter also discussed South Africa's "White Paper on e-Education" that forms the basis for ICT integration initiatives that led to the paperless school project in Gauteng and similar projects, like the Khanya project, in the country. The research problem statement, rationale for the research, aims and objectives with corresponding research questions to guide the study are clearly stated. The chapter was concluded with definitions of key operational terms.

The next chapter focuses on the review of related literature on various aspects of the study that will help to illuminate the understanding of teachers' beliefs and ICT integration in schools.

CHAPTER 2

TEACHERS' BELIEFS AND ICT INTEGRATION IN SCHOOLS: A CRITICAL LITERATURE REVIEW

"A deeper understanding of ICT integration in the classroom can be used to bridge the gap between theory and practice in developing new teacher training programmes" – Padayachee, 2017

2.1 Introduction

This chapter presents a review of relevant literature about ICT integration and teachers' belief within the context of the study. The chapter discusses some relevant topics related to the phenomenon under investigation, to locate the study within the various discussions in the field. In addition, the literature review is to identify any research gaps, and understand reasons for the integration of ICTs in South African high school classrooms. The discussions are structured around the scope and meaning of ICT from a broad point of view; An International perspective of ICT in Education, where I presented continental perspectives of ICT policies, programmes and projects from Asia, America, Europe and Africa; ICT in the South African Education System, I also give a detailed description of the introduction of ICT in South Africa from 1995 to date. The review also examines the nature and meaning of teachers' beliefs as a critical component of this study. In this review I discuss teachers' beliefs on teaching and learning in relation to ICT integration in classrooms and the importance of their beliefs to this research project. Given that the study's main focus is on teachers' beliefs on ICT integration in teaching and learning, I appraised and discussed the concept of ICT integration in relation to ICT use in the classroom so as to provide the necessary clarity needed to understand what ICT integration stands for in the research. I also considered it essential to review literature on facilitating conditions for ICT integration, such as administrative and technical support, ICT facilities, infrastructural and other forms of resources, in relation to the UTAUT model that serves as the theoretical lens for the study. Challenges to ICT integration in schools were also incorporated in the

discussions. Gaps were identified in the literature that provoked this study in the South African high school context.

2.2 Scope and Meaning of ICT

A clear understanding of the concept of ICT and ICT integration in classrooms is not only important for successful integration, but is also significant for effective policy and pedagogical decisions and choices. A thorough conceptualisation of the concept helps both education policy makers and implementers to find links between the theory and practice of education, especially in the 21st-century classroom.

Currently, the concept of ICT and its tools is popular, except some parts of Africa and Asia that are yet to witness modern civilisation. ICTs comprise of all the various technologies that aid in the capturing, interpreting, storing and transmitting of information across people and systems. Although it is similar to the initial concept of information technology (IT), ICT is broader in scope because it combines both IT and communication technology, which is a blend of two forms of technology that are interrelated and interdependent (Farhadi, Ismail, & Fooladi, 2012). ICTs are a combination of tools and processes which means that while the technology hardware is in the form of concrete tools, the technology software is in the form of stored information transmitted through communication processed. Considering this, it means ICTs have shrunk distances and brought people closer, creating the concept of a 'global village' (Golovine, 2014; Zembylas & Vrasidas, 2005). In education and classrooms in particular, ICT integration is fundamental to prepare learners for global citizenship that requires sufficient ICT knowledge and skills (UNESCO, 2013; DoE, 2004). To reiterate the importance of ICT, Groff (2013) believes that "the depth and breadth of technologies available today affords learning environments much diversity and opportunity for leveraging ICT as a means for educational change" (p. 3). This implies that transformation in education may be achieved through availability of sufficient and quality ICT in schools. However availability and quality of ICT only does not quarantee good education.

2.3 An International Perspective of ICT in Education

Since the end of the 20th century, the world has witnessed a revolution in education and knowledge production, because of the evolution of ICT (Noor-Ul-Amin, 2013). ICT is influencing the social and political life in all nations, thereby prompting governments in different countries to implement changes in their education system in order to reap the benefits of modern ICTs (Patru, 2006). According to Adomi and Kpangban (2010), "the ability to use computers effectively has become an essential part of everyone's education, and is a determinant of growth and progress in any society" (p.2). Earlier, Lim (2002) posited the need for schools to change learners' perceptions of learning and to make them lifelong learners capable of critical thinking and innovative learning skills, to manage their learning in a technology-driven world. Lim's position implies that the integration of ICTs into the classroom goes beyond making technology tools available, it also includes using them creatively and effectively to promote high-order thinking and generate new knowledge among learners. If this this is the case, it is understandable that the infusion of ICT tools, especially computers and other digital tools became a requirement for teaching, learning and general education (Noor-Ul-Amin, 2013).

The global trend for ICT integration in schools has led to the evolution of new education policies, teaching strategies, instructional designs, packages and teacher training programmes. In many of the European countries like the United Kingdom (UK), Scotland, Ireland, Italy, Greece and Turkey, the narrative about ICT in education and the integration in schools is remarkable. For example, in the UK ICT in education was introduced in the early 1980s when the British government allocated £8 million in the years 1981–1984, to conduct research on how computers could be used in schools. By the 1990s there were computers and Internet connectivity in some British schools and classrooms, resulting in the rapid uptake of ICTs because the government increased funding in education for the acquisition of more ICT hardware and software. Although the UK had no national policy on ICT in schools during the first decade, the adoption of ICT in schools and its subsequent integration into classrooms was possible because of the political will. Wastiau, Blamire, Kearney, Quittre, Van de Gaer, and Monseur (2013) report that, "In the UK both learners and teachers at primary and secondary school level

are expected to use ICT in class in all subjects, and also for complementary activities in all subjects in all countries except Scotland" (p. 14). This means that the use of ICT is compulsory for teachers and learners in UK (Hennessy, Ruthven, & Brindley, 2005), not only in the classroom and school subjects but also in all aspects of the learners' life to promote lifelong learning. This illustrates an understanding of ICT's diversity as a tool of affordance in education.

In Asia, the introduction of ICT in education was successful, especially in countries that are economically vibrant, like Singapore, Taiwan, South Korea and Thailand. Wallet and Melgar's (2014) findings of a study called "ICT in Education in Asia: A Comparative Analysis of ICT Integration and e-Readiness in Schools across Asia" stated that:

> ICT in education in Asia can be viewed from two different perspectives. The first reflects a development discourse that stresses the role of ICT in eliminating the digital divide by reaching the unreached and providing support to those who cannot access essential infrastructure, trained teachers and other quality educational resources. The second perspective adheres to an e-learning paradigm and is a response to the emerging knowledge society where ways of teaching and learning are evolving at a rapid pace to foster learner-centric educational environments, which encourage collaboration, knowledge creation and knowledge sharing. (p. 38)

While countries in Asia are at different stages of integrating ICT in education, however, the first and second perspectives are relevant for all Asian countries. Furthermore, the World Bank (2010) found that "ICT is much more integrated in education in high-income countries, such as the Republic of Korea and Singapore, permitting more time to use ICT in a variety of subjects"(p. 69). The reason for the high usage of ICT in these countries is the availability of technical infrastructure such as telecommunication infrastructure, high broadband, electricity and Internet connectivity. Even though this is the case, it was noticed that "ICT may nevertheless be used occasionally or not at all in many rural and remote schools in Asia, because of limited technical infrastructure and electricity" (World Bank, 2010, p. 66). To ensure a wide distribution of ICT opportunities to school learners, several approaches such as mobile Internet classrooms, radio, television programmes and use of mobile devices are employed to integrate ICT in schools. For example, in countries such as Samoa, Sri Lanka, Afghanistan and Nepal,

the government provides access to ICTs through radio and television broadcasts and computer and Internet classrooms have been made available in schools (Valk, Rashid & Elder, 2010). “Community radio has been used successfully in Nepal, Sri Lanka and Afghanistan to create innovative models for providing educational messages and creating community awareness in rural communities without electricity and telecommunication infrastructures” (Wallet & Melgar, 2014, p.29). These are deliberate efforts of governments to provide access to ICTs in schools in disadvantaged communities.

In the USA the usage of ICT integration in education and particularly in the school system has been existing since the evolution and plorifiration of computers in the society. Many countries relied on the USA for best practices in the use of ICT in the classrooms, because it has been part of their culture (Groff, 2013; Patrick, 2008). Thus ICT integration in education has been supported in schools across the USA through extensive funding since the 1980s, and of interest is that even though “the U.S. Federal Government is not responsible for the funding of primary and secondary schools, it provides as much as 50% of ICT funding for schools in districts across the nation” (Patrick, 2008, p. 1109). This indicates the important role that the national government play in providing ICT in schools, and the ICT policy statements are reviewed from time to time to cater for current ICT needs of schools (Office of Educational Technology, 2005).

Africa is not left out of the global competitiveness as some countries like Morocco, Kenya, and South Africa, to mention just a few, are already making concerted efforts to make ICT a norm in schools through policy and curriculum statements. If the relevant policies, strategies and programmes that have been introduced in South Africa, such as the e-Education policy, Technology Enhanced Learning Initiatives and the Presidential International Advisory Council on Information Society and Development are taken into consideration, they indicate a movement in the right direction for ICT integration in education. These policies do not overlook some political, financial, and social challenges that are experienced, because even though it appears like there is determination and actions by some governments in Africa to infuse ICT in the education systems, the processes are relatively slow because of infrastructural deficits. In Africa,

ICT integration in education systems is confronted with problems such as electricity supply, Internet connectivity and policies that limit the uptake of ICTs in schools (Wallet, 2015; Karsenti et al., 2009). Without using a deficit thinking model about Africa, it is worth mentioning that it is still a developing continent that is characterised by lack of developed infrastructure for ICT integration in education.

Given the above reality, Africa as a continent did not relent in its effort to join the global community in aspiring for a digital society too. Hence, "in response to this under-development, Africa adopted a renewal framework through the New Partnership for Africa's Development (NEPAD), which identifies ICTs as central in the struggle to reduce poverty on the continent" (Nsouli & Funke, 2003, p. 25). A report from the pan-African research agenda on the pedagogical integration of ICTs in schools shows that for most countries on the African continent, the use of ICTs in schools is still characterised by the teaching 'of' ICTs rather than teaching 'with' ICTs (Karsenti et al., 2009). The teaching 'of' ICTs refers to the process of exploring what can be done with ICTs, and involves teaching about the potential capability of ICTs. "It is an operational dimension that refers to the skills that are necessary for the use of ICTs. On the other hand, teaching 'with' ICTs refers to using ICTs to supplement normal teaching processes and resources. It involves stepping into a culture and mind-set that supports the practice of using ICT for educational purposes, regardless of one's level of expertise" (Cassim, 2010, p.20). Thus, it is the conscious, consistent and continuous application of ICTs in the classroom for teaching and learning purposes, and supporting new ways of teaching and learning as an effective means to support curriculum delivery and achieve educational outcomes (Karsenti et al., 2009).

Although ICT may not be a universal remedy to all the problems of education, it has the potential to improve the way teachers teach and facilitate the way learners learn with a greater degree of critical thinking and independence. Some African countries like Namibia, Nigeria, Niger, and Liberia are still struggling to find their feet in the global space of ICT in education, because they don't have full access to technologies for educational purposes. Thus, the current challenges in Africa, where ICT integration in

schools is low or non-existent, require empirical research to understand the factors responsible for the lack and/or challenges of integrating ICT into schools. Similarly, Petko (2012) was of the view that given the high level of confidence vested in the capability of ICT, educational researchers need to investigate and resolve possible contextual factors responsible for the slow rate of ICT integration in schools. Particularly, researchers need to examine why many teachers remain opposed to integrating digital technologies in their classroom teaching. Although it can be assumed that teacher training or lack thereof play a role in the success of ICT integration in schools, as posited by some scholars (Petko, 2012; Tedla, 2012), it is not scientifically proven beyond conceptual assumptions.

In conclusion, it is evident that countries that successfully integrated ICT in schools had strong policies that supported the introduction and implementation of ICT integration in schools. Even though South Africa may be considered to be in the league of countries making deliberate and concerted efforts towards ICT integration in schools for development, it is confronted with peculiar limitations given its history of apartheid.

2.3 ICT in the South African Education System

Mncube (2008) acknowledged that the apartheid regime in South Africa was characterised by social, economic and educational inequalities until 1994 when South Africa became a democracy. Most schools, especially in the townships and rural areas of the country, are historically disadvantaged in terms of basic infrastructures like water, electricity, communication, health and roads. Schools in black areas fell under the Bantu system of education that placed them at a disadvantaged position in terms of access to good educational opportunities compared to their white counterparts in cities (Tambe-Endoh, 2015; Mncube, 2008). The emergence of democratic rule brought about revolutionary changes in all spheres of life for the citizens, particularly in the education system where all forms of discriminations were abolished (Joubert, 2014). Since 1994, both national and provincial governments made deliberate plans to provide equal opportunities to all citizens through education, which brought about radical transformation in the governance of education, educational policies, curricular reform and teacher professional development in the South African educational system (Isaacs,

2007). Nevertheless, the quest for ICT integration in education remains a laudable ambition since the 1990s, as is evident in the different programmes and projects that have been initiated to infuse computers into South Africa's school system. As mentioned in chapters one, these initial efforts were strongly supported by non-governmental organisations and the private sector, particularly Internet service providers and other telecommunication companies such as Vodacom, Telkom, MTN and Mindset Network.

Although the initial attempts to introduce computers in schools were met by challenges of disparity in school infrastructure due to apartheid segregation of schools, the South African national government released a White Paper on e-Education policy in 2004. The aim of the White Paper on e-education is to transform teaching and learning in schools through ICTs; perhaps it was also to consolidate the earlier initiatives and projects that were introduced in 1995. Blignaut, Hinostroza, Els, and Brun (2010) adequately captured some of the provisions of South Africa's White Paper on e-education policy published in 2004 as follows: This policy "supports larger systematic, pedagogical, curricular and assessment reforms that will facilitate improved education and use of educational resources such as ICT" (p. 14). While this policy statement seems convincing, it overlooks the teacher and contextual issues such as socioeconomic and sociocultural issues that significantly influence the success of policy implementation. The policy statements consider the general perspectives of schools, however, appears not to consider the peculiarities of the South African context where schools are characterised by resource disparities. This study acknowledges the disparities between schools in terms of community context, resources, socio-economic status of parents and learners, and teacher ICT competence and confidence that directly or indirectly affect ICT integration in schools (Bayat, Louw, & Rena, 2014; Afshari, Bakar, Luan, Samah, & Fooi, 2009).

It is worth noting that in South Africa, provinces are responsible for funding and implementation of national policies on e-education. Of the nine provinces in South Africa, the Gauteng province is known for its leading role in ICT integration in schools, a

reason it has the highest cluster of ICT in South Africa. According to statistics published in the Gauteng ICT Development Strategy Draft (2015), Gauteng accounts for 57% of the country's ICT industry. The ICT sector in the province contributes more than 6% to regional GDP, followed by the Western Cape Province with 18%; KwaZulu-Natal contributes 8% and the remaining six provinces together contribute 18%. This means Gauteng controls more than half of the total broadband in South Africa, thereby placing their schools at an advantaged to enjoy Internet facilities and bandwidth. This is evident in its continued investment in ICT infrastructure for education and by rolling out ICT integration projects in schools across the province. The Gauteng provincial government has allocated R17 billion for the roll-out of ICT tools for integration in schools across the province for a five-year period (2015–2019). This is a giant stride towards achieving the country's e-education goals, especially when compared to other provinces.

As mentioned earlier, prior to the launch of the e-education policy in 2004 by the national government, the Gauteng provincial government had already initiated the Gauteng Online programme in 2002 through the GDE. The key objective of the programme was to create a sustainable school-based e-learning environment, where learners could maximise their educational experience (Gauteng Province, 2015). In 2017, the Gauteng provincial government rolled out infrastructures (digital tablets, laptops and interactive whiteboards) into selected pilot schools to start the paperless school programme in order to digitalise classrooms. At the launch of the Wired for Life project in 2017, the Gauteng MEC of Education stated, "This is a hugely important project, because it aims to ensure that youth in South Africa have equal access and opportunities to 21st-century tools—and seeks to enable learners to compete in a highly competitive global marketplace" (Lesufi, 2017). The MEC's remark about the aim of the project may be considered ambitious, given the disparities that already exist in schools in terms of infrastructure, facilities and teaching manpower.

Given the above profile of South Africa and Gauteng province in particular, this research seeks to explore and understand teachers' beliefs and experiences of ICT integration in some of the piloted paperless high schools in Gauteng province.

2.3.1 Past and Current Education ICT Initiatives in South Africa

In South Africa several initiatives in the form of policies, programmes and projects have been established to infuse ICT into the South African education system down to the classroom level. However, only some of the initiatives like the Khanya project in the Western Cape Province and Gauteng Online project in Gauteng lasted and remained sustainable. Other initiatives like South Africa's first free-access 'digital village', an initiative coordinated by Microsoft in conjunction with local computer companies and U.S. development organisation Africare, were not sustainable because of lack of continued funding and the host communities' failure to make the use of technology self-sustaining. Today there is little evidence of the 'digital villages' across South Africa (Cave, 2013).

Wallet (2015) described policies as documents that set out the principles, guidelines and strategies for planning and action, usually issued by government, to achieve collective goals set for the country. South Africa has witnessed shifts in education policy since 1994 to redress inequalities and provide access to the majority of learners. This included the designing of ICT or e-education policies to make ICT an integral part of classroom teaching and learning resources. Several ICT policies, initiatives and projects were proposed and implemented in South Africa since the 1990s. According to Dlamini and Na-Allah (2015), "over 20 different government initiatives and projects to integrate ICT tools in schools have been implemented, including the flagship projects Khanya and Gauteng Online"(p.170). Some of the latest ICT integration initiatives at national and provincial levels in South Africa include Operation Phakisa, which focusses mainly on ICT in education, and the paperless school project in the Gauteng province. Both the national and Gauteng provincial initiatives advocate for pedagogical integration of ICTs to promote higher order thinking among learners in schools. It is expected that the new education goals enshrined in the policies, ICT resources, and contemporary teaching and learning strategies outlined in the Curriculum Assessment Policy Statements (CAPS) will provide opportunities for learners to develop critical thinking skills for adulthood.

Operation Phakisa is “a development-driven programme aimed at improving performance in various sectors of the South African state” (Odendaal, 2015, p.1). The programme was first unveiled in 2014 at the inaugural implementation of the Oceans Economy Phakisa segment. In October, 2015, Operation Phakisa education was launched to radically transform South Africa’s basic education sector and leverage ICTs in schools, so as to improve teaching, learning and administration of the whole education system. It is worth noting that prior to the introduction of Operation Phakisa, several programmes and projects aimed at infusing technology into the education system to improve education delivery in schools were in place. Tables 2, 3 and 4 describe some of the important policies, programmes and projects that preceded the current Operation Phakisa education programme.

The vision of Operation Phakisa is to guide and fast-track the integration of ICT through connectivity in schools for effective teaching and learning (Kwet, 2017; Meyer & Gent, 2016; Odendaal, 2015). Unlike some previous South African ICT in education initiatives, Operation Phakisa convened several key stakeholders and decision makers. The purpose was to produce comprehensive and determinate plans as well as timelines for the placement of ICTs in schools in the following main streams: Digital content and curriculum, ICT teacher professional development, e-administration, IT lifecycle management, and connectivity (Meyer & Gent, 2016; Odendaal, 2015).

The identity of the stakeholders is not mentioned in particular but an audit of major ICT in education projects in South Africa reported on about 34 different collaborative ICT initiatives between the government and various businesses and/or organisations (George, 2015). Considering the collaborations, it is concerning that townships and rural schools seem to be behind in ICT developments, a process that needs to be prioritised. Also, considering the scope of this thesis and the number of ICT initiatives identified and undertaken at different levels in the country, it is not within the scope of the thesis to discuss all the initiatives in detail. However, Table 2 presents a summary of the various initiatives at different levels of government.

Table 2:

Broad Government Initiatives in ICT in Education

Year	Initiative
1995	Identification of the need for a technology-enhanced learning initiative (TELI)
2004	National policy on ICT in education (White Paper on e-Education) is gazetted, seven years after the draft policy was written (Howie, 2010)
2005	*Managing ICTs in South African Schools: A Guide for School Principals* is published to support the implementation of the White Paper on e-Education in schools (Bialobrzeska & Cohen, 2005)
2007	The national government publishes *The Guidelines for Teacher Training and Professional Development in ICT* to support the implementation of the White Paper on e-Education (Hindle, 2007)
2008	The government announces the Teacher Laptop Initiative
2010	The government launches the Teacher Laptop Initiative a year behind schedule
2015	Operation Phakisa is launched. Aimed to radically transform South Africa's basic education sector and leverage ICTs in schools to improve teaching, learning, and administration of the whole education system

Source: George, 2015

Table 3 focuses on some of the major national government collaborative initiatives with the private sector towards ICT provisioning and integration in schools. These initiatives involve collaborations between the national government and the private sector, parastatals and non-governmental organisations. The government understands that it cannot adequately meet the ICT needs of all the schools in the country, hence the collaboration with the private sector.

Table 3:

Collaborative Initiatives between the National Government and Private Organisations

Initiative	Area of Development
Sentech Ltd.	Improved infrastructure and connectivity
Telkom Internet Project (Supercentres)	Improved infrastructure and connectivity
Mindset Network	Provision of electronic content resources
Thutong Portal	Provision of electronic content resources
SchoolNet SA's Educator Development Network	Professional development
Intel Teach to the Future	Professional development
Microsoft Partners in Learning	Professional development

Source: George, 2015

Table 4 focuses on two major provincial collaborative initiatives in the country: The Khanya project in the Western Cape Province and Gauteng Online in the Gauteng province. These two initiatives still remain the most outstanding programmes and shape any subsequent ICT integration in schools in the country till date.

Table 4:

Two Major Provincial Collaborative Initiatives in ICT in Schools

Province	Project & Business partners	Launch & End dates	Aim
Western Cape	Khanya Project: Western Cape Education Department, Technology in Education Project	2001–2012	To supply ICT equipment to schools for the purpose of curriculum delivery (Khanya annual report for the period March 2007–April 2008, 2008).
Gauteng	Gauteng Online: Gauteng Education Department, Accenture, KPMG, and Ernst & Young	2002–2013	To equip public schools in the province with a 25-workstation computer laboratory, Internet, and email to be used for curriculum delivery.

Source: George, 2015

2.3.2 The e-Education White Paper as a National Aspiration

This section engages in detail with the e-Education Policy White Paper as an important policy for ICT integration in South Africa since 2004, to understand the role it played and continues to play in integrating ICT in schools. When countries seek education transformation through ICT integration, ICT policies precedes ICT integration in schools as it provides a framework for ICT integration in schools and also motivates teachers to adopt ICTs for effective change in the education system (Toit, 2015). This study acknowledges that most policies are driven by political motives and designed by politicians, and most education policies are implemented by teachers who are not part of the policy decision-making organ (Gandhi Kingdon et al., 2014). Therefore, teachers' responses to ICT policy implementation in schools could determine the successful implementation or lack thereof the policy. Teachers often resist policy-based change as they perceive it as imposed from outside without their input or participation, (Tyack & Cuban, 1995) and teachers in South Africa are no exception.

In South Africa, the White Paper on e-Education (2004) outlined the elements of transformed learning and teaching through ICT, and was supported by the publication of

"The Guidelines for Teacher Training and Professional Development in ICT" (Hindle, 2007) that provided guidelines for teacher professional development in ICT and educator competencies within a developmental framework. The White Paper is also supported by the publication of a guide for school principals to manage ICTs in South African schools, which is designed to provide principals and senior school management with information on using and managing ICT resources (Bialobrzeska & Cohen, 2005). The guide for school principals (Bialobrzeska & Cohen, 2005) also considers some implications of the use of computer and related resources for teaching and learning, which are important to ensure effective teaching and learning. In spite of this policy, guidance and support provisions, ICT integration in schools still faced a myriad of challenges. Yee (2000) claimed that some school principals cannot provide the needed leadership in ICT management because of poor funding and infrastructure in addition to their poor attitudes, knowledge and skills required to manage ICTs in their schools. This is evident in some of the schools that participated in this study where the principals lack the capacity to propel teachers to integrate ICT in their classrooms. These schools are deficient in ICT facilities and manpower too. In contrast, some of the schools that have ICT infrastructure and facilities carry out regular training for teachers and encourage them to integrate ICT in the classroom.

Besides, the e-education White Paper remains the single most referenced document in the discourse of ICT integration in South Africa because of its goal: "Every South African learner in the general and further education and training bands will be ICT capable (that is, use ICTs confidently and creatively to help develop the skills and knowledge they need to achieve personal goals and to be full participants in the global community) by 2013" (DoE, 2004, p. 17).

Considering that the current study was started in 2015 and the above mentioned goal was supposed to be achieved by 2013, based on evidence in schools, this cardinal e-education goal has not yet been achieved due to multiple factors. Findings of previous studies (Wallet & Melgar, 2014; Adomi & Kpangban, 2010) show that although the provision of policy and ICT infrastructure is important to ICT integration, it does not guarantee ICT integration in schools due to various factors. In South Africa, and the Gauteng province in particular, considering the nature of the majority of schools and

learners' socio-economic background, it remains unclear how the country intends to address the multifaceted factors that could potentially hinder the achievement of the ICT integration plan as discussed in Chapter 1. As stated earlier, ICT is relatively new in the South African education landscape and the majority of older teachers teaching in schools received their training when modern ICT tools and facilities were not in place for use in institutions that trained them to be professional teachers (Mukhari, 2016; DoE, 2004). Thus, this cohort of teachers might lack the required competence and confidence to work with ICTs in the classroom, especially because learners could be more knowledgeable than them.

In addition, individual teachers hold certain beliefs about innovations and the teaching profession, and these beliefs are informed by their personal formal knowledge, schooling, and instructional experiences (Hannula et al., 2016). These beliefs might exert significant influence on teacher's thinking and practices in paperless classrooms, which could further manifest in their attitude and instructional choices in the classroom (Fives, Lacatena, & Gerard, 2015). The establishment of ICT policy prior to integration is an important step, but like training, it does not in any way ensure the implementation of ICT integration in the classroom. In order to achieve success, policies must be supported with relevant resources through effective training, provision of infrastructure, facilities, and tools. For example, in Nigeria, even though there is an ICT policy in place and steps are taken to ensure availability and utilisation of ICTs at all levels of school, the uptake of ICTs in schools is still low (Adomi & Kpangban, 2010). This means that policies need to go beyond mere statements in a document, they should be supported by relevant frameworks and funding for effective implementation. In reviews of a number of educational policy statements in East African countries, Psacharopoulos (1989) stated that "the reason most educational policies are not implemented is that they are vaguely stated, and the financing implications are not always worked out" (p.178). It is practically difficult to implement policy statements that appear to be unclear and without clear cost implication for implementation.

Policies also fail when teachers resist policy-based change that they perceive as imposed from external sources without their contribution or participation (Tyack & Cuban, 1995). Because teachers are the implementers of most education policies, they

must be considered important stakeholders in every education matters. Teachers often get frustrated when forced to implement what they feel is alien to their understanding and practices in schools. This is why they need to be part of education policy formulation. This seems to depict the situation of the current paperless schools project in South Africa being investigated in this study where teachers were presented with the project to implement without prior consultations. Details of this will be discussed in chapters five and six as one of the challenges that confronted the implementation ICT integration in paperless schools.

Another reason for the failure of some education policies in schools is that some policies seems not to be related to teaching and learning, for example if policy focuses on ICT resources rather than their relationship to pedagogy. This suggests a disconnection between policy provisions and the actual practices used in schools to implement policy. It is essential that policy statements should explicitly link to classroom practices so the teachers can see the relationship between the policy statements and what they are doing or expected to do in the classroom. When this is done, policies will not be regarded as alien by teachers.

Sometimes policies fail when teachers are not given the opportunity to learn about the policy and its instructional implications (Messiou, 2012; Teodorović, 2008; Psacharopoulos, 1990). This usually occurs when policies are hurriedly introduced and implemented without given adequate time and consideration for teachers to comprehend the policy provisions before implementation. Evidence of such discrepancies in the processes of introduction and implementation of ICT in schools in South Africa was the launch of the Teacher Laptop Initiative, which the national government launched a year behind schedule in 2010 (George, 2015).

Another reason for the failure of education policies is “lack of programme and resource alignment to the policies’ intentions” (Cohen & Hill, 2001, p. 66). As earlier cautioned by Wallet and Melgar (2014) and Psacharopoulos (1989), educational policies must not be stated vaguely as mere symbolic gestures. Policies must align with educational resources and teacher pedagogical practices. I also add that policies must consider and align with teachers’ educational beliefs because teachers’ beliefs influence teachers’

choices and actions concerning teaching, learning and pedagogical practices in the classroom. The South African White Paper on e-education believed and clearly stated that:

> As in other spheres of social and economic development, ICTs have the potential to improve the quality of education and training if properly harnessed and integrated in schools for professional manpower production. It is for this reason that government has been quick to seize the opportunity presented by the affordances of ICT to teachers and learners in supporting teaching and learning in the twenty-first century. (DoE, 2004, p. 8)

It is in the spirit of pursuing the national e-education policy goal that the Gauteng provincial government embarked on the paperless schools project in 2015. The project is aimed at providing opportunities to teachers and learners to benefit from the practical benefits of ICTs to support teaching and learning in their schools.

2.4 ICT Affordances in Education

The evolution of ICT has contributed to positive changes in almost every field of endeavour in society, yet there is limited empirical proof about the affordances of ICT in the field of education. Conole (2004) claimed that not much is understood about the 'affordances' of different technologies, especially about how the properties of ICT might be exploited in learning and teaching contexts, despite increasing research into the use of ICT in education. Before delving into discussions about the affordances of ICT in teaching and learning, it is imperative to discuss the origin of the concept 'affordance' and explain its use in this study. The concept of affordance was first conceived and introduced in the literature in 1986 by Gibson, describing what an environment can offer to the objects around it. According to Hammond (2010) "affordance is all about the relationship between an organism and an object, with the object perceived in relation to the needs of the organism" (p. 1). This means the benefits that can be derived by both living and non-living objects from an organism in the environment. The benefits may be intended or not intended for the objects but by virtue of the object being in the environment will benefit from the organism.

In this study, the concept implies the properties of ICT that it offers to its users, especially teachers and learners performing their teaching and learning activities in

schools. In other words, it is the relationship between technologies and teachers, learners and other users in schools. This links with Norman's (1998) definition of affordances as "the perceived and actual properties of the things, primarily those fundamental properties that determine just how the thing could possibly be used" (p. 9). Thus, affordance in the area of ICT integration is that it consists of properties that are perceived to be useful in the classroom. Conole and Dyke (2004) stated that "a better understanding of the nature and properties of technologies will lead to a more systematic application of the use of ICT for learning and teaching" (p.10). The authors presented a seminal work that suggested taxonomy of ICT affordances based on of Norman's (1998) definition of affordance, which is useful to make informed decisions about the use of different technologies in education. The recommended taxonomy of ICT affordances outlined below are important to this study, because they provides a wide range of options that ICT can offer to the field of education but is not known to teachers at various levels of the school system.

Accessibility: offers relatively easy access to vast amounts of information through a variety of different mechanisms. However, free and easy access to the vast amounts of information has led to challenges of information overload and quality assurance. Selecting relevant information from online sources is a problem, especially for learners (Conole & Dyke, 2004). In the context of this study, teachers can access education information and other types of resources that are of educational value, and opportunities for teachers to update their lesson notes and give the latest information to learners. Teaching and learning is enhanced when teachers can access new information to enrich their teaching methods and content.

Speed of change: address the rapid speed of change associated with information, materials and events, making it possible to be up-to-date with happenings around the world. Information and events are viewed and accessed almost as they occur (Conole & Dyke, 2004). This could be frustrating for the teachers if not handled appropriately; nevertheless it is advantageous in keeping teachers up to date with new resources and global information on subjects being taught in the classroom.

Diversity: Gaining exposure to other people's experiences is considered a basic ingredient to effective learning, and this is possible through simulations of complex processes, access to discipline experts, websites, and soft learning packages (Conole & Dyke, 2004). In this study teachers can use ICT to meet the needs of various categories of learners in the classroom, and share information with fellow teachers within and across schools.

Communication and collaboration: is about offering unlimited access to people and knowledge sources through communication, and allows effective and efficient communication across physical boarders. New forms of dialogue and online communication are made possible, thereby fostering information sharing and collaborations (Conole & Dyke, 2004). This attribute of ICT provides teachers with opportunities to communicate with learners and colleagues in more effective and efficient ways in this study.

Reflection: provides the opportunity for deep reflections about knowledge, events and learning. Learners can critique and evaluate content by reflecting on what they have learned (Conole & Dyke, 2004). One of the goals of integrating ICT in the classroom is to promote critical and higher order thinking in not only learners but also in teachers, changing the way they select, prepare and present content to learners.

Multimodal and non-linear: The web is non-linear by design and provides different routes to learning, allowing learners different routes and platforms to achieve learning. This consequently, enables learners to move beyond linear pathways to learning. (Conole & Dyke, 2004).

Risk, fragility and uncertainty: This refers to the degree to which an ICT tool has associated unintended consequences, and the extent to which these are explicit (Conole & Dyke, 2004).

Immediacy: In view of the speed and flexibility associated with ICT, it is possible to respond to communication almost immediately. This singular attribute of ICT has made

communication and work more effective and efficient than in the past, because messages are now sent and received promptly. The bedrock of any teaching and learning process is communication therefore; ICT makes the teaching and learning process more effective because immediate feedback is possible (Conole & Dyke, 2004).

Monopolisation: The convergence and divergence of modern technologies of information and communication have led to globalisation. Knowledge is now diversified and accessible with minimum barriers (Conole & Dyke, 2004).

Surveillance: With ICTs in place, teachers can now monitor learner's activities more closely than ever before. Individuals and organisations can use tracking devices, cameras and other forms of technologies for surveillance and security checks (Conole & Dyke, 2004). The affordances that ICT offers to teachers and learners in the school environment are many and varied.

In the literature several scholars have reported some affordances as benefits of ICT in teaching and learning (Telkom, 2015; Blasco-Arcas, Buil, Hernández-Ortega, & Sese, 2013; Mdlongwa, 2012; Daniel, 2001). For example, in South Africa, Telkom (2015) claimed that:

> When ICT is implemented well in a school or any other learning environment, there are two major benefits. First, it benefits the learners as the technology can become an invaluable learning tool in the classroom. Second, it benefits the educators and other staff in the school as it provides administrative tools that can streamline the entire running of the educational institution. Some of the benefits to students include: increase in motivation, increased active participation and creativity, improved knowledge and skills, increased collaboration and increased responsibility to learning and self-esteem. Some of the benefits to staff and teachers include: Easier record keeping and access, reduced incidences of records lost due to misfiling, lower administrative costs and less paper wastage, easier communication between staff within and across schools and curbing exam paper scams. (p. 6)

As argued and succinctly captured in the quote above, the affordances of ICT in schools is diverse, affecting teachers, learners and administrative staff. ICT affords every member of a school community the opportunity to perform their task with ease and confidence. These positive attributes of ICT have remained an attractive force to many stakeholders in the education sector. ICTs are needed to be integrated into classrooms for improved teaching and learning in schools.

The assertion in the quote also corroborates the findings of this research presented in Chapter 5 and discussed in Chapter 6. It also confirms the findings of previous studies on e-learning in Africa. The e-Learning Africa Report 2012 surveyed the e-learning experience of 447 e-learning professionals and a range of other stakeholders from 41 African countries, and the findings revealed several benefits of ICT in schools (Mdlongwa, 2012).

In spite of the many affordances that ICT seems to offer the education system, especially in teaching and learning activities, there are limitations associated with the use of ICTs in schools. However, these limitations are often relative to the context of ICT use. For instance, what may be regarded as an affordance for ICT users in Singapore may not be an affordance to another user in Kenya because of difference in contexts. This implies that what may be considered beneficial for applying ICT in teaching and learning in one context may be a limitation to learning in a different context. Some of the limitations of ICT in education are discussed in Section 2.6 as challenges to ICT integration in schools.

2.5 Conception and Meaning of ICT Integration in the Classroom

> Conceptions are more general mental structures, encompassing beliefs, meanings, concepts, propositions, rules, mental images, preferences and the like … conceptions represent different categories of ideas held by teachers behind their descriptions of how educational things are experienced. (Brown, 2004, p. 303)

The above quotation presents a comprehensive representation of the complexity, depth and diversity associated with people's conception of ICT integration in the classroom. It shows how relative (depending on context) and subjective (depending on perspectives) conceptions can be depending on a persons' perspective contextual reality. Given the

complexity and diversity of conceptions, this study considers it necessary to address teachers' conceptions of ICT integration. Hence, the first research question in this study seeks to explore teachers' understandings of ICT integration in the classrooms.

There are different notions, meanings and usage of ICT integration concept among school teachers and researchers in relation to their individual perspectives. The disparities may be due to the difference in experiences, contexts and training opportunities that teachers are exposed to during pre-service and in-service programmes. According to the theory of social constructionism (Berger & Luckmann, 1966), people construct meanings of reality in the form of objects, events or issues from their personal or group interactions with other people in their social setting. This suggests that the meaning teachers give to ICT integration in the classroom is relative to their experiences and socially constructed from their social groups, social contexts, training workshops and personal access to knowledge of ICTs.

The concept of ICT integration is critical to this study because it is the basis on which the paperless school project was founded. This project is interested in how ICT can be successfully integrated into classroom to enhance teaching and promote learning in schools. The study is interested in exploring teachers' beliefs about the integration processes and their experiences of it during implementation in their respective classrooms. Unfortunately, ICT use and ICT integration are two concepts that are often perceived as interchangeable; hence, authors often use the two concepts interchangeably to describe or discuss the application of ICTs in classroom teaching and learning. Even though the concepts are similar in application, they do not have the same meaning and implication in the classroom context: ICT integration has more depth and implication than ICT use. The latter focus on utilisation of a different ICT tools to create, communicate, disseminate, store, retrieve and manage information, the former, which is important for the study address the teacher's innovativeness to make the delivery of lessons more meaningful, in order to improve the quality of teaching and learning so as to provide learners with 21st century skills.

According to Wilson-Strydom, Thomson and Hodgkinson-Williams (2005), the use of ICTs implies the placement of physical tools such as computers and other related

technologies to support the teacher in the classroom. This implies that the tools are made available in the classroom to serve as aid to the teacher in the delivery of lessons. The acquisition of ICT knowledge and skills is not embedded into the lesson rather "ICT skills are taught as a distinct activity, 'just-in-case'" Thus using technology is a random and sporadic process whose main goal is to instruct students on content and not to engage them with content. (Wilson-Strydom, Thomson & Hodgkinson-Williams 2005, p. 2). ICT integration, according to Wilson-Strydom, Thomson and Hodgkinson-Williams is about planned and systematic continued use of ICT tools in teaching and learning beyond the classroom environment. It involves the application of ICTs in all teaching and learning processes, from lesson planning to formative and summative assessment of learning. Wilson-Strydom, Thomson and Hodgkinson-Williams stressed that the integrated approach places ICTs in a critical role in transforming learning process. Here students learn with or through ICT devices in the classroom. Therefore, "ICT skills are acquired 'just-in-time' in the context of the activity that is meaningful to learners" (Wilson-Strydom, Thomson & Hodgkinson-Williams p.2). ICT integration entails effective use of ICT tools to teach and learn.

Although ICT use is mentioned several times in this thesis, the focus of the study is on ICT integration in the classroom. The study is concerned with ICT integration in the classroom as planned, structured and purposeful use of technology with students, and the ultimate goal is to engage and help students develop new thinking skills. In this study, I described ICT integration as regular application of ICT tools to facilitate learning and enhance teaching throughout all aspects of the instructional process. Therefore it involves a pragmatic application of ICT tools by both the teacher and learners in the classroom.

Historically, the concept of ICT integration started because of the state of dissatisfaction with the teaching and learning outcomes in schools. It was a response to the early introduction of computers in schools where much emphasis was placed on literacy, skill and use of computer applications in the schools (Wilson-Strydom, Thomson & Hodgkinson-Williams, 2005) instead of using them for pedagogical purposes. The increasing number of computers and other forms of digital technologies in schools are causing a shift in the focus of ICT integration, and learning is now seen as the primary

objective of ICTs in the classroom. As mentioned earlier in the chapter, UNESCO (2004) describes the concept of ICT integration as the process of "using computers to learn rather than learning to use computers" (p. 45). Recently, it has been observed that the integration of ICT tools into classroom teaching is becoming essential and inevitable, considering the influx of modern technological (Rabah, 2015). The above assertion is debatable because even though there is a general quest for ICT integration into classrooms, there seems to be no clear understanding of the type of integration that is most beneficial to teachers and learners.

Nevertheless some scholars have attempted to distinguish between the different kinds of ICT integration in the classroom. For instance, Raby (2004) distinguished between two different types of ICT integration, namely physical integration and pedagogical integration. According to Raby, physical integration entails the provision of technological equipment to teachers and students and promoting its use for occasional pedagogical needs. This means that physical integration of technology leads to the simple introduction and/or deployment of technologies in a school for use whenever there is a need to use gadgets in the teaching process. The physical integration of ICT appropriately describes the ordinary use of ICT in the classroom. In contrast, the pedagogical integration of ICT into schools means the appropriate, habitual and sufficiently regular use of ICT that produces beneficial changes in educational practices and improves students' learning (Raby, 2004). Pedagogical integration is a more holistic form of integration because it is more broad-based and learners can learn and socialise through a multitude of interactive and communication channels, it is not mere physical integration, which is nonetheless imperative (Karsenti et al., 2012). Physical integration is also imperative because communication, storage and retrieval of information are an important aspect of school management and administration; hence the need for ICT tools not only for pedagogical purpose but for other uses in school.

Many practicing teachers wrongly think that pedagogical integration of ICT is the simple provision and use of ICT tools in the school. It is also worth mentioning that the pedagogical integration of ICT does not rest only on the implementation of networks and infrastructure, but also on the effective use of innovative technological techniques like cloud computing and networking to enhance instructional processes within the school

and beyond. However, the concern for this study is limited to examining teachers' beliefs on the pedagogical integration of ICT within the classroom, i.e. in a context where the role of the teacher is observable and accessible for observation. In summary, the real essence of pedagogical integration of ICT in schools is captured by Earle (2002):

> Integration is not defined by the amount or type of technology used, but by why and how it is used. Technologies must be pedagogically sound, they must go beyond information retrieval to problem solving: Allow new instructional and learning experiences not possible without them; promote deep processing of ideas; increase student interaction with subject matter; promote faculty and student enthusiasm for teaching and learning and provide time for quality interaction space and on the whole improve the pedagogy. (p. 7)

The quote stresses that contrary to the understanding of many authors and ICT users, it is the quality of ICT application in teaching that benefits the teacher and learners and not the amount of ICT tools in the classroom. An assemblage of different ICT tools combined together in the classroom does not guarantee effective use; rather, teachers and learners get the most benefits out of ICTs when they are well harnessed through appropriate selection and application for the right predetermined objective in the classroom.

The concept of ICT integration in schools has drawn the attention of researchers all over the world and it is still continually being studied (Almekhlafi & Almeqdadi, 2010). A number of studies, programmes and projects have been conducted at different levels on various aspects of ICT integration with the aim of improving teaching and learning in schools and to meet the requirement of active participation in all affairs in the current digital world (Anderson & Maninger, 2007; Gulbahar, 2007; Karsenti et al., 2009). However, the notion and vision of ICT integration in education are as diverse as the scholars advocating and promoting it in schools. The divergent views about the concept are not unconnected to the diversity of reasons for the integration. This calls for an understanding of the different categories of ICT integration in the classrooms based on the purpose of their integration in the classroom. Table 5 provides delineation between

using technogy and technology integration in the classroom in order to dispel the usual misconceptions about the two concepts.

Table 5:

Differences between Technology Use and Technology Integration

Technology Use	Technology Integration
Technology usage is random, arbitrary and often on an afterthought	Technology usage is planned and purposeful
Technology is rarely and sporadically used in the classroom	Technology is a routine part of the classroom environment
Technology is used purely for the sake of using technology	Technology is used to support curricular goals and learning objectives
Technology is used to instruct students on content	Technology is used to engage students with content
Technology is mostly used by the instructor(s)	Technology is mostly used by the student(s)
Focus is simply using technology	Focus on using ICT to create and develop new thinking processes
More instructional time is spent learning how to use the technology	More instructional time is spent using the technology to learn
Technology is used to complete lower order thinking tasks	Technology is used to encourage higher order thinking skills
Technology is used solely by individuals working alone	Technology is used to facilitate collaboration in and out of the classroom
Technology is used to facilitate activities that are feasible or easier without technology	Technology is used to facilitate activities that would otherwise be difficult or impossible
Technology is used to deliver information	Technology is used to construct and build knowledge
Technology is peripheral to the learning activity	Technology is essential to the learning activity

Source: TeachBytes, 2013

2.6 The Nature and Meaning of Teachers' Beliefs

Belief is a complex concept to understand because of its emotive nature that cannot be determined by empirical means, except as it is expressed. Belief is inherent in the person and is developed over time as a result of experiences within contexts, which mean they are a set of convictions that a person holds due to accumulated experiences over time. Belief is strictly personal and internal to the person that holds it except when expressed in words or actions, it may not be predicted. Pajares (1992) posited that "the difficulty in studying teachers' beliefs has been caused by definitional problems, poor conceptualizations, and differing understandings of beliefs and belief structures" (p. 307). In this study, the complexity of belief as a concept is taken into consideration,

as different understandings in the literature are presented. Borg (2001) define belief as "a proposition held consciously or unconsciously, is evaluative (accepted as true by the individual), and is imbued with emotive commitment influencing their actions" (p. 186). Bingimlas and Hanrahan (2010) extended the definition of belief as "individual's judgment of the truth or falsity of a proposition, a judgment that can only be inferred from a collective understanding of what human beings say, intend, and do" (p. 316). The definitions highlight the individualistic and emotive nature of belief that makes it difficult to generalise. This means that only qualitative methods of inquiry can be appropriate to ascertain beliefs through personal interactions, like interviews with persons that hold the beliefs.

It is important to understand teachers' beliefs about ICT integration in schools, because their "judgements" and use in the classroom is significant in determining the success in education. Considering the emotive nature of beliefs and that it is a determinant to commitment or lack thereof, it is important to gain insight into teachers' views about ICT integration in the classroom as a global approach. The authors (Clark & Peterson, 1986; Munby, 1982) stated that teachers' theories and beliefs make up an important part of teachers' general knowledge through which they perceive process and act upon information in the classroom. Similarly, the findings by Mansour's (2008) state that beliefs control the gaining of knowledge, but knowledge also influences beliefs and the former can strengthen or weaken beliefs. This means that teachers' beliefs are developed from knowledge, experience and their physical and social environments, confirming the influence of socio-cultural context on the belief systems of people. Wang (2016) also explained that context plays a major role in forming teachers' beliefs, because the physical and social contexts or environment where teachers work or reside make up their beliefs and is especially potent for defining tasks and organising relevant knowledge. Thus, interrogating what teachers say about the role of ICT in general and ICT integration in the classrooms specifically; how they say it; and their reasons for saying it, is important, because it could shape teachers' actions and/or inactions. Scholars (Hannula et al., 2016; Richardson, 1996) agree that teachers' beliefs originate from three major sources, namely personal experience, schooling and instructional experiences, and experience with formal knowledge.

Personal experience: This occurs from activities, events and understanding of everyday life that lead to the formation of a world view, so it includes an individual's intellectual and virtuous disposition. "Personal experiences are gained through ethnic and socio-economic background, gender, geographic location, religious upbringing, and life decisions, which may all affect an individual's beliefs" (Richardson, 1996).

Schooling and instructional experiences: Richardson (1996) noted that when teachers were students, they were influenced by their teachers; hence, their own previous experiences of teaching and learning in their classrooms accumulate to form a set of beliefs that eventually influences how they teach. Perhaps this is why teachers tend to teach the way they were previously taught.

Experience with formal knowledge: In the context of this study, formal knowledge is viewed as the understandings that have been accepted as worthwhile and valid within a community of practice or community of scholars. This may be a prescribed form of knowledge from academic subjects and pedagogical knowledge from teacher education programmes. Formal knowledge is usually experienced in school subjects, outside readings, television, and any other form of media (Richardson, 1996).

As beliefs help guide individuals' interactions and interpretations of the world, this study examines whether and how beliefs guide teachers' interactions and interpretations of ICT integration in their classrooms. Inan and Lowther (2010) and Bingimlas and Hanrahan (2010) argued that teachers' philosophical point of view can be a significant factor in determining ICT integration practices in the classrooms, which means teachers' theories and experiences shape their practices in the classroom. For example, Ertmer (2005) indicated that teachers who have strong constructivist pedagogical beliefs are more likely to use technology in the classroom than teachers who have conservative pedagogical beliefs. The possible reasons could be that teachers with constructivist beliefs have the understanding that their role as teacher is to facilitate students' inquiry by providing guidance, and they may also know that students learn best by finding solutions to the problems on their own through thinking and reasoning processes. This supports Hargreaves and Fullan's (1992) earlier argument that, "It is what teachers think, what teachers believe and what teachers do at the level of the classroom that

ultimately shape the kind of learning that young people get" (p. 48). This view suggests that teaching does not usually go beyond what the teacher believes, and by extension, that learners learn what the teacher believes is relevant and important to learn. Although the view may appear controversial and debatable, the implication is that teachers are guided by their beliefs and learners are guided to learn what the teacher believe is worthy to learn.

It is pertinent to know that teachers' beliefs are shaped by many other factors, such as the influence of disciplines; subculture; the quality of pre-service experience in the discipline; and the opportunity to reflect on the quality of pre-service experience as can be deduced from the three sources listed above. If this is the case, it is imperative to gain a deeper understanding of the nature of beliefs that teachers' hold and how these beliefs influence the manner of talking about ICT integration in classrooms.

2.6.1 Teachers' Beliefs on Teaching, Learning and ICT Integration

Prestridge (2012) observed that the evolution of ICT use in education has influenced teachers to form personal beliefs about the role and value of ICT for student learning and of their confidence and competency in ICTs. Teachers' beliefs about teaching and learning are also known as teachers' instructional beliefs, although Fives et al. (2015) reported that there appears to be fewer studies about teachers' beliefs about learning than studies about teachers' beliefs about teaching. In the current literature teachers' beliefs about teaching and its relevance to ICT integration is discussed, because the study focus on teachers and teaching in school contexts where teachers are mandated to adopt and utilise ICT resources. The aim of the study does not overlook the importance of learners and learning, but consider the role of teachers' beliefs in influencing learners and their learning in school as significant. Currently, teachers' beliefs about teaching are often placed into one of two camps: They either view teaching from the direct transmission perspective or the constructivist perspective (Kim, 2005). The direct transmission perspective is considered to be traditional and teacher-centred, while the constructivist perspective is seen as modern and learner-centred.

Ertmer et al. (2014) stressed that, “Whereas the traditional approach emphasizes teacher explanation and learner’s’ repetitive practice, a constructive approach emphasizes experiences with authentic problems” (p. 404). The constructivist perspective is preferred in the current global educational trends that are influenced by technologies, new educational goals, pedagogical paradigm shifts, and high learner expectations.

Tondeur, Van Braak, Ertmer, and Ottenbreit-Leftwich (2017) observed that teachers’ beliefs are often undermined when introducing innovations in schools that can lead to partial or poor implementation and consequently non-attainment of set objectives. This study is both timely and important in the South African context where a staggering R17 billion is already earmarked to be expended on ICT integration in schools across the Gauteng province (EWN online news July, 2015). Not clearly understanding what teachers think of ICT integration in their respective schools might make the financial investment ineffectual, because it has been established that the provision of policy, funding and infrastructure does not directly translate into successful integration. Wastiau et al. (2013) conducted a survey of schools in Europe on the use of ICT in education and found that high levels of infrastructure provisioning, access to ICT and Internet connectivity do not lead to ICT use in learning and teaching. This corroborates the main findings the International Association for the Evaluation of Educational Achievement IEA, Second Information Technology in Education Study, SITES 2006 focused on the role of ICT in teaching and learning in mathematics and science classrooms. The survey found that provision, access and connectivity do not, in themselves, lead to ICT use in learning and teaching (Plomp, Pelgrum & Carstens, 2009). Other studies by Dlamini and Na-Allah (2015), Wallet and Melgar (2014), Law, Pelgrum, and Plomp (2008), and Hew and Brush (2007) also confirm the assertion that mere provision of infrastructure and availability of ICT hardware in schools do not translate to use or pedagogical integration of ICT into classroom teaching and learning.

2.7 Conditions that Facilitate ICT Integration in the Classrooms

ICT integration requires a conducive environment to thrive, which involve adequate supply of the needed equipment, facilities, infrastructure, support and motivation in school. According to Teo and Milutinovic (2015) "Facilitating conditions are factors in the environment that influence a person's desire to perform a task" (p. 366). In a school context, facilitating conditions for ICT integration include administrative and technical support, ICT skill training, and access to ICT knowledge and resources (Groves & Zemel, 2000). Other facilitating conditions may be the school setting and the ICT infrastructure such as the availability of tools, software, Internet access, facilities and other similar resources in the school (Moses, Bakar, Mahmud, & Wong, 2012). A study conducted on the determinants of perceived ease of use of technology by Venkatesh (2000) found that an individual's general perception of technology and resources, which implies facilitating conditions, could have a significant influence on the perceived ease of use for an individual. When the conditions are conducive to use technology in schools, the teachers perceive it as easier to use and consequently use it more. Lim and Khine (2006) revealed that poor facilitating conditions (e.g. lack of access to computers and inadequate technical and administrative support given to teachers) can act as serious barriers to ICT integration in the classroom. In relation to the UTAUT constructs, facilitating conditions were found to be significantly related to attitudes towards ICT integration (Teo, Ursavas, & Bahcekapili, 2012).

The above information suggests that when the facilitating conditions in the schools are favourable, teachers tend to develop positive attitudes that promote ICT integration in teaching; conversely, if the facilitating conditions are unfavourable, teachers develop negative attitudes that hinder ICT integration in the classroom. According to Venkatesh, Morris, Davis, and Davis (2003), facilitating conditions comprise of physical environmental conditions, human and material resources and other kinds of support systems in the school. Given this, it can be posited that the success and failure of ICT integration in schools largely depend on the facilitating conditions in schools. This is because in order for teachers to effectively teach with ICT, they require different forms of support, variety of resources and an enabling classroom environment. It is interesting

to note that Venkatesh et al.'s (2003) facilitating conditions links directly with actual use of technology, unlike performance expectancy, effort expectancy and social influence, which determine intention that leads to actual use. This direct relationship signifies the role of facilitating conditions as important factors to ICT integration in schools. In the same way, Teo et al. (2012) found that facilitating conditions have a direct influence on perceived ease of use and perceived usefulness to computer use among pre-service teachers in Turkey.

2.7.1 Support for ICT Integration

One of the factors that facilitate ICT integration in schools is the type and quality of support given to teachers in their schools. Studies (Mirzajani, Mahmud, Fauzi Mohd Ayub, & Wong, 2016; Ali, Haolader, & Muhammad, 2013) have shown that normally support remarkably impact teachers' use of technologies in classrooms. First of all, it is important to know that there are different kinds of support for ICT integration in schools ranging from administrative support, technical support, moral support (motivation) and training support. All these forms of support are essential, because although the teacher is bestowed with the responsibility to implement ICT integration in the classroom, the teacher cannot achieve this in isolation. Stressing the importance of support for teachers to integrate ICT in the classroom, Swig (2015) noted that, "If a school as a whole, teachers, administrators, and principals do not work together to incorporate technology into education systems, then an individual teacher will not be able to succeed at using technologies in their classes"(p.4). This suggests that the success of ICT integration in the classroom does not rely on the teacher alone but on the support and cooperation of every member of the school community and even beyond.

2.7.1.1 Administrative Support

The South African government understands the importance of administrative support to the success of ICT integration in schools. Hence, it provided guidelines for school principals to effectively manage ICT in schools. According to Bialobrzeska and Cohen (2005), these guidelines acknowledge that teachers need support in the form of funding, purchase, maintenance and upgrading of tools and equipment from school principals

and other senior management personnel. Teachers also require administrative support in developing school-based policies for the use of ICT and related equipment in the school. School principals are in a position to create the conditions to develop a shared ICT policy (Tondeur, Van Keer, Van Braak, & Valcke, 2008). This means that principals must provide the required leadership to champion ICT integration in the school through a shared vision with teachers and other stakeholders in the school. Appropriate leadership is a key factor in promoting change when it comes to merging ICT and instruction (Tondeur et al., 2008).

Furthermore, principals and school managers are expected to help develop and support staff, not only in using ICT to work more efficiently, but also in implementing new pedagogical approaches (Bialobrzeska & Cohen, 2005). The guide suggests that principals provide administrative support to teachers in diverse ways. Other agents of the school management team such as the school governing board (SGB) and other administrative staff are expected to support teachers by providing an enabling environment to integrate ICT in the classroom. This is important to this current study given that paperless school project is being implemented in schools where administrative structures are put in place to provide support to teachers for the achievement of the e-education goals. School principals and other support staff are enjoined to assist both teachers and learners in schools to transform teaching and learning using ICTs.

2.7.1.2 Technical Support

Though administrative support is imperative, technical support to teachers is also very important for successful ICT integration. Resta (2002) defined technical support as specialised skilled personnel who can support and assist teachers in implementing technology into classroom instruction. Technical support in the form of repair and maintenance of tools, devices and equipment is essential to ensure continued and uninterrupted use of ICT in teaching and learning (Moses, Bakar, Mahmud & Wong, 2012).

According to Teo and Milutinovic (2015), among the facilitating conditions for ICT integration in the classroom, technical support was found to be on the top of the list of factors that affect teachers' implementation of ICT integration. This may not be unconnected to the fact that most ICTs are electronics that require technical knowledge and skill to use and maintain. Thus, there is the need for technicians to provide technical support to teachers in the event of damage or to set up ICT gadgets for use in the classroom. Previous studies (Mirzajani, Mahmud, Fauzi Mohd Ayub, & Wong, 2016) revealed that teachers often get frustrated and disregard the use of ICT in the classroom because of lack of technical support in the school. In this study, teachers were also faced with similar situations, especially in schools where technicians are not assigned to provide technical services. Although the e-education white paper made provision for technical support as part of its implementation strategies (DoE, 2004), most schools that participated in this study did not have technicians on the ground at the time of data collection. Therefore, teachers were forced to abandon the use of the electronic smartboards installed in the classrooms because they did not work, and learners were unable to use their tablets for learning because of technical faults. This may have some negative implications to the attainment of the e-education goal as spelt out in the white paper. More so when teachers and learners don't use the ICT tools in a consistent manner, they tend to lose interest and forget some of the skills learnt.

2.7.1.3 Moral Support

Teachers also need moral support in the form of rewards and incentives to integrate ICT in the classroom. This is linked to administrative support because it is the responsibility of the school leadership to provide an enabling environment for teachers to integrate ICT. The government should also be committed to motivating teachers by providing rewards and incentives to teachers implementing ICT integration in schools. The e-education White Paper acknowledged the significant role of moral support for teachers to implement ICT integration in teaching and learning as part of its strategic objectives; hence, it states;

> "Support in the form of incentives will encourage teachers, managers and administrators to integrate technology into their daily activities and areas of responsibility… Integral to

> the strategy of motivating teachers and institutions to integrate ICTs into their daily functions, the Department of Education will continue with its incentive programme for the Most Improved Schools Awards in the category of Technology-Enhanced Learning Award. The aim of this award will be to celebrate excellence in the creative use of ICTs and to inspire learners and teachers to exploit the full potential of this rich and exciting technology. The awards have the potential to inspire teacher to creatively utilize and explore its utilisation appropriately (DoE, 2004, p. 26).

