

**Investigating technology acceptance in public secondary schools
in Pretoria**

By Helena Alexander

**Submitted in partial fulfilment of the requirements for the Degree in Magister
Educationis in the Faculty of Education, University of Pretoria**

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NOVEMBER 2019

DECLARATION

I declare that the dissertation, which I hereby submit for the degree of Magister Educationis at the University of Pretoria, is my own work and has not previously been submitted by me for a degree at this or any other tertiary institution.

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ABSTRACT

The purpose of this study was to explore the extent to which ICT (Information Communication Technology) is accepted and used in teaching in four public South African schools. The constructs of the Technology Acceptance Model (TAM) were used to generate an understanding of educators' technology acceptance and use in their classrooms for the purpose of teaching. It is generally understood that for the model to be successfully implemented, all the pillars of this theoretical framework must be present and operational in the classroom. This study followed a qualitative research approach and focused on multiple case studies. The use of a multiple-case study, which involved four schools in Pretoria, Gauteng, South Africa within a limited time, allowed the researcher to detect things that could be hidden or go undetected in a large-scale, broader, longitudinal study. Semi-structured interviews allowed the researcher to investigate individuals' opinions, their experiences, beliefs and/or possible motives on certain subjects. This instrument for collecting information allowed for more open-ended questions and is less structured. Data was also collected through field notes, observation and document analysis. The researcher opted to use the Atlas.ti programme to prepare and organise the data for analysis. It can be concluded from the findings that the educators perceived educational technology to be useful. There was a positive consensus among the participants that the technologies received are not difficult to use, and have in fact, reduced their workload. Further, there is a positive attitude from both learners and educators towards the technology.

Key words: ICT (Information Communication Technology), e-learning, technology integration, educators, technology acceptance.

LANGUAGE EDITOR'S DISCLAIMER

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3 December 2019

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9. LIST OF ACRONYMS

ICT	Information Communication and Technology
DBE	Department of Basic Education
SDGs	Sustainable Development Goals
NEPAD	New Partnership for Africa’s Development
SONA	State of the Nation Address
TPB	Theory of Planned Behaviour
C-TAM-TPB	Combined TAM and TPB
MPCU	Model of PC Utilization
IDT	Innovation Diffusion Theory
TAM	Technology acceptance model
PE	Perceived ease of use
PU	Perceived usefulness
BI	Behavioural intention to use
SA-SAMS	South African Schools Administration Management System
MoEVT	The Ministry of Education and Vocational Training
MOE	Ministry of Education (Malaysia)
HOD	Head of department
SMT	School management team
SGB	School governing body

CHAPTER 1: INTRODUCTION