The South African government is determined to motivate teachers teaching with ICT in schools as indicated in the quotation above. If the DoE provides these rewards and incentives and celebrate excellence as promised in the White Paper document, teachers are more likely to be persistent with the use of ICT tools in classrooms. Unfortunately, despite the above provisions in the White Paper, teachers in paperless schools don't get any form of special incentive and this seems to affect the extent of ICT integration in the schools. Generally, incentives and motivations like high salary, in-service training and professional development, merit awards for excellence, and commendations to teachers improve teaching (Ukpong & Uchendu, 2012). On the other hand, lack of incentives and motivations adversely affect teacher performance in discharging their professional responsibility of teaching in the classroom. Low teacher motivation can affect learners' learning because of teacher absenteeism (Bennell 2004; Thomas, 2016). According to the Education for All Global Monitoring Report 2015 on the achievements and challenges of Education for All 2000–2015, "Students learn more in classrooms with highly dedicated and motivated teachers" (UNESCO, 2015, p. 322). The report found that a motivated teacher strives to meet the learning needs of each learner in the classroom based on their diversities; hence, learners feel relaxed and benefit more from such teachers.

Thomas (2016) submitted that "improving the motivation and incentives of teachers greatly improves the overall quality of the education system, because highly motivated teachers teach better" (p. 30). Lee and Hannafin (2016) posited that motivation is critical for accomplishing ICT-driven teaching activities in the classroom. The authors further stressed that motivation to engage in ICT-driven activities influences both

teachers' choice of teaching approaches and their commitment to achieving lesson objectives.

2.7.1.4 Training Support

Though administrative and moral support is imperative to develop positive attitudes among teachers to integrate ICT, teachers require training support to acquire the requisite knowledge and skills needed for successful integration. As stated earlier, having ICT policy in place is important but it may not be sufficient to ensure implementation in the schools because effective training of teachers is needed to implement every policy or reform introduced into schools. Moreover, Khoza and Manik (2016) asserted that "training teachers to use technology within the curriculum is important because it may help them in developing students' positive attitudes towards the technology" (p. 194). To stress the importance of teachers in education, the Education for All Global Monitoring Report 2013/2014 stated that "an education system is as good as its teachers" (p. 24). Also stressing the importance of training teachers for ICT integration in schools, Mirzajani et al. (2016) cautioned that:

> Many countries are investing billions of dollars to equip their schools with modern computers and telecommunication networks, such investments would not pay off unless teachers were trained to be technology-proficient educators, who would confidently use these new e-learning tools to ensure successful teaching and learning. (p. 27)

For ICT integration to make the desired impact on education system in society, it is essential to cultivate teachers who are not only knowledgeable and skilled on ICTs but teachers who believe in the capabilities of ICTs. It is essential to have teachers who see ICT integration beyond classroom use of digital tools to support teaching and learning. This means having teachers that are comfortable to work with new technologies, willing to take new responsibilities, embark on curriculum change and adapt to the current curriculum content and teaching methods. Thus to have this calibre of teachers require well-designed training programmes that provide not only knowledge and skills to operate ICT tools in the classroom, but can change teachers' old beliefs about teaching, learning and ICT as a resource for education.

In the South African context, one purpose of training teachers for ICT integration in the classroom at both pre-service and in-service levels is based on the premise that;

> ICTs, when successfully integrated into teaching and learning, can ensure the meaningful interaction of learners with information. It is believed that ICTs can advance high order thinking skills such as comprehension, reasoning, problem-solving and creative thinking and enhance employability. Furthermore it is perceived that ICT is a motivational tool that enhances productivity. Success in the infusion of ICTs into teaching and learning will ensure that all learners will be equipped for full participation in the knowledge society before they leave further education and training (FET) institutions. (DoE, 2004 p. 14)

Even though teachers are not directly mentioned in the quotation, to attain the above stated ambitions teachers need extensive training to develop skills and appropriate knowledge to use and integrate technology during teaching and learning processes. According to Khirwadkar (2007), it is expected that "every teacher should know how to use technology, pedagogy and subject area content effectively in their daily classroom teaching to make learning more meaningful" (p. 86). Exposure to ICT during both initial and in-service teacher preparation is helpful in increasing student teachers' willingness to integrate technology with classroom teaching. In South Africa, the DoE acknowledges that:

> Many teachers have grown up in environments with limited electronic technology, and thus find the adaptation to working with ICTs more difficult than their learners do. A programme that urgently addresses the competencies of teachers to use ICTs for their personal work and in their classrooms must be developed. The development of the programme that will address these teachers' competencies will require extensive staff development and support at both pre-service and in-service levels. Thus, ICT will be central to the pre-service training of recruits and the ongoing professional development of practicing teachers. (DoE, 2004 p. 22)

In response to the ICT training needs of teachers, the GDE outlined the requirements for teacher development and support by prescribing that the actual training of teachers to integrate ICT in the classroom must be interactive and participatory and follow the 10:20:70 model of learning to train teachers. The concept of 10:20:70 is the idea that

10% of learning happens through formal learning such as classroom training or online courses; 20% happens as social learning with colleagues; and 70% of learning happens through experience. This means that time must be allocated to theoretical training and then participants be given enough opportunities to practice their newly acquired skills. Work integrated learning will take place when the participants return to their work stations. A formative assessment approach will be followed to determine pre- and post-test learner knowledge (Meyer & Gent, 2016).

The Pan-African Research Agenda on the Pedagogical Integration of ICT, conducted in ten South African schools from 2008 to 2011, revealed that teachers in most South African public schools have attended ICT training at one time but generally the training sessions consisted of teaching basic computer skills only (Ndlovu & Lawrence, 2012). Unfortunately, the skills and abilities that teachers acquired from these training sessions proved inadequate to equip them with the skills they need to infuse ICTs into their subject teaching (PanAf, 2008–2011). According to Ndlovu and Lawrence, (2012) the research findings further indicated that most teachers cannot go beyond using ICTs to type lesson plans, perform administrative tasks and tests questions for their learners. The lack of sufficient knowledge and skills to select and appropriately apply ICT tools to support teaching and learning limits ICT integration. This has some implications like poor handling of ICT tools which may lead to damages, wrong perceptions about the role of ICT in the classroom thereby making teachers to develop apathy towards ICT integration in the classroom.

According to Wallet and Melgar (2014), teachers have an important influence on classroom learning because of the important role they often play in facilitating the use of ICT among learners in the classroom. Teachers require training to accomplish their teaching role more effectively but unfortunately there is little or no empirical research to ascertain how much teacher training is required in most developing countries. Particularly in South Africa there is `no available information in literature on how often the training should take place, what kind of training is most appropriate and affordable, or what scope the training should be to create a teaching workforce that is motivated to use ICT with the new curricula and pedagogies in the classroom. These issues are pertinent, considering how teachers are hastily prepared to integrate ICTs in most

developing countries. Perhaps such hurried training were offered to teachers to enable developing countries like South Africa catch up with the global trends on ICTs in education; unfortunately, often these training programmes do not yield the desired results (Stevens, 2014; Wallet & Melgar, 2014). Given that technology is constantly changing, teachers need to be sufficiently exposed to digital ICT tools using pedagogical approaches, following-up with practical coaching or mentoring sessions in real classroom situation. Different approaches are applied to teacher training towards ICT integration in the classrooms around the world, and often each approach is dictated by the purpose for which ICT is to be infused in schools or classrooms. Thus, ICT in teacher training can take many forms as outlined below by Khirwadkar (2007). After careful consideration Khirwadkar (2007) merged the various approaches into the four categories below:

1. **ICT Skills Development Approach**: This training gives teachers a general knowledge of ICTs. Teachers are trained to be skilled users of ICT tools in their normal activities. The training usually centres on basic knowledge and skills of ICT software and hardware and how to use them for educational purposes.
2. **ICT Pedagogy Approach**: This training provides teachers with the requisite knowledge and skills to integrate ICT into school subjects. Teachers are trained on how to design lessons and classroom activities with ICT tools in order to achieve lesson objectives. The approach seems to be beneficial in that it allows the teacher to develop a consistent use of ICT tools in their lessons.
3. **Subject-Specific Approach**: This training prepares teachers to infuse ICT into their subject or discipline areas. In this approach teachers are equipped with skills to provide necessary exposure and innovative skills of learning the subject to their learners. The training approach provides opportunities to both the teacher and learners to interact with ICT tools across the curricula at all times.
4. **Practice-Driven Approach**: This training is designed to expose teachers to the use of ICT during professional training. It is a training approach adopted at the pre-service stage where pre-service teachers are leveraged with adequate and variety of ICT resources for pedagogical utilisation. The training approach allows

teachers to have unlimited access to ICTs in order to develop skills and confidence for ICT use.

Considering the different approaches to training described above, ICT integration training in South Africa, particularly those sponsored and organised by the GDE, can best be described as ICT pedagogy approach. Perhaps this approach is preferred because it is most suitable to achieve the objectives of the paperless project. Although the purpose and emphasis of the training offered to teachers in South Africa's paperless schools is to integrate ICT skills, the training are poorly executed because of poorly developed training programmes and incompetent trainers, leading to frustration and apathy among teachers. This is evident Section 5.3.1, where the majority of the research participants communicated their grievances about the nature of the training they received in their schools. Poorly facilitated training is ineffective in providing teachers with the requisite knowledge and skills. Perhaps this is why ICT integration is still slow in most developing countries, especially in countries where policies, funding and infrastructure are available. This corroborates the findings of some global (Balfour, 2016; UNESCO, 2016) and regional (Meyer & Gent, 2016; Tedla, 2012) studies that indicated poor training as a reason for slow ICT adoption and integration in developing countries across the world. Training is fundamental to ICT integration (Khoza & Manik, 2016) because it equips teachers with both knowledge and skills required for effective integration. Training not only ensures that a school's vision for ICT is executed exactly as imagined, but also ensures that a school gets the most out of their ICT resources and that teachers have the confidence to use ICT effectively in the classroom (Aston, 2016).

Because training teachers on ICT integration in schools is so important, there exist certain teacher ICT competency standards and training guidelines. Thus, it is imperative to discuss and examine the issue of training for ICT adoption in paperless schools and to measure it against the national frameworks and ICT Competency Standard for Teachers. It is imperative because training teachers on ICT integration is guided by a set of international and national standards supported with models for implementation. For example, in pursuance of the provisions of the South African White Paper on e-Education, the government prescribed a Teacher Development Framework for ICT

Professional Aptitude (Hindle, 2007), contained in the Guidelines for Teacher Training and Professional Development in ICT. The framework outlines five ICT development levels that are to be included in the ICT integration teacher training framework. This framework has remained a guide within the South African context. The levels and the expectations at each level of teacher development for ICT integration are described in Figure 2.1 below.

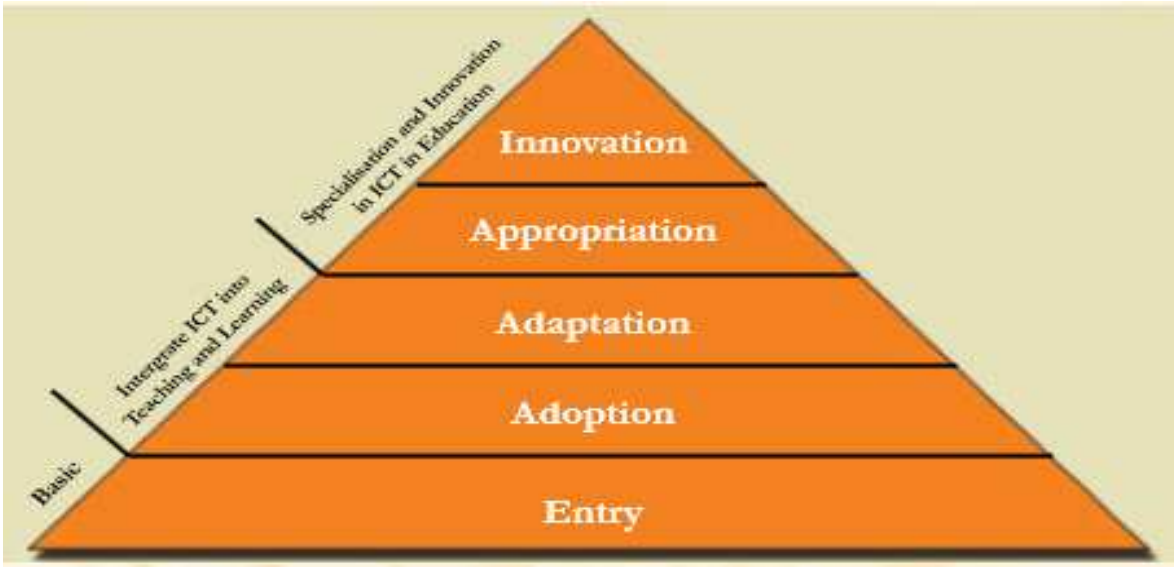

Figure 2. 1: Teacher Development Framework (Hindle, 2007, p. 7)

2.7.1.5 The levels of teacher development framework

The framework consists of five independent but interrelated levels of competence.

5. **Entry Level:** At this level, "teachers are computer literate and able to use computers. However, frustrations and insecurities are common during the introduction to ICT because users struggle to get acquainted with new tools. At this level, teachers are likely to lack confidence; yet teachers are expected to be willing and eager to venture into using ICT in teaching and learning" (Hindle, 2007,p.7).
6. **Adoption Level:** At this level "it is expected that teachers can use various ICT, including computers, to support traditional management, administration, teaching and learning and can teach learners how to use ICT. It is also expected that

teachers should have sufficient believe that ICT contributes to and can change teaching, learning and administration" (Hindle, 2007, p.7).

7. **Adaptation Level:** "The teachers can use ICT to support everyday classroom activities at an appropriate National Curriculum Statements level, assess the learning that takes place, and ensure progression. They can reflect critically on how ICT changes the teaching and learning processes and use ICT systems for management and administration. Productivity increases at this level. Now teachers are expected to possess the open mindedness, flexibility and vision to explore the potential of ICT and its applications in the curriculum" (Hindle, 2007, p.7).
8. **Appropriation Level:** "Teachers have a holistic understanding of the ways in which ICT contributes to teaching and learning. They understand the developing nature of ICT and that it is integral to the structure and purposes of the National Curriculum Statements. They have the experience and confidence to reflect on how ICT can influence teaching and learning strategies and to use new strategies and opportunities to integrate ICT into teaching and learning positively and with confidence. They also understand the educational value and potential of ICT in teaching and learning" (Hindle, 2007).
9. **Innovation Level:** "Teachers can develop entirely new learning environments that use ICT as a flexible tool, so that learning becomes collaborative and interactive. ICT is integrated as a flexible tool for whole-school development through redefining classroom environments and creating learning experiences that leverage the power of technology. The adaptation, appropriation and innovation phases should not, however, be seen as exclusive descriptors of teachers' skills level. Hence teachers must develop the confidence, flexibility and vision to develop new learning approaches that use ICT and understand that ICT is essential for whole-school development" (Hindle, 2007, p.7).

These are the expectations at each level of teacher development for ICT integration. Unfortunately, in South Africa in-service training courses for ICT pedagogical integration do not seem to align with the recommended framework. Findings show that trainers with

basic computer skills are usually deployed to train teachers on ICT integration, thereby making the training exclusive of the pedagogy component. In South Africa, paperless schools are supplied with computers, Wi-Fi, other ICT facilities and to some extent a reasonable quantity of infrastructure that depicting preparedness for ICT integration; however, much is left to be desired, particularly in preparing teachers to implement ICT integration in schools. Flanagan and Jacobsen (2003) states that mere installing computers and networks in schools is not sufficient for education reforms. This shows the need for the government to refocus on teacher training in addition to the provision of facilities and infrastructure.

2.7.2 Resources for ICT Integration in Schools

The importance of training teachers and supplying other forms of support to integrate ICT in the classroom cannot be contested. However, possession of ICT knowledge and skills by teachers is not enough to guarantee success. Appropriate resources in sufficient quantities are also imperative for effective ICT integration in schools. Resources are generally classified as either human resources or material resource, and this discussion will focus on material resources because of its crucial role in ICT integration (Mirzajani et al, 2016) and because the role of teachers who are critical human resources is already discussed in Section 2.7.1.

The role of ICT resources as a determinant of success to ICT integration in schools cannot be over emphasised. Many studies (George, 2015; Tay, Lim, & Lim, 2013; Salleh & Laxman, 2014) investigated factors influencing ICT integration in schools and their findings show that availability or lack of relevant and adequate material resources such as infrastructural facilities, electronic equipment and tools appear to significantly affect ICT integration in schools. This is why there could be disparities between success stories of ICT integration among schools in the same country or province. While schools with sufficient relevant resources are successful, schools with limited resources are struggling or even failing to integrate ICT (Padayachee, 2017; Muntaz, 2000). Material resources for ICT integration can be classified into the categories discussed below.

Infrastructural Resources: In this context, it refers to school buildings that have the capacity to support or constrain ICT integration in classrooms. The nature of buildings, whether permanent or temporary, secure or unsecure, affects ICT integration in many ways. For instance, if school buildings are used for dual purposes, it may affect the utility of the building and activities therein too. In some schools, computer rooms are used for storage of other equipment, thereby, limiting the space for computer work stations. The capacity of buildings also influences the type of activities that can be carried out. Some schools have constrained classroom structures which limit use of some ICT equipment like projectors with large screens and classroom interactions. Other classroom fixtures are not flexible enough to allow ICT integration in lessons: Rigid classroom structures with fixed chairs, desks and boards may not allow collaborations and group activities with ICT tools in the classroom. Such constrained classroom conditions do not facilitate ICT integration. The physical atmosphere of the classrooms is as important as the social atmosphere in promoting teaching and learning. Free and conducive classroom environments are required to facilitate ICT integration. This involves physical factors like temperature, space, acoustic (noise level) and lightening. Extreme conditions in classrooms can adversely affect teaching and learning with ICT.

ICT Hardware Equipment: These are hardware materials such as computer sets, smartboards, projectors and screens, laptops, tablets, and other forms of audio, visual and audio-visual materials needed for successful ICT integration. Hardware equipment in a technology-driven classroom is indispensable because it is the hardware equipment that assists in the utilisation of the software that contains the information that is communicated. Without the hardware, the software cannot function, and this means the utility of the software depends on the effectiveness of the hardware. Effective ICT integration in teaching and learning require functional hardware and software.

ICT Software Packages: These are digital applications, commonly known as programmes or apps, which contain the instructions and communicate it to the hardware in order to perform a task. Examples are MS Word, MS Excel, databases, websites, mobile apps, media players, antivirus software, and a variety of educational software for various subjects. ICT hardware needs relevant software to be effective. In

paperless schools, all learning content are expected to be in digital format. The availability of sufficient relevant digital content in schools can facilitate the implementation of ICT integration, while the lack of it may frustrate teachers and discourage learners from using the ICT hardware available. This means that the value of ICT hardware can only be realised when combined with the corresponding software.

Buabeng-Andoh (2012) observed that notwithstanding the factors that inspire teachers' use of ICT in classrooms, several researchers (Dube, Nhamo, & Magonde, 2018; Mndzebele, 2013; Bingimlas, 2009; Hew & Brush, 2007) conducted empirical research on factors that constitute challenges and discourage teachers from using ICT in schools. These challenges are discussed in the next section.

2.8 Challenges of ICT Integration in Schools

After years of studying human's attitude to change, Rogers (2003) found that people naturally resist change unless they are certain of how the change will benefit them. Given that ICT is relatively new in South Africa's classrooms as at the time of conducting this study, teachers are still not sure of the practical potential benefits of ICTs, hence their attitudes to resist ICTs in the classroom. However, this is not surprising, given that introducing any form of innovation is usually confronted with challenges, one of which is the resistance to accept the innovation. Tshiredo (2013) reported that introducing innovations or change in any context is always confronted with challenges that are often contextual in nature. Introducing ICT in schools as an innovation is not exempted from these challenges. Several factors pose challenges to ICT integration in schools and are the reason why ICT uptake and integration continues to be low in many developing countries, including South Africa. Several studies conducted in different contexts unsurprisingly show that ICT integration is not a smooth process, because there are challenges that limit the successful integration of ICTs. For example, Bingimlas (2009) conducted a review of literature on the barriers to successful integration of ICT in teaching and learning environments, the review categorised the barriers into two broad categories, namely teacher-level barriers and school-level barriers. He identified the teacher-level barriers to include lack of teacher confidence, lack of teacher competence, teacher resistance to change, and negative attitudes. On

the other hand, school-level barriers included lack of time, lack of effective training, lack of accessibility, and lack of technical support. The categories are important for this study because the context of the study is characterised by factors that allows for such challenges.

Hew and Brush (2007) carried out a review of past empirical studies on ICT integration in schools in the USA, Singapore and other countries across the world, and they found a total of 123 general barriers militating against ICT integration in teaching and learning. For the sake of providing a coherent and succinct description the authors classified the barriers into six main categories: (a) resources, (b) knowledge and skills, (c) institution, (d) attitudes and beliefs, (e) assessment, and (f) subject culture. They listed the barriers according to the level of frequency of occurrence during technology integration into the curriculum for teaching and learning purposes. And considering the importance of resources in implementing ICTs in the classrooms, it was found to be on top of the list, while subject culture is found to be the least of a barrier

In Africa, similar wide scale reviews were carried out in 2013 and the findings reveal distinct barriers compared to the earlier review conducted by Bingimlas in 2009. The findings of a regional study conducted by Mndzebele (2013) on the challenges faced by schools when introducing ICTs in developing countries showed that schools are failing to integrate ICTs because of lack of knowledge and skills among teachers in schools; lack of sufficient time to incorporate ICT tools in the classroom teaching; lack of ICT equipment in the schools; poor maintenance culture on available facilities and infrastructure; lack of Internet connectivity in schools; and insufficient funds allocated to acquire and maintain ICT tools and facilities. Irrespective of different contexts, studies show that there are similarities in the factors that affect ICT integration in schools. These factors are broadly associated with the teacher, school context, funding and policies.

Sife, Lwoga & Sanga (2007). argued that “ICTs have not yet permeated a great extend in many institutions of learning in many developing countries including South Africa, due to various socio-economic and technological circumstances”(p.57). For instance, in South Africa, despite the exciting e-Education Policy White Paper published in 2004,

complemented with heavy financial investments on teacher ICT training and the provision of infrastructural facilities in schools, "the state of ICT integration in schools is still slow due to an insufficient number of computers; lack of application programmes; teacher generational gap; inadequate teacher training; lack of ICT skills; lack of confidence; teachers' beliefs; poor school leadership; and lack of public support" (Mathipa & Mukhari, 2014, p.53). Unfortunately, even the pilot paperless schools that participated in this study are confronted with these challenges that hamper pedagogical integration in the classroom. The possible reason for the persistence of ICT integration challenges in different school contexts may be connected to the complex interactive processes involving teachers, tools and procedures over a long period of time. ICT integration is not a once-off event, but a long chain of activities that rely on the collective competencies of teachers, learners and administrative support. Within the South African context, President Jacob Zuma (2015) at the launch of Operation Phakisa remarked that;

> Despite notable achievements and progress, with 92% of schools having at least one computer for administrative purposes, 28% of schools using computers or other devices to enhance teaching and learning and 49% of schools having access to connectivity, South Africa had not taken full advantage and exploited the potential ICTs held for education. The reason being that the process is characterized by unsustainable and fragmented ICT initiatives which lacked centralized coordination, focus and measured impact" (Odendaal, 2015,p.2).

The above remark addresses important and realistic inequalities in the country and also shows the general picture of the state of ICT integration efforts in South African schools. The president's remark acknowledges that there are challenges in the process of ICT integration across schools in the country.

Within the South African context, studies have indicated that ICT integration in schools is limited by myriad of barriers. For instance, Mdlongwa (2012) found that despite the efforts made by the various tiers of government to integrate ICT in schools across South Africa, a number of challenges make it impossible to achieve this goal, including a lack of IT-based Management Information Systems, which are expensive to set up.

Schools are supposed to have learning management systems (LMS) that provide links to all the facets of the school system; unfortunately, this is not available in most schools in South Africa and developing countries in the world where ICT integration is still low. Secondly, teachers' resistance to change from their old-style of teaching to new IT-based methods of teaching, which arises because teachers are already used to particular ways of doing things, and so changing from the norm is difficult for them. Koksal (2013) once elucidated that "any hasty or formidable change in the traditional role of teacher and student is likely to elicit some form of resistance" (p. 3). This is specifically common when change involves the use of electronic or technological tools. "If the equipment is not simple to operate, and readily obtainable, resistance can be anticipated", hence "teachers and even administrators hold the belief that technological innovations tend to promote a mechanization of teaching and learning process, which eventually becomes "dehumanised", resulting in a loss of feedback between student and teacher" (Koksal, 2013, p. 4). They believe human emotions, feelings, thoughts and beliefs are important to teaching and learning, therefore, removing and replacing them with technology is abnormal and should be resisted.

Some of the older generation of teachers were struggling to adapt to using ICT, thereby developing some resistance to change. Older teachers lack the requisite competence and confidence to operate new ICT tools, because they are not exposed to the technologies during their initial professional training due to lack of the technologies in the schools. Mathipa and Mukhari (2014) asserted that, "Old teachers who are comfortable with the traditional way of teaching do not want new and innovative methods of teaching" (p. 1217). This is not surprising, given that several scholars (Koksal, 2013; Rogers, 2003) found that teachers often resist change or innovation because it is completely new, foreign and has not been used in the past. Another reason advanced by the scholars is that teachers are confident of the success of the methods they are used to, making innovation unnecessary (Koksal, 2013). Thirdly, lack of adequate ICT resources in schools adversely affects teachers' competence to use technologies because access to computers and Internet are still a major problem in schools. This challenge affects both teachers and learners, as the ratio of learners to computers is still high in some schools, especially in schools that have overcrowded

classrooms. Even in schools where each learner is expected to have a personal tablet computer; there is a short supply of tablets from the government. In addition, Internet services are not reliable in some cases because of low bandwidth, thereby making it difficult to effectively use ICTs in the classroom. Unreliable Internet access is more common in rural and township schools where infrastructure is inadequate or non-existent.

Ineffective security mechanisms in schools are also a problem that is more prevalent in township schools and give rise to unabated cases of thefts. Some schools are without perimeter fences to protect school infrastructure and even where perimeter fences are available; there are not enough security personnel to secure school facilities and infrastructure. Because of the security limitation, schools incur a lot of losses of material resources like computers, smartboards and servers due to theft. Language is also found to be a barrier militating against effective use and integration of ICT in teaching and learning, particularly among learners whose mother tongue is not English language. This is a challenge in most developing countries like South Africa, where English is not the mother tongue of the majority of the population and limits both teachers and learners from effectively using some ICT learning software or packages. About 80% of online content is in English, and most educational software packages are produced in English, creating a barrier for most learners that are using English as a second language. It is difficult for English second language speakers to read, comprehend, interpret and write correctly what may be expected of them from the computer language (Mdlongwa, 2012). It should be noted that these challenges are relative to both the broader context of society and to the context of a specific school.

2.8.1 Teachers' Beliefs as Barrier to ICT Integration in Schools

It is quite worrisome to note that in South Africa, both the national and provincial governments have been making concerted efforts to introduce ICT into school classrooms since the mid-1990s but the spread and impact of ICT in education is still slow and low in 2018. Because so little research exists, it is still not clear why ICT integration is still low in South African schools despite the funding, infrastructure, availability of e-education policy and plans to implement ICT integration in the education

system. Several interrelated factors may be responsible for the slow uptake of ICTs in schools. Earlier, I discussed how several human and non-human factors constitute challenges to ICT integration in schools. One of the human factors alleged to be a significant barrier to ICT integration is belief. Ertmer (2005) found that teachers' beliefs are a "second-order" barrier to the integration of ICT in teaching and learning. Similarly, Hew and Brush (2007), reporting on the findings of a study on integrating technology into K-12 teaching and learning in the USA, found that teachers' beliefs is ranked third among six categories of barriers inhibiting ICT integration in teaching and learning across the world. Teachers' beliefs are the only barrier that is regarded as a universal barrier to ICT integration, because it is found in all contexts, levels of education, genders and racial backgrounds. Apart from being a general barrier, it is also a significant barrier, given that belief shapes teachers' attitude and their goal setting to use technologies in the classroom (Ertmer, Paul, Molly, Eva & Denise, 199). Beliefs also influence their decisions, actions and pedagogical pattern of behaviour in the classroom.

Nevertheless and in view of the significance of teachers' beliefs as a barrier to ICT integration, it is appropriate to seek ways of eliminating this barrier as early as possible prior to introducing innovation in classrooms. One way of removing this barrier is to ascertain teachers' beliefs and facilitate a change of these beliefs; a reason why this research is important in order to address one of the research gaps in ICT integration in the classrooms. It is important to know that neglecting or overlooking the potential influence of teachers' beliefs on ICT integration may jeopardise the process of ICT integration in the classrooms. This is evident in the South African context where studies revealed that teachers may constitute potential barriers to ICT integration in the classroom due to their attitudes and beliefs. For example, the findings of a research study that investigated teacher factors influencing the use of ICT in teaching and learning in South African urban schools by Mathipa and Mukhari (2014) revealed that teachers lack confidence to operate ICT tools in their classrooms. Related to confidence is the teachers' lack of competence to use ICT because they don't have the knowledge and skills. Other factors internal to teachers are their resistance to change and negative attitude towards ICT in the classroom.

2.9 The Unified Theory of Acceptance and Use of Technology in Research

The UTAUT model propounded by Venkatesh et al. (2003) is a theoretical model that amalgamated eight individual technology adoption theories and models into one comprehensive model. The model evolved as a combination of eight independent theories and models of user acceptance and adoption of innovations in different settings. The model was necessitated because of the limitations of individual theories and models in addressing issues of user acceptance and adoption of new technologies. The UTAUT model consists of four major constructs, namely performance expectancy, effort expectancy, social influence, and facilitating conditions; and the four moderators of the constructs are age, gender, experience and voluntariness of use. The UTAUT model posit that performance expectancy, effort expectancy, social influence, and facilitating conditions are the four potential constructs that can be used to explain user perception and acceptance behaviour (Venkatesh et al., 2003).

The UTAUT model, which is now popular and used extensively among scholars, has remained one of the most relevant and reliable frameworks for investigating technology adoption, use and integration in different fields of research, especially in information systems, information technology, educational technology, management sciences, and in different contexts. Recently, researchers have increasingly used the UTAUT model, either singly or in combination with other similar theoretical models, to conduct studies on technology acceptance, use and related issues (Venkatesh, Thong, & Xu, 2016), especially in the areas of information systems, IT, business management, education, health, and other related disciplines.

Although the model is popular and has been used extensively in the last decade, most researchers used the UTAUT model to investigate user behaviour towards acceptance and use mainly through quantitative approaches. For example, in Canada, Khechine, Lakhal, Pascot, and Bytha, (2014) conducted a survey to determine the factors that explain the acceptance of a webinar system (Elluminate) in a blended learning course by students. In Indonesia, Siswanto, Shofiati and Hartini (2018) used the UTAUT to investigate the technology acceptance model of a mitigation disaster website in East Java in 2014, using a quantitative survey approach to obtain data. In Taiwan, Tan

(2013) used the UTAUT to investigate and explain Taiwanese college students' acceptance of English e-learning websites. The author employed the quantitative research approach using a questionnaire modified from the question items of Venkatesh et al. (2003) to gather data from the college students. In Ghana, Attuquayefio and Addo (2014) adopted the UTAUT model to determine the strength of predictors for students' intention to accept and use ICT for learning and research. Questionnaires were administered to 400 students in the Social Studies and Business Administration Faculties of the Methodist University College. In Guyana, Thomas, Singh and Gaffar (2013) investigated the utility of the UTAUT model to explain mobile learning adoption in higher education and evaluate the size and direction of the impacts of the UTAUT factors on behavioural intention to adopt mobile learning in higher education; the data were obtained through a web survey of university students. In Thailand, Bhatiasevi (2016) employed an extended UTAUT model to explain the adoption of mobile banking; a field survey of respondents was undertaken with both convergent and discriminant validities being conducted. In the UK, Hariri (2014) investigated the adoption of learning innovations within UK universities by validating an extended and modified UTAUT model; using a quantitative survey approach and utilising a questionnaire instrument, data was collected from staff members from a number of UK universities. And finally, in Turkey, Uğur and Turan (2018) proposed an extended model of UTAUT by examining e-learning adoption by academics; this study confirmed the hypotheses related to the effects of performance expectancy, effort expectancy, and system interactivity on behavioural intention to use e-learning technologies. These are just few of the past studies that used the UTAUT model to deduce inferences from quantifiable data normally obtained through quantitative designs and methods

2.10 Gaps in the Literature

There is dearth of empirical research that examined teachers' beliefs and experiences around ICT integration in schools where ICT adoption is mandated by the government. This reveals a gap in research focus as most studies that investigated ICT integration in schools in South Africa have focused on different areas and overlooked exploring and interrogating teachers' beliefs and experiences while integrating ICT in their classrooms.

Most research focused on the availability and accessibility of ICT in schools (Meyer & Gent, 2016; Tire & Mlitwa, 2007); ICT integration and teacher classroom practices (Aslan & Zhu, 2018; Donnelly, McGarr, & O'Reilly, 2011; Peeraer & Van Petegem, 2011); factors affecting adoption and or integration in schools (Dube et al., 2018; Wilson-Strydom et al., 2005); and challenges or barriers to ICT integration in schools (Nkula & Krauss, 2014; Mingaine, 2013)

In addition, during the review of literature, I also identified a gap concerning the application of UTAUT model as a lens for ICT adoption and integration research. Most of the studies reviewed showed that the UTAUT model was used as a lens for a quantitative investigation of ICT acceptance and use. Only a few studies used qualitative approaches and presented findings inductively in South Africa. The norm is to employ quantitative approaches to test hypotheses and deduce results. The majority of scholars in South Africa and beyond prefer to use the quantitative approach and methods with the UTAUT because of its popularity as a theoretical model for testing technology acceptance/adoption in various fields of inquiry, like banking, management, information systems, educational technology and computer science. It is also much easier to examine relationships among the different variables in the UTAUT model when using the quantitative approach. Another reason might be because the proponents of the UTAUT model first used quantitative approaches to test the model (Venkatesh & Davis, 2000). For example, a study conducted by Alabi (2016) at the University of KwaZulu-Natal: Although Alabi employed the mixed methods approach with the UTAUT and Diffusion of Innovation theories as theoretical lenses, the study was dominated by quantitative methods. The qualitative part of the study was minimal and was only used to conduct qualitative interviews to complement the large amount of quantitative data. Another methodological gap is the limited research using the qualitative case study design to explore teachers' beliefs and experiences around ICT integration in schools, particularly in South Africa. This study has successfully filled the gap by adopting the qualitative research approach with exploratory case study design (Yin, 2003) to explore teachers' beliefs and experiences around ICT integration in South Africa.

2.11 Summary of the Chapter

In this chapter, I reviewed literature that are relevant to the focus of the study to identify any emerging research gaps given that this is a relatively new focus of research in educational technology in South Africa. There was a detailed discussion of the relevant issues that pertains to the phenomenon investigated. The concept and scope of ICT was defined and described from different perspectives of scholars in the field. The chapter also provided information about the trends of ICT integration in education from the different continents of the world and streamlined to the South African context where the study is located. Similarly, past and current ICT policies, initiatives and projects in South Africa were discussed in relation to the E-education Policy White Paper which remains as a national aspiration of the country. In view of the confusion and misconceptions about the concepts of ICT use and ICT integration, a section was dedicated to unpacking the two concepts and their differences in classroom application. Given that teachers' beliefs occupies a central place in this research, the nature and meaning of teachers' beliefs were also presented to the reader. Several challenges of ICT integration and factors that influence ICT integration in schools were highlighted. As in the literature review, this study also identified a number of challenges limiting ICT integration in the classrooms as well as some contextual factors that affect the process of ICT integration in schools too.

A detail account of the UTAUT model will be presented in Chapter 3. The chapter was concluded by identifying gaps in the literature that the study seeks to address. The next chapter will present and explain the theoretical and conceptual frameworks adopted to serve as lenses in the study.

CHAPTER 3

THEORETICAL AND CONCEPTUAL FRAMEWORKS

3.1 Introduction

The importance of theoretical and conceptual frameworks to a research endeavour, especially a study of this nature and scope, cannot be overemphasised, given that research frameworks often serve as lenses to investigate and understand a certain phenomenon. Suter (2011) stressed the importance of theoretical and conceptual frameworks to qualitative research and stated that, "Theory, models, constructs, and perhaps metaphors" (p. 76). They help greatly in making sense of data requiring clear thinking. This means frameworks are an important means of clarifying raw data that enable the researcher to organise and explain data in a meaningful way to readers. This chapter discusses the theoretical frameworks used as a lens for understanding teachers' beliefs and experiences during the implementation of ICT integration in schools. The theoretical underpinning for this research study is the UTAUT model propounded by Venkatesh et al. (2003). The UTAUT model was originally designed for determining acceptance and use of technology, but in this study the UTAUT will be used as a lens to ascertain the beliefs that inform ICT integration in classrooms since beliefs are found to influence the decisions that teachers make in the classroom.

I considered the UTAUT model suitable for use in this study to understand teachers' beliefs and experiences in different school contexts that lead to ICT integration or to disregard the integration of ICT. The resolve for the adoption of the UTAUT model is based on the notion that models are the main route for researchers to develop conceptual frameworks, while theories lead to theoretical frameworks (Ngulube, Mathipa, & Gumbo, 2015). However, I also acknowledge that models simply describe a phenomenon, unlike theories that have the capacity to explain and predict, but the focus of the research is to explore and provide a critical implication of the phenomenon using critical qualitative approaches and reliable methods discussed in Chapter 4. Many scholars (Abayomi, Neil, & Thokozani, 2016; Alabi, 2015; Tan, 2013) that utilised the UTAUT instrument considered it adequate to be adopted across different cultural

contexts, especially in a developing country like South Africa. Hence, the UTAUT model is appropriate for this study, given the context and research focus. The UTAUT model is closely associated with some similar models such as the Theory of Reasoned Action (TRA), Theory of Planned Behaviour (TPB), Technology Acceptance Model (TAM), Technology Acceptance Model 2 (TAM2), Combined Theory of Planned Behaviour/Technology Acceptance Model (C-TPB-TAM), Innovation diffusion theory (IDT), Model of PC Utilization (MPCU), Social Cognitive Theory (SCT) and the Motivational Model (MM). In view of the scope for this study, the chapter will not provide a vivid discussion of the related theories and models associated with the UTAUT but shall provide a schematic representation of the process for the synthesis and formulation of the UTAUT model from the convergence of eight related models.

Figure 3.1 illustrates the eight different theories and models that converge to form the UTAUT model that is more comprehensive for investigating and understanding an individuals' behaviour to technology adoption and use. The model remains popular and relevant for scholars researching human behaviour patterns towards adoption and use of new technologies across disciplines.

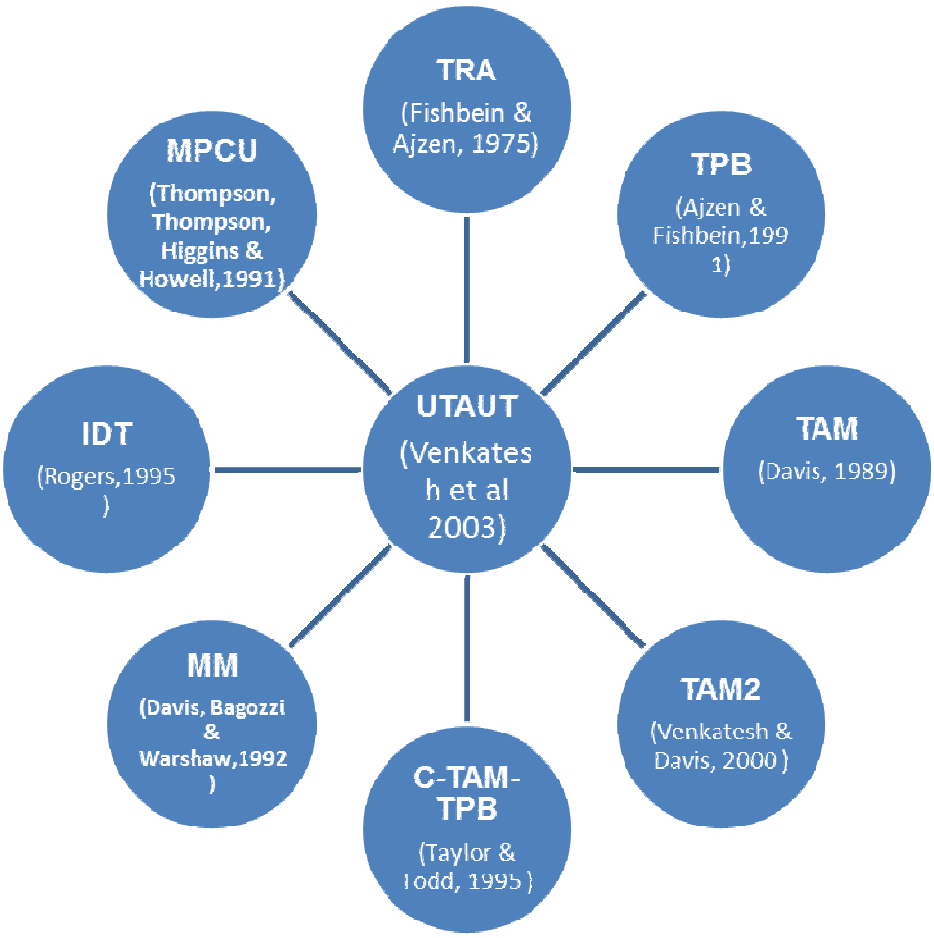

Figure 3.1: Synthesis and formulation of the UTAUT Model

After a detailed review of literature on various theories and models of technology adoption and use by Venkatesh et al. in 2003, seven constructs where identified as significant determinants of human attitude and intention to the use of technology. This was the basis upon which Venkatesh et al. (2003) analysed and theorised the four constructs they found to play a significant role, as direct causes of user intention to acceptance and usage of technology. The four constructs that Venkatesh et al. theorised to form the UTAUT model are: (i) performance expectancy, (ii) effort expectancy, (iii) social influence and (iv) facilitating conditions. These four core constructs are the main focus of this research study, because they are informed by the beliefs that users hold about technology.

3.2 The Unified Theory of Acceptance and Use of Technology (UTAUT)

Several models and theories of technology acceptance and use have been developed and applied to different phenomena, and in different cultural settings over the years (Oye, Iahad & Rahim, 2014; Attuquayefio & Addo, 2014). Some of these models are the Theory of Reasoned Action (TRA), Theory of Planned Behaviour (TPB), Technology Acceptance Model (TAM), Technology Acceptance Model 2 (TAM2), Combined Theory of Planned Behaviour/Technology Acceptance Model (C-TPB-TAM), Innovation diffusion theory (IDT), Model of PC Utilization (MPCU), Social Cognitive Theory (SCT) and the Motivational Model (MM). All the models and theories seek to address different phenomena in different ways, yet none of these models are without limitations to achieving what it is designed to achieve. It is in view of these commonalities and differences between the various theories and models that Venkatesh et al., who are also core proponents of some of the theories and models, studied and synthesised eight of the models to formulate the UTAUT model in 2003. The rationale for combining the eight models and theories (see Figure 3.1) was to eliminate some of the limitations found in the individual models.

Despite the availability of related theories and models that may be applicable to this research, UTAUT was chosen because it captures the different beliefs that teachers hold when deciding to integrate technology in the classroom. It is worth noting that, although the Theory of Reasoned Action, Theory of Planned Behaviour, Technology Acceptance Model, and many other models that address human beliefs, technology adoption and use may be applicable in this study, the UTAUT model was considered most suitable to address the stated research questions. Also, when compared with other similar theoretical models like the TRA, TPB and TAM, which use context specific variables for explaining behaviour or action, UTAUT finds more bearing in the phenomenon investigated because of the interrelatedness of its constructs with the phenomenon. The UTAUT model is comprehensive and identifies key factors in acceptance and use of ICT as determined by intention which is informed by one's beliefs to use the technology. The four determinants of ICT acceptance and use are (i) performance expectancy, (ii) effort expectancy, (iii) social influence and (iv) Facilitating

conditions. According to the model, performance expectancy, effort expectancy and social influence are direct determinants of an individual's attitude and behaviour, while facilitating conditions are direct determinants of user behaviour. UTAUT tries to explain the degree of acceptance that leads to use of technology. It determines whether the user will be able to accept the new technologies, and the user's ability to use it effectively. A diagrammatic representation of the UTAUT model is depicted in Figure 3.2.

It is important to also make it clear this early that not all the constructs in the model are relevant to this study, as I have modified it by extracting the relevant constructs to suite the research context and questions that guide the study. Given the focus and context of the study as mentioned earlier above, only four constructs of performance expectancy, effort expectancy, social influence and facilitating conditions are relevant for my study. Therefore, I discuss the constructs of the UTAUT model before presenting a modified model that captures the related research concepts in relation to the UTAUT model.

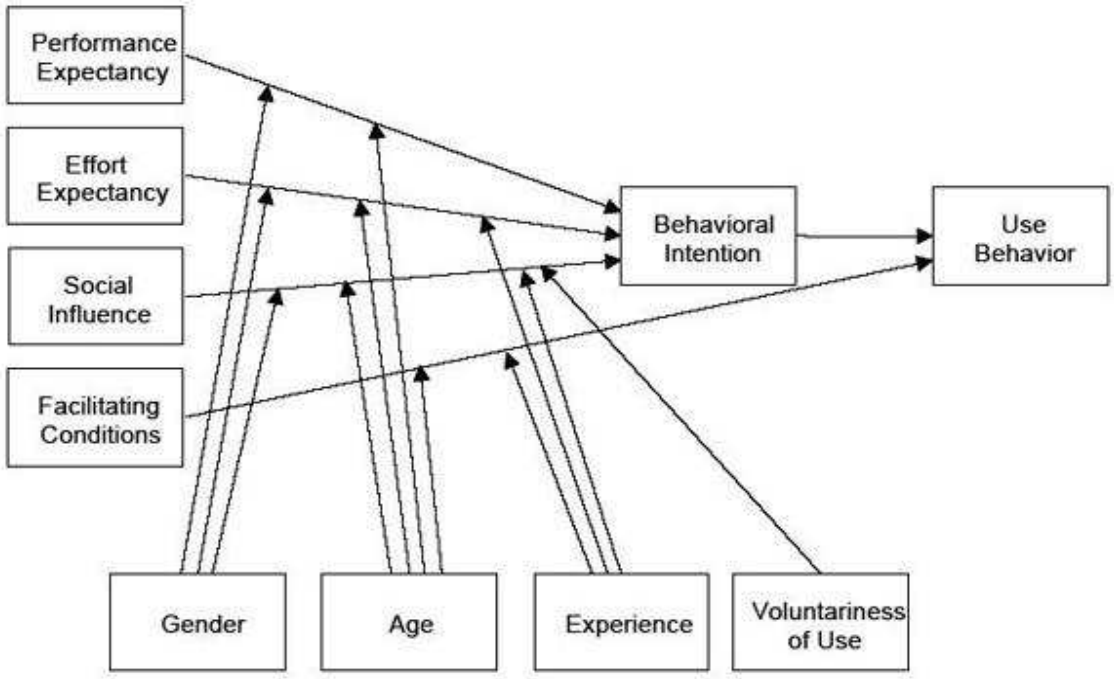

Figure 3.2: Unified Theory of Acceptance and Use of Technology (Venkatesh et al., 2003, p. 447)

The Table 6 below presents and defines the constructs of the UTAUT model with corresponding models and theories from which they are derived.

Table 6:

The UTAUT Constructs and their Primary Sources

Construct	Definition	Primary source of the Constructs from initial Model	Moderating Factors
Performance Expectancy	This is the degree to which an individual believes that using the system will help them to attain gains in job performance	Perceived Usefulness—TAM/TAM2/C-TAM-TPB Extrinsic motivation (MM) Relative advantage (IDT) Job fit (MPCU) Outcomes expectation (SCT)	Age Gender
Effort Expectancy	It is the degree of ease associated with the system	Perceived ease of use—TAM/TAM2 Complexity (IDT) Ease of use (MPCU)	Age Gender Experience
Social Influence	This is the degree to which an individual perceives that important others believe they should use the new system	Subjective norm—TRA, TAM2, TPB, DTPB & C-TAM-TPB Social factors (MPCU) Image (IDT)	Age Gender Experience Voluntariness
Facilitating Conditions	This refers to individuals' perceptions of the resources and support available to perform behaviour. (Venkatesh et al., 2003)	Perceived behavioural control—TPB, DTPB & C-TAM-TPB Facilitating condition (MPCU) Compatibility (IDT)	Age Experience

Source: Venkatesh et al., 2003, p. 447

Table 6 presents the four fundamental constructs of the UTAUT model with their meaning; it also indicates the primary source of each construct from the original model and the moderating factors that influence the degree of manifestation of each construct in an individual. Interestingly, the table shows that each of the constructs originated from two or more primary sources, which confirms the convergence of several models that formed the UTAUT model. In the next sections I discuss each of the UTAUT constructs to provide an explicit explanation and implication for the ICT integration process in schools.

3.2.1 Performance Expectancy

According to Venkatesh et al. (2003), "performance expectancy is the degree to which an individual believes that using the system or technology will help them attain gains in job performance" (p.447). Generally, technology users have great expectations and believe that ICT is invented to improve human life through the way they perform work and business. Similarly, teachers' and learners' expectations of learning are strongly influenced by their prior expectations of what ICT can offer to them in the classroom (Littlejohn, Margarian, & Vojt, 2010). Therefore, everyone using technology expects that job performance should increase otherwise there will be no need to use technology in job performance. Given the speed and accuracy associated with most modern technologies, users are already conscious of the efficacy of technologies, hence the expectations. It is the expectations that are the driving force behind most people accepting and using technology in work spaces.

3.2.2 Effort Expectancy

According to Venkatesh et al. (2003), "Effort Expectancy is the belief about the degree of ease associated with the system or technology" (p.250). This is related to performance expectancy, as people expect technology to be easy to use which means technology should not require much mental and physical effort from the user. The machines are expected to require less human effort or power to carry out work (Littlejohn et al., 2010; Wijngaards, 2009), which means that much human energy and effort will not be required to achieve reliable results during work with technological tools. For example, people prefer to use a digital phone to an analogue phone, which requires more human effort and energy to dial. Thus, the expectations determine individual's perceptions about and response to the use of technology. The simpler it is to use a certain technology, the more likely it will be accepted and used in the workplace including education and schools specifically. This implies that teachers will prefer to continually use ICT tools that require little or no technical skill to operate, as some participants in this study indicated that ICT are easy to operate and make their lesson preparations and content delivery in the classroom easy. While people may be

influenced to adopt and use ICT by its simplicity of operation, they may also be influenced to accept or use technology by other people such as colleagues at work, mentors, and employers in the society, especially people that have influence on their life through social interactions.

3.2.3 Social Influence

The actions, reactions, and thoughts of an individual are influenced by other people or groups, such as relatives, friends, colleagues, mentors and employers, in the case of this study it may be the school principals, learners, facilitators, and education officers from both the province and DoE. Teachers exert great influence on the life of their learners and similarly teachers are influenced by others within and outside their school environment. People are also influenced by media especially the present day social media. All these sources of influence are rightly described as social influence because it involves social interactions within different social groups.

According to Venkatesh et al. (2003), "social influence is the degree to which an individual perceives that important others believe they should use the new system" (p.451). In the case of this study, important other people that influence teachers in schools are their colleagues, officials of the DoE, principals, parents and learners who expect teachers to integrate ICT in their classrooms during teaching and learning processes. Teachers are specifically saddled with societal or social obligations and expectations that directly and indirectly affect what and how they respond to change in their respective school. For example, teachers in paperless schools may be influenced by relevant stakeholders that supports the idea of ICT integration in schools especially the government and parents to adopt and utilise ICT tools in the classrooms because teachers are mandated to adopt ICT in their schools as a requirement by the government through the GDE.

3.2.4 Facilitating Conditions

According to Venkatesh et al. (2003), this refers to individuals' perceptions of the resources and support available to perform an activity that is required by the new system or technology. When an innovation is introduced in the workplace, the

implementers or users of the innovation expect an enabling environment to carry out the new change. This implies provision of all essential resources and a support system for users of the innovation, and lack therefore can inhibit teachers from using technology. In fact, facilitating conditions are found to be direct determinants of ICT use in the classroom; therefore, the impact of facilitating conditions on innovation implementation is normally observable (Uğur & Turan, 2018; Hariri, 2014). However, I have argued that this may not always be the case in all contexts, because availability or absence of facilitating conditions in schools may be affected by the attitudes of teachers developed over time. Fishbein and Ajzen (1975) posited that attitudes influence human behavioural intentions towards actual behaviour or action.

Based on the Theory of Reasoned Action by Fishbein and Ajzen (1975), which is the precursor of the UTAUT, the beliefs in the form of performance expectancy, effort expectance, social influence and facilitating conditions lead to the development of certain attitudes. The higher the degree of beliefs on a given construct, the more positive the attitude will be, and consequently the greater the intention to integrate ICT in the classroom. This means that an individual's attitude influences their behavioural intention to use technology. On the other hand, when an individual does not believe in the potential benefits of technology because of either experience or observation, they develop negative attitudes that in turn affect their behavioural intention to use the technology.

3.2.5 Behavioural Intention

This is the function of both attitudes and subjective norms (social influence) towards that behaviour that has been found to determine the actual use (Tan, 2013). Prior to the development of intention to use technology, attitudes are usually formed. Attitudes are normally formulated by beliefs about the outcomes of performing behaviour and are supported by the perceived importance of that outcome for the person performing the behaviour. Thus, attitudes towards any behaviour are a function of the strength that behaviour will result in an outcome and the evaluation of that outcome. Likewise, subjective norms depend on views of important people who command significant

influence on users of the new innovation and their motivation to comply with the views of others (Kiriakidis, 2015).

3.2.6 Use Behaviour

This is the actual behaviour that a person displays after accepting to use a new system, technology or idea. In the case of this study, it is the actual use of ICT to teach in the classroom after accepting the idea of integrating ICT into teaching. User behaviour is the final outcome of user beliefs and experiences.

3.3 The Role of Moderating Factors in the UTAUT Model

Apart from the four major constructs of the UTAUT model, Venkatesh et al. (2003) also included the four variables of gender, age, experience, and voluntariness of use as moderators of acceptance, depending on the technology context under study (Williams, Rana, Dwivedi, & Lal, 2011). These are factors that influence performance expectancy, effort expectancy, social influence and facilitating conditions in complex different ways. Several studies (Akbar, 2013; Touray, Salminen, & Mursu, 2013; Macharia, 2011) investigated the influence of moderating factors on technology adoption and use across different contexts and revealed that age, gender, experience, and voluntariness of use do influence people's performance expectancy, effort expectancy, social influence and facilitating conditions towards technology adoption and use. However, the influence of the moderating factors on behavioural intention across contexts and national boundaries varies due to contextual factors like culture, economy and social issues (Alabi, 2016).

One of the research questions in this study seeks to consider the factors that influence teachers' beliefs. Age, gender and experience manifested as influencers of teachers' beliefs about the use of ICT in the classroom. In the next section, I discuss each of the moderators and how they influence user beliefs about the use of ICT.

3.3.1 Age

In the UTAUT model, Venkatesh et al. (2003) posited that the age of the technology user significantly influences all four belief constructs (performance expectancy, effort expectancy, social influence, and facilitating conditions) that determine technology adoption and use. In this study, age appeared prominently as a factor that influences ICT integration in paperless schools, whether positively or negatively due to different ICT exposure, knowledge and skills. The influence of age as a factor on technology use and integration is not novel: Howe and Strauss (as cited in Khoza & Manik, 2016) found that, “Age was a decider in the use of digital technology resources”. Khoza and Manik (2016) further stated that, “Digital technologies were found to be more attractive to younger generation (which includes students) than old aged people” (p. 192). While this is unsurprising, it cannot necessarily be generalised because some older teachers in schools can be more ICT savvy than the younger teachers in the schools. Availability of ICT training for teachers in schools makes a difference of the general perception, especially where all teachers are provided with equal opportunities to acquire knowledge and skills on the use of ICT in teaching and learning.

3.3.2 Gender

In the UTAUT model, Venkatesh et al. (2003) described the influence of gender, male or female, on performance expectancy, effort expectancy and social influence as factors that influence teachers’ decision to integrate ICT or disregard it. Perhaps the issue of gender did not appear as prominent in the findings of this study because ICT integration process does not require physical strength like strenuous activities in factories. ICT integration is an activity that requires mental ability and minimum physical ability to accomplish; thus the impact of gender is minimal in this case.

3.3.3 Experience

This is a process that an individual has undergone or is still undergoing, and provides some knowledge and skills through action, emotion, communication and cognition in life (Hohr, 2013). Experience builds up over time but can sometimes be instantaneous,

depending on circumstances. Experience is a central life process that culminates to lived experience and lead to particular human behaviours. Venkatesh and Davis (2000) posited that "experience is the direct effect of subjective norm on intentions that may subside over time with increased system or technology experience" (p.245). In this study, teachers' experiences of using ICT in school can be affected by the influences from fellow teachers, administrators and even learners. Although ICT integration is mandatory to all teachers in paperless schools, their intention to integrate ICT is affected by their experiences.

3.3.4 Voluntariness

This is the extent to which potential adopters of innovation perceive the adoption decision to be voluntary (Venkatesh & Davis, 2000). The more an individual perceives that they have the freedom of volition to accept or use an innovation, the bigger the chance of participation in the innovation. People often feel threatened when compelled to accept or participate in change (Rogers, 2003). Voluntariness influences an individual's degree of perception that important others believe he or she should use the new innovation.

3.4 Strengths and Limitations of the UTAUT

I recognise the strength of the UTAUT model in terms of its applicability to research in diverse fields and disciplines like information systems, IT, health, business and education. I also acknowledge the high efficacy of the UTAUT model in terms of its explanatory power in technology use behaviour as compared to other theories. However, Venkatesh et al. (2003) reported that the UTAUT model is only able to explain up to 70% of the variation in user acceptance of technology, and this suggests limitations of the model (Cohen, Bancilhon, & Jones, 2013). Scholars have critically examined the utility of the UTAUT in researching various disciplines and critiqued the model as having some limitations. For example, Liu (2013) critiqued the inflexibility of the UTAUT to adapt to different contexts. The UTAUT model is an adoption model created in the western context (USA) to study people's adoption decisions and innovation behaviours. It was first tested within the western context before it spread to

Asia and other parts of the world. Therefore, in as much as it can accurately measure and predict people's behaviour in western and other similar cultures such as Europe, it may be limited in contexts and cultures that are non-western. For example, a study on IT acceptance in Saudi Arabia showed the cultural difference between Saudi Arabia and any western country, which made it difficult for the researchers (Gahtani, Hubona, & Wang, 2007) to use the UTAUT to examine worker's adoption of computers in Saudi Arabia. The Arab cultural beliefs which place the male folk above the female folk became an obstacle for them to conduct the research using the original variables in the UTAUT model. It is worth knowing that workers in Saudi Arabia had different work-related values from that of workers in western countries like the USA and Europe. For example, in Saudi Arabia women are not allowed to freely engage in public service like their male counterparts. Likewise social interactions between men and women in public places are also restricted. These differences in cultural beliefs negatively intermingled with social influence, which made Saudi workers develop a resistance to IT use (Liu, 2013).

In another study that investigated the determinants of IT-related innovation acceptance and use behaviour, Moghavvemi, Salleh, and Abessi, (2013) critiqued the originators of the UTAUT model concerning the role of behavioural intention as an important predictor of behaviour that mediates the influence of various beliefs and external factors on behaviour. They called it the intention-behaviour gap. According to Moghavvemi et al., (2013).

> Behavioural intentions have three limitations; firstly, behavioural intention reflects an individual's internal representation of beliefs, and it does not represent the external factors that can affect the performance of behaviour. Secondly, behavioural intention has a weak predictive and explanatory ability to deal with uncertainty and unforeseen events between the time the intention is formed and when the behaviour is performed. Lastly, the authors observed that behavioural intention has a weak ability to predict behaviours that are not completely within an individual's volitional control. In the face of new information, an individual's belief and behavioural intention can and might change, if it changes, it renders the behavioural intention inaccurate, unstable and less predictive of behaviour. (p. 247)

Moghavvemi et al. (2013) also considered the absence of self-efficacy and attitude as another limitation of the UTAUT model. The originators failed to include self-efficacy as a direct determinant of behavioural intention in the UTAUT model. Yuen, Yeow, Lim, & Saylani (2010) and Straub (2009) found self-efficacy and attitude as indirect constructs that influence technology adoption and use and need to be included in the theoretical model that seeks to determine use intention and use of technology.

After a careful consideration of ICT integration processes from both the literature and the context of this study, I resolved to theorise affordances, knowledge facilitating conditions, influential factors and context as determinants of attitude and behavioural intentions that lead to ICT integration in the new model. The suggested model is presented and discussed in Chapter 6 (See Figure 6.1, Section 6.7).

3.5 A Conceptual Model for ICT Integration in the Classroom

The aim of this study is to explore and interrogate teachers' beliefs and experiences around ICT integration in paperless schools. It being a qualitative exploratory study, it is not committed to establishing causal relationships between the research constructs as in the quantitative methodology.

Despite the adoption of the UTAUT model that serves as a framework for the study, I consider it essential to develop a conceptual model to illustrate the relationships of the various concepts that informed my study without ambiguity. Being a qualitative case study that seeks to understand the beliefs and experiences of teachers in unique school contexts (paperless schools), and the findings is inductively presented in relation to the relevant concepts in the theoretical and conceptual models.

According to Miles, Huberman, Huberman and Huberman (1994),

> "A conceptual framework explains either graphically or in a narrative form, the main dimensions to be studied, that is, the key factors or variables and the presumed relationships. A framework can be rudimentary or elaborate, theory driven or commonsensical, descriptive or causal" (p. 18).

In this study, I considered it appropriate to use a conceptual framework to discuss the four constructs extracted from the UTAUT model that relate to my research study.

As stated earlier, this study is particularly interested in the four core constructs of the UTAUT model because they are direct determinants of behavioural intention and ultimately behaviour (Venkatesh et al., 2003). In the case of this research study, the four core constructs are regarded as the beliefs which teachers hold towards ICT integration in schools. However, in the course of my discussions I will talk about the role of attitude in an individual's intention to use or integrate ICT in the classroom, because attitude influences behavioural intention that leads to the manifestation of actual use behaviour.

Each of the four constructs presented in the conceptual framework is related to the concepts reviewed in the literature and addresses the research questions. For example, performance and effort expectancies are concerned with teachers' experiences of ICT affordances in the classrooms, while facilitating conditions address the training and other form of support structures in the schools as narrated by participants. The social influence in the framework is concerned with the human factors that influence teachers to integrate ICT in the classrooms. Interestingly, all the constructs function harmoniously in an interrelated and interdependent way towards determining ICT adoption and integration in schools. Given the relationships among the constructs and in relation to this study, I engage with these constructs differently in this section, in order to demonstrate their relationship to existing literature and their implications to this study. In this section, I discuss the research constructs beyond mere description by providing detailed explanations and relationships in relation to the implications to ICT integration.

The core constructs that form the UTAUT model appear to be indepently presented, but I believe they are linked together as beliefs influence ICT users' decision to integrate or not to integrate. As a matter of fact, the constructs are interelated to and interdependent on one another towards the actual user behaviour. The only difference is that while some are explicit (facilitating conditions and user behaviour), others are implicit, that is internal to the user (performance and effort expectancy and social inflence). Therefore I shall discuss the constructs in relation to each other based on the findings of this study.

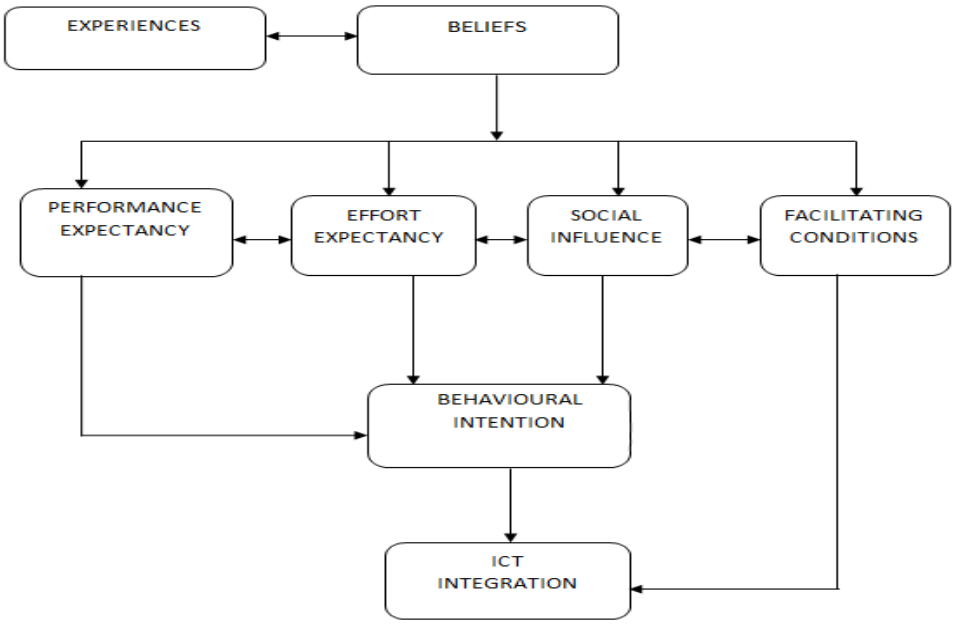

Figure 3.3: Conceptual Model for Teachers' Beliefs and ICT Integration emerging from UTAUT

It is pertinent to know that the introduction of ICT into the education system has spurred teachers to form beliefs about the role and value of ICT as a teaching and learning resource. These new beliefs often intersect with teachers' pedagogical beliefs that have been formed over the years (Prestridge, 2012). Nevertheless, both the new and established beliefs are informed by teachers' experiences of schooling and learning. As stated earlier, it is not the intent of this study to establish causal relationships between any of the UTAUT contructs to ICT integration. Rather the study seeks to establish the interdependent relationships and their mplications between the constructs as informed by teachers regarding integration of ICT in classrooms. In view of the position of this study, I have endeavoured to explain and illustrate the relationships of each of the construct to ICT integration in the sections below.

3.5.1 Experiences

Experiences are the determinants of human beliefs based on context and exposure to physical and social environments. Teachers acquire their experiences from personal everyday life endeavours and through group interactions. And literatures have proven

that experiences give rise to beliefs (Hannula et al., 2016; Richardson, 1996). Teachers begin to develop their beliefs from personal activities, events, understanding of everyday life, and sometimes through observation of other people in their environment. Teachers also develop experiences through schooling and formal learning settings that impact on their beliefs and belief systems. It is important to know that there are many sources of experiences that lead to the formation of different beliefs, such as religious beliefs, educational beliefs, and cultural or societal beliefs, which are usually tied to context. Lortie (as cited by Davis & Andrzejewski, 2009) argued that:

> The beliefs that teachers hold about teaching originate from personal experiences as students in previous schools attended. Nevertheless, some beliefs may have been derived from other personal experiences such as family traditions and values, social encounters, community participation, popular culture, teacher preparation programmes, observing other teachers, professional development, and scholarly literature. (p. 13)

Although this study is interested in teachers' beliefs, it is particularly interested in teachers' educational beliefs that emanate from their personal and contextual experiences. In this study, teachers' educational beliefs entail beliefs about teaching, learning, ICT and its integration in teaching and learning processes.

Teachers also gain experiences at primary school, high school and tertiary institutions of learning by observing how their teachers teach them. These experiences develop over time to form beliefs that teachers hold on to over time, and it impacts on their teaching decisions and classroom activities. Lortie (as cited by Davis & Andrzejewski, 2009) coined the term 'apprenticeship of observation' to describe the phenomenon that the majority of teachers teach very similar to their own teachers, which means "teachers teach the way they are taught" (p.13). Teachers are also exposed to in-service training workshops, seminars, and conferences and other forms of in-service professional development support courses that culminate together to provide them with a wealth of experiences that shape their beliefs. In this study teachers expressed different beliefs about the implementation of ICT integration in paperless schools. They had beliefs about their knowledge of ICT integration the classroom, the affordances of ICT especially in the classroom, training for ICT integration, challenges of ICT integration, and factors that influence ICT integration in school.

3.5.2 Beliefs

Teachers, like all human beings, have a set of beliefs that guide their choices, decisions and actions, and these beliefs influence how and why they choose to teach in a particular way (Ertmer et al., 1999). Though it is difficult to establish the veracity of human beliefs, its impact on human expressions, thinking, decisions, choices and actions can be determined with relative certainty. Surprisingly, studies (Djoub, 2018) have shown that teachers' beliefs are far more influential than their knowledge in determining teachers' planning, decision-making and attitudes in the classroom. This attests to the power of beliefs over knowledge in the life of teachers. Corroborating the above claim, Davis and Andrzejewski (2009) stated that "teachers' beliefs guide their decision making, behaviour, and interactions with students and, in turn, create an objective reality in the classroom, what students experience as real and true"(p.909). This is why this study adopted the qualitative methodology to explore teachers' beliefs and experiences of ICT integration in their school contexts.

Teachers' beliefs about the affordances of ICT in terms of performance and effort expectancy showed that teachers develop a positive attitude and intention to use ICT when they perceive that ICT has the capacity to greatly improve their teaching performance. Prestridge (2012) asserted that, "Even though beliefs are not easily changed, it does not mean that they cannot be changed" (p.449). Old beliefs that teachers formed from previous experiences may change when they are exposed to new experiences that counter the old beliefs. This is why teachers develop new beliefs when they are exposed to new experiences during training, workshops and seminars. As earlier indicated in the literature review section, when teachers change their beliefs, it leads to corresponding changes in other aspects of their behaviour in the classroom. For example, there may be changes in teachers' attitudes, teaching style, and teacher pedagogy because of new ICT knowledge, skills and resources (Prestridge, 2012). Beliefs influence teachers' trust on technology, which are the expectations of what technology can help them do in the classroom. Venkatesh et al. (2003) referred to it as performance expectancy.

3.5.3 Performance Expectancy

According to the UTAUT model, Performance expectancy is the degree to which an individual believes that using ICT will help them enhance or improve their teaching performance and which persuades them to use ICT in the classroom. This means performance expectancy is concerned with the relative advantage of using a particular technology (Rogers, 2003) and also the potential benefits of ICT. Teachers usually consider the gains that accompany ICT against the old teaching tools or resources in terms of job performance before resolving to integrate ICT in the classroom. Hence, teachers are only persuaded to use new technology tools in the classroom if it makes their teaching more effective and less stressful. This implies that the success of implementing ICT integration in schools depends on teachers' conviction about the benefits of ICT in adding value to teaching and increasing learners' performance in learning. Venkatesh et al. (2003) further theorised that individual's expectations of performance is influenced or moderated by age and gender (See Table 6).

It is worth knowing that the expectations of an individual about the benefits technology are usually based on the beliefs that they hold concerning the role of ICT tools in facilitating their job. A high expectancy increases the possibility of an individual's propensity to embrace the use of new technologies for accomplishing life and work goals (Zigurs & Hofer, 2009). Previous tests of technology adoption and use models like the TAM (Davis, 1989) and the IDT (Rogers, 2003) shows that performance expectancy is one of the strongest predictors of an individual's intention to use new technologies (Zigurs & Hofer, 2009).

Some scholars have reported the findings of studies indicating the influence of the age of teachers on ICT integration across different contexts. For example, the age of secondary school teachers is not a factor when it comes to teachers' use of ICT tools in delivering contents (Mazoya, Ismail & Manyilizu, 2015). Likewise, Jegede (2009) examined the effect of educators' age of on time spent interacting with ICT; the study found that in considering ICT use, age is not a factor. However, the author cautioned that findings of the study are only applicable to teacher educators.

Although this study is not concerned with the causal relationship between the constructs, it is imperative to note that performance expectancy, though a strong determinant of ICT use can change over time because of other related factors that influence the users. For instance, the experiences that teachers have during in-service ICT integration training and other forms of teacher development programmes may influence teachers to develop new beliefs about the affordances of ICT in teaching and learning. The trainer and trainee relationship has been found to be a powerful social influence on a trainee's life that affect the trainee's experience and consequently lead to changes in their beliefs (Venkatesh & Davis, 2000; Venkatesh et al., 2003).

3.5.4 Effort Expectancy

One of the affordances of ICT in education is its flexibility and ease of use by almost anyone that has learned the skill of operating them. Similar to performance expectancy, effort expectancy is about teachers' beliefs about the degree of ease associated with ICT use. Based on the assumption of the UTAUT, teachers will accept to integrate ICT in the classroom when it proves simple to operate; conversely, teachers will reject the use of ICT if it proves difficult to operate. This means the simpler it is for the ICT to use, the greater the extent of application of ICT in classrooms. Thus, for successful implementation, teachers must be provided with support through ICT integration training within and outside schools. When teachers acquire knowledge and skills to operate ICT in the classrooms, they might integrate them willingly during teaching and learning processes. Wei, Piaw, Kannan, & Moulod (2016) observed that in most school contexts, teachers are found to be at different levels of confidence and competence to operate ICT, even in school contexts where ICT adoption is mandatory for teachers. While some teachers may have sufficient knowledge and skills to operate ICT in their classrooms; others may struggle to acquire the skills of using ICT gadgets like electronic smartboards and computers; and others are still at the stage of learning basic skills to operate computers and related equipment for teaching and learning purposes (Wei, Piaw, Kannan, & Moulod, 2016). These disparities often occur because of context, past experiences, and accessibility of ICT resources in schools. Effort expectancy is moderated by gender, age and experience and influences behavioural intention.

3.5.5 Social Influence

The construct of social influence is relevant to this study, because both adoption and integration of ICT in paperless schools are mandatory to all teachers. Social influence is the change in behaviour that one person causes in another, deliberately or involuntarily, as a result of the way the changed person perceives themselves in relationship to the influencer, other people and society in general. This implies that social influence describes the situation in which an individual considers adopting and or use a particular technology to do work, because of other people's approval or recommendation. Authors (Venkatesh & Davis, 2000; Venkatesh et al., 2003) agree that social influence shapes individuals' attitudes, beliefs, and subsequent actions or behaviours as influenced by referent others. The referent others are the people that an individual look up to for collaboration, guidance and leadership.

Context and culture play significant roles in how and why people influence others (Venkatesh et al., 2003) which means an individual may choose to adopt or use a technology because they are socially influenced by some people that appear influential to their lives. The impact of social influence on an individual's behaviour can be positive or negative. If an individual is positively influenced through approval or motivation to adopt or use technology, the individual will develop a positive attitude and behavioural intention to use the technology. On the contrary, if an individual is negatively influenced with intimidations or negative verbal comments about the technology, there is a big chance that the individual will develop a negative attitude and withdraw his intention to adopt or use a technology. In this study, which focuses on teachers who implement ICT integration in schools, it is acknowledged that many education stakeholders often influence teachers in various ways and to varying degrees. Teachers normally interact with friends, colleagues, principals, learners, facilitators, and education officers from both district and DoE, and all these stakeholders can influence teachers' decisions, choices, actions and inactions in the school. Findings in this study revealed that the teachers in paperless schools believe these stakeholders have some expectations for them to teach with ICT tools, such as the smartboards, laptops, tablets and other

recommended mobile devices supplied in the schools. Furthermore, the teachers were expected to produce high grades as part of learner's performance. These expectations influenced the teachers' attitudes and decisions to integrate ICT in the classroom, because they want to meet these expectations.

It is pertinent to note that the teachers in paperless schools are not only influenced by the above-mentioned stakeholders through social interactions, but also through the expectations of government as stated in the e-education policy and CAPS curriculum statement. Unfortunately, this places the teachers at cross roads, because the teacher is expected to achieve both the e-education policy objectives which require full ICT integration in the classroom, and at the same time to achieve the content requirement stipulated in the curriculum statement. Other significant persons that influence teachers to develop attitudes and intention to integrate ICT in the classrooms are the trainers who facilitate ICT training workshops within and outside the schools. The attitudes and competence of the trainers have a direct, significant effect on teacher trainees and can be a determinant factor that influences teachers to adopt and or integrate ICT in teaching. I found out from schools that when training is poorly conducted, teachers get discouraged to use ICT in teaching, thereby developing resistance to adopt and integrate ICT.

ICT integration training that are facilitated by professional, competent trainers can make teachers believe in the capability of ICT to ease and enhance teaching in the classroom. This allows teachers to develop positive attitudes and intention to integrate ICT in teaching, and can also change the teachers' negative perceptions of ICT and their lack of intention to use ICT (Venkatesh, Thong & Xu, 2016). This signifies the power of social influence on teachers' beliefs and attitudes to use ICT. Although social influence is intrinsic, it can be determined through the testaments of teachers in schools about the factors that motivate them to integrate ICT in their classrooms. As indicated in the literature, it is interesting to know that teacher' beliefs, attitudes and intentions can be changed when new experiences are gained.

3.5.6 Facilitating Conditions

These are the most powerful direct determinants of user behaviour based on the UTAUT model. Facilitating conditions for ICT integration in schools include, but are not limited to, the school's physical environment, technical facilities, infrastructure, school culture, individual and institutional support, and other technological resources. The condition of school infrastructure, the support and the resources significantly impact on ICT integration in schools. Although the right facilitating conditions are necessary for ICT integration success, findings have shown that provision of facilitating conditions such as ICT policy and infrastructural facilities is not enough to guarantee ICT integration in schools. Pedagogical integration of ICT into classroom teaching and learning requires a combination of suitable facilities and competent teachers. In this study facilitating conditions is significant because teachers in paperless schools depend on support and resources to be able to implement ICT integration in their classrooms.

3.5.7 Intention to Integrate ICT

In this study, intention is concerned with teachers' commitment to integrate ICT in the classroom based on their beliefs and conviction that ICT are beneficial tools for teaching and learning. Before teachers consider their intention to use ICT or not, they first develop attitudes towards ICT tools and ICT integration in the classroom. These attitudes arise from their beliefs and they influence teachers' behavioural intention to integrate ICT in teaching. Bingimlas (2012) cautioned that, "An important consideration that should be taken into account when using ICT in the classroom is teachers' attitudes" (p. 7110). Teachers must have positive attitudes towards the use of ICT in teaching, if they must use it appropriately. Because it is only when teachers cultivate positive attitudes that ICT integration can be successful in the school.

This study found that teachers can change their attitudes and intention to integrate ICT in their classrooms when they get the right type of support and resources and when they get job satisfaction from the use of ICT in the classroom. This means both attitude and intention to use ICT are not static or fixed, and can change based on other associated factors that influence ICT use. However, a change in behavioural intention is

considered a limitation of the UTAUT model because Moghavvemi et al. (2013) argued that, “A change in behavioural intention renders the intention inaccurate, unstable and less predictive of behaviour” (p. 247). Nevertheless my argument in this study is not about the prediction of teachers’ behavioural intention of use, which may require some degree of accuracy and stability, but rather the implication of teachers’ behaviour in relation to each of the four core constructs of the UTAUT model. Given that human behaviour is flexible and subjective to change, change in teachers’ attitude and intention to use ICT in teaching may occur at any time during pedagogical processes in the classroom. Teachers may choose to change their attitude and intention to integrate ICT as a result of new experiences with ICT tools during ICT training or because of social influences from interactions with colleagues or training facilitators. Several factors can influence change in attitude and intention to integrate ICT in teaching. The study was interested in exploring to understand the teachers’ beliefs in relation to the performance and effort expectancy, social influence and facilitating conditions in their respective schools through inductive analytical processes.

3.5.8 Actual Integration of ICT

Consequent to all the beliefs and experiences demonstrated in performance and effort expectancy, social influence and facilitating conditions, teachers eventually integrate ICT in their classroom because of their convictions of the affordances of ICT in education and particularly classroom teaching and learning. However, there is also the possibility of total resistance and rejection of ICT integration if teachers perceive ICT as distracting and unprofitable to the performance of their teaching and learning activities. One of the factors that motivated teachers to use ICT was their satisfaction with ICT affordances (Bingimlas, 2012). It is teachers’ convictions of the potential affordance of ICT in the classroom that inform adoption and integration in the school. ICT integration increases as facilitating conditions, social influence, ease and performance increase over time because these factors serve as drivers to ICT integration. A decrease in any of or the entire four constructs may result in a corresponding decrease in ICT integration, although the impact may not be proportionate. Finally, ICT integration in the classroom is not dependent on a single factor but on several interrelated and

interdependent factors. These factors are both implicit and explicit to actual integration of ICT in the classroom.

3.6 Summary of the Chapter

In this chapter, I presented the theoretical framework that served as a support to the entire research project. The UTAUT was the theoretical model that served as the framework of the study. The chapter provided an in-depth explanation of the genesis and relevance of the UTAUT model and its constructs to the study. The convergence of eight similar theories and models that formed the UTAUT model was illustrated in a diagram to provide clarity about the synthesis and formulation of the unified model. A justification for adopting the model was also given in the chapter. However, given that the research is not interested in all the constructs of the UTAUT model, I designed and modified the UTAUT model to generate a conceptual frame that explains the findings of the study. The conceptual model contained only the four central constructs of the UTAUT model in relation to the study and how each of the constructs affects ICT integration.

The next chapter is named Pathways to Understanding Teachers' Beliefs and Experiences around ICT Integration in Schools, and provides the reader with the different strategies in the form of methodology, design, methods and instruments used to arrive at the findings of the study.

CHAPTER 4

PATHWAYS TO UNDERSTANDING TEACHERS' BELIEFS AND EXPERIENCES OF ICT INTEGRATION IN SCHOOLS

4.1 Introduction

According to Almekhlafi and Almeqdadi (2010) "most research studies conducted so far on ICT integration in classrooms focus on quantitative data collection methods such as surveys. Unfortunately quantitative research methods for data collection do not always give true reflection of ICT integration in the classroom" (p. 167), because results of quantitative inquiry are presented in numbers, which hide important details about the actual state of a phenomenon. Given that this research study is to contribute to policy decision-making, it is imperative to investigate the phenomenon beyond the peripheral level of inquiry to an in-depth level of inquiry using qualitative methods like interviews because "A good decision is based on knowledge and not on numbers" (Plato, c.428–347 B.C).

This chapter provides a detailed account of the research design adopted, justifies the methods selected for data generation, and describes how data was analysed. The chapter begins by discussing various paradigms, known as the philosophical foundations, upon which each type of research is foregrounded to locate the current study. The constructivist paradigm is considered most appropriate to foreground the study. This discussion will be followed by the descriptions of research methods and processes for data collection, research settings, and data analysis approach. I conclude the chapter with a description of the methods I employed to ensure the trustworthiness of the study and the ethical considerations of the study.

4.2 The Research Outline

The diagram below (Figure 4.1) is a graphic description of the overall research outline for the comprehension of readers on the current study. This research study was grounded within the constructivist epistemological worldview that claims that truth is relative and dependent on one's perspective. It recognises the importance of subjective

human creation of meaning but does not reject objectivity. “The paradigm supports close collaboration between the researcher and the research participants” (Thomas, 2010)

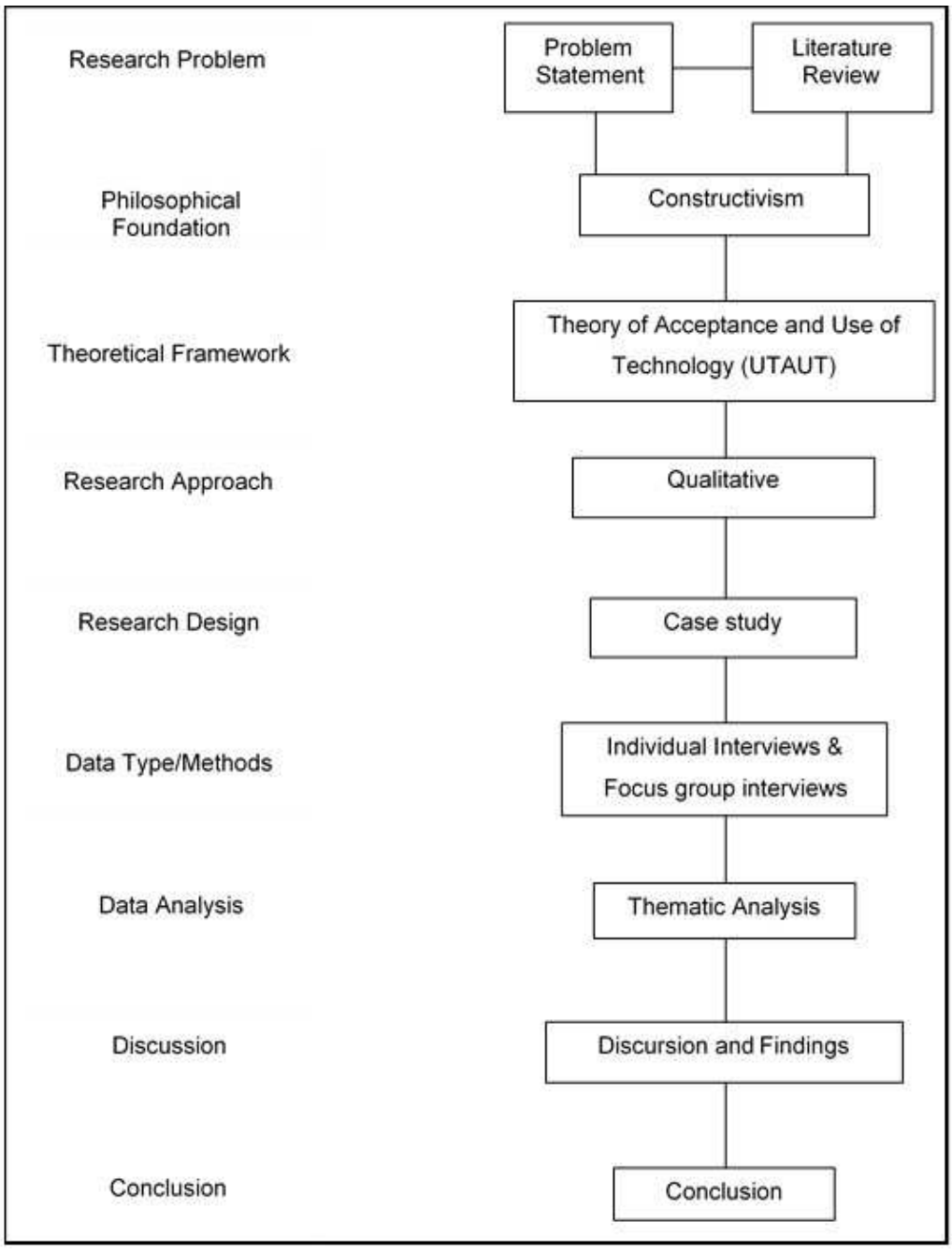

Figure 4.1: The Research Outline

This provides the investigator with the opportunity to listen and understand the participants' views about a particular subject in a given context. The study adopted a qualitative approach, which is a form of inductive research that focuses on the context and meaning of human lives and experiences. One of the benefits of qualitative data is that it helps to gain a deeper understanding of phenomena and processes, especially those that emerge over time and context. It involves a systematic and rigorous form of inquiry that uses in-depth interviews, ethnographic observations and review of documents, among others, to generate data (National Institutes of Health, 2012).

4.3 The Research Paradigms

Paradigms, also known as worldviews, are philosophies about what constitute reality and knowledge and the traditions of searching for knowledge. They are the basis for every scientific and social inquiry around the world and serve as the philosophical foundation upon which every effort to search for knowledge rests (Creswell, 2003). According to Guba and Lincoln (1994), research philosophies or paradigms are belief systems or worldviews that guide the researcher to not only make choices on the methods for investigation, but also to understand the ontology (nature of reality) and the epistemology (the nature of knowledge) of the investigation in fundamental ways.

I consider it appropriate to provide a brief description of each paradigm in relation to the study in order to provide justification for adopting one that I consider most suitable to the study. Although not all the paradigms identified in Table 7 are relevant and applicable to this study, I briefly present and explain the different philosophical views and their limitations for this study. Subsequently, I present a detailed explanation of the paradigm (constructivism) that I considered suitable for the study.

Table 7:

Categories of Research Paradigms

Positivism (Very rare in qualitative research)	Ontology: Realism. There is a "real", objective reality that is knowable. Epistemology: Objectivist. The researcher can, and should, avoid any bias or influence on the outcome. Results, if done well, are true. Methods: Tends toward quantification and controlled experiments.
Post-positivism	Ontology: Critical Realism. There is a "real", objective reality, but humans cannot know it for sure. Epistemology: Modified Objectivist. The goal is objectivity, but pure objectivity is impossible. Results are "probably" true. Methods: Includes both qualitative and quantitative methods. Seeks reduction of bias through qualitative validity techniques (e.g. triangulation).
Critical Theory	Ontology: Historical Realism. Reality can be understood, but only as constructed historically and connected to power. Epistemology: Knowledge is mediated reflectively through the perspective of the researcher. Methods: Focused on investigator/participant dialogue, uncovering subjugated knowledge and linking it to social critique.
Constructivism	Ontology: Relativist. All truth is "constructed" by humans and situated within a historical moment and social context. Multiple meanings exist of perhaps the same data. Epistemology: Researcher and participants are linked, constructing knowledge together. Methods: Generally qualitative, research through dialogue.
Advocacy/Participatory	Ontology: Varied Epistemology: The distinction between researcher and researched breaks down. Insider knowledge highly valued. Methods: Works with individuals on empowerment and issues that matter to them. Tends toward social, cultural or political change, using any appropriate method.
Pragmatism	Ontology: Varied. Pragmatists may be less interested in what "truth" is and more interested in "what works". Epistemology: Accepts many different viewpoints and works to reconcile those perspectives through pluralistic means. Methods: Focuses on a real world problem, by whatever methods are most appropriate, and tends toward changes in practice.

Source: Creswell, 2009; Guba & Lincoln, 1994

Saunders and Tosey (2013) pointed out that:

> How a researcher views the world, her or his taken-for-granted assumptions about human knowledge and about the nature of the realities encountered, inevitably shape how a research question is understood and the associated research design. This means a researcher's philosophy is her or his personal view of what constitute acceptable knowledge and the process by which this is developed. (p. 58)

Given the above assertions, I resolved to employ qualitative research methods that informed me to use a case study design to answer my research questions, which seeks to address teachers' beliefs and their experiences of ICT integration in schools. The choices I made conform to my relativist stand on what reality is and the belief that knowledge is constructed collectively through social interaction. My choice of research design and methods was also practically influenced by my epistemological position of construction of reality in society.

4.3.1 Positivism

Positivists assume that "reality is fixed, directly measurable, and knowable and that there is just one truth and one external reality" (Creswell, 2009, p.312). I have considered adopting the positivist approach because of the research questions, and particularly, the research objectives that seek to understand the beliefs that teachers have, explore their practices and understand contextual factors that affect ICT integration in the classroom. However, my use of the qualitative method to conduct the research cannot be devoid of subjectivity and bias from both me and the research subjects, which is totally against the absolute objectivity required by positivists. I also cannot replicate the findings of the research as required by positivism because it is a qualitative case study bounded by time and space (Yin, 2009). Unlike the positivists who subscribe to the use of controlled and measurable methods, such as experiments and tests, to investigate reality and truth, I employed interviews to understand and interpret the phenomenon.

This study is also not interested in absolute truth as expected by positivism, but rather it is interested in understanding the research subjects and the phenomenon with the intention of generating a theory to address similar phenomenon in the future. In view of the above, I have concluded that the positivist approach will not be suitable for this study.

4.3.2 Post-positivism

This paradigm is similar to the positivist paradigm. I considered adopting the post-positivist approach to this research in view of its reflexivity that tends to accommodate social science investigations such as this one. Unlike the positivist approach that believes in absolute reality, post-positivism believes in the existence of objective reality, which they say is beyond the physical reality and that cannot be seen with the eye.

Although post-positivism subscribe to the use of both qualitative and quantitative methods to gain knowledge (Creswell, 2009), my research is purely qualitative and it involves human subjects in a social context and investigates a social phenomenon based on their beliefs and lived-experiences. The post-positivist epistemological position is settled on modified objectivism, yet they strongly believe in objectivity as the main goal of knowledge (Creswell, 2009; Scotland, 2012). This research is limited in its goal of attaining such knowledge, because the subjects of the research are social beings with personal limitations, subjective opinions and varied experiences. Therefore, I am constrained to adopt the post-positivist approach in this research endeavour.

4.3.3 Critical Theory

The major focus of critical theory is to critique dominant modes of understanding in society to unearth and clarify underlying assumptions and render power relations explicit. Critical theory draws on different intellectual traditions such as phenomenology, sociology of knowledge, neo-Kantianism, pragmatism, and positivism and seeks to expose the domination, control and suppression that hide behind that which at first appears neutral, progressive and necessary (Macdonald, 2017). “Critical theory thus opens up possibilities for analysis of power, discourse and historical understandings” (Harney, 2014). Critical realists believe that reality can be understood, but only as

constructed historically and connected to power. To make meaning of any given phenomena or reality, critical theorists suggest that the investigator must reflect on the historical and social contexts of the phenomena (Creswell, 2009; Guba & Lincoln, 1994). Hence, they believe knowledge is mediated reflectively through the perspective of the researcher. The goal of critical theorist is beyond mere understanding of situations or phenomena as it appears. Normally critical theorist aim to bring about change in the way the situation or phenomena can be understood. They do this by being personally involved in the process of knowledge production, implying that the investigator is an active part of the research.

4.3.4 The Advocacy and Participatory

This paradigm focuses on groups and individual perceived to be marginalised or disenfranchised. It holds the view that a research inquiry needs to be matted together with politics and political agenda where the research contains an action agenda for reform that may change the researcher, research subjects and the context of the research (Mertens, 2010). According to the advocacy and participatory approach, research is practical and collaborative, and it starts and ends with the participants rather than research on the participants to use it on other people in a different context. The meeting point of this approach with my research is the focus of inquiry and the methodology. My contemplation to adopt this paradigm as the philosophical foundation of my research is informed by the application of qualitative methodology and the focus on individual teachers in schools, which the paradigm upholds. My point of departure, however, is that my research participants do not determine the research questions and methods and were not involved in collecting data as is practised by advocacy and participatory researchers. While my research seeks to understand teachers' beliefs in schools, it did not aim to promote or incorporate politics and political agenda into the research as encouraged by the advocacy and participatory researchers. In view of these conflicting stances between my research and the advocacy and participatory approach, it is inappropriate to adopt it as a philosophical foundation for this research.

4.3.5 Pragmatism

Pragmatism is “a philosophical approach that is not committed to any one system of philosophy or reality, but it places the research problem in the centre and applies all the approaches to understand the problem” (Creswell, 2017). Pragmatists agree that research always occurs in social, historical, political and other contexts. Pragmatists believe in an external world independent of the mind as well as an internal world in the mind, and individual researchers can choose between them. In this way, researchers are free to choose the methods, techniques and procedures of research that best meet their needs and purposes.

Pragmatism allows for the application of multiple methods, different worldviews, and different assumptions as well as for different forms of data collection and analysis; this makes it more suitable to mixed methods research than to any single method. My research requires that I focus on the method that will help investigate the problem, contrary to the pragmatists’ focus on the problem instead of the methods of solving the problem. Given the above disparities between my research approach and the pragmatist philosophical standpoint, it will not be wise for me to adopt pragmatism as a philosophical foundation of my research.

4.4 Philosophical Foundation Adopted in the Study and Rationale

Given that the study could not adequately fit into some of the philosophical standpoints discussed above without ambiguity, I resolved to adopt constructivism as the philosophical foundation to explore and interpret the phenomenon investigated. However, my resolve to adopt constructivism is principally guided by my personal experiences and beliefs about the relativity of truth being contextual. I believe knowledge is not absolutely objective but constructed through human interaction. Moreover, I believe that what we know and how we come to know is a function of context and relationships. Given these personal beliefs, I am persuaded to adopt the constructivist paradigm that aligns with my personal world view about what constitute truth and how knowledge can be created.

Riegler (2012) noted that constructivism is a not a homogenous paradigm, but one that is still developing since scholars are still formulating different approaches of constructivism through empirical research and philosophical reflections. Thus, some of the existing approaches to constructivism in the literature include radical constructivism, biological constructivism, phenomenological constructivism, cognitive constructivism and social constructivism (Riegler, 2012). Although these approaches to constructivism are all important, it is not within the scope of this study to explain each of the approaches. However, I considered it appropriate to discuss constructivism as a paradigm and how it applies to the study.

The constructivist holds that knowledge is created by a person through social interactions with other people and the social environment. Constructivists believe that knowledge is essentially subjective in nature, constructed from our perceptions and mutually agreed conventions. The approach will therefore afford me to use case studies as a research design to investigate the individual beliefs and experiences of the research participants, where their beliefs and self-reported experiences will count as data. Being a pure qualitative research, I seek to understand the subjective beliefs of the participants within their school context, given that constructivists hold the assumptions that individuals seek to understand the world in which they live and work. “The process of qualitative research is largely inductive, with the inquirer generating meaning from the data collected in the field” (Creswell, 2017). The adoption of the constructivist approach to knowledge production enabled me to use inductive approaches to infer and understand the research participants’ beliefs and experiences through individual face-to-face interviews and focus group interviews. I also gained deep meanings from the plenty data generated; this has led me to obtain in-depth views of the participants, rather than narrowing meanings down into few categories or ideas.

Constructivists believe that individuals are always in search of understanding of the world in which they live and work in order to make meaning out of it. Consequently, the individuals consciously and unconsciously develop subjective meanings out of their experiences, which are often different on the basis of context. The constructivist researcher always seeks to unpack the complex views rather than narrowing meanings down into a few categories or ideas (Creswell, 2014).

Constructivists believe that the aim of research is to search the phenomenon by relying on the participants' accounts of the phenomenon and to address processes of interaction among individuals in a social setting. They also focus on the specific contexts in which people live and work in order to understand the historical and cultural settings of the participants. This is important for this study because teachers as social beings and professionals are bounded by their history and culture in their respective school contexts, which inform their experiences and shape their beliefs. This is why studies by Bingimlas and Hanrahan (2010) and Kriek and Stols (2010) reported the influences of teachers' beliefs and contexts on teaching and learning in the classrooms. This study explored teachers in their school context to understand their beliefs and lived experience of teaching with ICT in paperless schools.

Unlike the positivists, "constructivist do not start investigation a phenomenon with a standing theory, rather they seek to generate or inductively develop a theory or pattern or meanings" (Creswell, 2003, p. 9) throughout the research process. This is because constructivists believe that knowledge and meaning is jointly constructed through social interactions in society. Therefore, the researcher must be open-minded by asking more open-ended questions during data generation to provide participants with the opportunity to express their views without any form of restriction; the researcher then listens carefully to what people say or do in their life settings; and the researcher develops a theory from the meanings that participants make from their views. Often the meanings that people construct are subjective and socially and historically negotiated (Creswell, 2014).

Constructivism often requires the use of qualitative data generation methods and analysis; however, in some instances when multiple realities require explanation and quantification, both qualitative and quantitative methods can be combined to generate knowledge. Nevertheless, even when methods are combined, the quantitative data is only used to support or elaborate the qualitative data to deepen the description of the phenomenon (Mackenzie & Knipe, 2006). Creswell (2014) identified the basic assumptions of constructivist worldviews. An assumption relevant to this study is that human beings construct meanings as they engage with the world they are interpreting. Qualitative researchers tend to use open-ended questions so that the participants can

share their views. This means that there is no limit to knowledge and reality is not absolute since humans have the power to construct and reconstruct knowledge, implying that knowledge is dynamic and changes over time. Constructivists also assume that humans engage with their world and make sense of the world based on their historical and social perspectives—we are all born into a world of meaning bestowed upon us by our culture (Creswell, 2014). Thus, qualitative researchers seek to understand the context or setting of the participants through visiting this context and personally gathering information. Constructivist researchers also "interpret what they find, an interpretation shaped by the researcher's own experiences and background". This means that the personal characteristics of the researcher influence their interpretations of the research findings in some ways. One other assumption of constructivism is that, "The basic generation of meaning is always social, arising in and out of interaction within a human community. The process of qualitative research is largely inductive; the inquirer generates meaning from the data collected in the field" (Creswell, 2014).

4.5 Qualitative Research

This study was conducted using qualitative research methods, which means I was not interested in quantifying the data but in the qualitative views and experiences of the research participants in their everyday lives. Given that there are other methods of inquiry, it is imperative to offer a detailed definition of qualitative research in order to provide a clear understanding of how the study was conducted. Creswell (2014) succinctly defined "Qualitative research as an approach to exploring and understanding the meaning individuals or groups ascribe to a social or individual problem" (p. 32). In every social setting people define phenomena and give meaning to prevailing situations around them, often times with the intent of having a common understanding of the situation. This is also the case in schools where teachers interact with learners, support staff, administrators, facilitators, parents and colleagues. In the course of their interactions, teachers make meanings of all prevailing situations in the school. ICT integration is a relatively new phenomenon in schools, especially in South African. Teachers are constructing and deconstructing meaning of this phenomenon based on

their experiences, beliefs and contexts. To understand these teachers' beliefs and experiences require qualitative methods of inquiry that allow collection of qualitative data through in-depth interviews.

It is imperative to know that "qualitative research is both theoretically and practically different from quantitative research, which is concerned with generalisation, outcomes, prediction, and cause-effect relationships through deductive reasoning. On the other hand, qualitative research is concerned with process, context, interpretation, meaning or understanding through inductive reasoning" (Yilmaz, 2013, p. 45). The goal of qualitative research is to describe and understand the phenomenon being investigated by capturing and communicating participants' experiences in their own words via observation and interviews. Given the focus and the aim of qualitative research, Yilmaz (2013) concluded that qualitative studies often emphasises "the examination of the context that influences people's actions or interactions and the meaning that people ascribe to their experiences" (p. 313). Concurring with Yilmaz, this study investigated the beliefs and experiences of teachers integrating ICT in paperless school contexts.

In qualitative research, the inquirer often makes knowledge claims based on constructivist perspectives, that is, based on the multiple meanings of individual experiences; meanings that are socially and historically constructed with intent of developing a theory or pattern (Creswell, 2003). Literature shows that "qualitative research often uses narratives, phenomenology, ethnographies, grounded theory or case studies as strategies of inquiry, where the researcher collects open-ended, emerging data with the primary intent of developing themes from the data" (Creswell, 2003, p. 18).

Personally, I believe reality is socially constructed and limited to context, space, time and individuals or groups in a given situation; reality is mind dependent and a personal or social construct (Chilisa & Kawulich, 2012). Reality cannot be generalised since people are constantly constructing realities based on their context and social circumstances.

Qualitative research is often characterised by an inductive focus and extensive description of a given phenomenon, which this study seeks to achieve through relevant

qualitative methods and instruments that conform to the research paradigm. “It is a kind of research that produces findings from real-world settings, where the phenomenon of interest unfolds by itself naturally” (Golafshani, 2003). The distinctive characteristic of qualitative research, as pointed out by Golafshani, is the neutrality of the researcher in the process of data generation. Often the researcher does not make any attempt to control or manipulate the data generation process. Unlike a quantitative empirical inquiry, the phenomenon of interest being investigated with qualitative approach naturally unfolds by itself, thereby making both data and findings rich and reliable.

4.6 Research Design Adopted and Rationale

According to Thomas (2010), a research design can be equated to the master plan of a research project that shows how the study is to be conducted. It can be compared to a building design or an architectural outline of a building structure: “A research design essentially illustrates how the entire major parts of the research endeavour study such as the population, samples, methods, instruments, etc. work together in an attempt to address the research questions” (Thomas, 2010, p. 308). This means that it is a comprehensive master plan that not only identifies and describes the various components of a research but also how all the components work in harmony towards answering a research question.

In this study, I deliberately employed a qualitative case study design to gain understanding of the phenomenon. I am motivated to adopt this design because Reid (2002) posited that in the early stages of the use of ICT in the classroom, it is more appropriate to employ an open-ended research method that allows unexpected findings to emerge. The design allows the researcher to get unexpected findings that may likely be missed when other rigid methods like questionnaires are used. Case study is a qualitative method that aligns to Reid’s description. This study is an exploratory and interpretive account of teachers’ beliefs and experiences of ICT integration in schools. It is interested in the experiences, beliefs and context that bound teachers together in their schools, given that these schools have unique characteristics. Through their views and narrations of their experiences, participating teachers provided me with understandings of how teachers think about ICT integration, ICT affordances, and

challenges and factors that promote or inhibit ICT integration in the classrooms. Also, the role of the case study in this study was to help me explore ICT integration as a contemporary phenomenon (intervention) and real-life school contexts (Yin, 2003). This is because there seems to be a lack of distinction between ICT integration as a phenomenon and the school contexts, since there is no clear evidence of the boundaries between ICT integration and the contexts in which the integration is happening.

To be precise, I used an exploratory case study design since the study involved a critical in-depth description of the processes of ICT integration based on the views of teachers in five pilot paperless high schools.

As a relativist who strongly believes in social construction of knowledge through human social interactions, I was convinced that a case study is appropriate to assist me in arriving at the findings of the study. Although case study design is limited with regards to generalisation of findings, I am sure the design have the potency to illuminate the phenomenon and provide a deep understanding of what, how, where and why the findings are as they appear to be.

4.6.1 Case Study

The aim of this research is to explore and interrogate teachers' beliefs and their experiences around ICT integration in paperless high schools. I adopted Yin's (2003) exploratory type of case study by using a single embedded design to explore the phenomenon because case studies are known to be outstanding in their ability to examine in-depth a 'case' within its 'real-life' context (Yin, 2004). In this research, case study provided a 'thick description' (Holloway, 1997; Lincoln & Guba, 1985) of teachers' beliefs about ICT integration as a phenomenon in the five paperless schools. "Thick description' refers to a detailed account of a phenomenon that includes the researcher's interpretation in addition to the observed context and processes"(Lincoln & Guba, 1985, p.67).

Different authors have defined 'case study' differently, depending on their perspective and orientation. This suggests that there is no universal definition of case study; rather it

is the author who provides the definition. Nevertheless, some renowned qualitative case study scholars such as Sharan Merriam, Robert Stake and Robert Yin have tried to provide definitions with relative common grounds. All these scholars agreed that case study is a research approach that is 'bounded' (Yin, 2003; Stake, 1995; Merriam, 2009). For example, Merriam (2009) defined case study as, "An in-depth description and analysis of a bounded system" (p. 40), and she sees "the case as a thing, a single entity, a unit around which there are boundaries" (p. 27): This implies that a case can be a person, a programme, a group, a specific policy and so on. A careful look at Merriam's definition suggests the inclusion of what is studied and the products of the research as part of a research project. Based on her definition, Merriam stressed that case study research focuses on a particular thing and that the product of an investigation should be descriptive and exploratory in nature (Harrison, Birks, Franklin & Mills, 2017). Merriam suggested three types of case study designs: Particularistic, heuristic and descriptive designs. Stake (1995) defined case study research as "The study of the particularity and complexity of a single case, coming to understand its activity within important circumstances" (p. 6). This is a more flexible stance on case study where the emphasis is on the rigour of the research processes with particular focus on what is studied rather than how it is studied. This means the case is more important than the method of understanding the case. Stake used three terms to describe case studies: Intrinsic, instrumental, and collective case studies (Harrison et al., 2017).

I adopted Yin's (2003) definition of the case because the study investigated real people (teachers) in real contexts (schools) about a real phenomenon (ICT integration). Although there are different types of case studies, I chose to adopt the explorative case study design as explained in Yin, because the study best fits into a single embedded case study design that is committed to explore situations in which the intervention being evaluated has no clear, single set of outcomes (Yin, 2003). In this study, ICT from different schools have diverse outcomes within each school context. I holistically investigated the beliefs that teachers hold about the integration of ICT in paperless schools. Five different schools in five different contexts constituted the five units embedded in the pilot school project. I was practically interested in the views and

experiences of teachers teaching in the initial five pilot paperless high schools. Therefore my unit of analysis was teachers in these paperless high schools.

In this study, I foregrounded the views of Yin (2003) concerning the conduct of this case study because Yin described “case study as an empirical inquiry that investigates a contemporary phenomenon within a real-life context, especially when boundaries between the phenomenon and the context are not clear”. Normally, case studies pay particular attention to contextual conditions in which something unique has occurred, often from the perspective of the people who experienced or are experiencing the unique phenomenon. I investigated teachers in their peculiar real school context to obtain their beliefs and experiences around ICT integration in their classrooms. My close interactions with the participating teachers during interviews in their schools gave ample opportunities to understand and interpret teachers’ beliefs and their experiences.

Thomas (2010) believed that, “Case study approach is especially useful in situations where contextual conditions of the event being studied are critical and where the researcher has no control over the events as they unfold” (p. 309). Similarly, this study focused on the contextual conditions of the pilot paperless high schools, which I believe have a significant influence on the beliefs and experiences of teachers currently implementing ICT integration in classrooms. The study seeks to understand what is happening in these schools in relation to ICT integration, from the perspectives of teachers who are experiencing the ICT integration process in their classrooms. According to Yin (2003), there are three types of case study research designs: The explanatory case study is often used when the researcher seeks to answer a question that require explanations on presumed cause and effect in real-life situations or interventions that are too complex for survey or experimental strategies. Secondly, the exploratory case study is used to explore phenomena in which the intervention being evaluated has no clear, single set of outcomes. Thirdly, the multiple case study design gives the researcher the ability to explore differences within and between cases; this design is aimed at replicating findings across cases. Yin further suggested that since comparisons will be drawn between cases, it is important that researchers take time to choose the cases carefully so as to enable them to predict similar results across cases or to predict contrasting results based on a theory.

In order to provide a thick description of ICT integration in paperless schools, as required by the qualitative approach, I operationalised all important concepts in the study and provided detailed explanations of how teachers' beliefs and experiences have influenced ICT integration in the classrooms. Furthermore, I provided a thorough accounting of the methods and procedures followed during and after data collection (Thomas, 2010). I also provided detailed explanations of the critical strategies adopted to generate data in schools in the various sections of this chapter where I explain every choice I made and the rationale for each decision. Hyett, Kenny and Dickson-Swift (2014) posited that an outstanding strength of the case study design is in its "level of flexibility that is not readily offered by other qualitative approaches such as grounded theory or phenomenology" (p. 1).

It is pertinent to note that the case study design is so flexible that it allows the researcher to make changes in decisions, choices, instruments and strategies before, during and even after the field study is conducted. For example, in this study, the exploratory case study allowed me to make changes and adjustments in the selection and participation of research participants in the field without any serious impact on the data obtained: During a focus group interview in school **A**, I allowed some teachers who volunteered to participate in the interviews to join the group even though they were not among the participants that were initially selected for the study.

4.7 The Research Setting

The research is situated in five pilot paperless high schools in the Gauteng province of South Africa. The pilot paperless schools project was conceived by the Gauteng Department of Education in pursuance of the national goals of e-Education. The paperless school project is aimed at empowering schools to switch from a paper based (analogue) school system to the modern paperless (digital) school system. Although the idea started in 2002, the formal launch of the paperless school project took place in January 2015 (EWN online news July, 2015). Seven schools were selected as pilot for the province-wide project. Of these seven schools, five are public high schools while the remaining two are primary schools. However this research was concerned with the five high schools where data was collected only. The schools have common characteristics;

all the schools are adequately equipped with computers, internet connectivity; interactive whiteboards and other forms of digital tools like smartboards, tablets, calculators and mobile phones for instructional purposes. Also each learner is provided with a personal tablet and or a laptop computer for school learning. The ultimate goal of the project is to see that ICT becomes fully integrated in all schools in line with the provisions of the white paper on e-education. A summary of the features of each of the five participating schools is presented in Table 8.

Table 8:

Demographic Characteristics of Schools

SCHOOL CHARACTERISTICS	SCHOOL				
	A	**B**	**C**	**D**	**E**
Location	Town	Urban	Town	Town	Town
Type	Public	Public	Public	Public	Public
Number of Teachers	42	68	54	52	34
Fee-Paying	No	Yes	No	No	No
Building Infrastructure	Perm.	Perm.	Temp.	Perm.	Temp.
Alternative Source of Electricity	No	Yes	No	No	No
Laptop to Teachers	Yes	Yes	Yes	Yes	Yes
Tablets to Teachers	No	Yes**	No	Yes	No
Tablets to Learners	Yes	Yes	Yes	Yes	Yes
Smartboards in Classrooms	Ye**	Yes	Yes**	Yes	Yes**
Whiteboards in Classrooms	No	Yes **	No	No	No
Projectors in Classrooms	Yes**	Yes	No	No	Yes**
Chalkboards Still in Use	No	No	Yes	No	Yes
Supplier of Laptops to Teachers	GDE	SGB	GDE	GDE	GDE**
Supply of Tablets to Teachers	GDE	SGB	GDE	GDE	GDE
Supply of Tablets to Learners	GDE	Parents	GDE	GDE	GDE
Supply of Smartboards in Classroom	GDE	SGB/ GDE	GDE	GDE	GDE
Supply of Projectors in Classrooms	GDE	Not in Use	Not in Use	Not in Use	Not in Use
Supply of Whiteboards in Classrooms	Not in Use	SGB**	Not in Use	Not in Use	GDE
KEY:					
Perm = Permanent		GDE = Gauteng Department of Education			
Temp = Temporary		SGB = School Governing Board			
Yes = Available		No = Not Available			
**** = Not Supplied in Adequate Quantities**					

The table above presents the demographic characteristics of the five paperless high schools that participated in the research. As indicated in the table, four of the schools (A, C, D and E) are located in township areas and one school (B) is located in an urban area. All the schools are public high schools (state-funded schools) managed by the government through the GDE. However, while students in four of the schools do not pay fees at all, school B is a fee-paying school. In terms of building infrastructure, schools A, B and D have permanent buildings built with bricks and mortar, while schools C and E

are constructed with temporary materials. Only school **B** has an alternative source of electricity to support electronics in the school in case of a power outage during lessons. School **B** has solar panels that supply the whole school with electricity during load shedding. All teachers in the five schools have either a laptop computer or a tablet computer for teaching in the classrooms. Similarly, the majority of learners in all five schools possess tablets or other forms of mobile devices for learning, usually provided to them by the DoE, except in school B where parents are responsible for the supply of tablets to learners.

The table also shows that smartboards are fitted in classrooms in all the five schools, although the table also indicates that there are limited number of classrooms with smartboards in schools **A, C** and **E,** which means that some classrooms in these schools do not have smartboards yet. There is only one school (B) that have whiteboards as alternatives to smartboards in the classrooms; the other four schools do not have whiteboards in the classrooms. Whiteboards are required to be available side by side with the electronic smartboards to serve as alternative boards in case of power outage, Wi-Fi failure or for any other use. School A and E have multimedia projectors in some classrooms, while the other three schools (B, C and D) do not have any type of projectors. Although all the schools are labelled as paperless, the table shows that two out of the five schools still use chalkboards in the classrooms. This implies that not all the classrooms in all the schools are equipped with facilities to fully implement the paperless schools project. The table indicates that the GDE is responsible for the supply of ICT resources, such as smartboards, laptops, tablets, projectors and whiteboards, to the four township schools (A, C, D and E); the only urban school (B) is supplied through the SGB and sometimes the GDE. Interestingly, it is only in school B that parents buy tablets for learners to use in school. In the other four schools (A, C, D and E), the GDE, through the DoE, supplies learners with tablets free of charge.

4.8 Population and Participants

The target population for the research was in-service teachers teaching in the five pilot paperless high schools in Gauteng, South Africa. The total population of teachers in the pilot paperless high schools where the research was conducted is 246 teachers, and

only 25 teachers were selected to participate in the study. The deliberate selection of a small sample for the study is a typical characteristic of a qualitative case study. The population is bounded by special characteristics common to all the participants. Specifically, the population consists of teachers in paperless high schools that use computers and smartboards to teach in their classrooms.

Table 9:

Personal Information of the Research Participants

S/N	Pseudonym	Gender	Age	Educational Qualification	Professional Teaching Qualification	Years of Teaching Experience	Years of Teaching with ICTs	School Code	School Location	Participation in the Interviews	
										Individual Face-to-Face Interview (FFI)	Focus Group Interview (FGI)
1	Lindiwe	Female	27	Bachelor	B.ED	2	2	A	Township	Yes	Yes
2	Ayanda	Female	30	Bachelor	PGCE	2	2	A	Township	Yes	Yes
3	Sonto	Female	28	Bachelor	B.ED	3	2	A	Township	No	Yes
4	Jabulile	Female	39	ACE	PGCE	9	3	A	Township	No	Yes
5	Nomsa	Female	41	Bachelor	PGCE	15	2	A	Township	No	Yes
6	Sandile	Male	50	Bachelor	PGCE	7	1	A	Township	No	Yes
7	Bongani	Male	38	Bachelor	B.ED	5	8	B	Urban	Yes	No
8	Thandi	Female	32	Bachelor	PGCE	4	4	B	Urban	Yes	Yes
9	Mbali	Female	30	Honours	B.ED	8	6	B	Urban	No	Yes
10	Gugu	Female	32	Bachelor	PGCE	4	4	B	Urban	No	Yes
11	Shaka	Male	29	Bachelor	B.ED	6	3	C	Township	Yes	Yes
12	Pamela	Female	44	Bachelor	PGCE	4	2	C	Township	No	Yes
13	Mandla	Male	27	Bachelor	B.ED	7	2	C	Township	Yes	Yes
14	Sipho	Male	26	Bachelor	B.ED	3	2	C	Township	No	Yes
15	Rose	Female	29	Bachelor	PGCE	2	2	D	Township	No	Yes
16	Lungile	Female	25	Bachelor	B.ED	2	2	D	Township	Yes	Yes
17	Muzi	Male	26	Bachelor	B.ED	3	3	D	Township	Yes	Yes
18	Bheki	Male	49	Honours	B.ED	27	2	D	Township	No	Yes
19	Kabelo	Male	27	Bachelor	B.ED	5	4	E	Township	Yes	Yes
20	Pilwane	Female	60	Bachelor	DIPLOMA	37	2	E	Township	Yes	Yes
21	Khoza	Male	54	Diploma	DIPLOMA	??	2	E	Township	No	Yes
22	Lerato	Female	28	Bachelor	BE.ED	5	2	E	Township	No	Yes

Table 9 presents personal information of the research participants who supplied the interview data analysed in this study. The table displays the pseudonym as the research identity of each participant, sex, school of affiliation in codes A B C D and E, location of school, status of participation in each of the interviews conducted, and years of teaching with ICT. It is pertinent to note that all the corresponding information associated with the

names is true characteristics of the participants. Ten participants participated in both the individual face-to-face interview and the focus group interviews. Two teachers from each of the five participating schools partook in the individual face-to-face interviews. Only 22 teachers out of the 25 teachers initially selected for the study participated and contributed to the data that inform the study. Three teachers did not participate at all.

4.9 Sample and Sampling Techniques

As is the norm in most qualitative research, I purposefully chose schools and research participants from the population who had extensive experience with the phenomenon that is under investigation. “Purposive sampling is a characteristic of the qualitative approach to empirical inquiry where researchers deliberately hand-pick cases to be included in the sample on the basis of their judgement of a particular characteristic that the researcher is looking for” (Cohen, Manion, & Morrison, 2011, pp. 156–157). Similarly, Creswell and Clark (2011) reiterated that “purposive sampling involves identifying and selecting individuals or groups of individuals that are knowledgeable about or experienced with a phenomenon of interest” (p.94). In this study, teachers who are involved in the implementation of ICT integration in their respective classrooms were purposefully selected to participate in the study.

Palinkas et al. (2015) stressed that, despite the popularity and wide use of purposive sampling in qualitative research, it is not without some weaknesses: It does not in any way represent the wider population from which it was drawn from. Hence, it is criticised for being selective and biased. Although the sample being studied is not representative of the entire population, it is not considered to be a weakness in qualitative research designs because it is selected based on population characteristics and study objectives. Therefore, notwithstanding the weaknesses associated with purposive sampling technique, I deliberately chose to adopt it in this study because I believe it will help me obtain the right kind of data to understand the phenomenon. Moreover, the primary concern of the study is not to make any form of generalisation, but rather to acquire in-depth information from teachers in pilot paperless high schools who are in the right position to provide information that will illuminate the phenomenon under investigation using inductive approaches.

Even though the participating schools are located in different socio-economic contexts, they appear to be homogenous in their purpose because they share common characteristics as paperless schools. For the selection of the participants, I requested school principals to assist with the identification and selection of five teachers to participate in the study, because the principals know which teachers are knowledgeable and experienced in ICT integration in their respective schools. I gave each of the five principals the criteria for the selection of the research particpants. When selecting teachers to participate in the research the principals were expected to consider the following:

• Teachers in the pilot paperless high schools

• Teachers who are knowledgeable and experienced in ICT integration in the classrooms

• Teachers currently using ICTs to teach in their classrooms

• Teachers that are trained or are undergoing training on ICT integration in the classroom

The rationale for selecting only five teachers from each school to participate in the study is connected to the experiences of the lukewarm attitudes of teachers towards interviews in schools. Other reasons were to avoid high rates of absenteeism and to reduce the challenges associated with large group discussions. From my experience of working with teachers in high schools, I am aware that it is difficult to assemble a large number of teachers at the same time for the purpose of research, especially for interviews. Dilshad and Latif (2013) acknowledged that, “It is considerably difficult to get the people together on time for the group session” (p. 197). Given that my study adopted a qualitative approach using individual interviews focus group interviews as methods of data collection, it was imperative for me to take precaution against abteeism of group members during the interviews, hence I decided to select five teachers per school to form a group.

To ensure adherence to ethical considerations employed in the study, I participated indirectly in the selection process by guiding the principals to adhere to the ethical

requirements of the study. This is to ensure that the selection of participants was done without compulsion, intimidation or prejudice. All the teachers selected demonstrated their willingness to participate in the research. To ensure that principal adhered to the ethical considerations of conducting the study, I provided a written guide for the selection and I also supervised the selection processe. In each school, the principal invited some teachers that they consider eligeable to participate in the study based on the criteria that I set. I brief the teachers on the aim of the study and their volunteeness to participate in the research. Only five teachers who agreed to participate where given consent forms to fill and return. In schools where more than five teachers agreed to participate, the excess were asked to voluntarily withraw their assent.

4.10 Data Generation Methods

This research endeavour used two techniques for data collection, namely individual interviews and focus groups interviews. This was, however, complemented with a document review and field notes. Both techniques are described below as well as how each was applied in the research.

4.10.1 Semi-Structured Interviews

In this study I chose to adopt a semi-structured interview format (see appendices F & G) for both face-to-face and focus group interviews. Semi-structured interviews gave me sufficient flexibility to approach different participants in different ways and not lose sight of the areas for data generation (Noor, 2008).

An interview is a face-to-face interaction process between the researcher and a single participant or group of participants. Interviews are a key qualitative data collection method for social science research. According to Alshenqeeti (2014), “An interview is a conversation, whose purpose is to gather descriptions of the ‘life-world’ of the interviewee with respect to interpretation of the meanings of the ‘described phenomena’” (p. 40). This technique is used to collect qualitative data by setting up a situation (interview) that allows the respondent the time and scope to talk about their opinions on a particular subject (Macayan, Quinto, Otsuka, & Cueto, 2018; New York University, n.d.). Normally the focus of an interview is decided by the researcher

because there are specific areas that the researcher is interested in exploring. The cardinal objective of an interview is to understand the respondents' point of view about a given phenomenon rather than to make generalisations about behaviour (Kemper, Stringfield, & Teddlie, 2003). In this research the interviews were designed to conform to semi-structured questions and consisted of open questions. Two kinds of interviews, personal face-to-face interviews and focus group interviews were conducted to understand teachers' beliefs and experiences around ICT integration in the classrooms.

4.10.1.1 Individual face-to-face interviews

Despite the wide acceptance and growing popularity of modern online and mobile surveys due to prevalence of ICT, individual face-to-face interview still remain a popular data collection method. "A face-to-face interview provides advantages over other data collection methods" (p.1). In this kind of interview the researcher engage with a single individual participant at an agreed-upon time.

These interviews provided me the opportunity to expand on their ideas and gave me a clearer view on their thoughts and experiences of ICT integration in the classroom. Ten participants, two teachers from each participating school, engaged in the personal face-to-face interviews.

Engaging with one participant at a time enabled me to gain insight into their genuine personal responses that were not influenced by other participants' responses. Individual face-to-face in-depth interviews allow for a much more representative approach than a focus group setting. Participants feel freer to express their opinions and emotions than in a group. "Social cues, such as voice, intonation, body language etc., of the interviewee can give the interviewer a lot of extra information that can be added to the verbal answer of the interviewee on a question" (Opdenakker, 2006,p.6).

In this study, personal face-to-face interviews provided in-depth information on the individual's beliefs and experiences of ICT integration in the classroom. This enabled me to obtain a detailed, deeper understanding of teachers' personal views about the phenomenon. All the interview sessions were recorded on an audiotape recorder for the purpose of replay and to avoid missing any piece of information from the interviewees.

Each recording was properly labelled with the pseudonym and school of the interviewee and the date and time of the interview. Creswell (2014) suggested that researchers must "respect the privacy of participants by using pseudonyms for individuals and places to protect the identities of participants" (p. 138).

To ensure consistency with all participants, I drafted some pre-planned questions to guide me in the interview. The individual face-to-face interviews were conducted in all the five selected schools between the months of April and June, 2016, during the second term of the school's academic calendar. The interviews were conducted at different venues in different school contexts, depending on the availability of a suitable venue. The interviews were conducted in staff rooms, offices of head of departments, libraries, computer laboratories and personal offices, as the case may be. Each interview session lasted 35–65 minutes, depending on how each participant responded to the questions and raised other related issues during the interview that required further probing.

4.10.1.2 Focus group interviews

In the course of the individual face-to-face interviews, participants raised some important issues such as security of ICT in schools, exclusion of teachers in decision-making, training flaws, and ICT policy requirements. These issues required further probing in relation to the introduction and implementation of the ICT integration project in schools. The issues raised formed the basis for focus group interview questions.

Focus group interviews are "the interactions between the researcher and a group of participants as well as the interaction among group members and it serves to elicit information and insights in response to carefully designed questions" (Kemper et al., 2003). Focus group are predominantly beneficial in qualitative research, especially "when a researcher intends to find out the people's understanding and experiences about the issue and reasons behind their particular pattern of thinking…it provide a rich and detailed set of data about perceptions, thoughts, feelings and impressions of people in their own words" (Dilshad & Latif, 2013, pp. 192–193).

I thought that during personal face-to-face interviews there may be certain important information (in the form of beliefs, facts, feelings, values and emotions) that fails to emerge from an individual interview participant. The hidden or forgotten information can possibly be elicited during group interaction. Hence, focus group interviews access information withheld by the respondent during the individual interview, which might be very significant in gaining a deeper understanding of the phenomenon.

Another reason for conducting focus groups interviews was my desire to collect high-quality data in different school contexts, which I believed could help in the understanding of the phenomenon from the viewpoint of the research participants (Dilshad & Latif, 2013).

Although there seems to be no universal standard for the number of participants that should constitute a focus group, different ranges have been suggested by scholars. The Business Dictionary (Focus group, n.d) defined 'focus group' as a small number of people between four and fifteen, but typically eight, brought together with a moderator to focus on a specific product or topic. Denscombe (2014) suggested between six and nine participants, Rennekamp & Nall (2000) recommended 6-12 participants and Morgan (1996) suggested that the number of focus group participants be 4–10 persons per group, there is however room for flexibility. Morgan pointed out that for certain reasons beyond the researcher's control, focus groups may be smaller or even slightly larger than the recommended numbers.

By the design in this study, five participants were supposed to participate in each focus group, including the two teachers that participated in individual face-to-face interviews, but that was not the case in most of the schools as most of the groups were smaller and one group was slightly larger; thus flexibility was apparently observed in this study. All the interview sessions were recorded on an audiotape recorder for the purpose of replay and to avoid missing any piece of information. At the end of each focus group I ensured that the recorded tape was well labelled bearing the assigned name of the group, name of the school, and the date and time of the meeting.

To ensure consistency with all groups in the participating schools, I drafted some pre-planned semi-structured questions to guide the interview (see Appendix G). Similarly, a

guideline that contained rules and procedures for the conduct of the focus group interview (see Appendix H) was drafted and read to all participants before commencement of each session in each school. To motivate the members of the focus groups, I provided beverages and snacks to refresh participants during each interview session in all the schools. All focus group interviews were scheduled in consultation with each participant, giving priority to their convenience. In all the five schools, it was the research participants who scheduled and determined the date, time and venues that best suit their convenience. The conduct of all focus group interviews was guided by the provisions of ethical considerations and democratic principles that allowed participants to freely express their views without fare or favour. With the consent of all members of each group, I recorded the voices of all participants during the interview sessions for the purpose of transcription. Each interview session lasted approximately one hour, but most sessions were 35 minutes on average.

4.10.2 Field Journal (Personal Diary)

During my several visits to the participating schools, I maintained a folder of 'field notes' to complement the recorded interviews. I recorded different events and scenarios that captured my attention and are of interest to the study; this included the characteristics of the schools, teachers' characteristics, and the views of other teachers that were not participants in the study but chose to express their views in informal ways.

At the beginning of my data gathering, during my initial visits to schools in April and May, 2016, I saw that all the schools had technical support staff that assisted teachers and learners with the repair and operation of tablets, laptops, smartboards and other electronic gadgets. In August and September, 2016, most of the technical staff were no longer at the schools to provide support to teachers and learners. Some teachers complained about the absence of technical support in their schools. I asked some teachers why the technical staff were no longer coming to work and was informed that their contracts had expired and their companies had to redeploy them.

I visited some of the classrooms to see the condition of ICT resources in the classrooms and observed that some of the smartboards were not used by the teachers because the

smartboards were either damaged or not available. Likewise, some learners could not operate their tablets because of technical issues. In view of the attendant technical problems in the classrooms, I observed that both the teachers and the learners were frustrated.

I noticed during some focus group interviews that some teachers were not active in the group and did not contribute much to the discussions hence; one or two voices dominated the discussion. This was particularly noticeable in schools A and E where two participants almost dominated the group discussion in each case. This was not too surprising given that Radwich (2015) noted that in any group discussion some individuals have stronger personalities and voice their opinions more strongly than others. Similarly, Anderson and Kilduff (2009) reported that, “Individuals high in the personality trait dominance consistently attain high levels of influence in groups” (p. 491). Such individuals eventually dominate the group discussions if nothing is done to manage the situation. This seems to be the nature of virtually all group discussions. To avoid group domination by some members of the focus group, Klein, Tellefsen, and Herskovitz (2007) suggested appointing a group moderator who must maintain control of the forum so that forceful personalities do not sway other members with their opinions.

I also noticed that in most of the schools, except in school B, the school management was not proactive about the pedagogical integration of ICT in the classrooms. Most of the school management boards waited for the government, through the GDE, to fix all the school’s problems and supply all school’s requirements for ICT integration. In the case of school B, I observed that the school management was always proactive. Unlike most township schools that depend solely on the GDE for project initiation and implementation, most decisions, innovations and projects in school B were initiated and executed by the school management and SGB. The GDE only provided support to school B to complement the school efforts. I also observed that only in school B did teachers use 3D software and projectors for teaching. I observed that the teaching and learning of life sciences with the 3D projector promoted learner participation and engagement in the lesson. It made teaching effective and learning more interesting to

learners. Teachers in school B were more confident about talking and teaching with ICT than teachers from the other four schools.

In the course of my interaction with teachers in the schools, I learned that teachers who teach history and languages, especially the home languages, in all the participating schools, did not practice ICT integration in their classrooms because of lack of content on the students' tablets and the smartboards; hence, they were excluded from the ICT pedagogical integration project. It was mostly science, mathematics and geography teachers who seemed to use ICT in their lessons because these subjects have digital content in form of text books uploaded on the learners' tablets and the smartboards. Some teachers also stated that most examples and illustrations of ICT integration given during training sessions were in the subjects of science, mathematics and geography.

4.11 Processes of Generating Data

Having obtained approvals from the Wits School of Education Ethics Committee (Protocol number **2015ECE021D;** see Appendix A) and the GDE (Reference number **D2016/388**; see Appendix B), I began the process of gathering data in the five paperless high schools in Gauteng province. Prior to the commencement of the process, I proposed a school visit timetable to guide the entire process within the official timeframe approved for me to access schools by the GDE. The timetable can be found in Table 10.

Table 10:

School Visits Schedule for Data Generation, 2016

Round	Activities	Dates	Remarks
First Round	Distribution of notification letters to the principals and teachers in schools	Monday, 11/04/2016 to Friday, 15/04/2016	Successfully accomplished
Second Round	Meet with the research participants (teachers) in each participating school to brief them on the purpose and importance of the research, collect their consent forms, and give a statement of their roles in the research	Thursday, 21/04/2016 to Friday, 29/04/2016	Not accomplished as scheduled. Extended beyond 29/04/2016. Completed on 17/05/2016
Third Round	Meet with the research participants to conduct individual interviews	As determined by the participants (Relative)	The individual interviews began on 10/05/2016 till 09/06/2016
Fourth Round	Meet with all the research participants in each school to conduct focus group discussions	As determined by the participants (Relative)	The focus group interviews began on 15/08/2016 till 01/09/2016

4.11.1 First Round of School Visits: Distributing Letters to Participating Schools

The first round of school visits started on Monday, 11 April, 2016. I visited two schools located in a township to distribute research notification letters to the principals and teachers. Being the first visit, I experienced some logistical problems in locating some of the schools. This happened because of the differences in the official address and the local names of the areas where the schools are located. Some local residents do not know the official names or addresses of the schools and could not help me locate the schools. Another problem was a language and pronunciation barrier between me and the local residents who could not understand my queries in English or my incorrect pronunciation of the school location. After the first visit to the first school, I employed the services of a guide, who understands the local language, to schools in certain townships like Tembisa, Kaalfontein, and Duduza. The guide also took on the role of driver, hence, the cost of logistics increased. All the letters were distributed within one week in all the schools as scheduled. It was the deputy principals that received the letters in all the schools, and they pledged their cooperation and support for the research.

4.11.2 Second Round of School Visits: Briefing the Participants

The second round of school visits was to meet with the selected teachers who were the research participants in order to brief them about the research project and their expected roles. This phase of the research started on Tuesday, 26 April, 2016. Five teachers were selected to participate in the focus group interviews in each of the five schools.

In some cases there were delays in meeting with the participants during the second round of visits to schools. In school A, the deputy principal kept the letters that were meant for the teachers in his office for over a month and so could not organise to select the participants in time, thereby delaying the first meeting with teachers. This round of school visits is based on appointments with the selected teachers, and in all cases, the teachers determined the date and time of the meeting. I exercised patience and waited for the deputy principals to organise the teachers; I did, however, follow up with several phone calls to remind the deputy principals. This phase lasted three weeks. Some participants were absent from the schools on the days of the scheduled meeting. I rescheduled the meetings for another date and time convenient to all the selected teachers. In school D and E, one and two teachers, respectively, were absent at the briefing. These three teachers were briefed on a later date during subsequent visits to the respective schools.

4.11.3 Third Round of School Visits: Conducting Individual Face-to-Face Interviews

During the third round of school visits I met with individual teachers for the individual face-to-face interviews. This phase started on Tuesday, 10 May, 2016. Prior to each visit, the teachers and I arranged and agreed on suitable dates and times for meeting at the convenience of each teacher. In each case, consideration is given to the teacher's convenience; as a matter of fact it is the teachers that determined the day, date and time for all the meetings. This approach is congruent to views of some scholars (The Puget Sound consortium for manufacturing excellence, n.d; Krueger & Casey, 2014) in the literature. The Puget Sound consortium for manufacturing excellence (n.d)

suggested that “before recruiting participants identify the location, date and time for the focus group. Select a location easily accessible to your participants. Based on your stakeholder’s input choose a time of day that will be convenient for the participants” (p. 9). Although the authors acknowledge the role of the researcher in identifying location, date and time for the focus group, they nevertheless stressed on the need to consider the input and convenience of the participants of paramount importance. I designed the main interview questions on the day prior to the interviews. All participants answered the same set of questions; however, there were questions that emerged from the participants’ responses to main questions. Hence, there were follow-up questions to gain clarification.

It is important to note that during the interviews, there were some cases of code switching by some teachers. “’Code switching’ is the practice of moving back and forth between two languages or between two dialects or registers of the same language” (Nordquist, 2016). In this case, some teachers code-switched between English language which is the official language of instruction in the selected schools, and their first language. This left me confounded; however, words spoken in the vernacular were translated during transcription by a qualified isiZulu teacher at Wits University. I deliberately employed the services of an isiZulu language teacher for the translation to ensure the trustworthiness of the transcripts.

Some teachers were willing to participate in the interviews but did not want their voices recorded. I accepted and respected the wishes of the participants in conformity with the ethical provisions of the research, which require that the research to respect the privacy, confidentiality, dignity, rights and anonymity of the participants. During the interviews with these teachers, I informed them that I would take notes of their responses while they spoke, but the participants changed their minds and allowed their voices to be recorded.

In Table 9 it can be observed that 15 teachers were interviewed. From the 15 individual interviews conducted, only 10 interviews, rich in content, were transcribed and used for analysis. I considered ten interviews adequate for the study because qualitative inquiries are interested in the depth and quality of data for analysis, rather than quantity

or scope of data (Saunders, Sim, Kingstone, Baker, Waterfield, Bartlam, & Jinks, 2018). I listened to all the audio-recorded interviews several times and finally selected the ten best interviews that were rich in content for transcription.

4.11.4 Fourth Round of School Visits: Conducting Focus Group Interviews

I visited all the participating schools between Monday, 15th August , 2016 to Friday, 19th August, 2016, to schedule focus group interview meetings with the teachers. In each school we discussed and arrived at a date and time that suited all five participating teachers in each particular school to meet for the focus group interview.

CASE: School A

In this school, I observed that some teachers were very enthusiastic about the focus group interview and were willing to participate. All five teachers selected for the interview were present at the school at the scheduled time of the interview. However, one of the teachers excused himself on the grounds of ill-health and so did not participate. Although the remaining four teachers assembled for the interview, one of them left the room, leaving her bag and umbrella behind and never returned to participate in the focus group. Interestingly, some teachers who were not initially selected to participate in the interview volunteered to partake in the discussion. Three of them were admitted to the group. The interview started with six participants, but before the end of the session three participants excused themselves and left, thereby leaving only three participants who stayed until the end of the interview. Although the withdrawal of three participants from the interview had implications on the reliability of the study, I do not intend to generalise the findings as typical of the phenomenon in all schools. However, the findings will provide a basis for understanding similar or same phenomenon in schools with similar characteristics, as earlier indicated in the research design.

CASE: School B

On Wednesday, 24 August, 2016, I received a phone call at about 9:30 a.m. from the deputy principal of school B informing me that the teachers were ready to participate in the focus group interview on that same day. This was impromptu because there was no

prior arrangement or confirmation of meeting for that day. Nevertheless, I prepared and proceeded to the school to respect the desires, needs and rights of the participants (Blandford, 2013). Creswell (2003) and Denzin and Lincoln (2011) suggested that every researcher is required to respect the rights and wishes of the participants in a research project. I arrived at the school at about 12:00 p.m., where I met the deputy principal in his office, and he told me that he had to call me on that day because the teachers were only free to meet with me on that day after school and that after that date all the teachers would be busy preparing for the coming internal and external exams. Before the scheduled time, one of the selected teachers excused himself for an engagement outside the school. Four teachers gathered at the venue of the meeting, and then, after about five minutes, one teacher also excused herself on the grounds of ill-health. Only three participants finally participated in the focus group discussion and remained until the end of the interview session, which lasted for 32.50 minutes. This has some implications on the study, given that some scholars (Marshall & Rossman, 2014; Morgan, 1996) are of the view that the rule of thumb for a focus group is 6–10 homogeneous strangers; however, there may be reasons to have smaller or slightly larger groups (Morgan, 1996). Nevertheless, the ethical conditions for research require that the conduct of research must be democratic, and participation must be voluntary (Blandford, 2013; Marshall & Rossman, 2014). This means that research participants have the right to withdraw from participation at any given time. In this study the withdrawal of participants could not be avoided because the concerned participants gave genuine reasons for their withdrawal at the time. One participant excused herself for ill-health and the other one was pregnant and could not sit still for 30–45 minutes. They requested to leave shortly after the commencement of the focus group interview, and I respected their rights.

CASE: School C

I visited school C on Friday, 26 August, 2016, and conducted the focus group interview with the teachers. Five teachers were initially selected to participate in the focus group interview, but only four teachers were present. One of the teachers had been transferred out of the school to Soweto. An attempt to replace the transferred teacher was unsuccessful; the teachers at the school who were contacted to replace the teacher

all declined to participate. The four participants available participated actively from the beginning to the end of the interview session. During the session, one of the participants raised a very important and interesting observation about the concept of paperless schools. She observed that it is not practically possible to have a 100% paperless school system, hence she perceived and defined the concept 'paperless school' as a school that uses less paper and more ICT to facilitate teaching and learning.

CASE: School D

I visited school D on Tuesday, 30 August, 2016, to conduct the focus group interview as scheduled. This is the only school where the deputy principal selected only three teachers for the focus group interview, hence, he decided to join the other three teachers to make up four participants who participated in the research. All the participants actively contributed to the discussion from the beginning to the end of the session. It is the longest of all the interviews conducted and lasted 64:00 minutes. In the course of the interview, participants raised critical issues like ICT policy provisions, exclusion of teachers in decisions making, institutional support, and many more that led to debates and elaborations among the participants. Though some of the issues raised during the interactions were not analysed in this thesis, they nevertheless added value and insight on the phenomenon being investigated.

CASE: School E

I visited school E on Thursday, 1 September, 2016. I conducted focus group interview with four teachers in attendance because one of the selected teachers was absent from school on that day. All the same, the interview was successful with the four teachers participating from the beginning to the end. The date, time and venue for the interview were arranged by the teachers. They chose a Friday afternoon when the learners were playing sports in the school for the focus group meeting; this gave them the opportunity to commit their time to the interview without any form of distraction or excuses. The teachers appeared to be enthusiastic about their participation in the interview; perhaps they perceived the forum as an opportunity to express their concerns about the implementation of the paperless school project. In this case, two voices were more

prominent in their contribution to the discussion. This interview marked the end of the focus group interview data collection phase of the research.

4.11.5 My Experiences of Data Generation

This section presents my personal experiences in the course of data generation across the five paperless high schools spread across the Gauteng province in South Africa. My experiences are a mixture of challenges, concerns, and some interesting aspects of the data collection processes. The schools are in located in different communities with different socio-economic characteristics, as indicated in Table 8. Four of the participating schools are located in township areas and only one school is in an urban area. All trips to visit the designated schools were by means of public transport, using registered Taxis complemented with a few metres of trekking to access the schools. My motivation for presenting these experiences was informed by my conviction that the experiences are unique and will contribute to literature on the methodology of conducting qualitative research in similar school contexts. It will also provide baseline information that will serve as a guide to future researchers who will be conducting research in the same school contexts.

4.11.5.1 Challenges

Challenges are part of every research process, especially when investigating different school contexts like in the case of this study. Some of the challenges that occurred during the data generation process were associated with logistical problems, technical problems and human factors like absenteeism and poor attitudes.

Absenteeism: On Thursday, 25 August, 2016, I visited school D to conduct a focus group interview. The meeting was scheduled and confirmed between the deputy principal and me a week earlier on 18 August, 2016. The meeting was scheduled for 11:00 a.m. during the school break period, and the deputy principal promised to communicate to and organise the selected teachers. On arrival at the school, I tried to meet the participants, but they arrived at the staff room 35 minutes late. They all complained that the deputy principal only told them about the meeting a few hours earlier. By then we had only 25 minutes left before they had to return to their

classrooms for the continuation of their lessons, and we had to cancel and reschedule the meeting for another day that suited them. The meeting was rescheduled for 30 August, 2016, at 2:30 p.m.

Similarly, on Wednesday, 31 August, 2016, I visited school E to conduct the focus group interview as agreed with the participants during phone conversation. The meeting was scheduled to be held during the school break time. On arrival, I met with the deputy principal who went around reminding the selected teachers to come to the meeting venue during break. However, at break time only two teachers reported at the venue because the other teachers were not in the school at that hour. Even the two teachers who were present complained that the scheduled time for the meeting was not suitable at all. The meeting could not be held then, and it was rescheduled for the next day between 11:00 a.m. and 12:30 p.m.

Technical Challenges: During the focus group interview at school C, I discovered that although the voice recorder was on, it was not recording the conversation. It was already ten minutes into the interview session when I noticed the technical glitch. I halted the interview to find new batteries for the recorder and reset the audio recorder to start recording. Meanwhile, the backup recorder, a cell phone, was on and had recorded the whole conversation from the start. The focus group interview lasted 64 minutes. When I came home, I attempted to replay both the audio recorder and the cell phone voice recordings before downloading it onto the computer; unfortunately, I realised that the backup (the cell phone) did not record anything of the just concluded focus group interview. The main audio recorder did record the conversation but missed the first ten minutes of the conversation because of battery failure. Regrettably, I could not recover the missing portion of the interview, and consequently, the data (responses) for questions 1–5 of the focus group interview for school C was lost and could not be transcribed for analysis.

Security Challenges: Another challenge I faced was the security situation in some of the schools located in township areas, especially schools with temporary building infrastructure. Typical examples of these schools are schools A, C and E, where I observed frequent cases of theft, especially among the learners. Each time I visited

these schools, I witnessed learners stealing each other's tablets. As a matter of fact, both the data and my informal interactions with teachers other than the research participants revealed that tablet theft among learners in these schools happened on a regular basis. Teachers complained of handling theft cases almost on a daily basis. The teachers attributed the incidences to the prevalent socio-economic conditions of the school communities. Most of the township communities in this research are characterised by their dense population and the low income status of households, which gave rise to criminality among residents and especially the youth.

Besides the challenges encountered during the data generation process, I also experienced some significant concerns that will contribute to the development of literature in the field of qualitative research in general.

4.11.5.2 Concerns

During the data generation process in school E, I noticed what I described as 'power struggle' between the school principal and the school ICT coordinator over the management of internal ICT training in the school. While the school ICT coordinator wants to spread his influence and exercise control over teachers through ICT training and support, the principal feels his authority is being threatened or undermined by the school ICT coordinator. Because of this, teachers in the school were divided over the soured relationship between the principal and the ICT coordinator. Some teachers supported the principal and his actions, while others supported the ICT coordinator who wanted to train teachers on ICT integration. As a way to frustrate the efforts of the ICT coordinator in the school, the principal refused to provide any form of support towards organising internal training for teachers to integrate ICT in the classrooms. This poor relationship between the school principal and the ICT coordinator had seriously affected the extent of ICT integration in school E. This school is one of the schools that have no school-based ICT policy to guide and define the roles of each stakeholder in the school ICT integration programme. Although there is a national guide for school principals in managing ICT in South African schools (Bialobrzeska & Cohen, 2005), the guide does not specify the role or the responsibilities of school ICT coordinator as distinct from that of the school principal. This is possibly the reason for conflict of interest between the

school principal and school ICT coordinator in schools, as indicated in the case of school E.

4.11.5.3 Interesting experiences

It was interesting to see some teachers, other than the ones selected to participate in the research, in school **A** volunteer to participate in the interview for various personal reasons. Interestingly, one of the volunteers actually joined the discussion for the incentives (drinks and snacks), another one wanted to make her voice heard, another considered the interview forum an opportunity to communicate his grievances to the government concerning the implementation of ICT integration in their school, and yet another teacher participated to contribute to the discussion simply because she was interested in the topic. Blandford (2013) noted there are many reasons that motivate people to participate in research, some of which corroborated with the reasons I stated above. To ascertain the motivations of people participating in research Blandford (2013) posed this question: "What motivates an individual technology user to engage with research on the design and use of technology?"(p.3). The answers that emerged intrigued her because some responses suggest that an individual may decide to participate in a study to make his or her voice heard; some participate to satisfy their curiosity, especially if the study involves using an innovative technology; and some people may be attracted by financial and similar incentives. However, Blandford cautioned that this is not universally the case in all contexts. This means that people are attracted to participate in research for different reasons based on different factors.

4.12 Data Analysis Approach

Data analysis is the process of making meaning out of data generated and interpreting of the meaning of data (Creswell, 2009). In view of the aim of the study, which is to explore and gain deeper understanding of the phenomenon, I consider it appropriate to adopt a thematic analysis approach to analyse data generated.

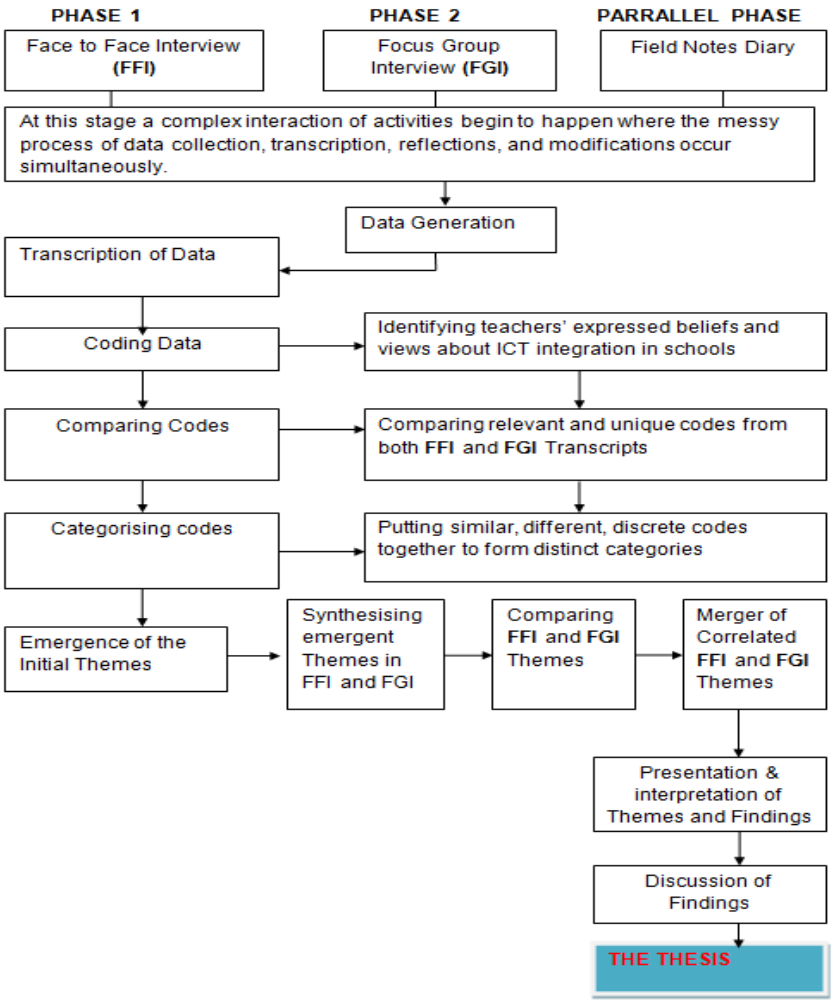

Figure 4.2: Analytical Approach

The data collected from the qualitative study were transcribed, sorted, coded, categorised into themes and analysed using thematic analysis. "Thematic analysis is a method for identifying, analysing and reporting patterns (themes) within data. It organises and describes data sets in rich detail. However, frequently it goes further than this, and interprets various aspects of the research topic" (Braun & Clarke, 2006, p. 79).

Braun and Clarke (2006) identified six phases of thematic analysis that I simply define below before I present and discuss equivalent stages of analysis that I embarked on in Section 4.12.1.

Braun and Clarke's (2006) six phases of thematic analysis are:

1 Familiarising with the data: This involves "reading and re-reading the data and making notes of ideas that spring to mind. The essence is for the researcher to be immerses in the data to such an extent that the researcher is familiar with every part of the data in preparation for analysis" (p.87).

2 Generating initial codes: "This involves coding the entire dataset systematically and collating data that is relevant to each code. Braun and Clarke defined codes as labels that identify a feature of the data (semantic content or latent) that appears interesting to the analyst" (p. 87).

3 Searching for themes: "Gathering codes (and related data) into proposed themes for further analysis" (p.87).

4 Reviewing themes: "Checking whether the themes work with the data and creating a thematic 'map' of the analysis" (p.87).

5 Defining and naming themes: "Refining the themes and the overall narrative iteratively" (p.87).

6 Producing the report: "This will, in turn, require a further level of reflection on the themes, the narrative and the examples used to illustrate themes" (87).

Similarly, in this study I employed a comprehensive approach to analyse the data based on Braun and Clarke's (2006) recommended six phases that provide a deepening engagement with the data through layers of analysis. Figure 7, above, illustrates the phases of thematic analysis approach I followed to analyse the data obtained from participants via individual and focus group interview questions.

4.12.1 Thematic Analysis

In view of the aim of the study which is to gain deeper understanding of the phenomenon, I considered it appropriate to adopt a thematic method to analyse the qualitative data generated. As stated earlier, thematic analysis is a systematic analysis and reporting of patterns or themes emerging from data. The thematic approach allows the researcher to organise and describe data set in rich detail (Braun & Clarke, 2006).

At this instance, my analysis involved gathering data that was generated through individual and focus group interviews. The data was organised and coded to identify relevant themes that emerged (see the stages below). The interpretation and discussions of findings was focused on the five themes that emerged, using the right research language and in accordance with the recommended procedure for thematic analysis in qualitative research.

After generating data from schools, it took me four weeks to transcribe 15 audio recordings of individual face-to-face interviews and another three weeks to transcribe five audio recordings of focus group interviews. This number of transcripts gave rise to a huge amount of data that gave me the opportunity to select exceptionally rich transcripts for analysis. It may be interesting to know that I could transcribe the 15 interviews that gave rise to so much data in four weeks because I am a full-time PhD student at the university: I had enough time to devote to the research project. Hence, I accomplished a massive task in the minimum time. It is worth noting that the initial stage of the transcription was very slow, and I transcribed the first interview of 35 minutes in three days, but my speed increased over time. After the transcription of the second interview I was able to transcribe two interviews in a day.

There are ten transcripts for the individual interviews and five transcripts for the focus group interviews. A total of 15 interview transcripts were analysed to obtain the findings of the research. Having completed the transcription processes of the individual face-to-face interviews and focus group interviews, I commenced the data analysis process through the following stages

Stage 1: Reading and listening: After successful transcription of the data, I read the transcripts and listened to the tapes several times. Reading the transcripts and listening to the audiotapes repeatedly gave me the opportunity to revise some of the transcripts to capture what I missed during transcription. I was so well acquainted with the data that I could identify each participant's transcript, affiliated school, date and time of the interview by merely listening to the recorded voice or reading the transcript.

Stage 2: Coding: Coding took place in multiple stages over time (Zhang & Wildemuth, 2009). I coded the interview transcripts taking into consideration unique words, phrases,

sentences, paragraphs, and even non-verbal cues expressed by each of the participants as indicated in the transcripts. The coding process for the ten individual interviews took me about a week to complete. I identified 488 codes from the ten transcripts. I found codes to be important elements that helped me to see the patterns that were emerging from the data, which led to the development of categories. It was from the categories that I began to search for the initial themes.

Stage 3: Comparing Codes: At this stage, I went further by comparing all the responses from the ten participants by assembling their responses on each interview question to see the patterns that were commonly emerging. The codes were compared here to provide a clear vision for the next stage of the analysis, which involves categorisation of the codes into similar categories.

Stage 4: Categorising Codes: At this stage, similar codes with common content were assembled together as categories, and the categories gave rise to the major themes. However, I identified secondary themes under each of the major themes. A criterion for categorising the codes is set as: Codes that are similar; codes that are different from the others; important codes; and interesting codes.

Stage 5: Emerging Themes: From the categories initial themes began to emerge, but some of the themes were not very explicit, and I considered merging some or eliminating them if they did not seem to address the research questions.

Stage 6: Comparing Face-to-Face Interview (FFI) and Focus Group Interview (FGI) Themes: At this stage, I tried to compare certain unique codes that emerged from individual FFI transcripts with similar ones in the FGI transcripts. The rationale for the comparison was to find common themes and merge them together for interpretation and discussion as indicated in Chapters 5 and 6.

Stage 7: Merging FFI and FGI Themes: After careful consideration and selection of similar themes from both interview methods, compatible themes were merged together. Consequently, the 14 themes (8 from FFI and 6 from FGI) eventually become 5 themes. This means that the complex process of data analysis culminated to emergence of the five themes that are presented and discussed in Chapter 5. These five themes became the basis of the research findings.

4.13 Ethical Considerations

This is a qualitative research in a social context involving human elements as participants, and therefore I took appropriate steps to adhere to all ethical guidelines in order to uphold the participants' privacy, confidentiality, dignity, rights and anonymity. This is aligned with Creswell's (2003) position that draws the attention of researchers to the fact that "every researcher has an obligation to respect the rights, needs, values and desires of the participants in a research project"(p.37). The participants of this research were teachers implementing ICT integration in paperless schools. I considered all relevant ethical issues in the research by giving out consent information letters to the participants prior to the commencement of the data collection process. I gave out information letters to provide information about the purpose of the research, procedures for data generation, type of data to be collected, and the benefits of the research to the participants and society in general. I also personally took time to inform the participants of their right to voluntary participation and that they could withdraw from the study at any time during the process without any consequence. Hence, upon refusal or withdrawal of any teacher from participation in the research, which did occur, I simply co-opted another teacher who was willing to participate. This happened in school A during the focus group interview when two teachers withdrew and four others volunteered to participate.

To ensure confidentiality, all data collected from participants were treated confidentially and kept in a safe place. Only the research supervisors and I had access to the raw data that were generated from teachers in schools. As a requirement in the Wits School of Education, the data will be destroyed five years after completing the research. To ensure anonymity of participants, fictitious names that had no correlation with the actual names of participants were assigned to each participant during all interview sessions.

4.14 Research Trustworthiness

It is very important in "qualitative research that data must be auditable by checking and ensuring that the interpretations are credible, transferable, dependable and confirmable"

(Lincoln and Guba, 1985). This study adopted Lincoln and Guba's (1985) four criteria to establishing trustworthiness in a qualitative inquiry.

4.14.1 Credibility

This is concerned with the internal validity of the qualitative data. Lincoln and Guba (1985) argued that "ensuring credibility is one of the most important factors in establishing trustworthiness in a qualitative inquiry" (p.67). It is the confidence in the 'truth' of the findings. Credibility is established when the findings of the research are confirmed and accepted by the research participants, because they are very critical in judging the credibility of the overall research findings. To ensure the credibility of this study, I made a follow-up of all the participants in their respective schools in February 2017 to show them the transcripts of the interviews I conducted with them. The reason was to provide each participant with the opportunity to read the interview transcript and make necessary corrections (if need be). The follow-up visits also gave me the opportunity to seek clarifications about certain grey areas, such as incomplete sentences and informal expressions, in the transcripts. Interestingly, all participants were willing to see and read their transcripts before returning them to me. All the participants were satisfied with the transcripts as none of them raised any objection to the content. I employed different instruments to collect data (semi-structured face-to-face interviews, focus group interviews, and informal interactions with non-participant teachers) in the schools.

Each of these methods provided me with rich data for analysis. I compared the data obtained with each method and corroborated it against the other methods. There were differences and similarities in the data obtained with the different methods, which is one way of increasing the credibility of research findings.

4.14.2 Transferability

According to Merriam (as cited by Shenton, 2004), transferability has to do with the external validity of qualitative research, which "is concerned with the extent to which the findings of one study can be applied to another situation" (p. 69). It is achieved by providing an in-depth description of the research process to allow a reader to see if the

results can be transferred to a different setting. To ensure transferability of the research findings, I provided a detailed process of the data collection procedures in relation to the theoretical frameworks of the study. I also made a critical exploration and detailed discussion of the phenomenon under investigation to give a clear understanding of teachers' beliefs and their experiences around ICT integration in paperless schools in South Africa.

4.14.3 Dependability

This is concerned with the reliability of the study. Marshall and Rossman (2014) noted that the changing nature of the phenomena examined by researchers conducting qualitative studies renders reliability of the research quite problematic. This is because most qualitative studies are conducted with human subjects, and humans are dynamic, which affects the phenomenon under investigation. Shenton (2004) suggested that dependability "may be achieved through the use of overlapping methods such as focused groups and individual interviews" (p. 71). The overlapping methods may be similar or dissimilar but must complement each other towards obtaining data.

In order to make the research findings dependable and trustworthy, I employed more than one tool to generate data for the study. I employed individual face-to-face interviews and focus group interviews to generate data from the participating schools. Thereafter, I correlated all the relevant themes that emerged from both individual face-to-face and focus group interviews, which gave me the final themes discussed in Chapter 6. I also gave a detailed description of the methods that I used to arrive at the findings. I deliberately did so to provide readers with the opportunity to have an in-depth understanding of the effectiveness of the methods employed in relation to the research paradigm and theories.

4.14.4 Confirmability

Confirmability is about the objectivity in research. Research is confirmable when the investigator's bias is reduced to a minimal level or even eliminated. It is "the degree of neutrality or the extent to which the findings of a study are shaped by the respondents and not researcher bias, motivation, or interest" (Ang, Embi, & Yunus, 2016). This can

be achieved by placing greater emphasis on triangulation of the methods or techniques for data collection. Even though case studies may not be free of researchers' bias (Harris, 2011), I applied appropriate measures such as neutrality during my interaction with the participants. I maintained neutrality as much as possible throughout the conduct of the research, which helped me to mitigate my personal beliefs, emotions and prejudices in the conducting, analysis and reporting of these findings. I also ensured confirmability in this study by making an in-depth methodological description so as to allow the integrity of the research results to be scrutinised. I compared and contrasted the research findings from individual and focus group interviews with the reviewed literature and the theoretical frameworks guiding the study. I drew conclusions based on the interwoven discussion of findings.

4.15 Summary of the Chapter

This chapter has provided a detailed account and discussion of the research methodology and design that served as pathways to the accomplishment of this qualitative study. In this chapter, I was deeply engaged in making choices about the pathways that I consider more appropriate to lead me to accomplish the study. However, each choice I made was supported by a valid rationale to justify my decision. Hence, the chapter provided justifications for the choice of the research methodology, design, methods, instruments and analysis approaches in conformity with the chosen constructivist paradigm.

In this chapter, I also acknowledged all the major philosophical foundations (paradigms) that guide empirical inquiries, and in doing that, I made an analogy of each of the paradigms to show how it relates to the study and its limit of application to the study. Constructivism was adopted as the appropriate paradigm to locate the study, and a rationale was provided to support its adoption. The adoption of the case study research design for the study was well explained and rationalised. The chapter also highlighted the step-by-step application of thematic analysis that the study adopted as an analytic approach with teachers as units of analysis.

I narrated my experiences during the course of conducting the study, especially my experiences with teachers and other persons during the data generation process in the five participating schools. The experiences were a mixture of challenges, encountered, concerns, and some interesting aspects of data collection process. Finally, the chapter concluded by describing ethical considerations in the study and the steps taken by me to ensure trustworthiness of the study.

After obtaining data from the research participants through the application of the methodology, design and methods adopted in the study, the next chapter will provide an in-depth analysis and interpretations of the findings that emerged from the data.

CHAPTER 5

DATA ANALYSIS, INTERPRETATION AND PRESENTATION OF FINDINGS

5.1 Introduction

This chapter presents the data analysis, interpretation and presentation of findings from the semi-structured face-to-face interviews with ten teachers and five focus group interviews conducted in five paperless high schools in the Gauteng province of South Africa. Themes that emerged from the teachers' conceptions and beliefs about different aspects of ICT integration in the classroom are presented and interpreted. The main research question and sub-research questions are re-stated in Section 5.1.1, and the themes that emerged are organised in relation to the research questions as presented below. It is important to note that I did not deliberately try to fit any theme to any research question as it appeared on Table 11. Rather, some themes appear to align with the research questions because of how the interview questions were arranged in line with the arrangement of the research questions.

5.1.1 The Research Questions

Main Question: What are the teachers' beliefs and experiences around ICT integration in paperless high schools?

Sub-Question: The following sub-questions are stated to provide answers that may help to respond to the main research question.

1. How do teachers conceptualise ICT integration in paperless schools?
2. What are teachers' experiences of ICT affordances during integration in paperless high school classrooms?
3. What are the factors that influence the integration of ICTs in paperless high school classrooms?

It is pertinent to know that in line with the qualitative approach to research, I used the inductive approach to analyse the data but without any predetermined theme in mind. All the themes that emerged from the data analysis were derived from participants'

views about their beliefs and experiences during the implementation process of ICT integration in the five paperless schools. On the overall, themes were compiled through convergence of data obtained from individual face-to-face interviews and focus group interviews and complemented by field notes recorded throughout the research process.

Table 11:

Themes and Sub-Themes

Themes and Sub-Themes	
THEME 1 **Teachers' Understanding of ICT Integration**	
THEME 2 **Teachers' Experiences of ICT Affordances in Classrooms**	
Sub-Theme 1:	ICT as flexible tools that enhance teaching and learning
Sub-Theme 2:	ICT as time saving tools in the classroom
Sub-Theme 3:	ICT as tools that promote interaction in classrooms
THEME 3 **Training and Support for Teachers to Integrate ICT in School**	
Sub-Theme 1	Teachers' experiences of the nature of training for ICT integration
Sub-Theme 2	Need for regular and in-depth training
Sub-Theme 3	Need to train learners to use ICT for learning
THEME 4 **Challenges of ICT Integration in the Classroom**	
Sub-Theme 1	Lack of baseline research
Sub-Theme 2	Contextual challenges to ICT integration
Sub-Theme 3	Learners' poor attitude to possessing ICT tools for learning
THEME 5 **Factors that Influence ICT Integration in Schools**	

Note: At the end of each quote from a teacher, some personal information about the participant is provided in brackets for easy identification of the participant and the source of the response. The information includes the pseudonym/data type/school code/location of the school; for example: **(Lindiwe/FFI/Sch.A/Township)**.

Abbreviations:

Participant: **Lindiwe** (Pseudonym)

Data type: Face-to-face interview (**FFI**) or focus group interview (**FGI**)

School code: **A**, **B**, **C**, **D**, or **E**

School location: **Township** or **Urban**

5.2 Theme 1: Teachers' Understanding of ICT Integration

Unsurprisingly, participants demonstrated different understandings of ICT integration into teaching and learning processes, considering their different school contexts, resources, available infrastructure and backgrounds. Participants' understanding of ICT integration and how they define it was derived from their experiences and from their social interactions, which gave rise to the creation of their perceived reality (Berger & Luckmann, 1966). Data also revealed that the available ICT resources in each school influenced participants' understanding of ICT integration. In short participants demonstrated their understanding of ICT integration in relation to the resources they know, see and interact with in their respective schools.

Findings from the semi-structured individual and focus group interviews reveal that participant's conceptions of ICT integration range from combining different media forms and tools, delivering content, and enhancing teaching. For example, during individual face-to-face interviews the following participants expressed their understanding of ICT integration as follows:

> ICT integration is about taking the content and using video, audio of the ICT, putting it together and making it one thing … be able to develop, to deliver your teaching and the lessons through the use of different kinds of media. **(Lindiwe/FFI/Sch.A/Township)**
>
> Integration means taking the traditional teaching methods and blends them with ICT; we now use technology in our teaching and learning. We use the smartboard, we are still writing, but in a digital form. **(Mandla/FFI/Sch.C/Township)**

> ICT integration is about replacing the 'old' with the 'new' teaching tools, and not necessarily merging them [sic], we are not using the chalkboard, but we are using our smartboard … not using the pen, the chalk any more, but using the tablet and the smartboard. **(Ayanda/FFI/Sch.A/Township)**

ICT integration plays a significant role in developing and delivering content during teaching in the classroom through the use of various media as suggested in the first response above. Based on Lindiwe's response the development of a lesson may be from the stage of planning through the implementation stage to the final evaluation of the lesson that involves the use of ICT tools at each stage for a complete teaching experience; to accomplish this, content and media need to be combined together. Compatibility of the content and the various ICTs is quite important here. This means that the selected media format and tools must be appropriate to the content, for example, audio media must be used for content that require audio communication, while videos, posters and diagrams must be used for visual content. When ICT are successfully integrated in the classroom during the teaching process, delivery becomes easier since ICT integration is about putting audio, visual and audio-visual properties together and "making it one thing" (Lindiwe) to facilitate transmission of content through various forms of communication. The above conception of ICT integration suggests the use of multimedia in the classroom to enhance teaching.

While Lindiwe defined ICT integration as a process of combining different media to deliver content for the improvement of teaching, Mandla's definition highlights the merger of the traditional way of teaching with modern digital tools to improve teaching processes because while writing still continues, it is now digital rather than the traditional manual writing on the chalkboard. The conception seems to focus on blending teaching strategies with the application of modern ICT tools. This conception of ICT integration was evident in some of the schools I visited to conduct interviews: I noticed how teachers were still employing old methods of teaching along with some ICT tools to teach in their classrooms. This scenario was more prevalent in schools where ICT facilities, like smartboards, tablets or laptops, were in short supply or unavailable in some classrooms. This was evident in my field notes and also reflected in Table 8,

which provides a description of the demographic characteristics of the participating schools.

The blended approach to teaching and learning involves strategic integration of traditional face-to-face and virtual learning methods to personalise learning (Bonk & Graham, 2012; Bielawski & Metcalf, 2005). Modern teaching and learning strategies such as constructivism, collaboration and blended learning support the application of technology into teaching and learning and promote the use of multiple senses in learning through a combination of media devices in teaching and learning spaces. Blended teaching approaches deepen and broaden classroom discussions, among other benefits, to improve old teaching approaches that depended on a physical space for face-to-face interaction (Lim, Morris, & Kupritz, 2007). The response acknowledges that although ICT integration involves the use of new tools, old strategies or methods of teaching that are less interactive and more teacher-centred are still in practice along with the new tools (Thomas, 2010). This conception of ICT integration corroborates the concept of blended teaching strategy that is becoming a popular alternative to pure traditional teaching.

The response also recognises that not all classroom practices like writing have changed, but the form of writing has changed to digital format using digital ICT tools like computers. Teachers now write on electronic smartboards instead of writing manually on chalkboards with chalks. Similarly, learners seldom use pen and paper to take notes in the classroom but write with their tablets in digital format.

Interestingly, Ayanda's response proposes that ICT integration involves substituting old teaching resources with new technologies. This seems to suggest a shift from the 'old-style' to the 'new-style' of teaching due to the introduction of new resources in the classrooms, which could be linked to the current paradigm shifts in education and pedagogy. We cannot use old approaches of teaching to meet the needs of the present-day learners, who are expected to participate in the global economic space driven by technology. It is a fact that in this current era of information and communications technology, every work place uses computers, and so people are surrounded with computers in their offices and at their leisure places, homes and schools. A 21st-cenutry

education requires learners to be ICT savvy in order to function effectively as global citizens operating in competitive spaces, and this means that 21st-century schooling needs to introduce new classroom resources and redesign learning environments. Beyond the present rhetoric about the importance of ICT in education, I think governments and school authorities need to provide teaching and learning environments that are technology-driven to meet the learning needs of present-day learners. This may imply an increase in education budgets to procure and maintain technological infrastructure and manpower in schools. In order to take full advantage of new technologies in education, Hennessy, Onguko et al. (2010) suggested that "governments need to fundamentally rethink their approaches to learning and education and also their ideas of how new technologies can support them" (p. 75). It is not good enough to introduce ICT in schools without giving consideration to the teachers that implement the integration of ICT in the classrooms. The government need to plan and design strategies that will address the needs of teachers and learners and the context for technology to fit well into the education system.

Most of the research participants considered teaching practices as the central purpose of ICT integration in schools. However, despite similarity in the participants' responses that seem to foreground teaching as the focal point of ICT integration, there appears to be differences in what they foreground. For example, Lindiwe seems to understand ICT integration as a process that combine different ICT tools to deliver and improve teaching, while Mandla emphasises blending old methods of teaching with new ICT tools, and Ayanda emphasised replacing old teaching tools with new ones. However, the distinct difference between Mandla's and Ayanda's understanding is that while Mandla suggested a combination of old and new to have blended approach to teaching, Ayanda suggested that old methods should be discarded to make room for new methods that involve use of digital ICT tools in the classroom.

Whereas the above responses describe ICT integration as a process that pertain to teachers and teaching in the classroom, it is difficult to divorce learners and learning from teachers and teaching in an ideal classroom instructional process. Other participants' responses show understanding of ICT integration as a process that

involves teaching and learning in the classroom. For instance, the responses below illustrate the differences in the participants' understanding of ICT integration.

> ICT integration implies [sic] when I am teaching, I must use ICT tools such as the learner tablets, and teacher's smartboard, learners' cell phones, and I must be able to use them all in order to deliver the content. **(Kabelo/FFI/Sch.E/Township)**
>
> ICT is a form of teaching using technology, computers, tablets, videos, sound and practice. Now there is a lot of practice for the learners, and a lot of them see things happen than before when they use to imagine how things are done**. (Lungile/FFI/Sch.D/Township)**
>
> ICT integration is when a teacher teaches using ICT like multimedia projector, a laptop, and interactive board at least. Also learners are starting to use technology ... Like school module or online blackboard or Sakai in their tablets to get their books on tablets. **(Bongani/FFI/Sch.B/Urban)**

Kabelo's response suggests that teachers and learners must use ICT tools together to substantiate ICT integration in the classroom. It is important to note that the tools mentioned include both teacher tools like smartboards and learner tools like tablets and cell phones, which implies that ICT integration is not just about teachers and teaching but also about learners and learning. It suggests that ICT integration is a cooperative process involving the teacher and learners in the classroom. Each plays a significant role in ensuring successful achievement of the lesson objectives and effective utilisation of ICT tools. Kabelo foregrounded the importance of using different media to deliver content. Although it is unclear whether all the media is to be used while teaching at all times, it is clear in the response that ICT integration require teachers to engage with various ICT tools and to allow learners to also use ICT learning tools during content delivery in the classroom. The usage of 'must' in the response is significant because it suggest that teachers are not only expected to apply ICT tools as an option but as a mandatory requirement in their job description. As earlier stated, in paperless school teachers are mandated to integrate ICT, even though not all teachers in all classrooms are provided with smartboards. Although not all classrooms in paperless schools were fitted with smartboards at the time of collecting data for this study, there were other ICT tools and facilities that teachers were required to use for lesson preparation, delivery

and even assessment. In view of this, teachers are expected to assume new roles dictated by the availability of ICT in schools. Prakash (2018), Bergmann and Sams (2012) and other scholars noted that the role of teachers in the classroom is dramatically changing because of ICT infusion. Therefore, teachers need to acquire technological knowledge in addition to their content knowledge in order to teach more effectively in a 21st-century classroom like the paperless classroom.

Every teacher in paperless schools is expected to use ICT effectively in all teaching processes, and based on the responses, it is also anticipated that teachers demonstrate the ability to use 'all' the tools to deliver the content. In this case, teachers are expected to be well versed in both ICT skills and pedagogy. The application of all ICT tools in the classroom is not limited to the use of hardware but ability to harness the tools in an effective manner to ensure the attainment of lesson objectives. The presence of ICT in the classroom, therefore, places more competence requirements on teachers.

Stating her understanding of ICT integration, Lungile believes that ICT integration increases learner participation in classroom activities because they are given the opportunity to engage in different activities using different media. Learners are practically engaged in hands-on activities in and out of the classroom. This is important in developing learning skills, tactile ability and mental ability to solve practical problems. The response further illustrates how learners are not limited in their learning with ICT in the classroom. Through the integration of ICT in classroom, learners can see and touch a variety of learning materials because ICT contains sound, video and real properties to interact with.

It was interesting that the participants mentioned that learners do not have to use their imagination anymore because of the consistent use of ICT in every learning activity. Unfortunately, ICT has the potential to discourage imagination during learning, especially when learners are aware that they can get information with the click of a button. Although the response seems to consider student's imagination of learning activities as a limitation to learning, various scholars in the literature tend to support the promotion of imagination among learners, which contradict this response. For example, Conole and Dyke (2004) stated that imagination plays a critical role in the learning

process because it involves mental activities like thinking, creativity, insight and experiences that drive a learner to engage in different levels of reasoning towards solving learning problems. This means that imagination is one of the most powerful tools to develop critical thinking and problem-solving skills, which are requirements for 21st-century schooling. If this is the case, it means that teachers in paperless schools need advanced training to acquire knowledge and skills that will enable them to realise the affordances of ICT in promoting imagination in learners. For now, teachers seem to be limited in realising all the potentials and affordances of ICT in the classroom. But this is not a surprise given the nature of training offered to the teachers and the competence level of the training facilitators, as revealed in the findings.

If ICT are used in the right way, teachers can encourage imagination in their learners in order to not just acquire new information but to fully explore a topic, so that they can increase their rate of retention and become active participants in the overall learning experience (Pappas, 2014). The responses further highlight the enrichment of teaching methods for effective delivery of content.

Bongani also considers ICT integration as a process that is not only about teachers and teaching but also about learners and learning because learners are also part of the classroom processes. Classroom activities involve the teacher and learners playing different roles with available resources in order for teaching and learning to take place. Furthermore, the response indicates that ICT integration is not just limited to classroom teaching and learning but that it also includes the use of online platforms like Sakai and online blackboards in and out of school. Dede (2000) argued that ICT can be used to support learners' learning and to enhance pedagogy if the ICT are systematically applied in the school system. When appropriately integrated, learners can have unlimited but guided access to a variety of information from a global resource, thereby, giving them an edge over other learners that are not so exposed to global resources. To reinforce the above claim, Bruce and Levin (2001) and Bransford, Brown, and Cocking (2000) affirmed that if organised properly, ICT can be used effectively as a cognitive tool for teaching and learning in the classroom.

The response seems to consider the combination and utilisation of different tools as equivalent to ICT integration in the classroom. The combination provides both teachers and learners with the opportunity to teach and learn with visual images, audio sounds and real objects. It must be noted that prior to the introduction of ICT in schools, the majority of the classrooms in paperless schools did not have televisions or any audio-visual devices to enhance teaching, especially the township schools (A, C, D and E) that had no ICT laboratories. It therefore appears like ICT integration in classrooms closes the knowledge gap in schools that lack ICT resources, because during a face to face interview, Bongani believe teachers can now use "TV and interactive smart table" to perform experiments, make demonstrations or illustrations of some classroom activities. Similarly, through the use of simulations in YouTube teachers and learners can view processes and procedures of scientific activities, e.g., the earth's revolution and rotation, which may not be practicable in a real classroom context. Interestingly, there is evidence in the literature (Mdlongwa, 2012; Conole & Dyke, 2004) that the use of ICT in the classroom adds a variety to teaching strategies that stimulate learners to develop interest in the lesson. ICT also promotes deeper understanding of content and promotes the production of new knowledge, among other benefits. According to Noor-ul-Amin (2013), availability of ICT enhances the classroom learning environment, making it a powerful resource for instructional improvement by means of stimulating interest to learning and reducing teaching time and effort. Nevertheless, it is fundamental to acknowledge that if such a classroom environment is not properly organised and utilised, it can turn out to be a powerful source of distraction to learners. Ultimately, Bongani believes that ICT integration is when teachers utilise modern digital technologies to enhance teaching processes and to foster learning in the classroom.

The understandings of the above group of participants indicated that the introduction of ICT integration into teaching and learning promoted simultaneous usage of multiple learning senses thereby increasing learner engagement in classroom activities.

To conclude the theme, it is unsurprising that the responses suggest that teachers understand ICT integration differently. While some participants see ICT integration as a process of combining ICT tools to enhance teaching, others see it as a way of combining media resources with methods to support teaching and learning within and

beyond the classroom environment. Almost all the responses seem to be linked to the types of ICT tools available in their respective schools, except for few participants who demonstrated their thinking of ICT integration beyond the availability of ICT tools within their reach. Teachers ought to understand that ICT integration goes beyond occasionally using ICT in the classroom. Finally, the theme has exposed the complexity and diversity of notions of ICT integration among teachers in paperless schools. Analysis of data further revealed how teachers expressed their views of their experiences with ICT integration in the classroom as presented and interpreted in the next theme.

5.3 Theme 2: Teachers' Experiences of ICT Integration Affordances in Classrooms

This theme presents participants' views of the experiences they had with integrating ICT in the classroom. In this theme participants' foregrounded flexibility, enhancement, effectiveness, efficiency, interaction, and feedback as affordances that are inherent in ICT tools. Most participants see ICT as tools that enhance teaching and promote interaction in the classroom. In this theme, three sub-themes were identified, and each is presented and interpreted separately but discussed interrelatedly because they are not isolated from each other. Participants mentioned that ICT enhance teaching and learning in diverse ways such as promoting interaction, sharing information, and communication among and between teachers and learners in the classroom

5.3.1 Sub-theme 2.1: ICT as Flexible Tools that Enhance Teaching and Learning

Evidence from both individual face-to-face and focus group interviews across the participating schools shows that the majority of participants concur with the view that integrating ICT into their teaching brings about some significant positive changes in the way they teach in the classroom. Participants claimed that they found ICT to be flexible tools that enhance teaching and learning processes. For instance, during individual face-to-face interview interaction with participants in their respective schools, the following comments were made:

> It (ICT) does enhance my teaching because it is not like standing in front of the classroom where you can just explain to the learners; now I have different ways of making my lesson more interesting … remember that you are not teaching one kind of learner, you must use different kinds of learning styles because remember you have the audio, visual and audio-visual devices, so if you have these, you are able to reach diverse learners. So it is inclusive in itself. **(Thandi/FFI/Sch.B/Urban)**
>
> I think to me, they (ICT) do enhance my teaching because when I have a lot of resources and I have different kinds of resources to show them (learners), it can either be a voice clip, it can be videos, it can be pictures, I just want them to interact and to participate in the class … unlike when you don't have lots of things for them to touch, to listen, and to analyse. **(Ayanda/FFI/Sch.A/Township)**
>
> ICT is very flexible. There are videos that learners can see, and there are sounds that learners can hear, so it is really flexible. **(Lungile/FFI/Sch.D/Township)**

As briefly mentioned in the introduction of the theme, participants' experiences with ICT integration foregrounds flexibility, even though they talked about it differently. Thandi mentioned that ICT integration meant no longer having to stand in front of the classroom to transmit information to learners, which is typical of traditional teacher centred methods of teaching without ICT. In the traditional classroom setting, the teacher does most of the talking while learners are passive listeners (Bista, 2012; Orlich, Harder, Callahan, Kauchak, & Gibson, 2004). Thus, due to the availability and utilisation of ICT, Thandi is now able to transcend conservative pedagogy (old-fashioned classroom practices) that is often prevalent in traditional classroom settings.

ICT provides teachers with the opportunity to diversify teaching methods such as discussion and collaboration during presentations of lessons. A combination of teaching methods has proved to be more effective than the use of a single method to teach in the classroom because the combination provides more opportunities for learners to get more involved in the lesson than single methods (Bidabadi, Isfahani, Rouhollahi, & Khalili, 2016). Data has indicated that using different ICT tools involves the application of different senses that makes learners more active because of the interest they develop from the variety of tools used. Thandi asserted that teachers are expected to meet the learning needs of all learners in the classroom, and ICT integration provides

teachers with the opportunity to meet the needs of diverse learners. Different learners have different learning styles and these are taken into consideration with the use of ICT integration in the classrooms, as the response indicates, ICT does not only provide opportunity for inclusiveness in the classroom, but it is inclusive itself. This means ICT caters for the needs of diverse learners because of its multisensory properties that appeal to multisensory learning. This claim may be linked to the fact that ICT include audio, visual and audio-visual properties, and that means no learner will be excluded in a classroom where the teacher employs a variety of ICT tools to teach. Therefore, the response considers ICT integration as a means of meeting the needs of various kinds of learners, namely visual learners, auditory learners, reading/writing learners, and kinaesthetic learners in a single classroom (Willingham, 2005). The opportunity for inclusiveness is a powerful attribute of ICT tools that makes ICT integration relevant and desirable in school. Interestingly, inclusive education is the focus of most nations for education in the 21st-century (Polat, 2011; Srivastava, De Boer, & Pijl, 2015).

Ayanda's response acknowledges that where resources are lacking, classroom activities may be adversely affected because both teacher and learners may be limited in doing some classroom activities effectively because learners may be deprived of getting the right learning experiences in school. This is in congruence with the findings of Visser, Juan, and Feza (2015) that the availability or scarcity of essential school resources significantly impacts on educational outcomes in South African schools. Studies (Hedges et al., 2016; Savasci & Tomul, 2013; Salmi, 2009) have shown that schools with abundantly rich resources usually achieve better educational outcomes while schools with few or poor resources tend to have low performances in educational outcomes. Savasci and Tomul (2013) investigated the relationship between the academic achievement level of students and the educational resources of schools. The authors argued that "the educational resources of schools play an important role in determining academic achievement and also create equal opportunities for students" (p.6). Quality teaching and learning resources supplied in adequate quantity ensure quality teaching and learning in schools. However, this must be complemented with other facilitating conditions like quality teachers and administrative support in the schools.

In this study participants believe that schools with abundant relevant ICT resources are in a better position to integrate ICT in the classroom. It must be noted that the resources are not limited to material (hardware) resources but include human (teachers) resources. This means for the successful integration of ICT in the classroom, availability of proficient teachers is as important as the availability of ICT tools and facilities.

Scholars (Abdullah, Bakar, & Mahbob, 2012; Hennessy, Deaney, Ruthven, & Winterbottom, 2007) recognised the significance of learners' active participation in the classroom as an indicator of teaching success. However, participation must be stimulated by the effective use of ICT resources that promote critical engagement of learners. The utilisation of video clips and pictures heightens dialogue, collaboration and cooperation, especially when learners are encouraged to analyse knowledge using different resources. Traditional teaching resources are limited in the different options it can provide learners to explore learning in the classroom because it contains limited attributes when compared to ICT tools that have more than one attribute in each tool (Behzadi & Ghaffari, 2011). Examples of traditional teaching resources are realia (real objects), specimens, pictures, posters, artefacts, etc., which may consist of one attribute that allows a learner to either see, smell, feel, taste or touch. On the other hand, examples of ICT include computers and mobile devices like phones or tablets that contain multiple attributes that allow the learner to see, touch, simulate, listen, write, and read at the same time using a single tool or device. Given the multiple attributes of ICT, it may be resolved that teaching with ICT has greater potential to promote learning in diverse ways than using traditional resources.

Not only does ICT integration enhance teaching, but it also allows flexibility in communication channels that facilitate a shift from one medium of interaction to another, such as shifting from visual communication to oral or written communication. As earlier mentioned by Lungile, ICTs are very flexible tools because there are videos that learners can see, and there are sounds that learners can hear. The concept of flexibility mentioned in Lungile's response may be interpreted as the ease of switching from one mode of learning to another or even of combining different modes to learn simultaneously; for example, learners may switch from oral learning to visual learning modes or from writing to reading using different ICT tools. Furthermore, learners can

embark on learning with a complex combination of multimedia tools to learn complex topics through simulations and games. This is a great advantage in learning because it signifies that learners are at liberty to embark on a cognitive shift, which means moving from one sense of cognition to another within learning spaces. It means that with audio-visual media, such as videos, learners can be dynamic in their approach to learning by using a variety of media tools. It is no surprise therefore that Majumdar (2015) posited that ICT integration "permits the move from knowledge transmission model of teaching and learning (traditional teaching model) [sic] to an independent, autonomous learning mode (modern teaching model) [sic] that promotes initiations, creativity and critical thinking with independent research" (p. 2). This implies that ICT are flexible tools that permit learners to be independent, creative and critical thinkers.

In conclusion, this sub-theme revealed that when ICT is adequately integrated into the classroom, teachers no longer assume same role in the classroom because the type and combination of media resources available influence the teaching skills and methods that can be adopted. For instance, as earlier stated, a combination of audio, visual and audio-visual media may require the teacher to employ a combination of teaching methods, like explanation, demonstration, use of examples and illustrations in one lesson. To support the above claims, South Africa's e-Education Policy White Paper categorically states in Section 2.5 that, "ICT when successfully integrated into teaching and learning can ensure the meaningful interaction of learners with information. ICT can advance cognitive, skills such as comprehension, reasoning, problem-solving and creative thinking" (DoE, 2004, p. 14).

5.3.2 Sub-theme 2.2: ICT as Time Saving Tools in the Classroom

Considering the importance of time management in education and particularly in the classroom, ICT is identified as saving time for teachers because it is effective in aiding both teachers and learners to accomplish tasks more effectively and efficiently. When ICT is used appropriately in the classroom, teachers can accomplish more teaching in far less time than when using traditional teaching tools. Similarly, learners can cover more learning content efficiently. In focus group interviews, participants raised the following points:

In terms of effectiveness, I no longer take too much time writing questions. I have all my questions on the memory stick or even on the tablet, and just to share with them (learners) from there can have it on the smartboard. Rather than writing all those questions on the chalkboard … it has made things quicker, I mean the time. Before the coming of the smartboard you will have to spend lot of time writing, going to erase when in another classroom you write the very same thing; you spent a lot of time. Now all of that is gone. **(Bheki/FGI/Sch.D/Township)**

There is time minimisation because once you have the ICT, you don't need to write again … you don't spend the whole day writing on the chalkboard, what you could do. You just present your prepared lesson, so it minimise the time, so they (learners) learn faster. **(Rose/FGI/Sch.D /Township)**

I think ICT has helped in planning a lot because now you can literarily spend less than ten minutes to plan your lesson because we have the resources available … Is just a matter of taking those resources and use it … rather than starting from scratch, trying to think of new ways. You can actually go online and see what another teacher has done and then take what you think will be effective in your circumstance. So it makes it very easy in planning. **(Muzi/FGI/Sch.D/Township)**

They (ICTs) are actually helping ... if you come to class with a power point presentation as well as integrated videos, you have certain concepts, then you may find that in one period you are able to do two lessons, which is plenty of time remaining. **(Shaka/FGI/Sch.C/Township)**

It actually takes less time if you use these things (ICT) … you just need to plan. It saves you time in the classroom; it saves you time in terms of marking; but you have to plan it properly … time in the class is reduced, you get more interaction with the learners and time after as well is reduced because it minimises your marking as well … the time for planning unfortunately at the initial stage, it takes more time, but once that is in place time is reduced … it's easier to explain concepts to learners when various ICTs are combined and used in the classroom because you can do it through illustrations, you can do it thorough videos, you can do it through animations. Those videos and animations are already edited, so something that you normally try to explain in 40 minutes or 50 minutes can now be explained in five minutes because its visual. And not just visual, it was planned and edited so that what you normally explain in a much longer time is now minimised. **(Bongani/FFI/Sch.B/Urban)**

During focus group interviews across the five schools, participants alluded that time is saved when ICT are properly used during teaching and learning. Proper use of ICT involves selection, preparation and application to the relevant topic in a suitable classroom environment. This means that teaching and learning objectives are likely achieved more proficiently with ICT and that the minimum time is required to perform tasks in the classroom. Some participants recalled their experiences of the impact of ICT on their teaching in relation to time conservation in specific areas of classroom pedagogy. For instance, in the area of lesson planning, much time is conserved since the teachers do not have to repeat a process; all the teacher has to do is to maintain the template and update it from time to time. Likewise, in the areas of timetabling and evaluation, teachers do not have to repeat the process in the classroom and in the school.

Bheki's response suggests that when ICT is incorporated in the classroom, the teacher does not have to write and rewrite notes repeatedly as is the case with using a chalkboard in a traditional classroom. With ICT teaching notes are prepared once and saved on a digital storage device, and it can be retrieved and shared several times with numerous learners, thereby defying some limitations of the old classroom setting. Although this seems to be an advantage over the old method of writing notes on a chalkboard, it is of concern that the use of ICT to share notes may limit learners' ability to develop writing skills, especially in the early grades. The response further suggests that ICT integration does not only save teaching time but also accelerates learning by allowing learners to accomplish more tasks within a shorter time. For example, learners can copy and share notes with computers faster and with minimal spelling mistakes than when using manual processes.

Both teachers and learners do not have to spend time writing on the board because digital content can easily be replicated (Muttappallymyalil et al., 2016). ICT integration has made planning and teaching easy, but more importantly, it has saved instructional time by eliminating repetitive writing activities in classrooms. According to Majumdar (2015), the fundamental reason for integration of ICT into classroom pedagogy is to improve teaching and create a new culture of learning that enhances teaching and promote effective learning. In these findings, participants provided narrative evidence of

their experiences to prove that ICT integration has indeed brought about improvement in their teaching. They claimed that ICT has created new cultures of learning in the classrooms through the provision of opportunities for new diverse interactions between and among teachers and learners in schools

Rose's experience is similar to that of Bheki concerning ICT's time saving attributes. She also experienced ICT as tools that provide teachers the opportunity to do more work in less time in the classroom because the availability and use of ICT eliminate the repetitive process of copying notes on the chalkboard. This further suggests the capability of ICT to expedite teaching and learning processes, right from the lesson planning stage to the execution of the planned lesson in the classroom.

For Muzi, ICT has helped a lot in the area of lesson planning because teachers now take minimum time to plan a lesson due to availability of ICT resources. In addition, his response suggests that the teachers require little or no effort to plan their lessons because ICT has made it easy to access planned lessons on the same topic from online sources and use it in the classroom. Even though Muzi considers this an advantage, it might not really be a time saving attribute of ICT for teachers because teachers are expected to employ ICT to creatively design lessons and not just to retrieve existing information for use. Teacher creativity and novelty in lesson preparation is essential (Constantinides, 2015) but this is absent in Muzi's claim. Constantinides (2015) believed that, "Teaching is not an exclusively creative process, but neither is it merely a set of repeated action sequences based on blueprints. Teaching is based on knowledge, professional understanding, technical know-how and the personal qualities of the teacher, and how this knowledge is synthesised, filtered, interpreted and translated into teaching is a complex process involving higher order thinking and cannot be 'learned' at a go but over time" (p. 115). This is why the creative ability of a teacher cannot be undermined in ensuring effective teaching in the classroom. Therefore Muzi's claim that it is "just a matter of taking those resources and use, rather than starting from scratch or try to think of new ways" suggests the teacher's lack of considerations for creativity and commitment to active teaching. Instead, it suggests plagiarism and lack of original thinking ability on the part of the teacher. This is not acceptable in the teaching profession because it compromises the rigour required in lesson planning for effective

teaching. ICT must be seen as tools that support teachers to be more thoughtful and creative in planning and designing new lessons in schools, rather than mere tools that aid the teacher to plan a lesson (Trucano, 2005).

In his contribution during the focus group interview, Shaka stated that ICT integration is beneficial to both teacher and learners in the classroom because if used correctly, it can help to save time especially when different media are combined to deliver lessons. But to achieve this, the response seems to suggest that teachers ought to prepare different formats of ICT such as power point slides and videos and audio clips before the lesson presentation. This is important in order to meet the needs of diverse learners through multimedia combinations that appeal to different senses for effective learning. Shaka's claims are supported by similar views postulated in the literature. For example, Kozma (2008) opined that appropriate media combinations to teach in the classroom leave plenty of time for teacher and learner interaction, dialogue and reconstruction of knowledge, thereby promoting collaboration and active participation in knowledge creation and knowledge sharing. This implies that the use of media provide more time and opportunities for interactive activities like collaboration, dialogue, critical thinking and perhaps even reflections in the classroom that may not have been possible in a traditional teaching and learning session that is both time and space bound. However, these benefits are not automatic because of availability of ICT in the classroom, rather it all depends on the teachers' ability to select and use ICT appropriately in the classroom.

Similar to Muzi, but with a different approach, Bongani cautioned and emphasised the need for proper planning in order to benefit from the use of ICT for effective teaching. The response placed emphasis on the need for proper planning as an important prerequisite to obtain maximum benefit from the use of ICT in the teaching and learning process. This participant acknowledged that at the initial stage of planning a teaching task, rigour is involved because it requires much time to be extremely thorough or accurate. But once it is properly planned, less time and effort is required in the subsequent usage of ICT in lessons. Teachers spend much time marking learners' examinations or test scripts even after the initial planning. This participant found that once the initial planning is done, less time will be required to mark examination scripts, and teachers consider this as a very beneficial impact on their work.

The foregrounding of proper planning as a prerequisite for effective teaching is significant to obtain maximum benefit from the use of ICT in the teaching and learning process. Spencer (2003) acknowledged planning as one of the important principles of good teaching because it helps the teacher to be systematic and orderly in the classroom, hence it saves the teacher from haphazard teaching that is likely to occur when the teacher fail to plan for every lesson. It should be noted that in view of the availability of new ICT tools in our classrooms planning has now become more critical than before because teachers are now confronted with many resources to select from. Hence, teachers need special ICT skills to be able to plan an ICT integrated lesson. Wang and Woo (2007) articulated specifically the importance and need for planning ICT integration into classrooms because successful integration and teaching with technologies rely on good planning. Planning is an important requirement for teachers to explicitly justify why technology is used in the classroom and to effectively incorporate the technology in the lesson.

By way of concluding, this sub-theme centres on the issue of time saving as an advantage of using ICT in the classroom. It revealed that it is easier and faster to plan lessons, deliver the lessons and explain concepts to learners in an ICT-driven classroom than in the traditional classroom. While the sub-theme outlined the various affordances that using ICT brings to the classroom, it also cautioned against the negative impact of ICT on teaching and learning. Hence, the need to pay more attention to the potential negative effects of ICT and to provide strategies to mitigate them.

5.3.3 Sub-theme 2.3: ICT as Tools that Promote Interaction in Classrooms

During focus group interviews in schools, participants also talked about ICT integration offering opportunities for different kinds of interaction in classroom as compared to a traditional classroom. Participants believed that when varied interactions occur in an ICT-rich classroom, a rich environment for sharing and collaboration in real time and real space is created.

> ICT makes them (learners) to also concentrate in the classroom because they are able to talk about the content, so they engage with the content instantly. **(Lindiwe/FGI/Sch.A/Township)**

> It has enhanced my teaching because learners are able to communicate with each other; so I improve my teaching by letting my learners be able to interact with some learners in other schools. Thus it is not only about interaction in the classroom but also with learners in other schools … you also get the learners as well to be part of what you are teaching … the lessons are more interactive. **(Mbali/FGI/Sch.B/Urban)**
>
> It's more interactive in the classroom. I think now the kids can see what you are talking about. Something you can show them. Learners are able to engage with various media to study content independently and or collectively. **(Gugu/FGI/Sch.B/Urban)**
>
> It's very much helpful because I am able to interact with my learners on WhatsApp. Because each one of them has a tablet, and I have everyone in grade 11 and ten classes on my Facebook, so I am able to disseminate information. So for me it's helpful. If they can't get and understand … they can simply Google an image because some learners learn well when it comes to visual learning. **(Kabelo/FGI/SchI.E/Township)**

Noor-ul-Amin (2013) claimed that appropriate incorporation of ICT in education can provide the needed rich environment and the motivation for teaching and learning, and thereby offering new possibilities for teachers and learners to interact. In every teaching session, teachers are encouraged to make use of a combination of interactional patterns in the classroom because lack of interaction or excessive use of a single interaction style can cause monotony, thereby making the lesson uninteresting.

Lindiwe asserted that ICT integration simultaneously promotes learner engagement with content and classroom control. This is perhaps due to the various stimuli developed from the use of different media that lead using different senses in learning process. This implies that if ICT are in place, learners are likely to engage more actively with learning activities given to them.

Mbali viewed interactivity differently: She believes that when ICT is introduced into the classroom, it makes teaching and learning more interactive because learners can connect with one another through digital communication formats like the YouTube, Facebook, WhatsApp and Twitter, which are relatively cheap, easy and accessible to learners in paperless schools. The manner of interaction also addresses connection within and across schools as learners can share information with other learners across schools. This confirms one of the affordances of ICT as suggested by Conole and Dyke

(2004). Mbali further argued that learners do not have to depend on the teacher for every piece of information they need in school because they can readily access their own information from the Internet and other digital sources. She also suggested that ICT enables learners to get deeply involved with learning content in the classroom, which supports the claim that ICT facilitates independent learning. Learners can now read e-books, blogs, graphic applications; watch tutorials and several controlled experiments on YouTube; or use relevant computer applications that are related to any topic in order to acquire practical knowledge and skills (Bhaskar, 2013). This is represented by the participant's sense of satisfaction about how she believes teaching is enhanced when learners get more involve in diverse interaction in and outside the classroom. ICT provides opportunities for both teachers and learners to interact with content and with one another. This type of engagement with content promotes collaborative learning, which is a popular teaching and learning strategy that is facilitated by use of technology in the classroom. Through collaboration learners can work together on projects, share knowledge and experiences towards solving learning task (Seaman & Tinti-Kane, 2013). Learners' ability to communicate and collaborate with other learners across schools may be considered a great opportunity for building social relationships among and between learners across physical and social boundaries. These social relationships among learners that are enhanced through the use of ICT promote collaboration among the learners for learning and even knowledge creation in some cases.

Interestingly, during a focus group discussion Gugu identified the opportunity for visual and tactile interaction as another form of classroom interaction made possible by ICT. It implies that learners can interact with learning content by seeing and touching different types of media tools in the classroom. This form of interaction usually promotes learning in more diverse ways through use of multiple senses than the traditional form of classroom interaction that is mainly centred on verbal communication. The response also reiterated the role of ICT in facilitating both independent and group interactions, given that learners can engage with various media to study curriculum content independently or collectively. This is possible because various media have unique properties that allow learners to use a particular form of communication for interactive

purpose. For example, learners can use mobile phones to engage in textual, oral and visual interactions among themselves and with other learners in another school. This enables learners to share information and collaborate towards solving learning problems. It may also allow learners to develop skills for searching and selecting information from the Internet, which is a rare skill to acquire in the classroom. However, this form of interaction between and among learners could also be disadvantageous to learners, especially if the selection and application of ICT is not guided towards achieving a particular learning objective. Learners' interaction with ICT and trough ICT must be tailored towards promotion of learning at all times, so that when, where and how learners engage with ICT tools do not undermine learning. Teachers must guide learners to benefit from social interactions, even on online social platforms like YouTube, Facebook, WhatsApp and Twitter.

Kabelo emphasised how interactions between teacher and learner can significantly impact on teaching, in and outside the classroom, when using the Internet via Google, YouTube, Facebook, WhatsApp and Twitter. ICT has practically enhanced physical and virtual interaction between teachers and learners in both synchronous and asynchronous learning environments. In this case, ICT seems to remove the seemingly physical barriers to communication between the teacher and the learners through the use of mobile ICT devices. Consequently, teachers can disseminate information to learners at any given time, thereby enhancing information sharing in teaching. In addition, the response points out the possibility of learners having access to a global information platform i.e. the Internet via Google. Learners can search for information independently and share it among themselves or with the teacher. Kabelo highlighted the potential benefit of using social media platforms as a mode of sharing information among learners and between teacher and learners. Today's learners are using YouTube, Facebook, WhatsApp and Twitter as tools for learning and collaboration. Seaman and Tinti-Kane (2013) and Hunter-Brown (2012) alleged that social media is a veritable tool for learning among 21st-century learners. Scholars (Mathias, 2012; Lederer, 2012) found that the use of social media is an effective way to increase learners' involvement and to build better interaction. The response also recognised individual differences that exist among learners in every classroom.

Ultimately, all the responses points out how ICT integration stimulate interaction between teacher and learners, and how it can significantly impact on teaching and learning processes in and outside the classroom, giving learners opportunities for diverse interaction and limitless learning spaces. This corroborates previous claims by scholars in the literature such as Cabero (as cited by Noor-ul-Amin, 2013) who stated that:

> The integration of ICT into teaching and learning processes contributes to increase the interaction and reception of information. Such possibilities suggest changes in the communication models and the teaching and learning methods used by teachers, giving way to new scenarios which favour both individual and collaborative learning. (p. 3)

Interestingly both the literature (Noor-ul-Amin, 2013; Poulou, 2009; Muntner, 2008) and research data seem to concur on how these classroom interactions are freely stimulated when ICTs are integrated appropriately in the classroom. Given the understanding that classroom pedagogy entails series of connections involving teacher, learners, content, media and the environment, findings reveal that participants believe ICT promotes diverse interactions between and among teachers, learners and content in school. According to Tan et al. (2012), one of the educational affordances of a ubiquitous learning environment is the capacity for diverse interaction.

5.4 Theme 3: Training and Support for Teachers to Integrate ICT in School

The theme consists of three sub-themes that focus on the nature of training and associated problems of inadequate training of teachers for ICT integration in schools. The importance of training and continuing support of teachers for ICT integration cannot be overemphasised for improving competence, knowledge and skills that are critical for successful implementation of ICT in the classrooms. At this juncture, it is imperative to know that one of the targets for initial and continuing teacher development in South Africa is that “all practising teachers who have access to ICT should, as a minimum, be trained to the adoption level of ICT training by the year 2010” Hindle (2007, p.8). From the discussions, teachers mentioned that they have undergone some kind of ICT integration training, although the majority of the teachers are unsatisfied with the quality and consistency of the training. Currently, there seems to be limited empirical evidence

indicating the level of teachers' attainment on ICT competence from the various training they attended. This theme presents the nature of training teachers attended in different schools and understanding their experiences of preparedness for ICT integration in their classrooms or lack thereof.

5.4.1 Sub-theme 3.1: Teachers' Experiences of the Nature of Training for ICT Integration

The focus of this sub-theme is the training teachers attended in their respective schools before and during the implementation of the paperless school project. During individual face-to-face and focus group interviews participants concurred that teachers in paperless schools received and some were still receiving during the course of data collection, some kind of in-service training on ICT integration in the classroom. Despite continued provisions of training in all the participating schools, the level, depth and frequency of training also varied from one school to the other. The responses obtained from participants during individual face-to-face interviews are illustrative:

> The Department of Education does enrol us for training workshops … especially that our school is a pilot school. We had ICT training, so we have gone there. **(Ayanda/FFI/Sch.A/Township)**

> We got continued training since I was employed two years ago [sic], we attend workshops … At the moment we have Mathew Goniwe workshop that runs every Mondays and Tuesdays, where we are taught how to integrate ICT with our normal lessons … It is regular, every Monday and Tuesdays, it has been running since we opened in January 2016 to date (May, 2016). Most of them take place here at school, others we go out to other schools that have ICT facilities as well. **(Lindiwe/FFI/Sch.A/Township)**

> I have attended a lot of training seminars with regards to ICT skill; last year I did train. They first initially trained me when I first came in during orientation and after the orientation we had like two seminars in the first year, then last year we did a lot of training, and then this year not like every week, may be once a term … the school organise them during the holidays and I also went for workshop beside this at

> NAPTOSA, so NAPTOSA had some workshop on ICT skills. I also attended some trainings organised by the GDE about twice. **(Thandi/FFI/Sch.B/Urban)**
>
> Actually, we did have some professional developments, especially in the early phases of the implementation of ICT programme, but currently we don't attend much training. But we do attend trainings which pertain to teaching the subjects, but not ICT training. **(Mandla/FFI/Sch.C/Township)**
>
> I have attended several workshops, like change management to say what we expect in terms of transforming way of teaching moving towards the digital age. I attended such workshops. Normally the trainings are somewhere (away from the school). Sometimes we also do have internal trainings. **(Shaka/FFI/ Sch.C/Township)**

From the responses presented above it is evident that teachers in paperless schools do receive some form of training workshops on ICT integration; however, the nature of training varies from one school to the other. Although the reasons for variation in the nature of training were not ascertained in the responses, it was evident in the data that there are disparities in the level and scope of ICT content taught during various training sessions.

The training ranges from the learning of basic computer operations like starting the computer, typing, copy and paste, and formatting text to more advance levels of pedagogical integration of several ICT tools like smartboards, laptops, mobile phones and tablets. Ayanda said she attended training workshops that exposed teachers to use ICT to teach in the classroom. She claimed that teachers attended training workshops sponsored by the GDE and facilitated by a hired ICT training company, hosted outside their school premises.

In a similar response, Lindiwe also claimed that training for ICT integration are provided to teachers in school. Lindiwe is a relatively new teacher who started teaching only two years ago; nevertheless, she had attended training and workshops that exposed her to the use of ICT in classroom teaching and said that the training are currently going on. Based on her response, teachers at her school regularly received training in 2016. The training were facilitated by Mathew Goniwe School of Governance, which is a private organisation partnering with the DoE to train teachers on the use and integration of ICT in school. Lindiwe's assertion that, "We are taught how to integrate ICT with our normal

lessons" may connote the mere use of ICT tools as teaching aids, which Raby (2004) described as physical integration of ICT in the classroom.

Thandi also said that she received training at her school and has attended a lot of seminars at the school and at other venues. In Thandi's school there is a policy that requires all new teachers to undergo a compulsory orientation programme upon arrival at the school. How to integrate ICT into pedagogy forms part of the orientation programme. Thandi went through an induction course; hence, she was exposed to the use of ICT in the classroom early enough. In addition to the orientation programme where teachers learn about the application of ICT in all aspects of their teaching profession, teachers are also offered internally organised seminars and training to update them with the latest technologies and strategies to use in their classrooms. Besides all the internal support for teachers, the school authority also enrols and sponsors teachers to attend ICT integration training and seminars outside the school; Thandi has had opportunities to attend these external training.

Mandla also acknowledged the availability of training for teachers in schools but tried to distinguish the kind of training that are offered; According to Mandla, the actual ICT integration training were organised for them at the early phase of the implementation of the paperless school project, that is, at the beginning of 2015, when the project was newly introduced into the schools but as at the time of collecting this data Mandla believes the training have changed considerably.

Now from the data it is evident that most trainings seems to focus more on specific subject methodology, that is, methods of teaching a particular subject discipline (e.g. Methods of teaching mathematics or science) which may or may not necessarily involve integration of ICT tools. It is important to note that the response is quick to point out that, teachers attended much longer and regular internal and external training during the early phase of the implementation of ICT programme in their school as compared to the current situation of training in the school.

Mandla noted that teachers in his school still attended some training, seminars and workshops that are not related to ICT integration; hence, training have shifted from ICT integration to teaching of subject content. This suggests a discontinuity of ICT

integration training in some schools, which is a problem to effective implementation of ICT integration, given that ICT integration requires continued training and practice because ICT tools, knowledge and skills keep changing quickly and require constant practice to keep up-to-date.

Based on participants' responses, it has been established with reasonable evidence that training exist in school, but the depth and frequency of the training remains an issue of concern in respective school contexts. It must be noted that while ICT integration training is regular in some schools, it is quite irregular in other schools. Just as school contexts differ, so also do their capabilities to implement ICT integration. Perhaps the disparities may be due to contextual factors, particularly the school context, such as availability or lack of school-based ICT committees that are vested with the responsibility of organising internal training. In addition, schools are not equally endowed with ICT resources, which may limit training and practice of ICT integration in schools. School policies also have the potential to influence the extent to which ICT may be integrated in the classrooms. Schools with favourable ICT policies usually promote ICT integration in the classrooms, as in the case of Thandi's school, while schools without ICT policies may discourage teachers from integrating ICT effectively in their classrooms. Another reason may be the level of support available to teachers to embark of ICT integration from the principals, fellow teachers, and technical and administrative staff within the school and from parents, facilitators and district education officers from outside the school. The type and level of support can also impact on both teachers' and learners' interest to use ICT tools, which may lead to effective integration.

Also related to availability of training in schools are the locations or venues where trainings are conducted. Participants spoke explicitly about venues for training. Although all the participants agreed that training is available to teachers in paperless schools, Lindiwe stated that venues where these training are conducted vary from within the school to out-of-school premises. The training venue is an important aspect because some scholars (Garet, Porter, DeSimone, Birman, & Yoon, 2001) believed that the physical environment where training are conducted have implications on the level of knowledge and skill that participants can acquire during the training. Receiving training in a familiar environment may allow teachers to be relaxed and learn better than

receiving training in an unfamiliar environment in which teacher may require time to adjust to the environment before learning. As corroboration, Guskey (2002) stated that on-site training within the school provided a different impact on teaching pedagogies from off-site training.

Lindiwe admitted that some of the training took place on their school premises while other times teachers were required to go out and attend ICT integration training in other schools that have ICT facilities for training. Teachers further disclosed that, while the internal training conducted within the schools are attended by teachers teaching in the school, training conducted outside the schools are usually attended by teachers from different schools in the school district. This implies that external trainings are hosted in venues that have adequate facilities and infrastructural capacity to accommodate a large number of teachers at a time.

Having established the existence of training in paperless schools, I wanted to know the frequency or regularity of training across the schools. So when asked to describe the regularity of training in schools, some participants in schools A, D and E expressed how they viewed the training in their schools as follows:

> Most of them take place here at school, others; we go out to other schools that have ICT facilities as well. **(Lindiwe/FFI/Sch.A/Township)**
>
> In the school we had trainings every Mondays at half past two in a particular classroom. There was someone who came to teach us how to use the smartboard here at school. **(Lungile/ FFI/Sch.D/Township)**
>
> Initially when the programme started, we had training during the June holidays; it lasted for a week and then the ones that we attended here in the school last year was once a month, on Saturdays. We also went for a whole weekend workshop last year outside our school. **(Kabelo/FFI/Sch.E/Township)**

Lungile's response suggests that teachers received training every Monday after normal school hours from 2:00 p.m. on the school premises. Although Lungile's response did not indicate the duration and times of the training, I was privileged to witness some of the training sessions at the school. The training usually took place from 2:30 p.m. to 4:00 p.m. The reason for the allotted time is possibly to avoid interference with the

normal school programme that runs from 8:00 a.m. to 2:00 p.m. Teachers considered attending training after school hours as synonymous to extra hours of work in disguise and this may not have resulted in effective teacher learning outcomes. In view of this, it does not seem appropriate to train teachers when they are already exhausted from the day's work. It is more suitable to train teachers during the off-school days, that is, during the days when schools are on holidays and free from academic activities, such as weekends and holidays. However, in order to encourage teachers to attend the training, teachers should be provided with some form of incentive.

Kabelo's response also signified that teachers dislike attending training during school holidays because they believe attending these training interferes with their private activities and affect the conduct of their social obligations (funerals, weddings, visits, travels etc.) during the vacation periods. Even though the participants did not overtly mention some of their grievances against these training sessions during the interviews, during informal interactions some of the teachers expressed their grievances against timings for the training. Some teachers even believed that keeping them in school for training after normal school hours without extra remuneration is an infringement on their rights.

From the research findings, which are based on the explicit views of participants, it is certain that external training were conducted prior to the implementation of the pilot paperless project in the affected schools. And there were more of internal training thereafter. It therefore implies that there were on-site training and off-site training. On-site training refers to ICT integration training conducted within the school premises of the participants, while off-site training are training that teachers attend outside of their school premises. Schools and centres that are perceived to have good ICT facilities are often preferred as suitable venues to host teachers from other schools with less or no facilities to train. Also, schools that have internal ICT committees with ICT teacher champions can organise on-site (internal) training for teachers in their respective schools while schools with no committees continue to depend on the DoE to enrol them for training.

It was interesting to note that during the interviews some participants presented opposite views about the frequency of training in their schools. The different views about training frequency in schools came from two participants in different school contexts. These participants, who are in school B and C, believed that training did not happen regularly in their schools. They disclosed that training are usually conducted only when there is a need or when new ICT devices or equipment are introduced in the school and the teachers have to learn how to use it. Here are the responses:

> I am currently doing online training, workshops and seminars not as it … But currently I am doing online training on ICT and how to integrate in teaching … Yes, it is personal, the school hasn't sent me. And we had two Microsoft workshops here at school where all teachers attended, but from that, and they are just signing us up. **(Muzi/ FFI/Sch.D/Township)**

> Now, it's not that regularly. I will say probably once every two years, and then I normally train when we got something new happening in the class and I just do a short training on that. Like if we have a new smartboard or a new type of interactive board, I normally do training on that. And we had some training when we received the 3D-three dimensional software; we also did a brief training on that. Normally as is needed I do bit of training. **(Bongani/FFI/Sch.B/Urban)**

> Normally if there is something new, maybe new software that is being added on the smartboard, the department (GDE) will actually call a training and we also have people from Vastratech which are here normally if they've got something extra. They actually conduct those trainings. **(Shaka/FFI/Sch.C/Township)**

Muzi believes in self-development; hence, he usually enrols in and attends online training, workshops and seminars on how to integrate ICT in teaching because he understands the importance of regular and advanced training for effective ICT integration in school. He said that there were two Microsoft workshops hosted in the school where all teachers attended, but after the two workshops teachers were not signed up for training again. Perhaps Muzi regarded the school training as grossly inadequate to equip him with essential knowledge and skills that can prepare him for effective ICT integration, hence, attending additional training options. Muzi's attitude is uncommon among teachers in paperless schools because most of the teachers rely on

GDE organised training and internal training organised by school ICT committees, where available. This suggests that Muzi considers acquisition of ICT knowledge and skills as necessary requirements for personal professional growth. To Muzi having ICT integration skills goes beyond classroom requirements and is his overall personal development because he understands that ICT skills are now a requirement for participation in global competitiveness.

Bongani spoke from the perspective of a teacher teaching in a former Model C school (a well-resourced, affluent school) that has been using new technologies in the classroom long before the introduction of the paperless school project in the province, as evident in the profile of the school. In Bogani's school, teachers are already very conversant with the use of ICT in teaching because it has been adopted in the school long ago and it is in the school's policy to use ICT in the classroom. This differs from some of the other schools that have only adopted ICT in recent years. Perhaps it is in view of this that teachers in the school do not require basic training offered to teachers in schools where ICT has only recently been introduced into classrooms. Although her response did not enumerate all the possible reasons why training is not conducted regularly in her schools, I have the privilege of knowing that teachers in school B are expected to be relatively competent in computer operation before they are considered qualified to teach in the school. There is also a provision in the school policy that all teachers at the school must undergo an induction course before they commence teaching in the classroom. During the induction course, teachers are trained on ICT integration skills since all classrooms in the school are fitted with ICT tools such as computers, smartboards, smart TVs, projectors and interactive boards for teaching and learning. In this school teachers are very conversant with regular use of ICT tools in the classroom and do not require regular training, except when a need arises, like introducing a new device, software, equipment or facility in the school.

Shaka shared the same sentiments as Bongani with respect to regularity of training in his school. Like Bongani, Shaka opined that training are organised and attended only for a specific reason, like introducing something new to the teachers in their school. Although school C, where Shaka coordinates ICT activities, is not as rich in ICT resources as school B, training also depends on the introduction of new device,

software, equipment or facility in the school or as determined by the DoE. However, school B does not depend on the GDE to organise training for its teachers as in the case of school C. It is interesting that irrespective of the schools' background, they share a common characteristic that is different from the other three participating schools. It is also worth noting that both Bongani and Shaka are ICT coordinators in their respective schools; thus, their responses depict a true reflection of the situation in their respective schools. As ICT coordinators, each of them is responsible for organising and coordinating internal training in their schools.

This underlines the disparities regarding training opportunities that exist in schools. Some teachers are trained in both basic and advanced ICT skills of ICT. This is true of teachers in school B where all teachers are adequately inducted, trained and updated with current ICT knowledge and skills. However, the majority of teachers in schools A, C, D and E depend on basic training where teachers are exposed to elementary skills required to operate computers and the smartboard only. This suggests that teachers in paperless schools do not have similar opportunities for ICT knowledge and skills' acquisition for pedagogical integration during in-service training. Scholars considered training as key to ICT integration in schools, as evident in Trucano (2005) where it is alleged that, "Teacher training and on-going, relevant professional development are essential if benefits from investments in ICT are to be maximised" (p. 35). Unfortunately, not all teachers have equal opportunities to be trained for ICT integration, even across paperless schools in South Africa.

In the same vein, schools have different cultures and support systems for teachers to integrate technology into teaching. Coupled with the range of ICT resources in the schools, teachers are very likely to receive different levels and quality of training for ICT integration. This thought was echoed by Mandla during our individual face-to-face interview, when he suggested that training should be provided based on individual teacher's needs. He also suggested that teachers should be grouped and trained based on the level of training that they require. This is because different groups of teachers have different training needs; therefore, grouping them will help the trainers to teach each group the suitable content. However, this is not without some disadvantages to both teachers and learners in schools. For instance, learners in classrooms where less

competent teachers teach may be lagging behind in learning with ICT tools as compared to learners in classrooms where the teachers are competent and use ICT confidently.

All the participants concur that there are training sessions for teachers on ICT integration in teaching, yet these trainings are regular in some schools and irregular in other schools. It is also evident in the data that few teachers engaged in personal ICT training to improve their ICT knowledge and skills. In some instances, schools have an ICT committee that organises internal training for teachers. The trainings were done in phases, and some teachers had basic and advanced training while some remained with basic training. This implies that teachers do not have equal exposure to the knowledge and skills for ICT integration.

5.4.2 Sub-Theme 3. 2: Need for Regular and In-Depth Training

In this sub-theme I present and interpret what the participants said about the type of knowledge and skills they received during ICT training sessions. Participants described the nature of the training and type of activities involved in the training. Findings reveal that the majority of the participants felt that most training activities focused on basic computer skills, like switching the computer on and off, typing text, editing text, copy and paste, and use of smartboards. This implies that most of the trainings were dedicated to teaching the basic processes of using computers and smartboards for teaching of subject content. Although basic computer training is imperative to meet the needs of some teachers, especially those with no computer knowledge and skills, dwelling on basic training with all teachers can demotivate some of the teachers with appreciable knowledge and skill of ICT.

The sub-theme also present and interpret the views that participants held about the need to provide additional and quality training in view of the shallow training currently being offered to teachers. Interestingly, various responses arose from both individual face-to-face and focus group interviews when participants shared their views about the phenomenon. Firstly, I present views of the participants obtained during individual face-to-face interviews about the nature of content of the ICT integration training:

> They taught us how to use the smartboard, how to switch it on, how to write on it, from unknown to known. And the different functions that it has. The second phase of training was how do we then integrate our lesson to the smartboard and how to create the lesson with smartboard. That's where we are now, yah, communication and preparation of lesson. **(Kabelo/FFI/Sch.E/Township)**
>
> We were taught the basic use of computers: How to open it with the switch and open buttons; how to use the word document; and how to write on the smartboard; and how to use the activities or tools on the smartboard. **(Lungile/FFI/Sch.D/Township)**
>
> We were trained on how to use the computer. How to use it to teach, a lot of things. How to use the smartboard, yes! What is it you can get from the smartboard, but it was a harsh, harsh thing, yes. **(Pilwane/FFI/Sch.E/Township)**
>
> We (teachers) do need constant training … as long as technology keeps changing. It will be better if we keep on going and attending these trainings, which will benefit everybody **(Shaka/FGI/SCH.C/Township)**

All the participants acknowledged being exposed to the elementary computer knowledge and skills that are required but are not sufficient to undertake advanced teaching tasks like selection and combination of ICT tools for demonstration, illustration and construction of lessons. Perhaps the present scenario in some schools where teachers are still struggling to integrate ICT into their teaching despite availability of computers, smartboards and tablets is connected to their low ICT knowledge and skills.

In his response, Kabelo provided a vivid illustration of the nature of training that are offered to teachers in their school, which varied from basic operations of computer and smartboards during the first phase of training to the processes of preparing and integrating ICT into the smartboard in the second phase of training. Although these initial training activities appear simple and elementary, they are significant and relevant in a pilot school context, especially to teachers without previous computer knowledge and skills. However, training teachers to simply operate computers and smartboards cannot sufficiently lead to the desired pedagogical integration of ICT in in the classroom. To transform classroom pedagogy through ICT integration, teachers require regular updated and advanced training. This is succinctly contained in the recommendations of this study in Chapter 7.

Lungile's response was similar to Kabelo's and she stated that most of the ICT integration training she attended covered the basic operation of computers and smartboards. In fact, Lungile described the rudimentary process of using computers and smartboards in the classroom right from starting the gadgets to the point of utilising them for teaching and learning. This is important too, given that most of the teachers in paperless schools, especially those in the township schools, might be using these new ICT tools for the very first time. Basic training is therefore as important as advance training because each is geared at meeting the needs of a certain group of teachers. Moreover, all learning moves from simple to complex and from known to unknown.

Like the previous responses, Pilwane also described the training as acquiring basic knowledge and skills of computers and smartboards. However, Pilwane went further to critique the nature of the training, and she alleged that the training sessions were hurriedly conducted. In her own words Pilwane described the nature of the training as "harsh, harsh thing". This means that despite the individual differences that exist among the trainee teachers, the training facilitators did not give any consideration to the specific needs of teachers based on their individual differences. It is important to know that in-service teachers come to the training with different levels of ICT competences and require different support during training sessions (UNESCO, 2008).

Shaka suggested that training must be continuous if teachers are expected to effectively integrate ICT in the classroom. He advocated for the provision of regular ICT integration training so as to enable teachers to remain conversant with the latest and relevant technologies that keep changing frequently. According to him, the fluidal characteristics of technology require a regular update of knowledge and skills needed to operate ICT tools. Shaka believes that continued provision of training may not only benefit teachers but everybody that has a stake in school ICT integration. The more teachers are trained, the more competent they become in the use of ICT in teaching and the better their classroom instruction will be. This means that teachers' ICT competence has the potential to impact on the school, teachers, learners, and society at large.

Although the reasons why some facilitators compromised the quality of training are not clear in this study, I understand from informal discussions with teachers and some

deputy principals that the trainers were hired to give training. As hired ICT instructors they were probably not professionally trained in teaching pedagogy and were likely limited in the discharge of their responsibilities. It may also be assumed that the trainers wanted to cover a lot of content in a short period of time, i.e. to accomplish much in less time. Although this claim cannot be substantiated with evidence, the description of how they conducted the training shows that they were in a hurry to complete the tasks assigned to them in a given time. Giving that the ICT integration training are designed to change teachers' pedagogical approaches in the classroom, the impact of hurried training on skill acquisition may have serious consequences. Some of the consequences are prevalence of rote learning, poor understanding, lack of peer mediation, and lack of meaningful engagement with the content. The implications are quite serious since learners will be poorly thought, will poorly understand the content, and likely remain ill-prepared for work in the future. We must recall that the essence of training teachers on pedagogical use of ICT is to provide the opportunity to acquire new knowledge and skills to accomplish effective teaching in the classroom.

Unsurprisingly, all these responses came from participants in township schools where the majority of teachers did not have regular access to ICT facilities prior to the introduction of the ICT integration project. This lack of regular access to ICT facilities prior to the paperless schools project affected the ICT competence level of teachers who are teaching in these schools. These teachers require basic training to operate new ICT tools introduced in their classrooms. From my experiences of facilitating ICT integration training in schools other than the paperless schools, I understand that in some teachers tend to shy away from the use of ICT in the classroom because of lack of competence and confidence and to avoid being shamed in the presence of learners. To prevent this kind of scenario, teachers really need advanced training in ICT so as to develop sufficient confidence to use them in the classroom. I believe that for our schools to derive the maximum benefits of using ICT in in the classroom, teachers must be knowledgeable and skilful in ICT to creatively design lessons for classroom use. This is an important quality required of teachers in the 21st century technology-driven world when teaching and learning is radically changing to meet the demands of a knowledge society (Jan, 2017).

Participants also believed that the depth of the content in ongoing training was not sufficient to help them with pedagogical integration of ICT. Examples of these views are presented and interpreted below:

> I feel they are not going forward. We always receive training about the same thing, always the basics; we are always taught the basics actually. We have never been taught more than the basics. The level of training remains the same. There is no progression. **(Muzi/FGI/Sch.D/Township)**

> Teachers need more training and in-depth training. It's better to train a few educators (teachers) and allow the few to train other educators on a day-to-day basis in their respective schools. **(Kabelo/FGI/Sch.E/Township)**

> I think we still need more training, I think in the area of classroom management, yah! That is the aspect I think we need training. There is the need to increase trainings monthly. **(Rose/FGI/Sch.D/Township)**

Considering the lack of depth in the training, participants advocated for in-depth training that can meet the current professional needs of teachers in schools. Muzi thought the kind of training that teachers required is both regular but qualitative. As the ICT coordinator of the school, Muzi is aware of the importance of frequent practice in the use of ICT tools.

Kabelo also echoed same view when he reiterated that more regular and comprehensive training is needed if teachers must perform excellently in ICT integration. Kabelo did not just point out the need for regular and detailed training but also suggested a better way to achieve more regular training. He suggested a strategy where a few teachers will be trained in each school and who will then be required to teach other teachers in their respective schools on a more regular basis. This strategy may reduce the cost of training and logistics because it will ensure that internal training are conducted on a more regular basis in each school. This suggestion conforms to the provisions of the e-Education Policy White Paper of 2004, Section 5.9, which stated that:

> Specialist teachers with higher knowledge and skills of ICT should be appointed to provide on-going professional and technical support to teachers in each school.

> Nevertheless, the specialist teacher must also be assisted by group of teachers who can provide support to other teachers respectively in their domains.

In view of this policy provision, Kabelo's suggestion can be sustained as a strategy to ensure regular training at schools. Rose believed teachers need to be trained in classroom management strategies.

Further revelations from the participants' responses in both focus group interview and individual face-to-face interviews showed that some of the problems encountered during ICT integration training are due to wrong actions or inactions of trainers. Many teachers complained about the low competence level of the trainers. Here are some participants' feelings about how they perceived the competence of the trainers that facilitated the training:

> The issue is that they (GDE) will be taking people who are incompetent to train people who are competent. At times they don't even check the level to say in a particular school the teachers that are coming here are actually at this level in terms of using ICTs. So sometimes it's like waste of time and resources. Because you will attend the training at the end there is nothing you are gaining from there. **(Shaka/FGI/Sch.C/Township)**

> Are the trainers themselves trained enough to train us, because sometimes people take chances. They come to train us, but they don't know what they are training us. So you find out that this is a trainer, but they don't know how to use the gadget itself. So we are just sitting here wasting our time, signing registers and going home, and we haven't learned anything. **(Ayanda/FGI/Sch.A/Township)**

> The people who train us, we feel that they are not really competent to use of ICTs, and you find out that some are just there. **(Mandla /FGI/Sch.C/Township)**

> An analysis of who knows what, who doesn't know what from the facilitators of the trainings is necessary; not to work on the assumptions that all of them are competent to train us. **(Kabelo/FFI/Sch.E/Township)**

The responses reveal the views of the majority of teachers in most of the paperless schools. Since ICT integration training involves both knowledge and skill competence, it is expected that every trainer can demonstrate such competence before the trainees. Some of the teachers were disappointed when they saw that the trainers cannot display some level of competence in operating some ICT devices during training. This makes

teachers with some level of knowledge about ICT get discouraged with the training, as indicated in Ayanda's response. When teachers are not satisfied with the training content, it is likely that such teachers will disregard invitations to attend future training. This could be one of the issues that make teachers develop negative attitudes toward training in their schools, as mentioned earlier in our discussion. Both Ayanda and Shaka described attending training facilitated by incompetent trainers as a total waste of time. Ayanda further registered her frustration in the last part of her response stating that, "So we are just sitting here wasting our time, signing registers and going home but we haven't learned anything". Teachers were expected to attend full sessions of trainings and register their presence through an attendance register that were usually provided by the sponsors of the training and the training facilitators. However, if not facilitated well, teachers go home without having gained anything from the training.

Mandla also said that teachers are not really satisfied with the performance of some trainers facilitating training in schools. I think the participants felt like this because they felt that the trainers were not meeting the training needs of teachers across participating schools. It is expected of all trainers/facilitators to practically illustrate and or demonstrate how to integrate ICT into classroom teaching during training sessions. Mandla concluded by saying that, "And you find out that some are just there". This can be interpreted to mean that although the trainers are physically present, they are not actually delivering the training content as expected, and so they are just there doing nothing profitable with the trainees.

In view of the attitudes of some trainers during training, Kabelo suggested the need to test and ascertain the competence level of trainers before assigning them to facilitate ICT integration training. He warned that to engage trainers based on assumption of their capabilities could be counterproductive in the long run. The implication of Kabelo's submission is that when recruiting training facilitators to train teachers on ICT integration, it is important to ensure that they have the requisite pedagogical and technological knowledge to train teachers, otherwise the set objectives of the training will not be attained.

Over the years, I have carefully observed how provincial departments of education in South Africa engage people with computer science knowledge or skills to train teachers on integration of ICT into classroom teaching. Perhaps this is based on the wrong premise that ICT integration in the classroom is all about the use of computers to teach. Although the concepts of 'ICT use' and 'ICT integration' are used interchangeably in the literature, it is imperative to be aware of the epistemological and pedagogical difference between ICT use and ICT integration into classroom teaching, as discussed in Chapter 2. For this reason, I think it is pertinent to always engage the right manpower to train teachers to integrate ICT into classroom teaching, preferably professionally trained teachers who have the epistemological and pedagogical competence to train. This is fundamental if teachers in high schools must get the appropriate competencies to effectively integrate and adopt ICT our schools. The right manpower is available in colleges and faculties of education across universities and in high schools where teachers are already grounded in the integration of ICT in teaching.

Closely related to the need for additional and improved training for teachers is the need to also train learners to adopt and use ICT appropriately for learning and search purposes. This was suggested by some participants in view of the misuse of tablets by learners in school.

5.4.3 Sub-theme 3.3: Need to Train Learners to Use ICT for Learning

While the study focuses on teachers' beliefs and experiences around ICT integration in schools, some participants believed that learners are also stakeholders in the implementation of the ICT integration in paperless schools. Hence, they did not only see the need to train teachers on the proper use of ICT but also the need to train learners on the correct use of their tablets for educational purpose. Since learners and teachers interact together in the classroom, learners also require some ICT training to appropriately use their tablets and other devices learning purposes. Some of the views captured from participants during focus group interviews are presented here:

> I think there is need to train learners too because what I realise with our learners is that they don't know how to use the tablets to look for the information on the Internet

concerning what they are learning. The only thing they know is to download games and other things. **(Rose/FGI/Sch.D/Township)**

I also think there should be training for them, that's for the same reason, i.e. they (learners) should know how to use the tablet because now they don't know how to structure the usage of their tablets to their educational advantage. **(Lungile/FGI/Sch.D/Township)**

I think they can organise classes for learners to show them what the best uses of tablets are. At the moment even the learners are not given proper direction about the tablets, hence it is being abused by learner. **(Sandile/FGI/Sch.A/Township)**

I view it as a whole system, if one part of it is not effective then the whole system will be affected. That's why teachers need to get trained, so too learners, they also need training because there is no use training the teachers only, but so do the learners. They also need training to use these ICTs and if they do not train how to use it effectively for schooling then there will be a breakdown in the whole process. **(Muzi/FGI/Sch.D/Township)**

I think whichever level they (learners) are at that time of introducing ICT in school, just workshop them in terms of how they can use the tablets, in terms of education purpose, so that they might not find reasons to misuse them. **(Lindiwe/FGI/Sch.A/Township)**

Rose was very convinced that learners need to be trained in the use of ICT like their teachers, which is probably informed by her realisation that most of the learners in their school do not know how to search for information on the Internet with their tablet device. In view of the fact that learners were provided with tablets give them unlimited opportunities to access information from global sources through the Internet, it is proper to provide learners with sufficient guidance and support to achieve this purpose to avoid misuse of their tablets. Rose noted that the learners only knew how to download games and other things that are not quite beneficial to academic learning, because they lack guidance on how to search for academic information on the Internet.

Lungile also held a similar view as Rose about the need to offer training to learners in paperless schools because of their inability to use their tablets in the appropriate manner expected of them. Lungile also noted that learners did not know how to structure the usage of their tablets to their educational advantage. This implies that

learners were unable to organise the usage of their tablets in a rational manner for effective learning. This may not be a surprise, given that most of the learners in the participating schools, particularly those in township communities, have never had the opportunity to possess or even operate a tablet or similar devices before now. This may be a justification for training learners on the usage of ICT for educational purposes because the academic use of ICT is quite different from other uses of ICT. While academic use of ICT for learning involves communication, collaboration, sharing and researching, other uses of ICT is mostly limited to communication and storage of information.

Sandile too believed that learners are abusing the tablets and devices at their disposal because they are not properly guided on how to use them for learning purposes. In view of that, Sandile recommended that special classes should be organised to teach learners how to use their devices for educational purposes.

These participants claimed that the learners had poor attitudes about utilising their tablets and that this may limit them from harvesting the educational benefits of the tool. For this reason, Rose and Lungile suggested separate training for learners to prepare them to effectively use of their tablets for learning.

While Rose and Lungile advocated for separate training of learners on the proper use of ICT in schools, Muzi held a different view. Muzi considered ICT integration in the classroom as a systemic process that involves various actors; therefore, all-inclusive support should be provided to all the major actors in the classroom at the same time. In short, he suggested that the right approach to training for ICT integration in the classroom should comprehensive and involves teachers and learners.

Lindiwe acknowledged that learners in the schools are at different levels (grades) with different backgrounds and ICT exposure, so whenever ICT are introduced in schools, all learners need to be properly guided on how to use it for learning. In order to provide such guidance to learners, Lindiwe proposed organising workshops in school for learners to teach them how to use their tablets for education purposes. She believed the workshops will make learners understand why they must not misuse their tablets but rather utilise them for the right educational purposes. So, she maintained that learners

do not need intensive training like teachers but rather be workshopped in their classrooms to show them proper ways of using their tablet computers. This suggested process can best be described as induction training or a kind of orientation that will usher learners to the use of ICT in the school. It is important to note that even the participants who did not subscribe to the idea of giving learners equivalent training to teachers, supported the use of orientation workshops to teach learners the educational use of ICT.

In conclusion, the theme described participant's convergent and divergent views about training that emerged from both the individual face-to-face and focus group interviews. All the participants concurred that there are training for teachers on the use of ICT for teaching and learning. The trainings are both internal, within the school premises, and external, away from the school premises. Although training is regular in some schools, it is quite irregular in other schools. Some schools have ICT committees that organise internal training for teachers, but other schools do not have such committees and depend on GDE enrolment to train. The training happened in phases, and some teachers had basic and advanced training while others only received basic training. This implies that the teachers do not have equal exposure to knowledge and skills for ICT integration. Considering the challenges faced by some novice learners in the use of tablets for learning, some participants believed learners need to be trained on the appropriate use of ICT devices so as to get acquainted with the tool and use it to support their learning. However, another set of participants believed in providing just basic orientation to learners on the use of devices and are therefore opposed to any form of intensive training for learners. Of importance in the research findings is that however participants perceived training needs in the school, it is clear from the foregoing excerpts that both teachers and learners in paperless schools require more organised training optimally perform teaching and learning. Similar findings in Canada recommended that both "students and educators need to be taught how and when to use technology as a tool appropriately and safely in the classroom" (Mona et al., 2008, p.29).

5.5 Theme 4: Challenges of ICT Integration in Classrooms

A range of issues emerged as challenges to ICT integration in the classroom including lack of baseline research to determine the feasibility of ICT introduction into schools and problems associated with learners in their contexts. Other issues raised as challenges were mishandling of tablets by learners, theft, electricity, and poor Wi-Fi and Internet.

Before discussing the specific challenges that seem to impede effective ICT integration in paperless schools in South Africa as identified by the research participants, it is important to note that contrary to the views of many participants about the affordances of ICT in teaching and learning some participants cautioned teachers about total reliance on ICT for classroom activities. During focus group interviews, Lindiwe and Sonto, from two different schools had this to say:

> I am limited in this tablet... like I can't broaden my imagination … we haven't quite seen the better idea, the bigger picture, and the beautiful picture. Yes, we all know there is a beautiful picture of technologies … but we are not seeing it, so it's difficult for me to tell of the advantages of these tools … Yes! It's like romanticising ICT. **(Lindiwe/FGI/Sch.A/Township)**

> Sorry, I have a different opinion, I teach mathematics … So for me it becomes more of a distraction than anything else because there are certain things in the learner's tablets ... other things that have absolutely nothing to do with mathematics. They (learners) rather do other things, and then because they are supposed to have tablets in class it is now [sic] very hard to monitor who is actually looking at a textbook and who is looking at something else. So in my class for mathematics is not as interactive. **(Sonto/FGI/Sch.A/Township)**

Based on their experiences in the classroom, both participants noticed the effect of ICT on teaching and learning with different lenses. For example, Lindiwe viewed the use of ICT in teaching as a limitation to critical thinking and creativity in the classroom. She perceived ICT as a tool that limits the teachers' thinking and creative ability because teachers often tend to rely on ICT tools to facilitate activities that dictate the pace and the type of activities to engage with in the classroom.

Lindiwe's apprehension about the role of technologies in society is on the overreliance on technologies in performing human duties that require rationality and social interaction like teaching and learning. This draws our attention to the importance of a human teacher in facilitating learning in the classroom. Complete dependence or overreliance on ICT in schools may rob learners of their social interaction experiences that are very important to human growth and development. Lindiwe also viewed such a scenario as capable of undermining the rationality of the human teacher in teaching a lesson because after all teachers are rational beings that need to think before they act. Lindiwe seemed to critique and interrogate the popular notion that portrays ICT as a tool that has the potential to improve students' learning; hence, she described the popular notion or claim as "the big picture or the beautiful picture", which she believes is contentious. This argument suggests that the merits of ICT as popularly described in the literature are merely the abstract appreciation of ICT, which Lindiwe depicted as "romanticising ICT". It also suggests that the much alleged benefits of ICT to teaching and learning is not yet proven through empirical evidence, because there is still limited literature indicating how ICT actually enhances teaching and learning in classroom (Van der Ark, 2012; Higgins, 2003). According to Trucano (2005), "It is generally believed that ICT can empower teachers and learners, promote change and foster the development of 21st-century skills, but data to support these beliefs are still limited" (p. 5). Hence, Lindiwe seemed to suggest that most of the claims put forward about the affordances of ICT are mere assumptions hypothesised and presented by scholars. From my informal observation, I can deduce that her point of view on ICT integration in teaching may be connected to the non-availability ICT tools in her classroom and the non-inclusion of language content on learners' tablets and the interactive smartboards supplied to the school.

In the same vein, Sonto argued that although much is said about the potential benefits of ICT in teaching and learning, in view of her experiences with the use of ICT in the classroom, it is still not clear to her how ICT is practically contributing to students' learning outcomes in mathematics, given that learners in her classroom lack mathematics content in their tablets and are too distracted to even learn other subjects with it. For Sonto the availability and use of tablets by learners is a distraction from

learning. This argument is congruent with the caution earlier posited by Bongani during individual face-to-face interviews that though ICT are important teaching and learning tools, it can be a distraction to learners. Sonto's critique is quite imperative considering the ongoing debates among scholars (Majumdar, 2015; Sangrà & González-Sanmamed, 2010; Van der Ark, 2012) concerning various claims about the importance of ICT in adding value to teaching and learning, especially in increasing student performance and learning outcomes. Even though there are claims in the literature (Noor-Ul-Amin, 2013; Mdlongwa, 2012) about the potential benefits of ICT in teaching and learning, there seems to be no sufficient empirical evidence to substantiate such claims. Most research reports in the literature only present evidence of conceptual or abstract appreciation of ICT in teaching and learning fields. It is against this background that this study remains relevant and timely to ascertain teachers' beliefs and experiences around ICT integration in schools with ICT resources.

In Section 2.4, I highlighted and discussed some challenges associated with ICT integration in schools, which some scholars (Fu, 2013; Hennessy, Harrison, & Wamakote, 2010; Hew & Brush, 2007; Ertmer, 1999) consider as barriers to ICT integration in schools. These challenges include resources, knowledge and skills, institution, attitudes and beliefs, assessment, and subject culture; others are lack of political will by the government, lack of time, lack of incentives and support, problems of language of instruction in schools, and lack of electricity and Internet access. Similarly and unsurprisingly participants also identified challenges to ICT integration in their specific school contexts, given that the ICT integration project was still new in the schools. Although some of the challenges discussed in the literature review also emerged in the findings, I deliberately chose to present and discuss the most unique challenges prevalent in the context of the study. The reason is to understand the peculiarity of the context of the study in relation to the challenges identified. It is also to emphasise the role of context as an important determinant of success or failure in the ICT integration process.

5.5.1 Sub-theme 4.1: Lack of Baseline Research

Beside the specific challenges related to pedagogical ICT integration in classroom teaching, participants also raised concerns about the lack of baseline research to ascertain the feasibility of the project because, as critical stakeholders and implementers of change in education, they believed teachers' opinions can shape the introduction of ICT. Dlamini and Na'Allah (2015) had pointed out the implications of embarking on radical changes such as the introduction of technologies in schools without a clear understanding of the context in South Africa and elsewhere. Some of the implications are the emergence of contextual challenges like socio-cultural constraints, socio-cultural economic constraints, teachers' beliefs and assumptions, teachers' behavioural intentions, and teachers' efficacy, which could have been avoided. Another implication is incoherence in the classroom implementation of ICT integration because of lack of uniform vision among the different stakeholders.

While the introduction of ICT in schools by the provincial government was viewed as a good initiative, participants expressed concerns about government's inability to conduct a baseline research to understand the school contexts, the stakeholders, like teachers, parents, and community leaders, and the nature of resources available in schools, before the introduction and implementation of ICT in schools. For example, the response mentioned communication and consultation with experts and teachers in schools in this order. The response is illustrative:

> The way the ICT integration project is being implemented is not in a good way. If the Department of Education can actually engage with the people in that relevant field and also have their opinion to say how this can be done... I think they can do better. If they can also come to the schools and hear the views of the teachers before they can actually start, because somebody up there will favour some idea, and the teachers on the ground are expected to implement … Things are not supposed to be that way. If there can be proper communication and consultations before they can actually implement. **(Shaka/FFI/Sch.C/Township)**

> I think initial research is needed and especially about the context where it is done, because now most of the tablets are being lost. So what was the plan for security?

> There should be more research on the security of the tablet, more research on parent's perspective to know their opinion about the initiative. **(Ayanda/FFI/Sch.A/Township)**
>
> I think they needed to do more research before they implemented it … it's a bit too early to implement ICT when other issues are not yet being dealt with in our public schools. If you compare ICT in our public school to ex-model-C schools, it's quite different because they have lesser challenges. We have to deal with basic challenges before we have to deal with ICT itself, like kids coming from poor background. Why would you give me a tablet of R2500 for free when I don't have an exercise book? Why are you not giving me uniform? Why do I have to carry this tablet when am going to be robbed on the street for this tablet? When I come to school hungry, why can't you be giving me food? Why are you not giving me uniform, when you can't meet my basic needs? They don't understand. So there are other issues that needed to be considered before we implement in our public schools. I mean even the kids themselves don't appreciate the tablets. **(Lindiwe/FFI/Sch.A/Township)**

All the participants lamented the government's approach to introducing major changes in schools without seeking public opinions and particularly, lack of consultation and involvement of teachers and parents at the conception and planning stages of the project before introduction. Decentralisation of power in schools addresses the importance of consultation with relevant education stakeholders before introducing any major changes in a school system (Melaphi, 2016; Naidoo, 2005). Furthermore, Melaphi (2016) stressed that contributions of parents to growth and development of schools as social institutions in society cannot be overemphasised. Parents can help in the formulation of school policies, to initiate and execute physical development projects and to motivate teacher and learner performance in schools. Hence, parents are critical stakeholders in schools' development and academic performance. McGinn and Welsh (1999) and Davies, Harber, and Dzimadzi (2003) reported that "the decentralisation of decision-making power has become an internationally acclaimed educational reform", and the decentralisation of power as a strategy for school management makes the role of parents quite imperative. Galiani, Gertler, and Schargrodsy (2008) reported that the main argument in favour of decentralisation in education, particularly of decision-making, is that it brings decisions closer to the people, thereby alleviating information irregularities and improving accountability in schools.

Given the brief discussion above, Shaka believed that the way ICT was being introduced into schools was not appropriate because the GDE did not engage with the relevant people in various fields of education that relate to the school systems. The contributions and opinions of people other than the politicians or policy makers are also important when considering ICT integration in schools. Shaka appeared to have strong convictions that the introduction and implementation of the ICT integration project would have been better if the officials of the GDE had consulted with teachers in schools to seek their views on how to plan the implementation better prior to the commencement of the project at the school level.

Many scholars (Alnefaie, 2016; Mafora, 2013; Dube, 2016) claimed that it is a common practice in most education systems around the world for government to make education policies without due consultation with the teachers who eventually implement the policies. In a study that investigated teachers' role in the development of English as a Foreign Language curriculum in Saudi Arabia, Alnefaie (2016) found that "teachers are marginalised in decision-making in general and in curriculum development in particular"(p.7). The findings further suggested that "marginalisation takes different forms such as, lack of teachers' voice or comments being ignored by the Ministry, the centralisation of the decision-making and the absence of teachers' participation in this process" (Alnefaie, 2016, p. 7). Likewise in South Africa, Dube (2016) examined curriculum decision-making in the selection of new subjects in selected KwaZulu-Natal high schools and found that teachers are often excluded from major decision-making processes. Lilly (2012) affirmed that teachers have no voice in local education policy at all levels of the education systems. Such scenarios lead to challenges at the implementation stage in schools. Unfortunately, rather than taking part in formulating new policies and or innovations introduced in schools, teachers are often left with the option of reacting to changes and the challenges that follow the changes (Livingston, 2016).

Ayanda's response also agreed that the success of ICT integration in schools require prior research and consultation with teachers, including making sure that appropriate security is put in place to ensure the safety of the technology facilities and infrastructure in schools. It is evident from empirical data that the introduction of tablets and

smartboards resulted to high theft rate by learners and hooligans in some of the school communities. Teachers' responses are understandable when the increase in crime is seriously considered in schools, especially when ICT were introduced in schools. Several cases of theft and burglary were recorded in many schools across Gauteng province when tablets, laptop computers and smartboards were introduced in schools in 2015 (Eye Witness News, 2015). This scenario may be connected to the rate of youth unemployment prevalent in society, particularly in black township communities of South Africa (Lam, Leibbrandt, & Mlatsheni, 2008), that leads to vandalism of school properties and lack of progress. Ayanda suggested that if research was conducted prior to the implementation of ICT in schools, it could have provided an understanding of the security implications for placing expensive and attractive electronic gadgets in township community schools. Her response also reveals that seeking the opinion of parents as major stakeholders in school affairs would have provided a useful source of information in preventing some of the challenges currently being experienced in the affected schools. Thus, findings from the baseline research might have helped to minimise or even prevent the cases of theft and damages currently being experienced in schools.

Lindiwe also reiterated the need for conducting preliminary research before implementing new innovations in schools. Lindiwe believed the project ignores the critical needs of the learners; especially in the township schools where learners' basic needs like food, clothing, stationary and security are not fulfilled (Spamer, 2017). Thus, she considered it wasteful to offer learners expensive tablets for learning and considered the introduction of ICT in a public township schools a mistake. The government assumed that what worked in former Model C schools can work equally well in every public school in Gauteng, which appears to be misconception of reality in most public township schools in South Africa. Perhaps, it is this assumption that prevented the GDE from conducting baseline research to ascertain the feasibility of the schools and communities where these paperless schools are sited. They failed to realise that the socio-economic realities of South African urban areas are different from those in township areas (Mahajan, 2014), which reflects even in the school systems.

Lindiwe's response further clarified that the reality is that "ex-Model C schools", which are schools previously owned and managed by the affluent white people in South

Africa, have fewer challenges in terms of learners' economic background, learning resources, school context and culture (Roodt, 2011). In essence, the response seems to suggest that teaching and learning with expensive ICT devices cannot be successful where learners are hungry and lack–basic necessities. Lindiwe believed that the sustainability of the ICT integration project in schools will largely depend on the resolution of these challenges in schools. Considering the relationship between schools as institutions within a society and society itself, the response seems to unfold the reality of some schools in poor communities. Taylor, Van Der Berg, and Burger (2012) had affirmed that in the Southern and East African Consortium for Monitoring Education Quality surveys of 2007, SACMEQ III. Acknowledged that the average socio-economic status of the school that learners attend and the socio-economic status of learners is an important factor associated with achievement. Taylor et al. (2012) asserted that:

> The effect of socio-economic status of learners on achievement may be a two-step process. The first step is the crucial one: socio-economic status which has an allocative effect in determining which part of the school system learners enter; then once enrolled in a school with a given combined socio-economic status (and largely corresponding level of functionality), the impact of a learner's own home background is less pronounced. (p. 6)

In contrast, Lindiwe's response indicated that learner's own home background is considerably pronounced in their attitude to learning and to the new tools that may ultimately lead to their academic achievement as posited by Taylor et al. (2012).

Finally, all the responses seem to suggest that the approach used to introduce and implement ICT in schools appears to be improper because of lack of communication and consultation with relevant people in the school systems. Baseline research is supposed to be an important first step to successful implementation of a new policy in schools. Considering the huge sum of money (R17 billion) allocated for the implementation of the paperless school project and the urgency for its implementation, it raises some important questions concerning why relevant stakeholders were neither consulted nor communicated to about the idea of introducing ICT in schools. It is inconceivable that even some staff in the GDE were not fully aware of the distinct characteristics of the communities where some paperless schools are located. This

confirms the claim made by some participants that there was no baseline research to ascertain security of schools before the ICT integration project was implemented

5.5.2 Sub-Theme 4.2: Contextual Challenges to ICT Integration in Schools

This sub-theme continues to address the challenges by addressing 'real' issues that can hinder effective integration of ICT in the classrooms, especially when issues of infrastructure, electricity and maintaining Internet access and connectivity are seriously considered in township schools. It is unquestionable that in some township schools the infrastructure leaves much to be desired, and considering that ICT need specific infrastructure, the participants' responses are understandable. In South African townships there is still a dearth of infrastructure to meet schools' needs for ICT integration, as some still lack reliable electricity supply and Internet connectivity.

Some participants regard the lack of reliable electricity supply to school as a critical challenge that affects ICT integration. During individual face-to-face interviews with participants, Ayanda mentioned the issue of load shedding as a challenge to the integration of ICT devices in the classroom. Ayanda, Shaka and Lindiwe explained that:

> If you depend on electricity too much, at times you don't have electricity, then you have to have plan B, okay! … If you don't have plan B then you waste the whole time and you cannot recover, so you cannot depend on it (electricity) so much. Much as it is beneficial but also you need to have other plans because we have things like load shedding. Yah!! You know South Africa is full of crime. Like now we have not been having electricity (in this school) since last week. **(Ayanda/FFI/Sch.A/Township)**

> One thing that I think will be a major problem for now is the issue of load shedding because we don't have backup, so if the power goes off … for example, this morning I don't know what happened, it just went off. So if you are only prepared to use the power point slides, or you are relying on the smartboard…as they actually removed the chalkboard from the classes and they didn't actually put some whiteboards in the classes so that you can always write. These are the challenges and also the strength of connectivity because in some cases if you want learners to interact with the board it actually require the connectivity, and also in most cases I can say I am relying on the Internet mostly because the type of learners we are having recently … are not like the

> learners we had previously in terms of picking skills is something that is not there. **(Shaka/FFI/Sch.C/Township)**
>
> The theft issue … you know every day you have a learner reporting, "My tablet has been stolen", some parts of the smartboard also get stolen. You get to the class the board is not working. Sometimes Wi-Fi is not working; you know, uhm such things are challenges. **(Lindiwe/FFI/Sch.A/Township)**

These responses present the views of teachers in schools that are located in township areas where there seems to be no steady supply of electricity. The responses identified the problem of load shedding as a significant limitation to ICT integration in schools, coupled with a lack of generators as backup in the school when there is no electricity. Ayanda gave an example of how their school was without electricity supply for a long period, a scenario that is not unfamiliar in most South African townships. Wright (2014) noted electric power as the topmost priority among five key barriers to educational technology adoption in Africa and strongly believed that, "Until power is widely available, reliable and affordable … Educational technology uptake will continue to be slow" (p. 1). In order to reduce or escape the adverse consequences of load shedding on teaching and learning with ICT in the classroom, Ayanda suggested that teachers must always make an alternative plan for every lesson that may require the use of electronic devices in the classroom. Although she did not specify or describe any form of alternative plan, some teachers have learned to shift from online mode to non-digital boards (e.g. whiteboards), if available in the classrooms, whenever the electricity goes off during lessons. Moreover some schools have installed either solar panels or generating plants as an alternative source of power to compliment regular electricity in the school (see Table 8).

Another significant challenge that is closely related to power load shedding observed by many teachers and reported by some participants at the individual face-to-face interviews is the issue of Wi-Fi and Internet connectivity. For example, Lindiwe confessed how frustrating it could be when a teacher prepares to teach with ICT tools, only to arrive in the classroom and find the smartboard or Wi-Fi not functioning. Lindiwe's response indicates a combination of interrelated technical problems that have the potential to impede the use ICT in classrooms.

Other contextual problems mentioned by participants during both interviews are inadequate building infrastructure and facilities that consequently affects the quality of teaching and learning in the schools. Even though all the paperless schools are expected to be homogenous in their characteristics, they differ one from another in terms of the quantity and quality of their resources. Evidence from the schools' demographic characteristics in Table 8 shows that some schools are better resourced than others; thus, the scale of problems related to infrastructure differs from one school to another. Shaka and Mandla teach in the same school and share similar views about the nature of the school infrastructure. Both are of the view that the school building infrastructure contributes to some of the challenges that teachers and learners are experiencing in the school. Participants described their school infrastructure as thus:

> I will start with the building … as you can see these are not permanent buildings. I don't know what you call this type of buildings … but they are not brick and mortar. Somehow it can hinder or it can make it easy for thieves to come in because they can go through the walls. Yah, but for all other infrastructure we are well equipped. We have enough rooms, we have a hall, and the main hall is built with bricks. We can use it as a lab, and then we have enough computers for teachers. The infrastructure is adequate in the school. And they are relevant, but we do have white elephant equipment, yes, we do. We do have this expensive 3D projector that we have here that no one is using it. **(Mandla/FFI/Sch.C/Township)**

> I think the problem or the challenge we are having as a school is that our infrastructure does not allow us to keep the tablets in the school because, I think initially the intention from the department was that learners were not to take the tablets home … We are now giving learners the tablets because we don't have a place to secure them due to break in by thieves. **(Shaka/FGI/Sch.C/Township)**

> The infrastructure is there. It's fine, but we thought … eeh the MEC is going to build us a better school which is having the bricks, not this one (referring to the present temporary structures). Yes, and again our classrooms are not that big. There is no enough space. Yes. The other thing is we don't have more rooms where the heads of departments HODs can be there; you know, we share space right here: This is a library. This is supposed to be a library but because of lack of enough space we have some other things which we put in here as a store [sic]. There are some few educators who are

> occupying those back rooms there, something which is not okay. Do you see that one; we thought maybe the MEC is going to build us a school somewhere, and then maybe this one can be converted to a primary school? **(Pilwane/FFI/Sch.E/Township)**

From the above responses it is evident that the school infrastructure is not quite reliable to secure facilities, tools and equipment such as desktop computers, laptops, smartboards, tablets and other electronic gadgets. Mandla and Shaka teach in school C that has a temporary building infrastructure as indicated by Item 5 in Table 8. In view of the temporary nature of the school infrastructure, participants believed that it can easily be invaded by thieves. Mandla described the porous nature of the school building that can allow thieves to break through the walls, which means that the school building is not reasonably secure to prevent stealing in the school, particularly after the school hours. From the responses it can be understood that the school authorities consider it risky to keep learners' tablets in the school buildings. This is the reason learners are allowed to carry their tablets home even though this was not the initial intention of the government for fear of loss and misuse. Although the school authority's decision to allow learners take their tablets home is to avoid theft of the tablets from the school buildings, the decision has not prevented this; learners still report loss and damage of tablets on an almost on daily basis. The prevalence of theft and loss of tablets could have been minimised or even prevented if the school buildings had a safe space to store devices in.

Shaka's response does not only acknowledge the school infrastructure as a challenge but it goes further to disclose the implications of security of the school's ICT facilities. This illustrates that these challenges are directly and indirectly interrelated. It also shows that school context does influence the original plan and implementation of ICT integration in schools. It is clear from Shaka's response that the school's context has unique challenges in terms of building infrastructure and security, which consequently compelled the school authority to allow learners to go home with their tablets. The learners' tablets could not be secured in the school buildings because security challenges, and this led to further associated challenges like tablet damage and theft among the learners holding the tablets. All these point to the role of school context in determining the success of implementing ICT integration in schools. The role of context

as an important determinant of ICT integration in South African schools has been reported in the literature; Dlamini and Na'Allah (2015) cautioned against parochial consideration in the introduction and implementation of ICT integration in schools. They suggested the need to rethink ICT integration in schools beyond the provision policies and programmes, and instead to contextualise ICT integration in South African schools.

Kabelo, in a different school, shares similar sentiments about the challenges associated with building infrastructure in their school. Kabelo teaches in school E that have the same type of building infrastructure as school C where Shaka and Mandla teach. Teachers in both school C and E seemed to experience similar challenges with regards to building infrastructure. Given that the present school buildings are grossly inadequate to meet the ICT integration needs of the school, Kabelo expressed his optimism and expectation that the government would build them a new school with permanent structures. He observed that the present temporary buildings in the school are inadequate because of too few utility rooms and a lack of classroom space, storage facilities and offices. Teachers were sharing office space, which made them ineffective in discharging some of their responsibilities. In this school too, classrooms were overcrowded and some classrooms were still without smartboards, and even in classrooms where smartboards were installed, some were vandalised by thieves, similar to the case of school C. Chalkboards were still used in most of the classrooms.

5.5.3 Sub-Theme 4. 3: Learner's Poor Attitude to Possessing ICT Tools for Learning

Although this sub-theme is primarily concerned with challenges of ICT integration in relation to learners' behaviour and attitude in and outside the classroom, it also continues to address the role of context in the ICT integration process. The sub-theme presents the views of participants regarding the challenges that teachers encounter with learners and tablet devices in the classrooms. It is imperative at this juncture to know that the provincial government provided each learner with a tablet computer free of charge in all the paperless schools with the exception of school B**.** In school B parents were responsible for the procurement of learners' tablets long before the general introduction of ICT in public schools. The school has a 'bring your device' policy.

Findings show that the most prevalent challenge with ICT integration in almost all the schools is that learners do not seem to use the tablets appropriately to support learning and research, but instead use their devices to engage with content such as music, videos and pornography. It was found that learners' easy, unlimited access to pornographic, violent, and other inappropriate online content usually constitute a serious distraction from actual school learning content. It is an even more serious problem if the material is shared with other learners in the classroom.

Almost all the participants in this study agreed that learners engaged in acts that may be viewed as a misuse of their tablet devices. So participants perceived learners' attitude to the use of tablets as a significant challenge affecting ICT integration in the classroom. The following responses represent the views of most teachers about their experiences with learners and their tablets:

> Kids are still excited about these tablets. You find that they are busy on social networks during school time. **(Lindiwe/FFI/Sch.A/Township)**
>
> I think learners are not able to use tablets for learning. Yes! So that's my problem, because if you try to teach and a learner is trying to play a game in his/her tablet, I think that is the worst scenario to you as a teacher. **(Ayanda/FFI/Sch.A/Township)**
>
> In the classroom I encounter that learners play most of the time with their tablets and they don't do school work. That's what we as teachers get with those technologies. Now learners don't concentrate anymore. **(Lungile/FFI/Sch.D/Township)**
>
> Classroom management now is a bit challenging when it comes to this tablet because these learners don't know the main purpose of having these tablets; for them it's like they have to use it as their own tool not for learning, because you find that sometimes you are teaching and the learner is busy playing games or the learner is busy on social media while you are teaching. And they have their own way of hiding them, so that you can't see them… They are overcrowded classes: If we have about 52 learners or 40 something learners it's not easy to monitor all of them at the same time. So it's a bit challenging. **(Rose/FFI/Sch.D/Township)**
>
> ICT can be a distraction as well… the major issue we have at the moment, is that it causes distraction. It's easier and more fun for learner to play games on the tablet than

having to do their school work, you know? And that's a big problem. **(Bongani/FFI/Sch.B/Urban)**

Firstly, the participants noticed how excited learners were about tablets when ICT were first introduced into the schools. They noted that learners' excitement seriously affected their academic performance. The tablets became a distraction to the learners instead of a learning support tool.

Lindiwe noted that learners were not yet benefiting from the use of ICT is in school because the initial excitement of owning tablets devices was not yet over for the learners. It may be interesting to know that most of the learners in South Africa's township schools, such as the one where Lindiwe teaches, never had the opportunity to operate mobile devices before, and perhaps they never even thought of owning one so soon. Hence, learners were not only overwhelmed with the excitement of having a tablet in their hands, they were also busy exploring social media sites instead of engaging with the curriculum content prescribed for them. Although learner excitement may be regarded as positive, it can become negative if taken to an extreme level, especially when the main purpose of having the tablets is not explicit to the learners. Such is the case with learners in most of the township schools in this research because their excitement about having a tablet has turned out to be disadvantageous to their learning. To mitigate this prolonged negative excitement about using tablets among learners in high school, it may be better to expose learners to ICT at an early stage in primary schools.

Ayanda thought the worst experience for a teacher was to find learners playing games with their tablets during a lesson; her response indicates teachers' frustration in the classroom due to learners' attitudes to tablets. However, one tends to question teachers' competence in classroom management and control because it is expected that every teacher be equipped with classroom management skills and techniques that must be used as the situation demands. From the teacher's account of what transpired in the classroom, it seems that the teacher did not adequately engage learners in the classroom, and so the learners decided to engage themselves in activities that excited them. If teachers actively engage learners in the use of their tablets during teaching and

learning in the classroom, the problem of learners playing with tablets may seldom occur. Teachers must realise and appreciate the reality that learners in high school are mostly adolescents, full of vitality and curiosity to explore things and situations. At this stage in life, most learners do not want to remain idle but need active engagement at all times. Therefore, it is the responsibility of the teachers to devise practical ways of engaging learners with tablets in the classroom. The teacher ought to engage learners with activities that will require the use of ICT for learning at all times, so that learners will always be engaged with profitable learning tasks. If learners are not properly engaged, there is the likelihood that they will engage themselves with whatever will satisfy their curiosity.

Lungile's experiences in the classroom as expressed during the individual face-to-face interview reveal that learners do not dedicate much time to do school work anymore because of the tablets. The irony of this attitude of students is that the tablets were provided to them to improve their learning and now it is negatively affecting their learning. However, this scenario is not uncommon given that a number of researchers (Goundar, 2014; Aguilar-Roca, Williams, & O'Dowd, 2012; Awan, 2012) have reported that the use of ICT by students during a class or lecture can be disadvantageous in terms of classroom interaction, easy access to information, motivation, development of interest to learn, and ease of communication. The disadvantages may be manifold, affecting the learners, teachers and school system.

Rose considered an overcrowded classroom environment as quite challenging, especially when learners have tablets. She attributed the problem of classroom management and control to class size. She believes the overcrowded nature of the classroom provided an avenue for the learners to hide their activities in the classroom, since the teacher cannot monitor every learner at the same time. Emmer and Stough (2001) confirmed that teachers find it difficult to monitor behaviours and activities in overcrowded classrooms. Although overcrowded classes pose a challenge to classroom management (Webb & Cox, 2004; Emmer & Stough, 2010), nevertheless teachers in ICT-driven classrooms must be able surmount that challenge by harnessing ICT tools properly and engaging learners in worthwhile activities in the classroom at all times. Contradicting this, Sabanci, Ozyildirim, and Imsir (2014) found that ICT can be used to

facilitate effective classroom management. Even though the scholars did not describe how ICT can really facilitate classroom management, I think effective integration of ICT in the classroom keeps every learner engaged throughout the lesson thereby giving them little or no chance to get involved in distractive behaviours in the classroom. Webb and Cox, (2004) asserted that ICT may make the classroom control more effortless because it provides materials that make the class more interesting and easier to control.

Bongani believed ICT have the potential to distract learners' attention from the main content of the lesson to other irrelevant content as contained in various media forms. As a matter of fact, technology tools in the classroom are not only a distraction to learners but also to the teacher. The sound and videos can be so engaging that it can take away the attention of both teachers and learners from the main activity taking place in the classroom. Learners, in particular, can be more distracted if their access and use of ICT tools and content in the classroom are not regulated. For example, learners may prefer to watch a video for an hour rather than to solve mathematical problems on the board. On the other hand, teachers may be distracted from teaching by dwelling too much and dedicating too much time to illustrating topics in electronic format. All these can steal away the teachers' and learners' instructional time. This is evident in the work of Mona et al. (2008) who similarly acknowledged that although "learners respond best to high technology, more often their teachers may become very distracted by it in the classroom"(p.81). This means teachers too can be distracted by a media if the necessary steps are not taken to utilise them in an effective way.

Given the nature of ICT as tools characterised by different modes of communication, teachers ought to apply caution in the selection and combination of media formats for teaching and learning purposes so as not to distract learners from gaining the appropriate learning experiences expected of them. Although Rose viewed ICT as a source of distraction to learning, she also acknowledged, most importantly, that ICT make learning fun. Indeed ICT provides learners with the opportunity to learn independently and cooperatively through social media platforms, video streaming, video conferencing, games, podcast and other forms of collaborations.

Bongani and some other teachers considered ICT tools as problematic to formal learning because learners tend to dedicate more time to exploring social media than other content on their tablet devices, which makes the tablets distractive to formal learning. To corroborate Bongani's claim, Goundar (2014) posited that "the use of ICT devices in the classroom can have serious negative consequences on students learning, teaching, and classroom management" (p.16). Goundar (2014) found this to be the case in New Zealand where he conducted an online survey to identify the extent and purposes for which students are using personal ICT devices, like laptops, smart phones, tablet computers, etc., during lecture sessions in higher institutions of learning. Findings of the survey revealed that:

> The use of personal laptops in class were increasing and causing disruption to the teaching and learning process. The findings further show that some students who are not having laptops complained that the use of laptops by other students during lectures was distracting them from paying attention to what was being taught. Other students complained that they were being interrupted by those technology users who were not paying attention and who did not know what was going on in class. (p. 212)

Finally, in this theme participants identified several challenges and raised many concerns about the integration of ICT in paperless schools. Interestingly, while some of the challenges identified in the findings are already established in the literature, others are quite unique and have just emerged from this study. Some of the challenges mentioned by research participants that already exist in the literature are teachers' attitudes (Ertmer, 2005; Sime & Priestley, 2005; Gill & Dalgarno, 2008; Lin, Wang, & Lin, 2012), training (Wright, 2014; Sime & Priestley, 2005), resources (Sime & Priestley, 2005; Dawson, 2008), electrical power, (Wright, 2014), and Internet connectivity (Wright, 2014; Dawson, 2008). On the other hand, unique challenges found this study are learners' attitudes, classroom management problems, incompetent trainers, poor security, and poor quality and irregular intervals of training. It is surprising that the participants in this research did not mention issues of access and funding of ICT in schools as posing any challenges to ICT integration in their school, even though access and funding often appear to be prominent challenges to ICT integration as reported by different scholars in the literature (Jang & Tsai, 2012; Goktas, Yildirim, & Yildirim, 2009;

Bingimlas, 2009; Miller & Glover, 2007; Syh-Johg & Meng-Fang, 2012). The participants also raised concerns about the lack of baseline research with regards to the introduction and implementation of ICT integration in paperless schools.

5.6 Theme 5: Factors that Influence ICT Integration in Schools

This fifth theme derived from research question 5 seeks to understand teachers' perceptions of the factors that influence ICT integtraion in paperless high schools. Although several factors were identified by the participants, only the most occurring ones, age of teachers, attitudes of teachers to change, Internet connectivity, time and timetable, institutional support and material resources, are listed and discussed here. During individual face-to-face interviews participants in schools repeatedly mentioned these factors as having a significant impact on ICT integration in their schools.

5.6.1 Age of Teachers

In this study age refers to both the chronological age of teachers and their years of teaching in school. Older teachers here refer to those teachers that underwent teacher professional training before the advent of ICT in the education system and have been teaching in the classroom continuously for longer than five years. On the other hand, younger teachers refers to the set of teachers that were exposed to the application of ICT during their teacher professional training and have been teaching in the classroom consistently for not more than five years, as at the time of data generation. Participants talked differently about the role of teachers' age and years of teaching experience on ICT integration in schools. Particularly age was found to be an important factor that influences ICT use and integration into teaching and learning in the way they respond to the adoption, training and integration. Kubiatko (2013) noted that one of the important factors that influence the use of ICT for education is age, given that teachers who are expected to promote the adoption and integration of ICT in schools fall into different age brackets. Some participants acknowledged significant differences between older teachers and younger teachers regarding their beliefs and approaches to the integration of ICT in their respective classrooms (Kubiatko, 2013). The differences in age among teachers affect the extent of ICT integration in the schools because some teachers are

willing and competent to integrate ICT in the classroom while others are not. For example, during individual face-to-face interviews some participants acknowledged that age is indeed a factor:

> I will start with age of the teachers: There is a discrepancy between the younger and older teachers. The younger ones are more eager to use ICTs because they are brute when it comes to ICT and then for the older ones, you find that they take longer to get used to these ICTs, even though they are more willing to learn. But the younger teachers are the ones who are active because they love these ICTs more, because they have the skills. Now there is a gap between them when it comes to the knowledge. **(Mandla/FFI/Sch.C/Township)**

> I can say the age of the teachers affect ICT adoption in school because the learners are already in the age of technology and so teachers that are in the same age are more likely to use technology than the ones that are not in the age of technology (older teachers) **(Lungile FFI/Sch.D/Township)**

Mandla's response classified teachers into two categories, the older and younger generation, and detailed how each category responded to ICT integration and adoption in the classroom. His response revealed that the younger teachers pick up the application of ICT in teaching in classroom instruction faster than the older teachers. However, his response also shows that despite the older teachers' slow pace in learning about ICT, they were more willing to learn with and about ICT than the younger teachers, probably because they had no option but to use ICT in the classroom given that the chalkboards were physically removed from classrooms and replaced with electronic smartboards. Perhaps the older teachers resolved to learn ICT skills in order to cope with their new roles and the demands of their jobs, but it could also be that the older teachers believed they were capable of learning to use ICT and were therefore willing to learn.

On the other hand, younger teachers were found to be very conversant with various ICT devices right from the time of their professional training at college or university, as evidenced in the data. Because they had prior exposure to ICTs, they were eager to manipulate ICT devices in the classroom. For example, in the empirical data obtained, Mandla pointed out that the younger teachers are the ones who are active because they

love the ICT more and because they have the skills to manipulate the new technologies. Thus, this disparity between the younger and the older generation of teachers in schools leaves a gap in the scope of ICT adoption and integration in the schools. The integration process and pace becomes slow and arbitrary because teachers are doing different things in different ways. Hence, there is lack of uniform and coherent integration in the long run.

How long teachers have been teaching is also a critical factor that influences ICT integration in schools. This is supported by study conducted by the National Centre for Educational Statistics 2000 (as cited in Tedla, 2012) that found that teachers with fewer years of teaching experiences demonstrate greater use of computers than teachers with more teaching experiences. Although ICT has the propensity to change the actions and behaviours of its users in a dramatic way, the pace and extent of such change depend on how teachers apply it. Tchombe et al. (2008) claimed that whenever ICT are introduced into classrooms everything changes, since things cannot remain the same when ICT is integrated into teaching and learning. With ICT in the classroom, modes of communication become more varied and complementary, and teachers' and learners' roles automatically change. Teachers become facilitators of learning instead of transmitters of learning, while learners become active participants in the classroom activities instead of passive listeners. This leads to different experiences that influence decisions and actions in the classroom. The pace and extent to which teachers integrate ICT in the classroom are affected by the teachers' years of teaching without ICT. However, it is interesting to note that previous studies (Tedla, 2012; Ertmer & Ottenbreit-Leftwich, 2010; Subramaniam, 2007) suggested that older teachers who have taught for a greater number of years without exposure to ICT are more likely to resist ICT integration. In this study, findings show that, older teachers take longer time to get acquainted with ICT. This may be connected to the fact that teacher in the context of paperless schools have no option but to use of ICT in the classroom, given that most of the teaching and learning resources available in the schools are ICT driven. All teachers in schools designated as paperless are expected to adopt ICT in the classroom, thus even the older teachers who have taught for many years without practical exposure to ICT have to develop an interest in ICT so as to be able to fit into

the new system and to retain their jobs. The case of teachers in paperless schools can therefore be regarded as exceptional, even though teachers still have their grievances about the implementation, which was discussed in theme four.

Generally, teachers have been found to be hesitant about adopting new innovations in schools. And their resistance has often made the desired changes to be slow and difficult. Rogers (2003) posited that people normally resist change because of fear and uncertainty about the new innovation, and it is not easy for people to forego their usual ways of doing things for new ways. Similarly, Ertmer and Ottenbreit-Leftwich (2010) noted and reported that, in general, teachers are hesitant to adopt new innovations due to lack of relevant knowledge, low self-efficacy, and existing belief systems. This supports the views of Lungile, who said that there are teachers who are within the age of technology, which means teachers who are born in the era when ICT already abound in schools and society. These teachers were conversant with ICT in their environment even before going to study after school. And because they used ICT devices at school, they possess a basic knowledge of ICT, which implies that they can use ICT in the classroom to a certain extent unlike those older teachers who have no knowledge of ICT use at all. However, the possession of basic or foundational knowledge and skills of ICT does not guarantee adequate use of ICT for pedagogical purpose in the classroom. Thus all teachers require sufficient training for pedagogical integration of ICT in teaching.

These are the older generation of teachers that are currently learning how to use ICT devices to support teaching and learning in schools. Like the other participants, Ayanda acknowledged the existing dichotomy between younger and older teachers in some schools with regards to compliance or rejection to integrate ICT in their classrooms: “Especially with the old generation, I think women are more relaxed, they are more resistant to use ICT in their classrooms, yes a little bit”. Her response reveals that older female teachers in school are likely unresponsive to the use of ICT, and while the mention of a specific gender is interesting, it is unclear why older female teachers develop resistance to the use of ICT (Mathipa & Mukhari, 2014; Raman & Yamat, 2014). Without promoting gender bias or stereotyping, perhaps the older female teachers consider the application of ICT tools in teaching as an additional burden on

them and so they try to resist it. In contrast, the male teachers did not exhibit such resistance perhaps due to their masculinity and ego which drive them to accept challenges without complaining. The older male teachers rather strived to learn the application of ICT in the classroom, since it is now mandatory for them to use it in the classroom. Researchers (Tedla, 2012; Collis & Jung, 2003) indicated that it could be due to age and/or personal belief: Older teachers might be technophobic (fear for technological tools) while some teachers might consider the use of computers as a sin because of their personal beliefs (Tedla, 2012).

To support the findings from empirical data in this study, Venkatesh et al. (2003) in the UTAUT model listed age as an important factor that influence teachers' performance expectancy, effort expectancy, social influence and facilitating conditions, which supports the findings from the empirical data in this study. It could also be that the teachers are still sceptical about benefits of ICT in teaching. Kubiatko (2013) compared different age groups' attitudes towards and the use of ICT in Slovakia and the Czech Republic. The findings from the quantitative study revealed that there is a significant difference in attitudes towards use and actual use of ICT between different age groups, especially between the millennial generation, which were born after 1980, and the older generation. The millennial generation was found to demonstrate favourable attitudes towards ICT and often use ICT in school, while to the older generation are sceptical and less assertive towards ICT and seldom use ICT. Kubiatko further found that

> The older generation used Internet more for mailing. However, the millennial generation used it more for chat. This is in line with previous findings regarding attitude scores. For younger people belonging to the millennial generation, email does not feel very interactive. That´s why younger people belonging to the millennial generation rather use chat. Also the why younger people have more positive attitudes towards downloading music and movies from the Internet. (p. 1271)

Closely related to teachers' age are teachers' attitudes, which some participants believed also influence ICT integration in schools. Participants thought that the ages of teachers may influence their attitude towards change and innovations in school. The next section presents how teachers' attitudes to change may constitute a significant factor that affects ICT integration in schools.

5.6.2 Teachers' Attitudes to Change

The way teachers in schools understand the concept of ICT integration and their personal experiences may be responsible for their attitude towards ICT integration. This means that teachers' attitudes can either promote or frustrate ICT integration processes, and some participants viewed the attitudes of the teachers to change as a crucial factor capable of influencing ICT integration in schools. For example, during individual face-to-face interviews participants declared:

> I will say the attitude of teachers, because if the teachers themselves are not comfortable with it and they don't promote it, then it will be hard to actually apply the ICT. So, the teacher's attitude affects adoption. **(Muzi/FFI/Sch.D/Township)**

> I will say more problem of getting an attitude change than having ICT … if you have taught for so many years in one way, then it is hard to change to another new one. And so it is more of an attitude change than not having the facilities available. **(Bongani/FFI/Sch.B/Urban)**

> They (older teachers) were feeling alienated from the use … definitely attitude is all what it takes. **(Ayanda/FFI/Sch.A/Township)**

The responses show that if teachers are not well disposed to use ICT in teaching, they are likely to develop negative attitude towards ICT and subsequently will not promote ICT integration in the classroom and adoption in the school. Consequently, this kind of attitude may adversely affect the overall process of ICT integration in schools. Teachers have to accept and appreciate the benefits of ICT in teaching and learning for them to be able to integrate ICT in their teaching and also to encourage learners to use ICT for learning. And teachers can only appreciate these benefits of ICT if they are provided with opportunities for continued access to ICT knowledge and skills through training, workshops and other forms of teacher professional development activities that promote ICT use (Trucano, 2005). The responses also stated that teachers' attitude towards new innovations can constitute a problem to ICT integration in schools because changing teachers' attitudes from their old practices to new practices are quite problematic. It can even be more difficult than the lack of ICT facilities because human behaviour is indeterminate, but ICT facilities are determinate and can be acquired whenever

required. Hence, the inherent attitude of teachers must first be changed, before introducing ICT in schools.

Ziphorah (2014) also noted that infrastructural provisioning is often given top priority at the expense of teacher capacity development when introducing ICT in schools. He thus recommended that teacher capacity building be given top priority so as to change their attitudes and beliefs at an early stage before the implementation of ICT integration in schools. This is really important in view of the power of teachers' attitude as a significant determinant of ICT acceptance and implementation in the classroom. It may be recalled that attitudes are rooted in experience, which determine what an individual will see, hear, think and do. Thus teachers' attitudes greatly influence what they teach and how they teach content. By implication, teachers' pedagogical practices with ICT are a direct reflection of their attitudes. Ertmer and Ottenbreit-Leftwich (2010) noted that:

> When teachers are asked to use technology to facilitate learning, some degree of change is required along their (a) beliefs, attitudes, or pedagogical ideologies; (b) content knowledge; (c) pedagogical knowledge of instructional practices, strategies, methods, or approaches; and (d) novel or altered instructional resources, technology, or materials. (p. 258)

An attempt to effect these changes in teachers is a herculean task that can only be achieved over a long time, given that attitudinal change is a process, not an event, especially with older teachers who have been teaching in a particular way for a long period.

The response also indicates how difficult it is for teachers to change their attitude from their usual way of teaching of many years to a new way of teaching with ICT devices. It is understandable that making such a drastic shift is quite difficult, which is why some teachers resist change even if it may be beneficial in the long run. Based on the responses, this problem is more associated with teachers with many years of teaching experience than with the younger teachers with less teaching experience. This is supported in previous research studies on teachers' attitudes and change (Ertmer, 2005; Rogers, 2003).

5.6.3 Internet Connectivity

Earlier, in Theme 4, I discussed Internet connectivity as a factor that is a challenge to ICT integration in schools because of slow Internet speed due to low bandwidth. In this section I am presenting the issue of Internet connectivity as a determinant factor that can either facilitate or frustrate ICT integration, depending on the circumstance in the school context. Some participants believed that Internet and Wi-Fi connectivity are important factors that can influence ICT integration in schools. For instance, Thandi believed that the main factor that hinders the smooth integration of ICT in the school is connectivity:

> Besides the days when we don't have Wi-Fi and when you find the smartboard not working, there shouldn't be anything that frustrates if you are prepared. **(Lindiwe/FFI/Sch.A/Township)**

> If you prepare a lesson and you expect the learners to go onto the Internet to get something on their tablets and then they don't have Wi-Fi connection, it interrupts the whole thing which you had planned. Or if learners come to school and they forget their chargers, and then the tablets dies in class, which means now they don't have access to materials. **(Muzi/FFI/Sch.D/Township)**

> ICT integration becomes challenging if you don't have simple things like connectivity. If your kids can't connect, you can't use e-learning. So in this state you can't use e-learning, but you always have a backup in case the e-learning fail us. **(Gugu/FGI/Sch.B/Township)**

> I only feel frustrated, if I prepare only with ICT resources. I feel very much frustrated if there is no electricity. I will be frustrated, I feel frustrated if the Wi-Fi is down and the learners want to download something, that causes frustration, but I will immediately switch to another topic. **(Kabelo/FFI/Sch.E/Township)**

Lindiwe talked about poor Internet connectivity in the school, which suggests that lack of reliable Internet connectivity in the classroom during lessons seems to be a source of worry to virtually all teachers in schools. The response indicates that teachers get frustrated whenever Internet connectivity is not available during lessons. The implication here is that teachers likely disregard the use of Internet to prepare and deliver lessons if

connectivity is not always reliable. This makes the application of ICT in the classroom irregular, thereby affecting the integration of ICT in school.

In the same vein, Muzi's response also suggests that a well prepared lesson can be frustrated if at the time of delivery, Wi-Fi is not functional or if it does not meet the teaching and learning needs of both teacher and learners. This is especially relevant when the lesson requires learners to go online for additional information or activities. Teachers perceive this as a significant challenge to ICT integration into the classroom because Internet connectivity is a basic requirement in every technology-driven classroom setting. Apart from slow or no Internet connectivity, lessons can also be frustrated by learners' failure to come prepared to use their tablets in the classroom. Because e-learning requires learners to use their devices in all processes of learning, whenever learners fail to charge their tablets to full capacity online activities may be adversely affected in the classroom because learners cannot use their tablet devices.

Gugu shared similar sentiments than Muzi regarding Internet connectivity and learners' use of tablets in the classroom. She felt that teaching and learning through e-learning can be frustrated whenever Internet connectivity fails because teacher cannot teach the planned lesson. From experience, Gugu suggested the need for backup in case there is no Internet. Although Gugu did not specify the type of backup that teachers need to adopt, experience has shown that lessons prepared to be taught using online videos, simulations, YouTube, websites etc., can also be taught using downloaded online materials or other electronic teaching resources that do not require Internet connectivity.

Kabelo confessed to getting frustrated because of poor Wi-Fi connectivity, especially when he already prepared to teach with ICT resources or when he expected learners to download some information during lessons. This signifies that the unreliability of Wi-Fi connectivity in the school has the potential to discourage teachers from regular integration of ICT into teaching. In the literature many scholars (Mukhari, 2016; Rahim Sajid, 2013; Tedla, 2012; Buabeng-Andoh, 2012) have mentioned poor Internet connectivity as a significant factor inhibiting ICT integration in schools across the world, particularly to the developing countries.

5.6.4 Time and Timetables

Time is an important factor worthy of consideration in all school programmes because all school activities operate based on time allocation. The school timetable specifies the time allotted for every activity in the classroom based on the prescribed curriculum. Some participants acknowledged the effect of time and timetables on ICT integration in school. Although the participants believed that ICT integration in school is affected by the school timetable, participants talked differently about how it affects ICTintegration in relation to each school context:

> Time is another problem: We don't have enough time to put everything in … there are lot of things to explore and yet there is still content expecting you to finish, so there is no time in the classrooms. **(Lungile/FFI/Sch.D/Township)**

> I don't think the timetable has changed much to accommodate the use of ICT, and I think the timetable need to be looked into because now we are still using things traditionally, since we have introduced these ICTs something has to change. The timetable is still the traditional timetable, but it is informed by policy, so if policy can integrate ICT … maybe they (teachers) will find room to include ICT activities in the timetable. **(Mandla/FFI/Sch.C/Township)**

> On the timetable issue [sic] yes and we are busy working to integrate it into the learning management system, so our learning management system will be time table driven. This means that when a learner opens a tablet... the timetable will determine what the learner will be working with at that period. **(Bongani/FFI/Sch.B/Urban)**

Lungile's response perceived time as a problem to ICT integration in school because teachers did not seem to have enough of time to explore all that is needed to explore with ICT coupled with the school curriculum requirements. The implication here is that the school timetable has not made any provisions to accommodate the use of ICT in the course of teaching content in the classroom. Timetables can be a positive or negative influence on ICT integration, depending on how appropriate the timetable is designed to accommodate ICT integration in the school classroom. From the views expressed by various participants in the responses above, it is understood that timetables are an important determinant of how successful ICT can be integrated in our schools.

According to Hsu and Kuan (2013), teachers in most schools do not have sufficient time provided on the school timetable to pedagogically integrate ICT in their classroom lessons, and this has constituted a significant barrier to ICT integration in many schools.

Mandla's response signifies that the school timetable has not changed to accommodate the ICT integration activities in the classrooms. He clearly indicated in the response that although teachers are required to integrate and adopt ICT in their classrooms, the current timetable in the school remains traditional. This means that the timetable is not aligned to the new innovations in the classroom and so does not accommodate effective integration of ICT into teaching and learning at the school level. His response further pointed out the need for instructional processes to change in the classroom since new equipment and instructional procedures have been introduced in the classroom. He observed that since the school timetable is informed by policy, then it is appropriate that the policy also provide for the application of ICT into the timetable, i.e. to align the timetable with ICT integration in the school. It is only when the school timetable can accommodate ICT integration in the classroom that ICT adoption by teachers in the school can be achieved. This shows the significant role of school timetables on ICT integration in classrooms and how it affects adoption in the school as a whole.

In Bongani's school the situation is different: The learners' tablets are configured to align with the school timetable through a LMS that is still under construction. As indicated in his response, when completed, the school timetable will eventually determine what learners can access on their tablets during each period. This means that there will be no disparity between the school timetable and what will be seen on learners' tablets during each lesson. Each lesson will conform to the central timetable in the school, but this is only possible through a LMS. Unfortunately, most of the schools do not have a LMS yet. The use of an LMS in schools could be the solution to the issue of time and timetables for ICT integration in classrooms.

In conclusion, time or timetables is an important factor that influences ICT integration in schools but in different ways depending on the school context. While in some schools teachers believed there was sufficient time in the school timetable to accommodate ICT

integration, teachers in other schools believed there were not sufficient time on the time table to allow for teaching with ICT tools.

5.6.5 Support

The type of support that teachers get in and outside of their respective schools is considered an important factor that affects ICT integration in paperless schools. Some participants in this research mentioned some types and sources of support that they received to facilitate ICT integration in their respective schools. Participants narrated how school management support is crucial to ICT integration in schools. However, while some participants said they received support, others denied getting reasonable support to integrate and adopt ICT in their schools. Generally, teachers require different forms of support to be able to innovatively integrate ICT into classroom activities, given that the use of modern technology devices in the classroom is a relatively a new practice. Hennessy, Harrison and Wamakote, (2010) proposed that teachers always require every form of support to integrate ICT into classroom. The responses presented below describe three levels of support teachers are getting in different school settings:

> The management are keen; we don't have trouble with integration at all. We get a lot of support. The school has permanent technicians employed that if there is any problem, we get help. Parents support us as well, with what we are doing, how we are changing the way we are teaching. So we get a lot of support from most of the stakeholders. **(Bongani/FFI/Sch.B/Urban)**

> From the parents I do have support because the parents know that in order for their children to be enrolled here, they need to buy the tablets … All my learners, most of them have tablets and then in terms of the principal, there is support. If you have problem, you can meet the head of department. If you have any queries, if I have any question and in terms of GDE, my facilitator also encourages us to use the laptop … He does encourage us. There is support also from the SGB, so I don't lack anything in terms of technology to teach my subject in the school. **(Thandi/FFI/Sch.B/Urban)**

> The principal is quite supportive and is the one who actually is driving this whole process and motivating us too to be part of it. The department (GDE) is also supportive in its

ways but communication is not quite impressive, between the department and the educators. **(Mandla/FFI/Sch.C/Township)**

The principal of the school is in support of the ICT integration, even the district office, they are supportive. And yes, I can say they provide trainings for teachers at the district office or the department. Yah, because they want to see these things happening. **(Shaka/FFI/Sch.C/Township)**

We have enough support for the training of the smartboard in using ICT. Yes, we do have a trainer, he is around the school for technical problems as well as training. We get support from colleagues. There are some of those that know how to use the smartboard more than others; when you have a chance you do go to them for support. The community? Not much so from the community. I don't think there is support, mainly because I don't think they understand the technology themselves. **(Muzi/FFI/Sch.D/Township)**

From the responses, it is apparent that teachers receive different types and levels of support from different sources towards ICT integration, and perhaps this is the reason for the disparities in the extent of ICT integration implementation in various schools. While teachers in some schools enjoy sufficient support from various stakeholders, like in the case of Bongani and Thandi, who share common experiences and convey similar opinions about getting sufficient support for ICT integration in their school, other teachers enjoy limited support from a few stakeholders. The guidelines for principals in managing ICT in South African Schools (Bialobrzeska & Cohen, 2005) requires that teachers implementing ICT integration be given adequate support by the school management, particularly the principal, for optimum implementation.

Bongani and Thandi teach at the same school (school B), where teachers are adequately supported to integrate ICT in all teaching and learning processes. According to their responses, the school management, parents, and technicians offer support to teachers towards ICT integration in the school.

Bongani and Thandi further maintained that they get lot of the support from all the people that are concerned with the idea of integrating ICT in the school, i.e. the stakeholders. Their responses also recognised role of the SGB in providing support for ICT integration. When compared to the other four high schools investigated in the study,

it may be deduced that perhaps the scope of support that teachers are getting in school B is responsible for the full integration of ICT of the school. Therefore, it may be resolved from the findings that provision of adequate support from all stakeholders in and outside the school to teachers is essential for ICT to be fully integrated in schools (Buza & Mula, 2017; Albion & Redmond, 2008; Venkatesh et al., 2003). Albion and Redmond (2008) believed that, "The effectiveness of ICT integration is impacted by several interrelated factors which include teachers' motivation to integrate, personal knowledge and experience with ICT, confidence in ICT use, access to ICT resources and training, teacher preparedness and technical and pedagogical support" (p. 1). Although the authors mentioned technical and pedagogical support only, teachers also require administrative, moral and training support to enable them integrate ICT in the classroom based on the educational goals and objectives set for them.

Mandla and Shaka were teaching in the same school. They both acknowledged the supportive role of the school principal towards ICT integration. Mandla admitted that the principal provided motivation and drove them to engage actively in the whole process of ICT integration. Shaka added that some staff from the district office of the DoE also provided moral and training support to teachers in paperless schools within the educational district. Education officers from the district usually help to organise internal and external training support for teachers in schools. According to Venkatesh et al. (2003), when teachers perceive that adequate support is available for them to carry out their teaching task with ICT, they tend to adopt the new innovations much quicker. The type and level of support given to teachers determine the extent of their commitment to implement ICT integration in the classroom.

It is pertinent to know that the role of school principals in promoting ICT integration in schools is clearly spelt out in the e-education policy implementation documents (Bialobrzeska & Cohen, 2005). According to the guidelines for principals in managing ICT in South African schools, principals as managers are required to support and promote ICT integration in schools by every means possible. "The purpose of the guide is to give principals and senior school management information on using and managing ICT resources so that they can provide leadership in their respective schools" (Bialobrzeska & Cohen, 2005, p.6).

Kabelo had a different experience from the participants from school B and C. Kabelo hails from school E**,** which is a different context from that of the previous participants. He claims that the internal support in their school is not pragmatic:

> Internally the support is only verbal, is not practical. The principal will only support us but is not practical … During teachers and parents meeting, community members do identify the loss of tablets, and they do tell us who steals in the community. (**Kabelo/FFI/Sch.E/Township)**

Kabelo sounded dissatisfied with the form of support given to teachers in their school. He described it as mere verbal support from the principal with nothing to substantiate in practice. However, he admitted to getting some form of support from the community members by way of providing useful information about cases of theft in the community. It may be deduced from the response that there is minimum support in school E. Tezci, (2011) found that lack of sufficient support to teachers contribute significantly to low ICT integration in schools. When teachers are not supported with training, coaching and mentoring, they tend to lack the required knowledge and skills to integrate ICT in the classroom. Likewise, when teachers lack support in terms of facilities, motivation in the form of incentives or reward systems, they easily get demoralised to strive for ICT integration in schools (Chigona, Chigona, & Davids, 2014; Rahim Sajid, 2013.)

It is imperative to also note that only a few participants in the same school acknowledged getting support in form of resources for ICT integration. When asked to describe the factors that influenced their integration of ICT, Bongani and Thandi categorically stated during the face-to-face interviews that availability of resources is the chief factor enabling them to adopt ICT in teaching. Bongani admitted that they have sufficient ICT resources available in the school. His response considered availability of facilities and funds as important factors that drive teachers to adopt ICT in the school. Provision of teaching and learning resources in school are known to motivate teachers to do their work with ease and convenience.

Thandi also said that she had all the resources she required to teach her subject in the school. Her response specified the kind of resources (in terms of technology) she did not lack in the school. Both participants considered the availability of ICT resources in

the school as a major determinant of successful integration of ICT in the classroom. They believe resources have significant influence ICT integration in school because resources can promote or frustrate teachers' enthusiasm and effort to integrate and adopt ICT.

It is relevant to note that even though not all the participants in this research acknowledged resources as a crucial factor affecting ICT integration in school, there are sufficient evidence in the literature (Bingimlas, 2009; Hew & Brush, 2007) acknowledging how availability of resources or lack of it affects both integration and adoption of ICT in our schools. Therefore, the submissions of the participants in this study are a confirmation of what previous scholars have found elsewhere. Although findings and the literature reveal that the availability of ICT material resources is important in schools, it does not guarantee effective implementation of ICT integration in the classroom in the absence of teachers' technological and pedagogical expertise (Tedla, 2012). Similarly, Majumdar (2015) warned that mere availability ICT tools in the classroom does not make good pedagogy, and learning ICT skills may not be sufficient either but using ICT to improve teaching and learning is fundamental to the pedagogical integration of ICT.

5.7 Summary of the Chapter

This chapter presented the rigorous processes of data analysis, interpretation and presentation of findings. Five themes emerged from the analysis of data obtained through individual face-to-face interviews and focus group interviews. The analysis was based on the research questions outlined in Section 1.7 and reiterated in Section 5.1.1. The first theme was concerned with the various understandings of participants about ICT integration in the classroom, where findings revealed that teachers have different understandings of ICT integration and the diversity of their understanding is informed by the school context and types of ICT resources available to them. The second theme was about the beliefs and experiences of teachers while integrating ICT in their classrooms. Participants believed that ICT tools help them to enhance teaching even as they also found the tools to save teaching time and promote interaction in the classroom. Theme 3 presented participants' views about the nature of training and

support for ICT integration in their respective schools. Although participants concurred on the availability of training and support in schools, there were divergent views about their experiences of the nature and frequency of training in schools. Thus, participants suggested the need for regular and in-depth training of teachers. The fourth theme presented various challenges in the course of ICT integration in the five participating schools, some of which are associated with policy makers, context, teachers and learners. Theme 5 was concerned with the factors that teachers considered as having influence on ICT integration in their schools. Some of the factors mentioned by participants include teachers' age and years of teaching experience, attitude to change, time and time tables, institutional support, and availability of teaching and learning resources in school.

All the findings obtained from the analysis are further discussed in greater detail in the next chapter, which will present detailed thematic discussions to synthesise the entire findings of the study.

CHAPTER 6

THEMATIC DISCUSSION AND SYNTHESIS OF FINDINGS

"A good decision is based on knowledge and not on numbers" – Plato, 428–347 B.C.

6.1 Introduction

The aim of this study is to explore and understand teachers' beliefs and experiences around ICT integration in five South African paperless high schools. In the preceding chapter, I presented and interpreted the data generated from participants in the five participating schools through interviews. I also analysed policy provisions for ICT integration in schools as contained in the e-education White Paper and the guideline documents for implementing the policy. This chapter outlines the main findings of the study and also discusses the reviewed findings that emerged from the study in relation to the reviewed literature and espoused theoretical frameworks for the study as presented in Chapter 3.

The theoretical model selected for understanding teachers' beliefs and experiences around ICT integration in schools is Venkatesh et al.'s (2003) UTAUT model. The model assumes that teachers are normally persuaded to accept to use or really use technology by their beliefs and experiences of the technology. These beliefs are expressed in terms of the degree of performance expectancy, effort expectancy, social influence and facilitating conditions associated with the technology (Venkatesh et al., 2003). In this study teachers' beliefs and their previous experiences with the technology determined whether they are actually using ICT in their classrooms. Studies on the application of the UTAUT in school settings have shown that although the four types of beliefs significantly influence technology implementation and use, performance expectancy, which is the belief that using the technology will help the person to attain higher gains in performance of their job, have a stronger influence.

This chapter is logically structured around the five major themes that emerged during data analysis and in accordance with the research findings as presented in the preceding chapter. The first theme discusses teachers' understandings of the concept

of ICT integration in the classrooms. The theme discussed the diversity in teachers' understandings of the concept and why such differences exist. The second theme focuses on teachers' views about their experiences with ICT integration in the classroom in particular the benefits of using ICT in teaching are discussed with particular focus on how ICT enhances teaching and learning in the classroom. The next theme discusses the nature of training offered to teachers to integrate ICT in their classrooms. Theme 4 is concerned with the challenges associated with ICT integration in the classroom. Lastly Theme 5 discussed the factors that influence ICT integration in paperless schools. All discussions are in relation to but not limited to the theoretical frameworks of the study presented earlier in Chapter 3. All the theories acknowledge the role of beliefs as determinants of attitude that inform action or inaction among human beings.

Table 12 below presents the relationship between the constructs of the conceptual frameworks and the findings of the study based on the views of the participants about teachers' beliefs and experiences around ICT integration in the schools that were investigated.

Table 12:

Linking the Research Findings to the Conceptual Model

Teachers' Beliefs and Experiences (The Findings)	Related Construct in the UTAUT	Implication	Remarks
• ICT enhance teaching • ICT saves time during teaching (see 5.3.2) • ICTs are effective tools tor teaching and learning • ICT is very helpful to teachers in lesson planning • ICT makes teaching and learning interesting • ICT makes teaching and learning interactive • It is fun to use ICT in teaching	Performance Expectancy	Teachers are integrating ICT in the classroom because they found the tools useful in enhancing their teaching processes	Teachers integrate ICT when they are convinced that it adds value to their teaching.
• ICTs are flexible (see 5.3.1) • ICT is convenient to use • ICT is easy to use	Effort Expectancy	Teachers are integrating ICT because they can use the tools with optimum ease.	The easier it is for teachers to manipulate ICT tools, the more they integrate them in teaching.
• Parents expect better learner performance • GDE expect teachers to produce higher results at matric exams • Learners expect better teaching • Principals expect teachers to use ICT to teach • Training facilitators influence teachers to display ICT knowledge and skills in their classroom	Social Expectations	Teachers believe that they are required to integrate ICT in the classroom because parents, government, principals and some other people expect teachers to do so.	Having approval and expectations from other people to integrate ICT in the classroom have a powerful influence on teachers' decisions to integrate ICT in teaching.
• Teachers get training support from the GDE and school ICT coordinators. • Teachers get other forms of support from school principals, parents, colleagues, learners and technical support (see Section 5.6.5 and 6.6.5) • Resources (infrastructures, facilities, equipment, tools) are available in the schools (see 5.6.5 and 6.6.6)	Facilitating Conditions	Teachers are integrating ICT in their classrooms because they are trained and supported with resources to teach with ICT tools	Availability of administrative, moral, technical, and training support and available material resources do motivate teachers to integrate ICT in to classroom teaching.

6.2 Teachers' Understanding of the Concept of ICT Integration

All participants in the schools have certain level of understanding the meaning of ICT integration in the classroom, from their personal experiences and views of the concept. I had no prior expectation from participants to provide a predetermined, generally acceptable definition of the concept because I was aware that the participants are neither ICT experts nor were they very conversant with ICT prior to the introduction of the paperless project in their schools. As a matter of fact, some of the teachers in the schools are just learning rudimentary computer skills. Nevertheless, they had been using ICT in their schools for more than one year and had attended some ICT integration training, and they were expected to demonstrate some level of understanding of the pedagogical implications of ICT integration in the classroom. Participants had various understandings of ICT integration based on their personal experiences and views of the concept. A careful overview of participants' responses proved that their understanding of the concept were largely shaped by their past experiences with ICT, ICT integration training, available ICT tools in classrooms, and past and present interactions with people in and outside the school. Most of the participants described the concept of ICT integration as a process of using different ICT tools in the classroom, which simply describes mere use of ICT to support the teacher to teach in the classroom. This position depicts what Raby (2004) referred to as physical integration of ICT in the classroom. Raby made a clear distinction between two different types of ICT integration namely physical integration and pedagogical integration. Pedagogical integration goes beyond mere the placement of ICT for use by teachers in the classroom. Given the different notions of ICT integration, Kshetrimayum (2007) cautioned that, "ICT Integration should not be defined by the amount or type of technology used, but by why and how it is used" (p. 63). The responses of the research participants were not much of a surprise given the sociological theory (Berger & Luckmann, 1966) that postulates how people construct their own meaning of reality (including concepts) through active interaction with other people around them. According to the theory of social constructionism, all reality and meaning are not

absolute but relative and subjectively constructed through dynamic interaction with individuals or a group of people. In view of the above theoretical stand, it may be inferred that teachers are bound to hold a different understanding of ICT integration because of the social interaction they engage in with different people in and out of the school.

A careful look at the various responses presented in Chapter 5 reveals the diversity teachers' understanding of ICT integration in different schools. The study found that the majority of the participants understood ICT integration as the combined collection and use of different ICT tools and devices, such as computers, tablets, multimedia projectors, smartboard, cell phones, videos, audio, sounds and online blackboards, in the classroom. This seems to be congruent with Chigona, Chigona, Kayongo, and Kausa (2010) who succinctly described ICT integration as "the blending of technological components, parts or elements into a complex but harmonious whole, as well as how ICT is seamlessly embedded into the classroom" (p. 21). Although the participants did not define ICT integration in the same way, most of them shared a common idea about ICT integration as mentioned above and earlier. They believed ICT integration is about a combination of new digital technologies like the Internet, video, audio, laptop computers, smartboards and learners' tablets. The pattern of the responses may be connected to the available ICT tools in their respective schools, signifying subjectivity in their understanding of the concept. The definitions appear to be subject to the available tools that the participants saw around them, coupled with what they do with the tools. It could also be that the meaning the participants assigned to the concept was informed by the social integration with their colleagues in school and with ICT facilitators during ICT integration training in different places. This will confirm the proposition of the social constructionist theory that says; it is the influence of social interaction that lead to personal construction of meaning and reality. According to the theory, reality is socially constructed as a dynamic process, and it is re-produced by people acting on their personal interpretations and their knowledge of reality around them.

It is pertinent to know that even in the literature ICT integration has multiple definitions based on the different points of view of the scholars. Bebell, Russell, and O'Dwyer (2004) upheld the popular assertion that there is no clear standard definition of

technology integration in schools. Notwithstanding the lack of a general standard definition of ICT integration, a certain phrase or concept seems to recur across different descriptions or definitions of technology integration in schools. This phrase is the 'use of computing devices' for teaching and learning purposes. Hew and Brush (2007) acknowledged the attempts made by different scholars to define the concept of ICT integration from different perspectives. For example, Hew and Brush (2007) believe that "technology integration can be defined in terms of types of teachers' computer use in the classrooms" (p.224). Similarly Hennessy et al., (2005) view technology integration in terms of how teachers use technology to carry out familiar activities more reliably and productively, and how such use may be reshaping these activities. Yet other scholars (Lim et al., 2003) consider technology integration in terms of teachers using technology to develop students' thinking skills" (pp. 224–225). In their contribution towards unpacking the concept of ICT integration, Hew and Brush (2007) described "Technology integration as the use of computing devices such as desktop computers, laptops, handheld computers, software, or Internet in schools for teaching and purposes" (p. 225).

Furthermore, although the majority of participants' understandings are linked to the availability of ICT tools in schools, as pointed out earlier, few participants demonstrated their thinking beyond the available tools around them. For example some participants (Shaka & Mandla) demonstrated unique thinking and understanding of the meaning of ICT integration in classroom. Shaka thought ICTs are there to actually assist us to make sure that the teaching style actually changes or the method of teaching change in a way that it will lessen the work on the side of the teacher and also making teaching more exciting and also make learners to understand more in terms of the concepts that we deliver every day. Likewise Mandla believed ICT Integration means taking the traditional teaching methods and blending them (improve) with ICTs meaning that we now use technology in our teaching and learning. For instance when we use the the smartboard we still writing but now in a digital form, so integrating, that means you include day to day teaching aah practices. These manner of thinking about ICT integration demonstrated deeper knowledge and skills of ICT, given that they have been exposed to the use of ICTs for at least five years.

Some of the teachers in the participating schools have been teaching with ICT tools for over five years prior to the introduction of the paperless school project. In fact, after careful consideration of the various definitions presented by the research participants, I think that participants' conceptions of ICT integration in teaching may also be informed by their experiences with the ICT tools and their school context. From the responses it could be argued that participants have limited understanding of ICT integration because they failed to present a comprehensive definition of the concept. Especially if ICT integration is considered as the deliberate, conscious and regular application of ICT devices by both teachers and learners for the facilitation and enhancement of all aspect of teaching and learning processes or if Raby's (2004) definition (see 2.6) is to be considered as a standard definition in this study.

However, the role of context need to be seriously taken into consideration in this study, given that most of the teachers interviewed reside and teach in township and rural school settings. In township and rural contexts, ICT facilities and information is limited because of certain challenges, which are enumerated and discussed in much detailed in Section 6.4.

I noted from the teachers' response that those who teach in a classroom with projectors, laptop computers and tablets tend to understand and define ICT integration as a process of using projectors, laptop computer, and learner tablets to deliver curriculum content during teaching and learning in the classroom. Similarly, teachers who teach in classrooms or schools with limited ICT resources do combine them with traditional tools or methods and therefore tend to understand or define ICT integration as a combination of old and new tools and methods of teaching. This suggests that the kind of ICT tools that teachers are exposed to determine the extent of their understanding of the meaning of ICT integration. Hence, teachers' understandings are skewed to the types of tools and devices available in each school context. Although some of the definitions given by participants captured some key words mentioned in some definitions in the literature, it is imperative to mention that most participants fail to provide a comprehensive definition of ICT integration as described in the e-education White Paper document. This is especially if the definition that is provided in the e-Education white paper document is

considered as a guide. The White Paper defined ICT integration within the perspective of e-education to mean:

> The ability to apply ICT skills to access, analyse, evaluate, integrate, present and communicate information; Create knowledge and new information by adapting, applying, designing, inventing and authoring information; and to function in a knowledge society by using appropriate technology and mastering communication and collaboration skills. (p. 14)

This means that e-education is more than developing simple computer literacy and the skills that are required to operate different types of ICT tools in school; it is a more holistic endeavour involving machines, tools, processes and human resources. For example Hudgins (2008 p.7) define ICT integration as "the use of various technological tools that support and enhance teacher instruction and practice […] and that provide access to resources that augment learning activities in classroom practices". This definition shows the complexity and large scope of ICT integration in the classroom. Furthermore, In view of the definition of pedagogical ICT integration earlier given by Raby (2004) and a careful observation of the various definitions provided by participants, it means that teachers need more pragmatic exposure to ICTs through hands-on pedagogical ICT integration training and teacher professional development programmes, to ensure that the teachers integrating ICT in classrooms are adequately prepared with requisite knowledge and skills needed for successful ICT integration in the classroom.

6.3 Teachers' Beliefs and Experiences around ICT Affordances in the Classrooms

There seems to be lots of contestations about what ICT can offer to teachers and learners in the classroom. Scholars have divergent views and beliefs regarding the role of technology in teaching and learning. For example, Trucano (2005) argued that:

> There is widespread belief that ICT can and will empower teachers and learners, transforming teaching and learning processes from being highly teacher-dominated to student-centred, and that this transformation will result in increased learning gains for students, creating and allowing for opportunities for learners to develop their creativity,

> problem-solving abilities, informational reasoning skills, communication skills, and other higher-order thinking skills. (p. 5)

Although this is a popular belief among most education stakeholders, they can be regarded as an abstract appreciation of ICT because there is no empirical evidence justifying this belief. In this study one of the participants, Lindiwe described it as "romanticising ICT" during her face-to-face interviews. Conole and Dyke (2004) believed that ICT offer lots of affordances to both teacher and learners and provides immense support to them in the classrooms. Nevertheless, Tan et al. (2012) and Conole and Dyke (2004) posited that although ICT is associated with various affordances that can enhance teaching and learning, there are equally negative attributes associated with ICT that can be detrimental to teaching and learning.

In the same way, scholars have divergent views and beliefs regarding the role of technology in teaching, participants also had different beliefs and experiences of ICT integration in their classrooms. The study findings indicated that, of the 22 participating teachers, 12 participants believe that ICT integration is the combination of different ICT tools and methods for the purpose of teaching and learning in the classroom. Teachers go through different experiences in the course of integrating ICT in the classroom for the purpose of teaching and learning. Thus in this study, participants acknowledged that ICT tools can be both beneficial and distractive in the classroom. For instance, while describing their experiences with ICT integration in their classrooms, participants explained how ICT tools have helped them to deliver lessons with relative ease and ultimately enhanced their teaching. Participants considered ICT tools to have positive potential because while using ICT tools in the classroom, they found that ICTs are flexible tools that enhance teaching and learning, are time saving tools, are tools that promote interaction in the classroom and are tools that provide immediate feedback to learners. In view of the above experiences of teachers, there is the likelihood that pedagogical integration of ICT in paperless schools can succeed and be sustained in schools since teachers are finding the tools valuable not only for teaching but for learning too.

Venkatesh et al. (2003) claimed that teachers tend to develop the intention to integrate ICT into teaching when they perceive that ICT tools can help them to perform their task better and with ease. According to the UTAUT, performance expectancy is a concept that describes the degree to which an individual believes that using the new innovation will help them gain, in terms of job quality, quantity or time, in job performance. In this case it implies that teachers will integrate ICT into the classroom if they are sure and convinced that it will enable them perform teaching better. The UTAUT also described effort expectancy as the degree of ease of performing the job that is associated with the new innovation in the classroom: The easier the means of performing a task using the new innovation, the more likely it will be accepted and adopted by teachers in the classroom. The findings revealed that teachers in paperless schools were integrating ICT in their classrooms because it is easy to use after receiving appropriate training.

The theory explains what really drive people to accept and implement an innovation. The innovation may be in the form of a new system, product or procedure. Based on the theory, the beneficiaries of the change will only accept it if they can discover through experiences that the innovation will make their job better and will require less effort to perform the same task. In this study participants believed that ICT enhances their teaching in the classroom because the tools are flexible to use singly and in combination due to their multimedia properties that promote multisensory learning in the classroom. Conveying their experiences during their individual face-to-face interviews, Thandi and Ayanda both said that ICT enhances their teaching in terms of efficiency and effectiveness. Given the above responses and in the light of the provisions of the theoretical framework (UTAUT), it can be resolved that teachers who experience teaching enhancement as a result of ICT are likely to employ the tools in teaching continuously because of their perception that ICT tools are valuable for teaching and learning. In addition, the findings also show that some of the participants believed that when ICT is properly used in the classroom, it can save a lot of instructional time.

This study also found that teachers in paperless schools view ICT integration in the classroom as an important tool for the promotion of learners' active participation in classroom activities. Participants reported that ICT promoted interaction in the classroom. This finding reinforces the outcomes of previous studies that found that

interactivity is one of the affordances of ICT in the classroom environment (Tan et al., 2012). Although I acknowledge the fact that many scholars (Beauchamp & Kennewell, 2010; Blasco-Arcas et al., 2013) have identified different forms of interactivity in the classroom, it is not in the interest of this study to probe or discuss any form of interactivity in much detail. The study only seeks to establish the existence or nonexistence of interactivity between and among key actors as a consequence of ICT integration in the classroom. Beauchamp and Kennewell (2010) posited that "Central to the type of interaction is the relationship between the teacher and the students and the ability of either to provide structure or potential for action both prior to and during the lesson" (p. 761). What is of importance to this study is to ascertain the existence of any form of interaction that can establish a relationship between and among teachers and learners in the classroom because of the presence of technology.

The position of this study concerning classroom interaction aligns with an earlier claim by Buckley (2002) who suggested that the relationship between ICT and learning processes is more in the aspect of interactivity than any other thing. This is in addition to the normal learner-to-learner and learner-to-teacher interaction that usually prevail in normal classroom lessons. According to Blasco-Arcas et al. (2013), the advent of new technologies has drastically changed how learners and the teacher interact in the classroom and has provided new opportunities to enhance interactivity. The integration of ICT into teaching has impacted positively on learners' motivation and rate of interaction in the classroom, as evident in the empirical data discussed in Sub-theme 2.3 (Section 5.3.3). Blasco-Arcas et al. (2013) considered the provision of opportunities that promote interactivity in classrooms as indispensable because they believe that through interaction learners can collaborate and share knowledge that can lead to better and more effective learning. This study found that teachers were excited and really valued the level of learners' participation and all forms of interactions happening in the classroom as a result of ICT integration. Importantly, the findings show that learners could interact with content and with fellow learners both in and beyond the classroom environment which enable them exchange knowledge and promoting of learning. For example, ICT devices, like clickers, tablets, mobile phones and cameras, were found to promote interactivity in the classroom (Caldwell, 2007). In this study teachers also

stated that learners interacted with their tablets, the interactive smartboards and their mobile devices to search for information and to communicate with peers and teachers. This claim is evident in Kabelo's response that acknowledged how ICT is very helpful to him because he can interact with his learners on WhatsApp. Through the use of class WhatsApp groups Kabelo and his learners can interact using their mobile devices to communicate not only in school but beyond. In addition to improving interaction, the findings for individual and focus group interviews shows that ICT tools provide immediate feedback to learners in the course of learning in and outside the classroom. Learners can learn independently with ICT tools and get immediate feedback about success or failure of their learning, even in the absence of the teacher. This also proves that learning is possible beyond the school system. This corroborates with the findings of Blasco-Arcas et al. (2013) about "the use of clickers in the classroom to provide immediate feedback on learners' understanding of the lessons and to facilitate the active participation of students in the learning process by discussing the answers to questions" (103). During focus group interviews participants affirmed that with the introduction of ICT in school learning, learners now do not have to wait for teachers to mark their everyday learning activities because they can embark on their learning using computers and tablets in school or at home and still get feedback on the tasks. Provision of instructional feedback is a characteristic of programmed learning that is based on Skinner's "operant conditioning", a psychological theory of behaviourism (Skinner, 1963). Programmed learning is a progressively monitored step-by-step teaching and learning method that presents learning content to learners in a graded sequence of controlled steps where learners are required to follow the steps to complete the given task. Programmed learning packages are often presented through the use of computers, teaching machines and other forms of technologies that are designed to allow for input and feedback mechanisms. With computers and other forms of programmed machines, learners work through the learning material independently and at their own pace and abilities, thereby affording them the skills of independent study. The machine provides immediate feedback on the task and sometimes provides additional information (The Columbia Encyclopaedia, 2001–2005). Programmed learning is based on the principles of small steps, self-pacing, and immediate feedback.

The use of programmed instruction with computer technology allows teachers to package instructional content for learners to engage with anytime and anywhere.

Participants also admitted to the flexibility of ICT in teaching and learning since it allows users to review and repeat activities and procedures several times without negative implications. Telkom (2015) confirmed that one flexibility of ICT in teaching and learning is that, "It allows both the teacher and learners to utilise and experience the educational material at their own pace with the possibility to pause and repeat it as many times as necessary until they fully understand it" (p. 6). Telkom (2015) further asserted that effective integration of technology into teaching and learning environments afford students to learn new concepts through digital tools at their own pace. Learners can work through examples, discussions, and assignments in class, applying what they have learned.

Even though participants acknowledged the benefits of integrating ICT in their classrooms as indicated above, they also narrated their negative experiences with ICT in teaching.

6.4 The Nature of ICT Integration Training in Paperless Schools

Generally, training is a basic requirement for the development of knowledge and skills among teachers in order to successfully integrate ICT into the teaching and learning process. Training is critical to the implementation of ICT in education, like the e-education initiative in South Africa. However, Bingimlas (2009) observed that mere provision of training for teachers to use ICT tools is not sufficient for effective ICT integration into teaching. Teachers need pedagogical ICT integration training that can prepare them with the requisite knowledge and skills to teach with ICT tools, confidently and effectively.

Interestingly, from the research findings presented in Chapter 5, all the participants unanimously agreed that ICT integration training were available and ongoing in the paperless schools. However, the scope, depth and regularity of the training were not satisfactory. This is revealed in the empirical data (Section 5.4.1) where participants clearly described the nature of training offered to them in schools. By design the training

were aimed at preparing teachers to acquire relevant skills and knowledge for pedagogical integration of ICT into teaching, but apparently the aims of the training were not being reached, as will be discussed in the later part of this chapter.

The findings show that teachers have been provided with different ICT trainings and are still ongoing to a certain extent in the paperless schools. Of concern for some teachers are the scope, depth and regularity of the trainings that were offered by the Department of Education and were not satisfactory. For example, in some schools, teachers feel the training sessions were short and irregular resulting in the disconnection between training and actual practice in the classroom. While some schools had internal ICT committees that conducted training in the schools in addition to the external training, other schools did not have such committees to further assist with the internal trainings. This meant that some teachers were better acquainted with ICT tools and more knowledgeable and skilful than others.

When the participants started their training, their levels of ICT knowledge and competencies varied. Unfortunately, the findings also revealed that even after attending training, significant disparities remained among the teachers in terms of ICT knowledge and skills. The implication is that the training given to the teachers during the implementation of ICT integration in schools had little or no impact on their level of competence, because there appears to be no much difference between their competence before and after attending the training.

They participants said they were receiving some level of support to implement ICT integration in their classrooms. They considered ICT integration training offered in the schools as synonymous to support for ICT integration in the classroom. It is imperative to know that teachers, like all other professionals, need support in the form of training to discharge their roles and responsibilities. Hence, provision of in-service training to teachers may be considered as a kind of support for teachers to play their expected roles in the classrooms. Measured against facilitating conditions in the conceptual model and based on participant's views about getting support in form of training, it may resolve that teachers in paperless high schools are integrating ICT in the classroom. According to the UTAUT, the facilitating conditions around a task are important

determinants of individuals' intention to use or actually use technologies in the classroom (Venkatesh et al., 2003). The facilitating conditions may be material resources or support from various sources that an individual perceive can help him/her to perform a given task effectively. The implication is that where teachers perceive available support from relevant stakeholders, like colleagues, principals, learners and facilitators, they tend to embrace change. In this case, teachers may agree to move away from traditional teaching styles to incorporate the application of ICT in the classroom. On the other hand, when teachers perceive a lack of support to integrate ICT, they tend to resist or even reject any form of change that will lead them to move away from their normal traditional teaching styles to employ ICT in teaching.

It is generally established in the literature (Cox, Cox, & Preston, 2000; BECTA, 2004; Buabeng-Andoh, 2012) that teachers need a range of support, administrative, technical, moral and pedagogical, to be able to adopt and integrate ICT in the classroom. Cox et al. (2000) recounted the importance of giving support to teachers, in particular towards ICT adoption in schools. Cox et al. said:

> Much research by Fullan (1991) and others has shown that the most effective way to bring about the adoption of an innovation in schools is to engage the whole school in a democratic process of planning change. This means that all the teachers are involved in the decision to adopt ICT in the school and are supportive of any individual teacher going on a course and willing to learn from their new knowledge and skills when they return. If the school, and particularly the head teacher, are not committed to adopting change and particularly ICT, then if one teacher goes on a course, the rest of the school sets up antibodies to any new ideas which the unfortunate teacher brings back into the school. The last thing the other teachers will then do is to change their practice. (p. 1)

Expanding the above submission, Similarly, Youssef (2015) suggested that the key to achieving modern educational goals is the level of support given to each of the school administrators, teachers, learners and the whole school community to both understand and manage the changes that new technologies can offer.

In this study, it was found that while teachers seem to be supported by the GDE, they lacked sufficient support from other important sources, particularly from the relevant education stakeholders like school administrators, parents, learners and the local

communities that host the schools. Drawing from previous studies, Hennessy, Harrison, and Wamakote (2010) corroborated the findings that "school administrators offer very little structural support and few incentives to use technology effectively in the classroom" (p.43). The lack of incentives and support for teachers considerably hinder teachers from continued application of ICT in the classroom, which may have a detrimental impact on ICT adoption and integration in schools. Guhlin (1996) also reported that, "Most teachers desire to learn to use educational technology effectively, but they lack the time, access, and support necessary to do so" (p.14). Certainly when teachers perceive problems in the process of innovation, they tend to become hesitant to accept or adopt it.

A classroom is a microsystem within the school system where three major elements namely teacher, learners and technology interact together. Therefore it is imperative to acknowledge that while teachers are supported to employ technologies in the classroom, learners too need similar support also, even if it is not the same as teachers. An effectively working system is ensured when all the components of the system are in harmony with each other. Thus, the findings consensus views about the poor attitudes of learners in the usage of their tablets at all times. This resulted in findings that further strongly suggest also prioritising the training of learners on effective use of ICT devices for educational purposes to ensure that the objectives of the paperless schools project are achieved. I suppose ICT integration can be more effective if both teachers and learners can get support towards application of tools in the classroom.

My argument for the provision of training to all the key actors in the classroom is in line with evidence from both the literature (Youssef, 2015) and empirical data. The findings from the empirical data reveal that many participants expressed consensus views about the poor attitudes of learners in the usage of their tablets. It is in view of this coupled with the fact that the teachers considered it as a critical challenge in the classroom, that I feel learners need to be well guided on how best to use their devices for educational purposes. To further support my view, some participants also believed that learners too need to be trained on effective use of ICT devices and others thought that learners should be given once-off training on how to use tablets for educational purposes.

Drawing evidence from the literature, Youssef (2015,) postulated that:

> Professional development should not only be provided for teachers, but it will also be needed for parents, students and staff in order to avoid future problems and create awareness about managing these technology devices. It is important to help parents understand the challenges they will face with their children in working with new technologies and how to benefit from this new technology devices for educational purposes. This will reduce the complaints and worries parents have about their children working with it and will prepare the community for the new change in education. (p. 1)

Both the empirical data and the literature (Youssef, 2015) provides sufficient evidence that it is a mere illusion to assume that because high school learners are born into the age of technology, they do not need to be guided on the use of technology tools in schools. Although it is indisputable that some learners are already familiar with the use of computers and mobile devices from home, most learners do not use the tools for educational purposes. Four out of the five pilot paperless high schools are situated in township areas, which are characterised by low income and low standards of living. In these areas, basic social amenities like clean water and electricity are often in short supply or unavailable. And most of the learners from these areas have never used these new ICT before; therefore, it is my view that these learners need a basic introduction to using tablets for educational purposes. Although I consent to the idea of providing training to both teachers and learners, I suggest that priority should be given to teachers. Teachers should be given continual and comprehensive quality training by their school authorities or the DoE as part of the teacher professional development programme. My argument is based on my understanding and supported by the thinking of some scholars (Prakash, 2018) suggesting that teachers need comprehensive and sustained professional development opportunities in order to function effectively in this era of IT pervasiveness. I strongly believe teachers need constant training on various aspects of ICT integration because technology keeps changing very quickly. And as long as technology keeps changing, the demands for technology application in the classroom will continue to change.

UNESCO (2016) acknowledged that the process of ICT integration involves various areas related to the key roles of teachers integrating the technologies into their work.

Therefore, teachers need a well-designed training programmed that will equip teachers with relevant ICT knowledge and skills to meet the requirement of their new roles. This calls for continual teacher development in the area of ICT and e-education implementation in schools. Both teachers and learners need to update their technology knowledge and skills to implement desired changes in teaching and learning environments. Previous studies conducted by scholars, Clasquin-Johnson (2011) in South Africa; Chireshe (2006) and Chirume (2007) in Zimbabwe; ActionAid (2004) in Kenya; Kachingwe et al. (2005) in Malawi; Samuel (2004) in India; and Burgess et al. (2010) in Australia, discovered that inadequate resources and poor professional development programmes emerged as major barriers to effective implementation of change in schools, and the same factors are responsible for most teachers' reluctance to apply innovations in the classroom.

Similarly Fatemi (1999) noted that, "Lack of professional development for technology use is one of the most serious obstacles to fully integrating technologies into the curriculum" (p. 5). The implication is that the DoE at all levels needs to design a comprehensive professional development programme for teachers to effectively use modern technologies in the classroom. This is essential because the traditional once-off training sessions and workshops organised for teachers to introduce innovations in schools have proved to be inadequate and ineffective in recent times. Preparing teachers for their new roles in the 21st-century classroom requires a more articulated training programme at both pre-service and in-service levels. Prakash (2018) posited that teachers require sustained and continual in-service training that can meet the requirements of their new roles, i.e. a programme that makes technology an integral part of their professional lives.

From the empirical data obtained in this study and based on my personal informal observation in the schools I visited, it is clear that schools lack a comprehensive professional development programme that incorporate pedagogical ICT integration content. I observed that in some schools teachers were given training occasionally, i.e. only when the need arises, hence there is lack of continuity in training. The lack of continuity in training creates gaps that promote improper implementation because of lack of follow-up. This is evident in the empirical data (Section 5.4.2) where participants

stated that training is conducted in their schools only when something new is introduced in the schools or when new equipment is supplied to the school. Given the above scenario, pedagogical ICT integration cannot be sustained in such schools. Wright (2014) suggested that:

> Whatever training and professional development opportunities that are provided to teachers must be long enough for them to grasp the concepts behind teaching with technology, to have hands-on experience using the technology, and to revise or develop one lesson that they can use when they return to their classroom or online environment. (p. 2)

Given the nature of ICT as hands-on tools that require constant use and practice, the need for continued training and retraining of teachers on the use of ICT in the classroom cannot be over emphasised.

6.5 Challenges Associated with ICT Integration in Paperless Schools

The implementation of ICT integration project involves some challenges because it requires a period of time to accomplish, involves different stages of planning and action, and is anchored by different stakeholders playing different roles at the different stages of both introduction and implementation. Within the South African context, the introduction of ICT into high school classrooms is an innovation that comes with various challenges especially during the implementation stage when many stakeholders and material resources are involved in a systematic way. This is evident in the findings as concerns and different challenges like the dearth of LMS in the schools, lack of baseline research to ascertain the feasibility of introducing ICT in schools as an innovation, inadequate supply of relevant ICT resources and facilities like tablets and smartboards in some schools, and learners' poor attitudes are some of the challenges. Some of these challenges are not new as some authors have identified others, for example, Mndzebele (2013) and Mdlongwa (2012) reported that there are a number of challenges that make it difficult to integrate ICT in schools across South Africa. Some of these challenges include the language barrier, ineffective security of computers and other facilities at schools, lack of adequate ICT resources in schools, teacher resistance to change, poor maintenance culture on available facilities and infrastructure, lack of

Internet connectivity in schools and insufficient funds allocated to acquire and maintain ICT tools and facilities are some of the challenges. Some of the challenges peculiar to the context of the study mentioned by the research participants include and are discussed in the sections below.

6.5.1 Lack of Learning Management Systems (LMS) in Schools

There is dearth of LMS in virtually all the paperless schools. LMS is a computer system designed to manage, distribute and allow effective collaboration between the teacher and learners in a physical and virtual school system (Rotimi & Oluwafemi, 2016). LMS is very important to the success of the paperless school system because "it allows the management of every aspect of a course, from the registration of students to the storing of test results, as well as allowing the teachers to accept assignments digitally and keep in touch with the students through various communication formats" (Rotimi & Oluwafemi, 2016, p. 1). In addition, LMS is cost effective, time saving and reliable in the delivery of educational content. It is particularly helpful in education for online lessons and in supplementing traditional classroom-based courses. Unfortunately, so far the government has not been able to establish any operational LMS in any of the paperless schools. Hence, participants considered the lack of LMS as a big challenge because there was not the desired synergy between the various facets of the schools. However, despite the advantages associated with the use of LMS in education, its implementation in schools is also associated with some challenges that perhaps make it unavailable in most schools. For example, the high cost of acquiring and maintaining LMS equipment in school is too high to be afforded by every public secondary school that rely on government for funding. Other factors that may militate against the implementation of LMS in schools, within the context of this study, are electricity power supply, Internet connectivity failure, difficulty in integrating ICT to teaching and learning, insufficient teaching time, and lack of qualified ICT and maintenance personnel.

6.5.2 Inadequate Supply of Tablets and Smartboards in Some Schools

Empirical data also indicated that the participants said there was an inadequate supply of tablets and smartboards in some schools. Even though all five schools investigated

are designated as paperless schools, it is only in principle because the roll-out of the project is still in course; hence, some schools are still under-resourced in terms of ICT tools and facilities. As a matter of fact, some of the township schools do not have secured infrastructures that can accommodate effective implementation of ICT integration to a paperless standard. Not all learners in all the schools have tablets for learning, and even those that have tablets (Grades 11 and 12) loose them to theft and damages, thereby rendering the learners incapacitated to learn with ICT as expected.

6.5.3 Lack of Baseline Research of the School Contexts

Linked to the lack of adequate resources in the schools is the lack of baseline research to inform planning and implementation of the paperless project in relation to distinct school contexts. A baseline study is a study that is done at the beginning of a project to establish the current status of a population before a project is rolled out (Monitoring and Evaluation Blog, 2013). “The purpose of a baseline study is to provide an information base against which to monitor and assess an activity’s progress and effectiveness during implementation and after the activity is completed” (Cram Essay, 2012,p.1). In view of the uncertainties that are prevalent in different school system contexts, it is important to gain understanding of the general and specific dynamics of schools before introducing new policies or projects that are aimed at school improvement. Conducting a baseline study is the first step before commencing any project implementation. Through baseline surveys key information about different variables that have the potential to influence the project or policy implementation is uncovered. A baseline research survey provides the basis for effective planning and for subsequent monitoring and evaluation of the project (Cram Essay, 2012). Most of the research participants considered the lack of a baseline study a big drawback to the achievement of the project goal and objectives, even though most of the paperless schools depend on government for provision of ICT infrastructure, facilities and tools. Participants believed that if a feasibility study had been done prior to the introduction and implementation of the project, government would have been able to ascertain existing contextual peculiarities of the schools and to take appropriate steps that might have curtailed some of the challenges that were being experienced in almost all the schools as a result of

ICT. In the same vein, findings from baseline research would have provided useful information about the specific needs of each school, thereby avoiding the problem of insufficient resources.

6.5.4 Lack of Prior Consultation with Relevant Stakeholders

Linked to the lack of base line research is the lack of prior consultation with relevant stakeholders like teachers, parents, schools host community leaders and important others before government resolved to embark on the ICT integration initiative in public schools. The exclusion of relevant school stakeholders made the implementation of integrating ICT in schools to be perceived as foreign and inappropriate because the majority of stakeholders did not seem to understand the government's vision. They also failed to understand the importance of the innovation towards meeting the learning needs of their children in schools. Thus, in most of the schools the participants held the view that the then current problems in the implementation process of the project were as a result of the improper conception, planning and introduction of the project in schools, and particularly, in the classrooms.

From the empirical data, it appears that some of the participants thought that the idea of introducing ICT in schools was the sole decision of political leaders in the province, especially the MEC of Education, because there was no input from other education stakeholders like teachers and parents. Perhaps the MEC's decision was informed by his political will to make significant innovative improvements in the education system. Although the political will of the government is important to the implementation of ICT integration in school in terms of funding, training, facilities and infrastructural provisioning, it is not enough to ensure the successful implementation. Inputs from other stakeholders are equally important because, after all, ICT implementation is a systematic process involving several people playing different roles towards the same goal. Wadesango and Bayaga (2013) and Lilly (2012) asserted that teacher participation in decision-making in education does not only help in ensuring success in the implementation of policies, curriculum and innovation, but also lead to many advantages in schools. For example, Wadesango and Bayaga (2013) posited that when

different relevant stakeholders participate in making policies or decisions in education, the following benefits emerge:

> It makes the policies and the decisions more likely to be acceptable and implemented because they reflect and serve the interest of all stakeholders responsible for implementing them, it also increases and sustain trust between the top management staff and the field staff who implement the policies. (p. 1690)

Furthermore, Wadesango and Bayaga (2013) and Khoza (2003) enumerated some specific advantages associated with allowing teachers participate in decision-making in education, which include, but are not limited to, the following:

> It enables teachers to become active participants in school management processes, which consequently allows teachers to share and pursue the school vision. It enables teachers to be highly motivated to carry out their responsibilities. And it enables teachers to partake and make reasonable contributions to professional development decisions that affect them. (p. 1689)

Similarly, the role of parents in education decisions cannot be overemphasised because their participation may contribute in no small measure to the formulation of relevant policies that may serve the interest of society. A study conducted by Anderson and Minke (2007) found that parents' involvement in education is associated with many educational achievements in schools. They reported that, "There is a causal relationship between parent involvement in education decisions and higher learner achievement in school subjects, lower dropout rates, increased ability to self-control and higher level of social skills among learners" (p. 1).

6.5.5 Learner's Poor Attitude to Possessing ICT Learning Devices

Most teachers experienced challenges with classroom management and control due to inappropriate use of tablets possessed by learners. Teachers complained about learners' attitude to use and handling of tablets in the classroom. Most teachers believed classroom management had now become more difficult due to the deviant behaviours of learners in the classroom. Findings revealed that learners engaged in downloading and playing games, music and videos instead of researching educational content with their tablet. Perhaps this requires that teachers ought to be aware of their

new roles as facilitators of learning and not traditional transmitters of knowledge any longer. In a study titled “The Distraction of Technology in the Classroom”, conducted in New Zealand, Goundar (2014) found that “students are more interested in online resources, such as Facebook, game sites, chat and YouTube, than in classroom lectures and textbook chapters about computer science and other subjects”(p. 14). In view of the evidence from both the empirical data in this study and the literature, it suggests that the phenomenon cuts across countries, education levels and races.

Beside the challenges enumerated and described by teachers during both individual face-to-face and focus group interviews, teachers also expressed their fears and concerns about the introduction and implementation of ICT integration in schools. It is normal for individuals to entertain fears, suspicions, exercise resistance and express concern about any form of change introduced into a system. People, including teachers, are always afraid to accept new innovations or to agree to change easily from their usual way of doing things, especially if they are not too sure of the efficacy of the new innovation. This feeling of uncertainty breeds fear and suspicion, and fear leads to resistance to change. Sahin (2006) noted that uncertainty is an important obstacle to the adoption of innovations in every system. Sahin further stated that uncertainty is a creation of the perceived consequences of innovation. According to Rogers (2003) “consequences are the changes that occur in an individual or a social system as a result of the adoption or rejection of an innovation” (p. 436). In order to mitigate or reduce the rate of uncertainty of adopting the innovation, Sahin recommended that individuals should be educated about the advantages and disadvantages so as to make them aware of all the consequences of the innovation.

It is understandable that everyone has some concerns about change and identifying these concerns is critical to the success of any change effort (Hall & Hord, 2001). As a matter of fact, neglecting or overlooking these concerns may be counterproductive to change. Unfortunately, neither the government that initiated and introduced ICT into schools nor the school administrators vested with the responsibility of managing and administering the change process have taken the time to identify and address teachers’ concerns or grievances about the new innovation introduced in schools. Until teachers and all other stakeholders are included in making decisions that affect them, teachers

will be bewildered and continue and to ask questions about what, how, when and why is ICT necessary in classroom for pedagogical processes?

6.6 Factors that Influence ICT Integration in Paperless Schools

Several factors are found to influence ICT integration at various levels in different school contexts. Tedla (2012) conducted a study using a synthesis of literature, observation and focused group discussions with scholars on the use of ICT in primary and secondary schools in East African countries, with a particular focus on understanding the importance of, impacts of, and barriers to ICT integration into classroom instruction. Tedla reported that there are several factors that promote or inhibit the use of ICT in classroom instruction, and he classified and discussed these factors under three main categories namely school based factors (i.e. internal to the school), community based factors (i.e. external to the school but within the school community context), and teachers' personal issues (i.e. factors related to the teacher as an individual). Tedla further noted that although the impact of each factor could be different on ICT integration efforts, all the factors greatly affect the use of ICT directly or indirectly. In this study these factors were also identified and played various significant roles in either enabling or disenabling ICT integration in paperless schools.

During individual and focus group interviews in the five schools, the participants remarked that regardless of infrastructural provisioning and the availability of ICT facilities in schools, pedagogical integration of ICT into classroom was still influenced by some teacher-related and context-related factors. Chief among the teacher-related factors that participants mentioned were the age, attitude and experiences of teachers.

6.6.1 Age of Teachers

Based on Tedla's (2012) classification, teachers' age and teaching experience may be regarded as teachers' personal issues. In this study, the findings show that age and previous experiences of teachers to technology define their attitude towards change or innovations in school. When participants were asked to state the factors that influence teachers to integrate ICT in classroomks, findings show that teacher's chronological age was an important factor. Based on the findings, teachers' attitude towards ICT

integration is influenced by their age because participants assume that the learners are already in the age of technology, so teachers that are in the same age brackets with the learners are more likely to use technology than the ones that are not in the age of technology. In the same vein, teaching experience is also considered a significant influencer of ICT integration in the classroom. Some participants are of the view that teaching experience does affect ICT integration because teachers with 20 years teaching experience will respond differently to the introduction of ICT in the classroom because with all that is happening in the 20 years of teaching and then the sudden introduction of ICT now is a total different story. Participants also believe that one of the factors that prevent ICT integration in classrooms especially in paperless schools is that when ICT integration started in the schools, older teachers were feeling alienated from the use of technology to teach in the classroom. This is not the case with younger teachers in the same schools; hence it shows that age affected the adoption and integration of ICT in paperless school classrooms. Similarly, a study that was conducted in the Eastern Cape of South Africa with a focus on the Challenges, benefits and recommendations of ICT as a means of enhancing education in schools in South Africa, Mdlongwa (2012) found that some of the older teachers were struggling to adapt to using ICT in the classroom as compared to the younger teachers. A study conducted by the National Centre for Educational Statistics in 2000 cited in Tedla (2012) reported parallel findings. The report revealed that, “Teachers with fewer years of teaching experience use computers more than teachers of longer teaching experiences” (p. 202). In this study some participants expressly stated that teachers’ age is indeed a relevant factor that influences ICT adoption in the classroom because they believe some teachers and learners are more ICT savvy than others. Participants also asserted that South African high school learners and the younger crop of teachers are more conversant and friendlier to the application of ICT in classroom tasks and other activities than their older teacher counterparts. This conforms to similar findings from a study on the evaluation of ICT knowledge and skill levels of Western Australian government school teachers. The study “found that males, younger teachers, teachers with less teaching experience and secondary school teachers are more likely to have higher levels of ICT competence” (Trimmer, 2012, p.21). Evidence generated during individual

face-to-face interviews in the schools shows how one of the participants presented her position based on the conviction that teachers' age influences ICT integration in the classroom. This seems to justify the differences in ICT integration in classrooms among teachers in paperless school as noted and reported in the findings of this study. .

6.6.2 Teachers' Attitudes to Change

It is not an easy task to attempt to convince teachers to change from their usual way of teaching and adopt a new way with new tools. Change is a difficult and gradual process that requires time and persuasion (Rogers, 2003) for teachers, like all others. According to Hew and Brush (2007) and Nyaumwe (2006) teachers play a major role in successful technology integration and utilisation in education and particularly in the classroom environment where learning is often facilitated. The attitudes of teachers always come to bear on them playing their roles in the classroom. Anghelache and Benţea (2012) defined attitude to change as "A process of transformation, alteration or reorientation of the general attitudes of an individual or a group, by modifying the elements or rapports that favoured their original formation" (p. 599). So teachers' attitudes to change constitute a significant factor that affect ICT adoption in school as well. Anghelache and Benţea described attitude as a dimension of personality that transpires in the individual behaviour in relationship with others or certain situations. Teachers as human beings possess attitudes and dispositions about and react differently to other people, issues and situations around them. According to Liu and Szabo (2009), there is always a difference between human factors, like attitude, and actual implementation of technology integration into the curriculum. This is evident in previous social studies like the TRA propounded by Ajzen (1988) where it is proved and reported that attitude has been found to be a significant determinant of an individual's behaviour. Ajzen (1991) described human attitude as the degree to which the person has a favourable or unfavourable evaluation of future behaviour or action, which implies that attitude determine an individual's course of action. Hence, Liu and Szabo (2009) reported that, "Teachers' attitude has been found to be a strong motivation mediator in predicting teachers' intention to use computing technology" (pp. 6–7). The study found that positive attitudes of teachers towards technologies usually push them to use technology

more often in the classroom, while negative attitudes often discourage them to use technology in the classroom. Liu and Szabo further stressed that not only do teachers' attitudes or beliefs predict intention to use technology, but it also impact on its adoption and implementation in the classroom. The above claim is supported by Ajzen's (1988) TRA which postulated that human attitude is an important determinant of human behaviour or action. Participants acknowledged that teachers' attitudes are indeed a problem to ICT adoption but believed that attitudinal change is required of teachers to accept and benefit from the new innovations introduced into classrooms. Bingimlas (2009) acknowledged that teachers' resistance to change and negative attitudes constitute significant barriers inhibiting ICT integration in the classroom. In the same vein, Player-Koro (2012) reported that, "Research in the area of teachers' use of ICT in education sees attitudes as having either a direct or indirect influence on a teachers' use of technology in classrooms" (p. 96). Player-Koro believed attitudes have strong influences on the ways people interact as members of organisations and groups. The Diffusion of Innovations Theory by Rogers (1995) provided a detailed explanation of this view: The theory posited that people who adopt and choose to use new innovations such as ICT are those who have positive attitudes to ICT tools. The theory is relevant for explaining the process that makes teachers accept or reject the use of ICT in their classrooms (Chang & Tung, 2008; Hermans, Tondeur, Van Braak, & Valcke, 2008).

Human attitude is an important predictor of behaviour or action as suggested in TRA (Ajzen, 1988), and evidence to support this also abound in the literature and from empirical data generated in this study. Therefore, in view of the importance of teachers' role in ICT adoption, it is imperative to understand and adequately address teachers' needs, concerns and attitudes before introducing change in the classroom (Lawless & Pellegrino, 2007). This is important because the impact of any intervention brought into schools can only lead to the desired changes in the classroom when teachers' needs and concerns are sufficiently addressed (Pepe, 2016). Furthermore, we must understand that positive change does not only occur in the classroom as a result of the knowledge that teachers gain from professional development activities, but change occurs when teachers can shift their attitudes and beliefs from what they already know and practice over time to the current knowledge and practices that are acceptable

(Southwest Educational Development Laboratory, 2015) and also when teachers value teacher training (Inan & Lowther, 2010).

6.6.3 Internet Connectivity

Another significant factor influencing ICT integration in classrooms as identified in this study is Internet connectivity which is also linked to electricity supply. This is a very important factor that not only influences ICT adoption in every school context, it also determine the success and/or failure of teaching and learning and the implementation process. During individual face to face interviews the findings show that the strength of connectivity is a challenge to teachers when attempting to integrate ICT in the classroom because Shaka in school C stated that "in some cases if you want learners to interact with the smartboard it actually requires internet connectivity, and also in most cases I can say I am relying on the internet mostly because the type of learners we are having recently …are not like the learners we had previously in terms of picking skills". Similarly Thandy in school B confirm that they are mainly confronted with connectivity problem in their school. She stated that "we do experience internet connectivity problem because all of us try to use it at the same time, sometime the system stops because the server is overloaded". In the literature, Internet connectivity and electricity supply have always appeared at the top of the list of factors that affect ICT adoption in schools. Wright (2014) argued that about 70% of people living in sub-Saharan Africa, which includes South Africa, do not have easy access to electrical power. This lack of regular electricity supply negatively influences how electronic educational resources are put to use in schools.

South Africa is a developing nation on the continent of Africa and is not yet self-sufficient in bandwidth as well as electricity supply that can serve its entire population. Schools located in townships and rural areas of South Africa are still confronted with these daunting challenges due to unequal distribution of basic utilities across the population. The rate of inequality in South Africa is quite alarming, such that recently in March 2018, the World Bank reported that South Africa is one of the most unequal countries in the world by any measure because in South Africa inequality has been steadily high and persistent since 1994. The reports stated:

> "With the consumption expenditure Gini coefficient of 0.63 in 2015, South Africa is the most unequal country in the world and incomes are highly polarized. The country is characterised by high wealth inequality and low intergenerational mobility which arise from high income inequality and inequality of opportunity for children" (Sulla, Victor, Mikhail, & Precious, 2018, p. 2)

This scenario of inequality described in the above quote is reflected in all spheres of the South African society, including the school system. For instance, in South African townships, electricity supply is still erratic and bandwidth is too low and slow to meet the needs of schools where electronic devices are regularly operated. This provokes the question of what truly motivated government to introduce ICT in these schools located in communities that are apparently faced with challenges of social amenities and infrastructure. The reason for above question justifies the importance of conducting baseline research and involving the relevant stakeholders prior to the implementation of the project in schools, which appears to be lacking in the paperless schools that were investigated.

The situation described above has led some schools to be confronted with more problems in the classroom, since chalkboards have physically been removed from classrooms to discourage teachers from using traditional teaching tools and practices. While most schools in urban areas can remain consistent in the application of ICT in the classroom, teachers in township schools remain frustrated due to erratic power supply and poor Wi-Fi and Internet connectivity. Wright (2014) pointed out that:

> The challenge for all countries in the developing world is delivering the last 'mile' of connectivity to homes for a reasonable cost … increased Internet accessibility and increased bandwidth are unlikely to occur without commitment by governments and the involvement of private enterprise such as the mobile phone operators. (p. 1)

Interestingly, at the inception of introducing computers into the education system of South Africa during the 1990s, a reasonable number of schools, mainly in urban areas, enjoyed the benevolence of private mobile phone operators such as Telkom, Vodacom MTN, Multichoice, SchoolNet SA and several other companies. These companies supplied and supported computer programmes in schools. But unfortunately, such support is no longer available in public schools today. Apparently rural schools were

marginalised in getting initial access to ICT for learning, which further increased the existing inequality between rural and urban schools and by extension the citizenry. Although there are research projects seeking to ascertain the feasibility of integrating ICT in rural schools, like the ICT for Rural Education and Development in ICT4RED, Cofimvaba, Eastern Cape, there is not a deliberate effort to roll out ICT in rural schools in South Africa yet. Unfortunately, this continued neglect of rural schools in ICT integration may be a draw back on the realisation of the overall goal of e-education in South Africa.

6.6.4 Time/School Timetable

Teaching time and timetables are significant influencers of ICT integration in every school because of the shift from an old classroom environment where traditional teaching methods are used to a new classroom environment redesigned to accommodate new teaching and learning technologies. The new approaches to classroom teaching and learning with ICT tools require ample time to plan and execute. In this study it is indicated in the empirical data that despite the introduction of new teaching approaches and the installation of ICT facilities in the classroom resulting in a new classroom environment, the teaching and learning time on the school timetables have not significantly changed in most of the paperless schools. This situation leaves both teachers and learners struggling to adjust to new realities of teaching and learning using new tools with an old timetable. Eventually, both teachers and learners get frustrated and fail to complete class tasks or even fail to use ICT in the classroom at all. In order to avoid these kinds of problems, Hew and Brush (2007) once suggested that schools should change their timetabling schedule to increase class time from single period sessions to double period sessions as a strategy to overcome some school-level barriers to ICT integration in classrooms. The lack of compatibility between the school time table and the new requirements of ICT integration in classroom teaching and learning was recognised by all the research participants in all the schools. In view of that, Bongani suggested during his individual face-to-face interview that the current challenge of time allocation and timetabling in paperless schools can be addressed more effectively through the introduction of an LMS in each school. However, he

cautioned about the high cost of the LMS, which could be the reason LMS is still not available in any of the paperless schools.

6.6.5 Support

Both empirical data and the literature has indicated that provision of the right kind of support system and relevant resources give rise to the right facilitating conditions that is needed to integrate ICT in the classroom (Venkatesh et al., 2003; Davis, 1985). In this case, support can be in the form of training, motivation or provision of facilities that support teachers and learners to use ICT. One of the four constructs of the UTAUT framework (Venkatesh et al., 2003) is facilitating conditions which regard and highlight the importance of support and provision of relevant resources as essential factors that determine why people may accept to use new innovations or otherwise. This implies that availability of different kinds of support and resources in the school are important factors that influence teachers to accept to teach with new technologies. It also means that if support and resources are not available or insufficient in classrooms or schools, teachers are not likely to adopt the use of new innovations in school. In this study, it is evident in the empirical data that teachers in some of the paperless schools received some kind of support while other schools did not enjoy any form of support apart from the training that were offered to them in their respective schools.

The quality of training offered to teachers as implementers of innovation in the classroom makes a significant impact on the integration process. Likewise, the quality of trainers facilitating training in schools determines the quality of knowledge and skills that teachers will get to innovate in the classroom. Poor training facilitated by incompetent trainers usually impact negatively on teachers' zeal and ability to integrate ICT into classroom teaching. Therefore, teachers need to be adequately supported by empowering them with relevant technology knowledge and skills to be able to adopt innovations more effectively.

Alluding to the scholarly works of several scholars (Hsu & Sharma, 2008; Jedeskog, 2005; Nivala, 2009; Pelgrum, 2001; Peralda & Costa, 2007; Teo, Chai, Hung, & Lee, 2008; Player-Koro, 2012) who reported that limited expertise of ICT use and other

factors such as teachers' beliefs and knowledge about how to integrate ICT into teaching are responsible for the slow rate of ICT integration in schools in Sweden. Similarly, empirical data has indicated that in paperless schools teachers seem to have limited expertise regarding ICT use and limited knowledge of how to integrate ICT into teaching because of the limited capability of trainers in schools. Some of the trainers facilitating training were not competent enough to facilitate the training because the majority of them possess knowledge and skills of computer operation only. Because the trainers lacked pedagogical competence, they often resorted to teaching basic computer skills only to teachers. Meanwhile, teachers were expected to acquire both technological and pedagogical knowledge to be able to integrate ICT in the classroom. Raman (2014) noted that most of the frameworks employed to integrate ICT in classroom focus on general pedagogy, which is practically insufficient for teaching and learning in modern classrooms where different forms of technologies are deployed to facilitate teaching and learning. It is in view of this reality that Koehler and Mishra (2008) and Mishra and Koehler (2006) developed a framework describing seven kinds of knowledge that teachers need to possess for effective ICT integration in classrooms. According to Koehler and Mishra (2008), teachers are required to have sufficient pedagogical knowledge, content knowledge, technological knowledge, pedagogical content knowledge, technological content knowledge, technological pedagogical knowledge and technological pedagogical and content knowledge.

Based on the responses of the participants on the nature of training in schools, it is not likely that pedagogical integration of ICT can be achieved with the basic computer operation skills offered to teachers, as claimed by some participants. I have carefully noticed how government, through the DoE, often engage people with computer science knowledge or skills to train teachers on ICT integration over the years. Their argument is often based on the wrong premise that ICT integration in the classroom is all about the use of computers to teach. Although there is no clear distinction in general usage between ICT use and ICT integration, it is still important to know the epistemological and pedagogical difference between ICT use and ICT integration in classroom teaching as discussed in Section 2.6. For this reason, I think it is apt to always employ the right manpower in training teachers to integrate ICT into classroom teaching. I suggest that

professionally trained teachers who have acquired the epistemological and pedagogical competence to train should be employed to train their colleagues. This is fundamental if teachers in high schools must get the appropriate competencies required to effectively adopt ICT our schools. The right manpower is available in colleges and faculties of education across universities and yet others are in certain high schools where the teachers are already grounded in integrating ICT into teaching and learning.

The above scenario calls for the need to have the right calibre of human resources in and outside the schools to champion ICT integration. This involves having the right crop of teachers that are skilled and knowledgeable in both technology and pedagogy to drive the innovation process at the school level. It also requires having the right calibre of training facilitators that are equally knowledgeable and skilled to train teachers for pedagogical ICT integration in the classroom. This means that training should be driven by pedagogical integration motives and not by mere use of ICT tools to support teaching. Providing the right kind of training by trainers constitutes a social influence on teachers as implementers of an innovation in schools. According to Venkatesh et al. (2003), teachers are surrounded by social influences that dictate how they implement innovations in schools. The UTAUT model (Venkatesh et al., 2003) posits that social influence denote “the degree to which an individual perceived that important others believe he or she should use the new system” (p. 451). Based on the UTAUT model, social influences that involve human capital are as important as facilitating conditions in schools. Therefore the relationship between teachers, principals, training facilitators and district officials do influence the way teachers adopt ICT in school. This is because all the relevant stakeholders place some level of expectation on the teachers. Teachers are quite aware of these expectations, as evident in the empirical data generated in the study. Excerpts from individual face-to-face interview transcripts illustrating this indicated that the participants believed there are high expectations on them to perform better than other schools that are not paperless.

6.6.6 Material Resources

The issue of resources features prominently in the empirical data as one of the factors that influence integration of ICT in schools. Resources can be broadly classified into two major categories namely human resources and material resources. Most of the participants made remarks about the influence of both available and lack of material resources for ICT integration in schools. Surprisingly, none of the participants acknowledged the influence human resources can have on ICT integration. Perhaps the participants took for granted the issue of human resources, notwithstanding their complaints about the competence of some trainers. A careful overview of the participants' submissions suggest that adequate supply of relevant material resources do positively influence teachers to embark on continued application of ICT tools in their teaching task. This means that teachers are often stimulated to utilise ICT tools in their lessons in the presence of favourable facilitating conditions in the classroom. Conversely, teachers get discouraged from the use of ICT tools to teach when classroom conditions appear to be unfavourable in terms of tools, facilities, equipment and skills. Although the participants did not mention human resources like training personnel and subject facilitators from the GDE as significant factors that influence ICT integration in school, the role of training facilitators cannot be overlooked because training remains an important determinant for success in ICT integration in schools.

6.7 Synthesis of Findings

It is interesting to note how all five themes are implicitly and explicitly interconnected to each other, thereby generating a coherent body of findings. As discussed earlier, the findings have shown that teachers have different understandings of ICT integration in the classroom. These understandings are found to be as a result of the respective school contexts and ICT resources available in the schools. The school context and its resourcefulness likewise determine the type of experiences teachers get while integrating ICT in their classrooms, which further inform their beliefs about the role of ICT in teaching and learning. In view of their experiences with ICT tools in the classroom, some teachers believed that when properly integrated, ICT enhanced their

teaching. Furthermore, other teachers believed ICT tools save teaching time and promote interaction between teachers and learners and among learners in the classroom. On the other hand, some teachers were of the view that although ICT integration is important in facilitating teaching and learning processes in school, ICT tools constitute a distraction during teaching and learning in the classroom, where learners were found to be playing games, music and watching movies during lessons.

In view of the fact that effective utilisation of ICT tools require some level of related knowledge and skills to operate, training becomes very essential. The findings have shown that even though teachers are exposed to training for ICT integration in schools, there seem to be disparities in terms of regularity, depth of content and progression, thereby leading to diversity and differences in teachers' understanding, beliefs and experiences around ICT integration in different school contexts.

It is established in the study that the schools that participated in this study are located in different community contexts with different socio-economic characteristics that likely present different challenges to ICT integration in schools. Although the majority of the schools are located in South African township areas, one of the schools is in an urban area of Johannesburg. Nevertheless, even the township paperless schools appeared to have different contextual characteristics because they are located in different township areas in Gauteng.

Some of the challenges limiting ICT integration in school are found to be contextual in nature. For example, while schools located in township areas were faced with electricity and Internet connectivity issues, the urban school was not limited by such challenges. In the same vein, while township lacked adequate support from community, parents, learners and even some principals to integrate ICT, teachers in the urban school received full support all stakeholders, especially from the school management and the parents (see Thandi and Bongani in Section 5.6.5). Notwithstanding the contextual relatedness of challenges inhibiting ICT integration in schools, certain factors that have direct links with context also influence ICT integration in schools (see Section 5.6 and 6.6). These factors that are identified as teachers' attitude to change, teacher's age and years of teaching experience, time and timetables, institutional support and general

resourcefulness of schools are contextual and relative. These factors directly and indirectly influence teachers' understanding of ICT integration and impact on teachers' experiences of ICT integration in the classroom. They also determine the frequency and depth of training as well as type and level of support that teachers get in their schools. Likewise, these factors determine the type of challenges prevalent in schools and how the challenges limit ICT integration. The relationship between the findings is illustrated schematically in Figure 6.1 below.

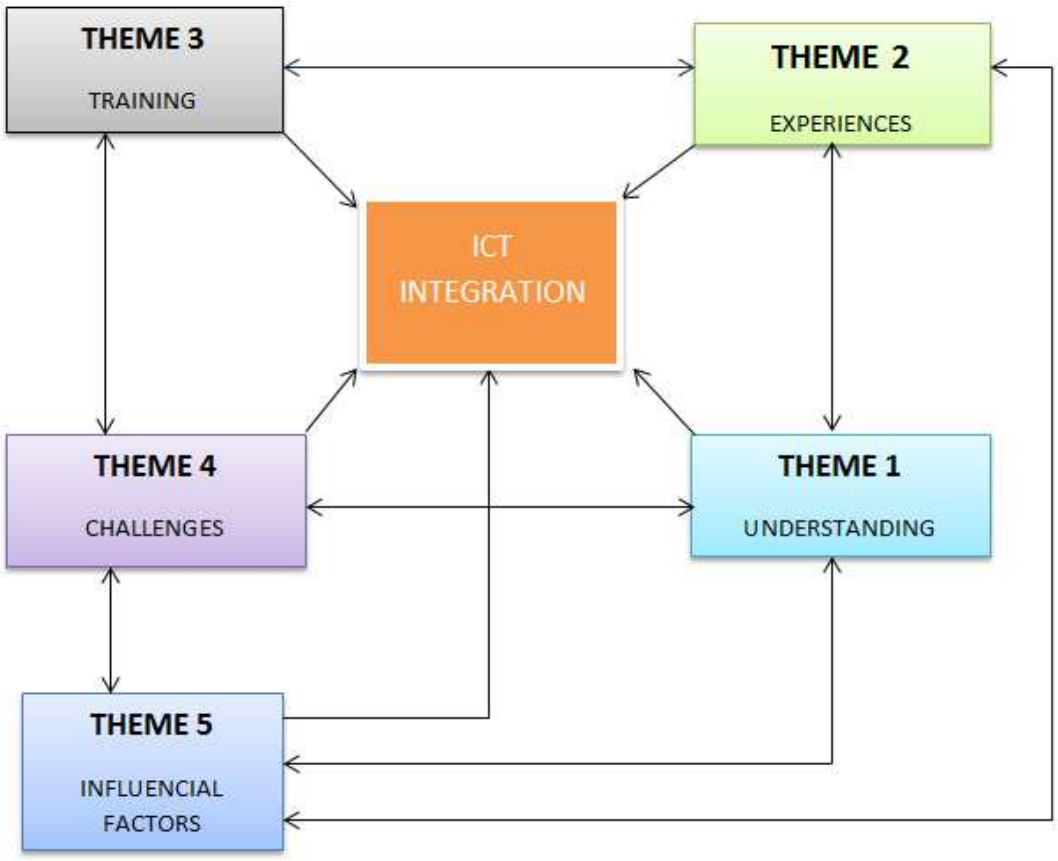

Figure 6.1: Thematic Relationship of Findings

The schematic diagram in Figure 6.1 illustrates how the five themes impact on each other and how each theme also impacts on ICT integration. While some themes impact ICT integration explicitly, others do implicitly. However, both implicit and explicit effects are found to be significant on ICT integration. The complexity of these relationships is

complicated involving explicit and implicit complexity beyond the comprehension of how they appear schematically. Table 13 shows the type of relationships between the themes and ICT integration.

Table 13:

Types of Relationships between the Themes

S.No.	Elements	Type of Relationship
1	Theme 1-Understanding and Theme 2-Experience	Implicit
2	Theme 2-Experience and Theme 3-Training	Explicit
3	Theme 3-Training and Theme 4-Challenges	Implicit
4	Theme 4-Challenges and Theme 5–Influential factors	Explicit
5	Theme 1-Understanding and ICT Integration	Implicit
6	Theme 2-Experience and ICT Integration	Implicit
7	Theme 3-Training and ICT Integration	Explicit
8	Theme 4-Challenges and ICT Integration	Explicit
9	Theme 5–Influential factors and ICT Integration	Explicit

From the foregoing, I concluded that there are explicit (open) and implicit (close) relationships between the five different components of findings, that is teachers' understanding of ICT integration, teachers' beliefs and experiences around ICT, ICT integration training, challenges to ICT integration, and contextual factors that influence ICT integration in school with actual integration of ICT in the classroom. This implies that ICT integration is not influenced independently by explicit factors like resources, training and contexts as commonly reported in literature, but that ICT integration is also influenced by implicit factors like teachers' understandings of ICT integration, teachers' beliefs about the role of ICT in teaching and learning, teachers' experiences of integrating ICT in the classroom, and attitudes in an interrelated fashion. This means the relationships between the factors that lead to ICT integration are not strictly linear but interconnected. Both the factors and the processes are mutually interrelated and interdependent. This has implications for design, planning and implementation of ICT integration projects in schools. Most previous studies acknowledged the relationship and influences of teachers' knowledge, beliefs, and experiences, training support, and contextual factors as important impactors of ICT integration in schools and in different contexts. However, they fail to report the nature of the relationship between and among

the factors as mutually interrelated and interdependent. The findings of this study have succeeded in addressing the gap in literature.

6.8 Summary of the Chapter

In this chapter, I represented the findings obtained from Chapter 5 in a thematic fashion. Findings linked to each of the five themes were discussed in great detail. The discussion of each theme was aimed at addressing a particular research question in a chronological way, that is, from question 1 to question 5. Hence, the chapter discussed the findings based on the empirical data generated, supported with relevant literature and the theoretical frameworks that support the findings. The discussions provided a deeper understanding of the phenomenon, given that it revealed how ICT integration in South Africa's paperless schools is understood differently by teachers in schools.

The mixed experiences (negative and positive) of teachers during the application of ICT tools in the classroom also led them to having mixed feelings about the efficacy of the tools to support teaching and learning. While some teachers saw ICT as tools that enhance teaching and learning, others saw ICT as tools that distracted both teachers and learners in the classroom.

Challenges associated to training, context, teachers and learners during the ICT project implementation process are traced to lack of adequate knowledge of teachers and learners' capabilities and deficiencies. Adequate information about schools and community contexts prior to the introduction of the innovation is also lacking.

The findings also showed that the implementation of ICT integration in schools is often influenced by certain factors such as age of teachers, teachers' attitudes to change, Internet connectivity, school timetables, support, and material resources. In this chapter I also tried to synthesise all the findings to give a coherent whole picture of the implementation of ICT integration in paperless schools in the Gauteng province.

Considering the participant's responses, which reflect authentic views of teachers' implementing ICT integration in schools, and the aim of the study to understand teachers' beliefs and their experiences around ICT integration in schools, there is a need to suggest a framework for effective ICT integration based on contextual

peculiarities of schools in South Africa. The next chapter is the final chapter of the thesis and provides the summary, recommendations and conclusion of the thesis.

CHAPTER 7

OVERVIEW, RECOMMENDATIONS AND CONCLUSION

"If we teach today as we taught yesterday, we rob our children of tomorrow"_ J. Dewey

7.1 Introduction

In the preceding chapter I discussed the findings of the study about teachers' views on the implementation of ICT integration in their schools. It will be recalled that the study is located within the constructivist paradigm, otherwise known as the interpretivist paradigm. The qualitative approach and interpretive paradigm that is employed in the study provided a clear and reliable roadmap for attaining the main goal of the research. Hence, I investigated teachers' beliefs and experiences about ICT integration in paperless high schools and provided explanations through the interpretations of participants' views on the phenomenon.

This chapter presents an overview of the entire study, recommendations, and limitations of the study and a reflection on the findings. The chapter also provides suggestions for further studies that can be used as a springboard by future researchers to advance research in the field. Finally, conclusions are drawn from the findings.

7.2 An Overview of the Thesis

An overview of the study is deliberately structured on the basis of the seven chapters that gave rise to the thesis. The reason is to provide the reader with a chronological sequence of the thesis, showing relationships between each of the seven chapters that consists the thesis.

Chapter 1: This is a general introduction to the entire thesis and it consisted of the background of the study, which provides the basis upon which the study is founded. The focus of the study is exploring the beliefs that teachers hold about the implementation of ICT integration in paperless schools. The chapter also highlighted the background of the phenomenon in relation to the context. The problem statement and rationale for

conducting the study were clearly stated with the aim of the study and its objectives also enumerated to guide me in the pursuit of the aim as indicated in the chapter.

Chapter 2: All the relevant literature related to the phenomenon investigated are carefully selected and reviewed. The chapter provided a detailed discussion of all the relevant topics related to teachers' beliefs and ICT integration in the classroom. The role of ICT in education, with particular reference to pedagogical use of ICT in the classroom, was discussed. The chapter also presented the meaning and sources of teachers' beliefs and how it impacts on teaching and learning in the classroom. Discussions on the barriers to ICT integration the classroom also formed an integral part of the chapter. The literature review also focused on teacher training for ICT integration in schools along with the factors that influence ICT integration in schools.

Chapter 3: This described the theoretical and conceptual frameworks that were used as lenses in the study. The UTAUT model (Venkatesh et al., 2003) and the conceptual framework for ICT integration were vividly described and explained in this chapter. The relationship between the theoretical frameworks and the research questions was also discussed in great detail.

Chapter 4: This chapter discussed the research methodology in which the research design, research paradigm and the methods adopted to generate data from the participants were presented. The chapter also provided a holistic outlook of how the entire research endeavour was conducted. In the chapter, procedure for data generation, settings, participants, sample and sampling techniques are well described. The chapter also provided a narrative and schematic description of the analytical approach and the analytical tool used to generate findings. Finally, the chapter outlined and discussed the ethical procedures employed to protect the research participants.

Chapter 5: This chapter provided a detailed account of the data analysis in relation to the research questions. The chapter detailed the thematic and content analysis approach adopted in the study. This means the five themes that emerged from the empirical data were discussed, but beyond that, the chapter also analysed the content of the data. The outcomes from the chapter directed me to a more detailed discussion of findings in the next chapter.

Chapter 6: This chapter gave a detailed thematic discussion and synthesis of the research findings. The five themes that were analysed in the preceding chapters were discussed in greater detail in this chapter. The discussions are supported with relevant literature and theories. The findings were further synthesised to provide the basis for the conclusion of the study in the subsequent chapter

Chapter 7: This is the concluding chapter of the thesis and it presents an overview of the entire thesis. A summary of key findings, implication of the findings, contributions of the study to the existing body of knowledge are discussed in this chapter. Furthermore, the chapter comprises of the recommendations, suggestions for further study, limitations of the study and my reflections on the findings.

7.3 A Recap of Major Findings

From the analysis of data that was presented and interpreted in Chapter 5, the following key findings were identified and are summarised in relation to the research objectives clearly delineated in Section 1.7.

Teachers' Understanding of the Concept of ICT Integration in the Classroom: Unsurprisingly, the study found that teachers in the paperless schools understood the concept of ICT integration differently. And their understandings are subject to the available ICT facilities and tools in their school contexts. The study also found that almost all teachers commended and accepted ICT integration as a project in the schools. The majority of the teachers did not have a comprehensive knowledge of what pedagogical ICT integration in the classroom entails. The outstanding finding in this theme was that most teachers considered the ordinary use of ICT tools to teach in the classroom is the same as ICT integration in teaching.

Teachers' experiences of ICT affordances in the classroom: According to the self-reported experiences of teachers with ICT tools in the classroom, teachers found ICT really beneficial to their teaching, especially for lesson delivery. One of the outstanding findings in this theme was the identification of ICTs as beneficial to the teaching because of flexibility, enhancing teaching and learning, saving teaching and learning

time and promoting effective interaction between and among teachers and learners in the classroom including providing feedback to learners.

Training and Support for Teachers for ICT Integration: The study found that in all five paperless schools, teachers were exposed to several ICT integration trainings which differed in nature and approach; trainings were shallow in some schools, and non-progressive, irregular and facilitated by incompetent trainers. These findings are congruent with earlier research findings reported by Tedla (2012) in a paper titled "Understanding the Importance, Impacts and Barriers of ICT on Teaching and Learning in East African Countries".

Challenges of ICT integration in the Classroom: The findings showed that the majority of teachers believed that learners' attitudes to possessing tablets constitute a major challenge to ICT integration. Teachers perceived ICT as distractive tools to learners' learning that makes classroom management difficult, especially in overcrowded classrooms. Other challenges identified include poor training, unreliable Internet connectivity, irregular electric power supply, and inadequate infrastructural facilities, especially in the township schools.

Factors that influence ICT integration in Paperless schools: The study found that teachers' age and years of teaching experience, attitudes, the school timetable, internal and external support, and material resources are very prominent factors that influence ICT integration in the paperless schools.

There was lack of incentives to motivate teachers to integrate ICT in their classrooms. Goktas et al. (2009) suggested that teachers integrating ICT in schools need motivation in the form of incentive payments. The lack of incentives for teachers in the paperless schools, as said by the participants, may have affected the process of ICT integration in paperless schools. Hennessy, Harrison, and Wamakote (2010) reported that a lack of incentives and support for teachers are important factors that hinder their use of ICT. Teachers held some grievances against the DoE because the paperless school project was conceptualised and introduced into schools without due consultations with teachers, parents and community stakeholders. Teachers believed they needed to be informed and involved right from the conceptualisation stage of the project. Data has

shown that the government just brought the policy and put in place and that not all stakeholders were involved in the decision-making process that led to the paperless schools project.

7.4 Implications of the Findings

The findings of this study have significant implications for teacher training and professional development at both pre-service and in-service levels. It also has implications for future implementation of similar ICT integration projects within the South African context and in similar contexts beyond South Africa.

Although ICT integration trainings were readily available to prepare teachers for ICT integration in all the paperless schools, the trainings were limited to basic computer knowledge and skills. The pedagogical component of the training was not presented to teachers because the trainers themselves were deficient in it. Training was also found to be irregular and varied from one school to the other. For this reason, ICT integration in the classrooms remained poor and slow in most of the schools. The implication for insufficient training is that teachers will be ill-prepared and lack ability, skills and confidence to teach with ICT in classroom. This will affect learner's competence in the application of ICT for learning purposes and on their performance in school subjects. Also insufficient training affects the extent of ICT integration in the classrooms since teachers lack capacity to transform teaching and learning using ICT tools effectively (Mirzajani, Mahmud, Fauzi Mohd Ayub & Wong, 2016). Teacher training and professional development for ICT integration in schools need to be carefully and professionally designed to meet the individual needs of different categories of teachers in the schools. Training teachers for ICT integration requires competent training facilitators who are both competent and confident in content and pedagogy; otherwise the training may be futile. Employing computer operators and inexperienced personnel to train professional teachers on pedagogical ICT integration is capable of demotivating teachers about the implementation process. Ndlovu and Lawrence (2012) pointed out that, "It is a misconception to assume that basic ICT teacher training is sufficient to prepare teachers for quality ICT pedagogical integration" (p. 3). Basic ICT training only provides basic knowledge and skills to teachers, but teachers need more than basic ICT

knowledge and skills to be able to integrate ICT in the teaching and learning process. This is because teaching is a dynamic activity requiring dynamic processes and resources that basic training cannot offer to teachers.

Another implication of the findings is on future ICT integration projects in South Africa. Given the views of participants and the apparent scenarios in most of the paperless schools, it is imperative to suggest that in future, the DoE should ensure that teachers, schools and context readiness is adequately ascertained and addressed before embarking on such a radical change in the school. This means a baseline study must be conducted to determine the feasibility of the project before introduction and implementation. This is necessary because the context and the teachers who implement the change in schools are critical for success. Howie and Blignaut (2009) acknowledged that location, which imply context, is a very important factor to ICT access and utilisation. The higher the certainty of teacher and context readiness for change in schools, the greater the chances of success.

7.5 Reflections on the Findings

In view of the findings identified in Chapter 5, discussed in Chapter 6 and summarised in 7.3, above, I considered it appropriate to reflect on the research findings.

Firstly, prior to conducting this study, as a researcher I had certain assumptions about the extent of ICT integration in the participating schools. I was quite aware that facilities, infrastructure and funds were heavily invested towards the attainment of e-education goals in these five pilot schools. So, I assumed that the uptake and implementation of ICT integration in these schools would be smooth and successful. Surprisingly, the findings of the study turned out to be somewhat different from my initial assumptions. For instance, I assumed that in 2015, most teachers and learners in the schools would have already acquired sufficient knowledge and skills of ICT for integration in schools since the main goal of e-education stated in the White Paper was expected to be achieved by the year 2013, which was two years before 2015. The White Paper stated that, “Every South African manager, educator and learner in the general and further education and training bands will be ICT capable by the year 2013” (DoE, 2004, p. 17).

Now, three years after the target year of the goal achievement, the study found that many teachers and learners still lacked basic knowledge and skills of ICT for teaching and learning. This conforms to the views of some scholars (Dlamini & Na'Allah, 2015; Mathipa & Mukhari, 2014) who advanced arguments that mere provision of infrastructural facilities in schools would not translate into ICT integration in schools. It implies that several factors other than infrastructural facilities have a significant influence on ICT integration in the classrooms. In this case, it was found that teacher-related factors (teachers' beliefs and attitudes) and context-related factors (connectivity and power supply) determined how successful ICT can be adopted and integrated in the classrooms.

If the Gauteng paperless school project failed to recognise teacher- and context-related factors in its planning, as is evident in the data, then it may be assumed that even the e-education White Paper was drafted on the basis of borrowed ideas from countries where such policies were already working and yielding favourable outcomes. The argument conforms to statements credited to the Gauteng MEC of Education during the launch of the Wired for Life project in Midrand on 4th October, 2017:

> "I travelled across the world to explore and determine where the world is [with education]," said Lesufi. "I was at an expo in London, and I went through lots of products. When I saw the smart product I said, "This is what I want" (Moyo, 2017).

It is no wonder that the implementation of the paperless school project was hasty and haphazard. Hence, it was misconstrued by many teachers in schools who suspected that the project was introduced because of motives other than the educational needs of the people. Similarly, the e-education policy does not seem to recognise the inherent disparities in the South African society, and by extension, in some of the schools, especially in townships. It will be recalled that during the face-to-face interviews in schools, Lindiwe argued that some learners' basic needs like food, school uniforms and even security were not yet being met (see Section 5.5.1), and therefore, these learners do not see the value in possessing a tablet for learning when they have no food or school shoes, which are basic needs. To appreciate the above arguments, it is

imperative to seek answers to the following questions even though they appear to be outside the scope of this study.

Firstly, what is the motivating factor(s) for introducing ICT into classrooms in South African schools? It is pertinent to know whether the switch to new technologies for teaching and learning in schools is informed by the contextual needs of the South African society and schools or just an act of 'following the crowd' because other countries are integrating ICT into teaching and learning, and so it is a global trend that must be followed.

Secondly, what are the empirical evidence that South African learners are likely to learn more (quantity) and better (quality) with modern digital technology tools than with the old traditional technology tools (textbooks, chalk and chalkboard)? I believe shifts in paradigms or change in procedures should be motivated by empirically proven evidence and or the contextual needs of the system or people. I think introducing innovations into a system should not be guided by mere assumptions or some sort of ambition but by objectivity.

Considering the perplexing nature of some of the findings in this study, it is my hope that these reflections will serve as a guide for better design and implementation of ICT integration projects at different levels of the South African school system in the future.

7.6 Flaws in the Implementation of ICT Integration in Paperless Schools

The introduction and implementation of the paperless school project by the GDE in five pilot schools was not free of certain flaws that may have some detrimental effect on the success of implementation of the project. Some of the flaws that are apparent were by omission or commission. Although the Gauteng provincial government has aspired to achieve the national e-education goal by embarking on the paperless school project, it was so ambitious that it overlooked some important people and issues before and during the introduction and implementation process of the project. Even though some people criticised the project for being politically motivated and not based on the educational needs of the schools, the government remained resolute and committed to

the roll-out of digital technologies in schools and training teachers on ICT integration in schools across the province.

I will enumerate some of the flaws as identified by the research participants during various interviews in schools, as contained in the empirical data.

1. There was no adequate information about the readiness of teachers, learners, and the schools' contexts before ICT were introduced into the classrooms.
2. There was a lack of meaningful engagement with parents, teachers, community leaders, and all other relevant stakeholders on matters that affect them and their children.
3. There was a lack of competent personnel to train teachers on the pedagogical integration of ICT.
4. There were no incentives to motivate teachers integrating ICT in the schools.
5. There was a lack of monitoring and evaluation of the project during the

implementation. UNESCO (2004) reported that:

> Monitoring and evaluation are the weakest components in most ICT in education programmes. While a number of stocktaking research studies have been conducted on ICT infrastructure penetration and access in schools, there have been minimal monitoring and evaluation of ICT integration and its impact on teaching and learning. Evaluation is an important phase in the formulation and implementation of ICT in education programme. Evaluation, both formative and summative, means that policies, practices, and activities are documented, interpreted and analysed. (p. 135)

It is imperative to know that the situation has not yet changed. The implementation of the paperless school project in the Gauteng province is still characterised by a lack of monitoring and evaluation of the process. This is evident in the views of the research participants who decried a lack of monitoring and evaluation of the project by the DoE from inception.

7.7 Contributions of the Study

In spite of the narrow scope and limitations of the study, it is interesting to know that this study has made significant contributions to the existing body of knowledge in the field of educational technology, and more particularly, in the area of introduction of ICTs in schools, preparing and supporting teachers for ICT integration in schools in the following ways.

Firstly, with regard to ICT integration practice and policy, the study provides empirical baseline data that can be used as a guideline for policy formulation, support, monitoring and evaluation in driving future ICT integration initiatives.

The use of the UTAUT model to investigate ICT integration using qualitative approaches and presenting the findings inductively using the case study design is an important methodological contribution in the field of educational technology in South Africa.

Furthermore, the original UTAUT model by Venkatesh et al. (2003) appears to be limited in scope (see section 3.4). The model fails to acknowledge and incorporate the role of user attitude, user knowledge and context as significant determinants of behavioural intention and use of technology. In this study it was found that the amount and quality of ICT knowledge that teachers have and their context have a significant influence on ICT integration expressed through their attitude and intention to integrate ICT in teaching.

To close the gap, I designed a technology integration model (TIM) drawing from the original theory of the UTAUT model. Not overlooking the important role of other factors like policy, hardware and software, the TIM foregrounds beliefs as the most significant determinants of ICT integration in schools because all other constructs are somehow inclined to a person's beliefs about the constructs. Figure 7.1 depicts a suggested TIM.

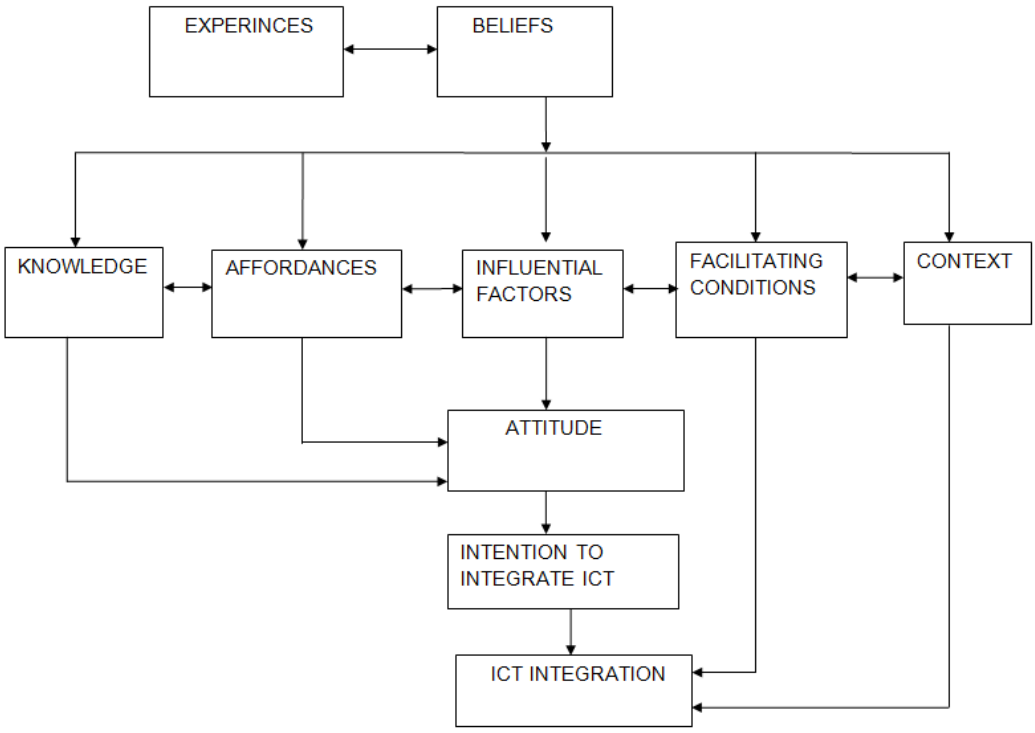

Figure 7.1: Technology Integration Model (TIM)

Experience: is the composition of an individuals' life that is conciously gained through knowledge, activities and events in an environment.

Beliefs: beliefs are personal and group assumptions and convictions that are held to be true regarding concepts, events, people and things" (Businessdictionary.com)

Knowledge: is the individual's understanding of the role of ICT in teaching; in other words, the technological and pedagogical knowledge of the user.

Affordances: are the individual's degree of belief about the potential benefits of ICT in terms of job performance and ease of operating technology tools.

Influential factors: are the human and non-human factors that influences the behaviour of ICT users.

Facilitating conditions: are "the degree to which an individual believes that there is adequate human and material resources to support the integration of ICT in schools"(Venkatesh,2003,p. 243).

Context is the physical and social environment of the school where ICT integration is implemented.

Attitude is the dispositions that teachers have towards their intention to use ICT in the classroom. These attitudes are developed over time from beliefs and knowledge of ICT affordances.

Intention is the function of both attitudes and social influences toward the behaviour that has been found to determine the actual use of ICT in classroom (Tan, 2013).

ICT Integration is the actual incorporation of ICT into the process of teaching and learning in the classroom.

The study also made a theoretical contribution to the field of educational technology in South Africa by reporting that ICT integration is not only influenced by explicit factors such as resources, training and contextual factors as commonly reported in literature but also by implicit factors like teachers' understandings of ICT integration, teachers' beliefs about the role of ICT's in teaching and learning, and teachers' experiences of integrating ICT in the classroom.

Although the introduction and implementation of the paperless school project via the e-education policy appears to be a welcome initiative among various stakeholders, there are factors of omission or commission that appear to be inhibiting the process. Presently, most teachers implementing the paperless schools project do not believe that the project is sustainable because of the prevalent challenges highlighted in Chapter 5 and subsequently discussed in Chapter 6. Even the few teachers that seemed to be optimistic about the project acknowledged that the present challenges must be eliminated if the project is to be sustainable.

Given the number of challenges confronting ICT integration projects in most African countries (Wright, 2014; Tedla, 2012); one may begin to ponder over the sustainability of ICT integration projects in schools in Africa. Hence, Wright (2014) once asked how the use of technology will be sustained in schools once initial funding has ended. Certainly, the question still remains relevant, even within the context of South Africa. Everyone seems carried away by the excitement of the latest trends in schools,

especially the use of tablets in the classroom, with little or no thoughts of how to sustain it. One of the challenges of introducing innovations into the education systems of most African countries is the issue of sustainability. Apparently, in many African countries innovations are often introduced into the education systems with little or no vision about how to sustain the innovations. This has remained a salient reason why most innovations do not remain viable and consequently fail shortly after they are introduced.

Based on the literature, the findings of this study and my knowledge of the South African schools contexts, I am convinced that some of the ways to ensure a sustainable e-education system in South Africa is to address issues of educational imbalances in the form of unequal access to quality education in the country. Disparities in social amenities between urban, township and rural communities must be genuinely addressed to promote equity among citizenry. Above all, there is the need to design an ICT integration framework that can accommodate the current peculiarities of South Africa, instead of importing and adopting foreign frameworks that do not recognise the contextual distinctiveness of teachers, schools and communities in South Africa.

Based on findings in this study, it is apparent that South Africa still lack a context based framework for ICT integration in schools. Perhaps the frameworks that were used to introduce ICT in schools in 2015 were imported from foreign contexts and adopted in local context. It is erroneous to assume that by transferring ideas from a one context to another different context, the same results can be obtained. Unfortunately, most developing countries in Africa have always attempted to transfer technology from developed countries to their own contexts in Africa, and it has never yielded good results. In a study conducted in East Africa, Tedla (2012) found that some African countries borrow ideas and experiences of other countries and simply adopt them in their home countries and expect the ideas to work out perfectly. Such attempts have always failed. I submit that unless each country is able to design frameworks or models of technology adoption and integration based on their context, Africa will continue to lag behind in terms of educational advancement and general development.

Howard and Maton (2011) observed that within the South African context there is no theoretical grounding informing discourse on ICT pedagogical integration, and where

there is no theoretical grounding, there is certainly no data to inform any investigation. The lack of an ICT integration framework is affecting the process of ICT integration in all levels of education in the country. This study has contributed rich empirical data that can guide discourses on theoretical grounding for pedagogical ICT integration.

In view of the recent empirical evidence indicating dysfunctional ICT integration processes in paperless schools and to contribute to the field, I suggested a nine stage context-driven framework for ICT adoption and integration in South African high schools. The proposed framework consists of ten interrelated stages of progression namely the vision, baseline research, policy/guidelines, strategic planning, introduction of ICT, training the trainers and mass training of teachers, implementation coaching/mentoring that lead to a sustainable ICT integration.

The schematic representation of the proposed framework is depicted in Figure 7.2 However, it should be noted that the stages in the framework are not strictly linear by nature but involve a to-and-fro progressive movement. Hence, the interrelationship among the stages is of more importance than the direction of movement. Some level of planning is required before each stage and monitoring and evaluation is also essential at each stage from Stage 3 to Stage 10. The dotted line from Stage 9 back to Stage 4 signifies a feedback mechanism based on the outcomes of the summative evaluation back to the strategic planning stage for adjustment and modifications.

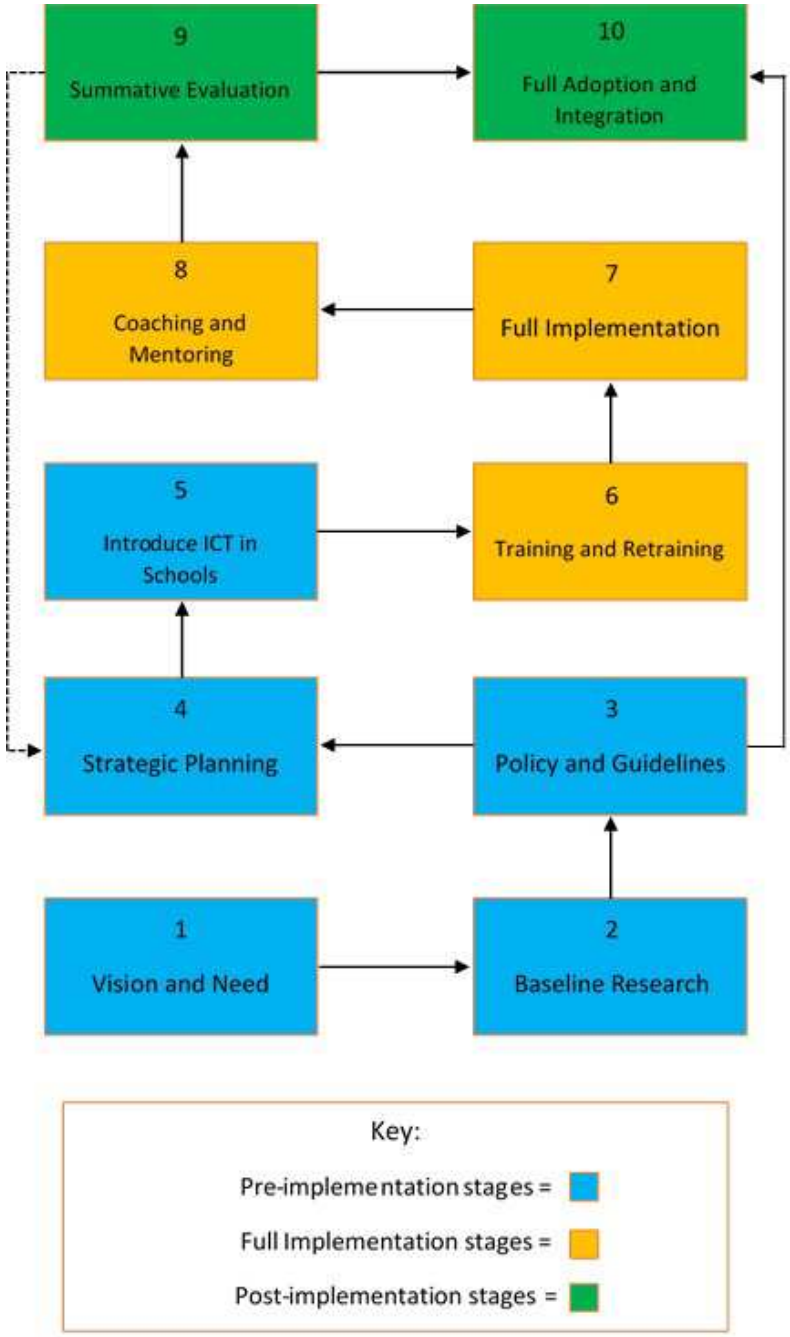

Figure 7.2: Sustainable School ICT Integration Framework

1. **The Vision:** At this stage the relevant education stakeholders begin to conceive a vision to infuse ICT into the education system based on a needs assessment. In this context, "Vision refers to the aspirations and goals of both individuals within a school and the school system as a whole" (UNESCO, 2002 p. 23). The vision is then shared through formal and informal contacts. This is important because the

development of a shared vision concerning how ICT is to be used for teaching and learning is very important (Hughes & Zachariah, 2001; Otto & Albion, 2002). Through the strong will of the stakeholders the vision is pursued through the government's DoE.

2. **Baseline Research:** This is a feasibility study that must precede policy formulation and actual introduction of the innovation in schools. The government or relevant organisations launch and conduct a feasibility study on the host communities, school contexts, teachers, learners and important others. It is essential to ascertain the state of school infrastructure, facilities, security and teachers' beliefs and readiness, community support etc. before venturing into a system change.

3. **Policy/Guidelines:** Based on the outcomes from the baseline research, decisions are taken to draft an e-education policy that will capture the contextual considerations. Guidelines for the implementation of the policy are also drafted at this stage. The guidelines are for teachers, district education facilitators, school managers and administrators.

4. **Strategic Planning:** This involves the acquisition, allocation and organisation of ICT tools, facilities, infrastructure and logistics at the school level. It also involves the designing and training programmes and training strategies.

5**. Introduce ICT:** At this stage, schools and all relevant stakeholders are introduced to all the necessary ICT tools, facilities, infrastructure and logistics at the school level. This leads to dramatic changes in all aspects of the school system. Consequently there is both shock and resistance to change, particularly from teachers. Nevertheless, some teachers will be anxious to explore the tools and apply them in teaching.

6. **Training:** This involves developing capacity for change management within the school system. At this stage, a few teachers are selected from schools to undergo comprehensive training on pedagogical ICT integration. They are trained to serve as trainers to other teachers upon return to their respective schools. This is followed by mass training of all other teachers in the schools. All the teachers in the schools undergo the same training that was given to the trainers, but now the teachers are

trained by their colleagues who have earlier undergone an intensive training. This training is ongoing since the trainers are fellow teachers who are resident at the schools. The emphasis in all training is the acquisition of both technological and pedagogical skills of teaching with ICT.

7. **Implementation:** This involves the full execution of the vision with all the stakeholders fully involved at their respective levels and capacity in a systemic process. At this stage, ICT are fully available and integrated in all classrooms in the school and all teachers are conversant and confident to apply ICT tools in their teaching. They can also support learners and facilitate their learning with ICT tools.

8. **Coaching/Mentoring:** This involves a one-on-one personal relationship between a teacher a fellow teacher who is more knowledgeable and skilled in ICT integration. The relationship is usually mutual since both the teachers and their coaches or mentors are colleagues at school. The coach or mentor must be a professional teacher or a professional ICT trainer with both technological and pedagogical knowledge of teaching.

9. **Evaluation:** A summative evaluation of the entire project is conducted at this stage to ascertain success or failure. If successful, it leads to full integration of ICT in schools. However, if unsuccessful, strategic planning is undertaken again to bridge the gaps and eliminate possible barriers. According to UNESCO Bangkok (2004) evaluation is an important phase in the formulation and implementation of ICT in education program. Evaluation, both formative and summative, means that policies, practices, and activities are documented, interpreted and analysed.

10. **Full Integration:** At this final stage, ICT is fully accepted and assimilated in all aspects of the school system. This is attainable after about 3–5 years from the time of introducing ICT in schools with deliberate and consistent support to teachers and the schools.

The framework is carefully designed to be comprehensive and based on the contextual peculiarities of the study area. It considers the pre-implementation, implementation and post-implementation requirements for successful ICT integration in formal school

settings. The ultimate aim of the proposed framework is that all schools integrating ICT should attain a level of sustainable e-education beyond the school level.

7.8 Recommendations

In view of the research findings it is strikingly clear that ICT adoption and integration in South African schools are still lagging behind, notwithstanding the huge financial investment made by the various tiers of government in infrastructural provisioning since the 1990s. In view of this, I make the following recommendations to improve the process of introducing and implementing ICT integration in our schools towards enhancing classroom instruction.

1. Policy formulation and decisions to initiate innovation projects should be guided by contextual needs through outcomes of feasibility studies about the context and major players in the system. This implies that government should first of all conduct baseline research on the community, school contexts, the teachers and the learners in order to ascertain the level of their readiness to accept new technologies for teaching and learning.

2. The DoE must first of all prepare the entire system for change with particular focus on the schools, district education officers, host communities and the various organs of the DoE. Hence, training for ICT integration should be extended to subject facilitators at the GDE and district offices who should be empowered with knowledge and skills to support teachers at schools, because teachers need more mentoring and coaching than training for ICT integration in the classroom. Teachers are likely to learn ICT skills better through mentoring and coaching programmes. Mentoring and coaching provide ample opportunities for teaches to have closer and regular meetings with their mentors and coaches.

3. Future ICT integration projects must focus on teacher preparedness before introducing change in the classroom. The current approach where teachers are undergoing initial ICT integration training at the implementation stage of the project must be avoided in future because it slows down the progress of the integration process. Ertmer et al. (2014) suggested the urgent need to make a shift from

obtaining more technology hardware to the development of teachers' beliefs that enable teachers to work with current technologies to attain meaningful ICT integration in their classrooms.

4. Only competent and experienced training personnel who are teachers by profession with both technological and pedagogical competencies should be engaged to train other teachers on ICT integration in teaching.

5. The 'big bang' approach to introducing ICT in schools, especially in the classroom, must be avoided as far as possible. Hence, adequate planning must precede both introduction and implementation of new innovations in schools. Effective implementation of the change process must be ensured through regular monitoring and evaluation.

7.9 Suggestions for Further Research

In stimulating further research, the study suggests that a longitudinal study should be conducted on a larger scale in the same or similar schools that participated in this study. The scope of the new research should involve teachers, learners and principals using classroom observation, interviews and focus group discussions to evaluate and consequently ascertain the impact of implementing ICT adoption and pedagogical integration on teaching and learning outcomes. Unfortunately, this study could not go beyond its scope because of limited time and funds, which may not be the case in a longitudinal study.

Furthermore, the study should be repeated with learners in the same or similar schools in order to ascertain learners' beliefs and experiences around the same phenomenon in the same context.

Now that the project has attained four years of steady implementation, an appraisal study should be conducted to investigate teachers' practices with ICT in the classroom, learning outcomes, and the impact of ICT on learners' performances in school subjects, particularly in external examinations.

7.10 Limitations of the Study

Although I have employed all measures humanly possible through the use of ethical instruments to avoid any form of bias in this study, I could not dismiss potential prejudices that emanated from me as the researcher and the research participants due to inevitable human dynamics. And like any other qualitative study, an investigation of teachers' beliefs and experiences around the implementation of ICT integration in schools using qualitative approaches is prone to some probable limitations. Therefore, the study had the following unavoidable limitations:

1. Being a PhD research endeavour, bounded by scope and time, the study is limited to teachers' beliefs and self-reported experiences in their classrooms. The study did not involve all the relevant stakeholders (parents, teachers, learners and principals) in a school system. Only few teachers who were considered knowledgeable and competent to discuss the topic under investigation were nominated by the school principals to participate in the study. Because of this limitation, a longitudinal study that can span over a longer period of time to ascertain what is actually happening in the classrooms could not be conducted within the given time frame and with the limited resources.

2. I could not go into the classrooms to observe the teachers' practices with ICT integration because it is not the aim of this study. This is coupled with the fact that the paperless project started in January 2015, and I started generating data for this study from April 2016, barely 15 months after the commencement of the project. At this time teachers were still undergoing training to integrate ICT pedagogically; hence, it was considered too early to start appraising the impact of the project. Having the understanding that this type of change process in the classroom requires a minimum period of five years to mature and yield desired outcomes, an appraisal study could not be conducted.

3. Being an exploratory case study with few participants in few schools, I am aware that the findings may not be generalised in all schools in South Africa or elsewhere. However the findings can provide clues to what is required when embarking on a similar endeavour in a similar context in the future. Similarly, my interpretations of

findings may not be devoid of prejudices and biases owing to my personal knowledge, experiences, values and beliefs (Creswell, 2007). Similarly the views of the research participants may be subjective as a result of their context, values, knowledge and past experiences too.

At this juncture it is pertinent to note that exposing the limitations of the study does not imply that the study is invalid by any means, but rather it will help to identify important gaps for further research in the fields of educational technology, pedagogy, teacher professional development and educational policy. The study has also contributed to the understanding of teachers' beliefs about the current innovations driven by the pervasiveness of ICT in the global education landscape.

7.11 Conclusion

The aim of this study was to explore teachers' beliefs and experiences around ICT integration in five paperless high school classrooms. It also seeks to ascertain the factors that influence ICT adoption and integration in schools. Through the views of the research participants I was able to obtain and analyse empirical data that provided the basis to ascertain the beliefs that teachers hold about the introduction and implementation of ICT integration in paperless schools. The findings were contrasted with constructs in the conceptual model that was derived from the UTAUT model (Venkatesh et al., 2003). The findings revealed that context plays a significant role not only in teachers' understanding of the concept of ICT integration but also influence the implementation of ICT adoption and integration in classrooms. Based on the participants' self-reported narration, it can be concluded that teachers readily integrate ICT into teaching only when it adds value to their teaching, that is, enable them to achieve their lesson goals. Secondly, teachers integrate ICT in teaching when it does not require extra effort. Participants acknowledged the role of societal expectations and availability of facilitating conditions as determinants of ICT integration in schools. Thus, it can be concluded that teachers integrate ICT in the classroom when they are aware that their employers, learners and society expect of them to use ICT tools to teach and also when there are adequate support and resources available in the classrooms. ICT integration is not only influenced by explicit factors such as resources, training and

contextual factors as commonly reported in literature (Raby & Meunier, 2011; Sobikwa & Ditsa, 2017) but also by implicit factors (Ertmer, 1999) like teachers' understandings of ICT integration, teachers' beliefs about ICT's role in teaching and learning, and teachers' experiences of integrating ICT in the classroom. Finally, teachers need support and an enabling environment to integrate ICT in the classroom.

7.12 Summary of the Chapter

As the seventh and concluding chapter of the thesis, this chapter presents an overview of the entire research project where a summary of key findings and their implication were outlined. The chapter also highlighted some of the major contributions that the study made to the existing body of knowledge. Given that the study is bounded by time and scope, the research made some recommendations and suggestions for further study. I also pointed out in this chapter what the limitations of the study are and reflected on the findings. Conclusions from the findings as presented in this chapter suggest that teachers readily integrate ICT into teaching only when it adds value to their teaching, that is, enable them to achieve their lesson goals. They also readily integrate ICT into teaching when it does not require extra effort. It was also concluded that participants acknowledged the role of societal expectations and the availability of facilitating conditions as determinants of ICT integration in the paperless schools

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Appendix A

Ethics Approval letter

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Wits School of Education

27 St Andrews Road, Parktown, Johannesburg, 2193 Private Bag 3, Wits 2050, South Africa. Tel: +27 11 717-3064 Fax: +27 11 717-3100 E-mail: enquiries@educ.wits.ac.za Website: www.wits.ac.za

05 November 2015

Student Number: 1079382

Protocol Number: 2015ECE021D

Dear Danbaba Na-Allah

Application for Ethics Clearance: Doctor of Philosophy

Thank you very much for your ethics application. The Ethics Committee in Education of the Faculty of Humanities, acting on behalf of the Senate has considered your application for ethics clearance for your proposal entitled:

Teachers' beliefs about Pedagogical ICT Integration into Digital Classroom in Gauteng Paperless Schools.

The committee recently met and I am pleased to inform you that clearance was granted. However, there were a few small issues which the committee would appreciate you attending to before embarking on your research.

The following comments were made:

- Amend consent forms by deleting any items which do not apply to your study. In your consent letters, specify the amount of time teachers will spend filling your questionnaires or answering your interview questions.

Please use the above protocol number in all correspondence to the relevant research parties (schools, parents, learners etc.) and include it in your research report or project on the title page.

The Protocol Number above should be submitted to the Graduate Studies in Education Committee upon submission of your final research report.

All the best with your research project.

Yours sincerely,

M Mabeta

Wits School of Education

011 717-3416

Cc Supervisor: Dr Reuben Dlamini

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Appendix B

GDE Research Approval Letter

For administrative use only:
Reference no: D2016 / 388
enquiries: Diane Buntting 011 843 6503

GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

GDE RESEARCH APPROVAL LETTER

Date:	**8 February 2016**
Validity of Research Approval:	**8 February 2016 to 30 September 2016**
Name of Researcher:	**Na'Allah D.M.**
Address of Researcher:	**P.O. Box X3; Johannesburg; 2050**
Telephone / Fax Number/s:	**063 119 1426; 062 012 5231**
Email address:	**danbabana@gmail.com; danbabana@yahoo.com**
Research Topic:	**Teachers' belief about Pedagogical ICT Integration into Digital Classroom in Gauteng Paperless Schools.**
Number and type of schools:	**FIVE Secondary Schools**
District/s/HO	**Ekurhuleni North; Ekurhuleni South; Gauteng East and Johannesburg East.**

Re: Approval in Respect of Request to Conduct Research

This letter serves to indicate that approval is hereby granted to the above-mentioned researcher to proceed with research in respect of the study indicated above. The onus rests with the researcher to negotiate appropriate and relevant time schedules with the school/s and/or offices involved. A separate copy of this letter must be presented to the Principal, SGB and the relevant District/Head Office Senior Manager confirming that permission has been granted for the research to be conducted. However participation is VOLUNTARY.

The following conditions apply to GDE research. The researcher has agreed to and may proceed with the above study subject to the conditions listed below being met. Approval may be withdrawn should any of the conditions listed below be flouted:

CONDITIONS FOR CONDUCTING RESEARCH IN GDE

1. *The District/Head Office Senior Manager/s concerned, the Principal/s and the chairperson/s of the School Governing Body (SGB.) must be presented with a copy of this letter.*
2. *The Researcher will make every effort to obtain the goodwill and co-operation of the GDE District officials, principals, SGBs, teachers, parents and learners involved. Participation is voluntary and additional remuneration will not be paid;*

2016/02/09

1

Making education a societal priority

Office of the Director: Education Research and Knowledge Management ER&KM)
9th Floor, 111 Commissioner Street, Johannesburg, 2001

3. *Research may only be conducted after school hours so that the normal school programme is not interrupted. The Principal and/or Director must be consulted about an appropriate time when the researcher/s may carry out their research at the sites that they manage.*
4. *Research may only commence from the second week of February and must be concluded by the end of the THIRD quarter of the academic year. If incomplete, an amended Research Approval letter may be requested to conduct research in the following year.*
5. *Items 6 and 7 will not apply to any research effort being undertaken on behalf of the GDE. Such research will have been commissioned and be paid for by the Gauteng Department of Education.*
6. *It is the researcher's responsibility to obtain written consent from the SGB/s; principal/s, educator/s, parents and learners, as applicable, before commencing with research.*
7. *The researcher is responsible for supplying and utilizing his/her own research resources, such as stationery, photocopies, transport, faxes and telephones and should not depend on the goodwill of the institution/s, staff and/or the office/s visited for supplying such resources.*
8. *The names of the GDE officials, schools, principals, parents, teachers and learners that participate in the study may not appear in the research title, report or summary.*
9. *On completion of the study the researcher must supply the Director: Education Research and Knowledge Management, with electronic copies of the Research Report, Thesis, Dissertation as well as a Research Summary (on the GDE Summary template). Failure to submit your Research Report, Thesis, Dissertation and Research Summary on completion of your studies / project – a month after graduation or project completion - may result in permission being withheld from you and your Supervisor in future.*
10. *The researcher may be expected to provide short presentations on the purpose, findings and recommendations of his/her research to both GDE officials and the schools concerned;*
11. *Should the researcher have been involved with research at a school and/or a district/head office level, the Director/s and school/s concerned must also be supplied with a brief summary of the purpose, findings and recommendations of the research study.*

The Gauteng Department of Education wishes you well in this important undertaking and looks forward to examining the findings of your research study.

Kind regards

.....

Dr David Makhado

Director: Education Research and Knowledge Management

DATE: 2016/02/09

Office of the Director: Education Research and Knowledge Management ER&KM)
9th Floor, 111 Commissioner Street, Johannesburg, 2001

Appendix C

Letter to School Principals

Divisional of Educational Information Technology,
Wits School of Education, 27 St Andrew Road Park Town,
University of the Witwatersrand, 2050,
Johannesburg, South Africa,
10th April 2016.

Dear Principal,

My name is Danbaba Magana Na-Allah I am a postgraduate PhD student in the School of Education at the University of the Witwatersrand. I am doing research on: Understanding Teachers' Beliefs and Experiences of ICT Integration in Five South African Paperless High schools.

My research involves conducting a survey involving teachers in your school. The survey will be conducted by use of questionnaires composed of questions that will assist to elicit information relating to teachers' beliefs and experiences of ICT integration in the classroom. Their knowledge of ICTs and the classroom practices that they engage in will also be explored. Thereafter, I will conduct individual and focus group interviews with few selected teachers in your school. In view of this, I seek for your indulgence to choose any five teachers in your school to participate in the interview sessions. Our conversations will be recorded by means of an audiotape. Both the survey and interview will be conducted between 5th April and 30th September 2016. The rationale for the interview is to gain deep understanding of teachers' beliefs and experiences of ICT integration in digital classrooms.

The reason why I have chosen your school is because of its status as one of the first seven schools selected by Gauteng department of education for the digital school pilot project. I am therefore, inviting your school to participate in this research study. Each of the teachers will be served with a letter of information and a consent form to indicate their interest and willingness to participate in the research.

The research participants will not be advantaged or disadvantaged in any way. They will be reassured that they can withdraw their permission at any given time during this

project without any penalty. There are no foreseeable risks in participating in this study. The participants will not be paid for this study.

The findings from the research will be submitted as a thesis report to the University of the Witwatersrand, Johannesburg and may also be published in journals or book chapters. The names of the research participants and identity of the school will be kept confidential at all times and in all academic writing about the study. Your individual privacy will be maintained in all published and written data resulting from the study.

All research data will be destroyed 5 years after completion of the project. Please let me know if you require any further information. I look forward to your response as soon as is convenient.

Yours Sincerely

Danbaba Magana Na-Allah

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Appendix D

Letter to Teachers

Divisional of Educational Information Technology,
Wits School of Education, 27St Andrew Road Parktown,
University of the Witwatersrand, 2050,
Johannesburg, South Africa
10th April 2016.

Dear Teacher,

My name is Danbaba Magana Na-Allah and I am a postgraduate PhD student in the School of Education at the University of the Witwatersrand, Johannesburg.

I am doing research on Understanding Teachers' Beliefs and Experiences of ICT Integration in Five South African Paperless High schools. The target participants of my research are the in-service teachers in five pilot paperless high schools in Gauteng province.

My research involves using a questionnaire composed of questions that will assist to elicit information relating to your beliefs and experiences of ICT integration in the classroom. Your knowledge of ICTs and the classroom practices that you engage in will also be explored. Thereafter, I will interview you as an individual and as a group; our conversations will be recorded by means of an audiotape. Both the survey and interview will be conducted once between 5th April and 30th September 2016. The rationale for the interview is to gain deep understanding of teachers' beliefs and experiences of ICT integration in digital classrooms.

The reason why I have chosen your school is because of its status as one of the first seven schools selected by the Gauteng department of education for the digital school pilot project. I am therefore, inviting you to participate in this research study.

Your name and identity will be kept confidential at all times and in all academic writing about the study. Your individual privacy will be maintained in all published and written data resulting from the study. I will personally ensure this by the creation of an anonymised transcript for any further or broader sharing of the data beyond myself and my supervisor.

All research data will be destroyed 5 years after completion of the project.

I assure you that, you will not be advantaged or disadvantaged in any way. Your participation is voluntary, so you can withdraw your permission at any time during this project without any penalty. There are no foreseeable risks in participating and you will not be paid for this study. Please let me know if you require any further information.

Thank you very much for your help.

Yours Sincerely

Danbaba Magana Na-Allah

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Appendix E

Teacher's Consent Form

Please fill in and return the reply slip below indicating your willingness to be a participant in my voluntary research project called: Understanding Teachers' Beliefs and Experiences of ICT Integration in Five South African Paperless High schools.

I, _____ give my consent for the following:

Permission to be interviewed

I would like to be interviewed for this study. YES/NO

I know that I can stop the interview at any time and don't have to

Answer all the questions asked. YES/NO

Permission to be audiotaped

I agree to be audiotaped during the interview YES/NO

I know that the audiotapes will be used for this project only YES/NO

Permission for questionnaire

I agree to fill in answer to question for this study. YES/NO

Informed Consent

I understand that:

My name and information will be kept confidential and safe and that my name and the name of my school will not be revealed.

I do not have to answer every question and can withdraw from the study at any time.

I can ask not to be audiotaped, photographed and/or videotape

All the data collected during this study will be destroyed within 3-5 years after completion of my project

Sign_____ Date_____

Appendix F

Individual Face to Face Semi-structured interview Questions

1. At the institution you trained as a teacher were you exposed to the use of ICTs for teaching and learning?

2. After you have been trained as a teacher, how often do you participate in professional development activities?

Is it regular?
Where do you have the trainings?

Who are the organizers?

Can you please describe the activities?

In what ways do the activities affect your present job?

3. What is your understanding of ICT integration in the classroom?

Do you think every teacher in the school have the same understanding?

What do you think is their perception of ICT integration?

What do you think is responsible for their perception?

4. What type of ICT tools do you use in the classroom?

Are they different from the ones you used during your professional training?

5. Considering that your classroom has been equipped with ICT tools and facilities, how often do you use them in the teaching and learning processes?

How do you find them helpful in doing your work as teacher?

6. What is your experience with the use of ICTs in the classroom?

7. From your experience how does ICT enhance your teaching?

8. What are teachers' perceptions on the use of ICTs in the school?

Are they feeling compelled to use ICTs in the classroom? (Why?)

9. To what extend are ICTs adopted in the school?

Can you regard it as low, moderate or high?

What do you think is the cause?

10. What professional benefits do you derive from the use of ICTs in the classroom?

What are some of the challenges you do encounter?

In view of the above benefits and challenges, what do you think is the future of education in South Africa if ICTs are continued to be used in schools?

11. Given that your school has been involved with ICT integration, what is your own view about the initiative?

12. Kindly comment on student's attitude to learning before and after the introduction of computers and tablets in the classroom?

Are the learners strictly using the tablets for academic purpose?

13. What factors (Within and outside the school) do you think influence ICT adoption in your school? (Negatively and positively) Example: language of communication, time table, school policy teacher's Age, Gender, years of teaching experience, Initial training)

Given that this school is special as a paperless school, do you enjoy any **special incentive** from the government, community or any other source for teaching in this school?

14. How do you regard the infrastructure and facilities available for ICT integration in the school? (*Adequate or not? Relevant or not? Describe please.*

15. How do you perceive the available support for ICT use in the school? (Support from colleagues, principals, GDE, Parents, the community etc.)

Appendix G

Focus Group Semi-structured Interview Questions

1. What is your perception about the introduction of ICTs in South Africa's Educational system?

2. How are you able to use ICTs to solve teaching and learning problems in the classroom which may not be possible without ICTs? (Classroom management)

3. What are the new instructional and learning experiences gained by use of ICTs which are not possible without them? (Innovation and Creativity)

4. How has the use of ICTs increased student interaction with the subject matter or otherwise?

5. How has the availability of ICTs in your school promoted teacher enthusiasm (*Interest/passion/zeal/zest)* and motivation for teaching and learning? (Teachers interest)

6. How are you able to use ICTs to improve your overall teaching practices in the classroom without which it may not be possible to achieve it?

7. In your opinion what do you think is responsible for the different amount and levels of training in different paperless schools in Gauteng?

8a. Now, Can you regard your school as truly paperless? **Why?**

8b. if No, what do you think is needed to make it a paperless school in the nearest future?

9. Kindly comment on the following issues in relation to ICT integration in your school:

ICT policy and goals (Need for consultation with teachers and parents for ICT policies/ programmes /projects)

Need for intensive Training of teachers and learners

Need for Teachers' control over the learner's learning content in their tablets/Misuse of tablets by the learners (What action can teachers take?)

Need for school rules/policies guiding the teacher to deal with erring learners on misuse of tablets in the classroom. Sustaining the paperless school project in Gauteng

10. Suppose you have one moment to talk to the MEC about the inclusion of ICTs in Gauteng schools, what would you say?

Appendix H

Rules and Guidelines for Focus Group interviews

Welcome

Introduce Moderator and Assistant moderator

Topic: Understanding Teachers' Beliefs and Experiences of ICT Integration in Five South African Paperless High schools.

Your views will be used for research purpose only

You were selected to participate in this research because you are involved in integrating ICT in teaching in paperless school setting

Guidelines

1. There is No right or wrong answers, only differing points of view. You don't need to agree with others, but you must listen respectfully as others share their views

2. We're tape recording the conversation; therefore, one person is to speak at a time

We will be addressed with pseudonyms

3. All Cell phones must be switched off or put on silence during the discussion. If you cannot and if you must respond to a call please do so as quietly as possible and re-join us as quickly as you can.

4. Only one person will be allowed to talk at a time (No interruption while someone is talking)

5. Your opinion should be a true reflection of your beliefs or conviction on the issue or matter raised by the group

6. Note that Negative (No) response are as good and important as positive (Yes) responses. (*Don't forget that we are here to solve a problem*)

My role as moderator will be to guide the discussion, not to contribute to the discussion

(Any questions?)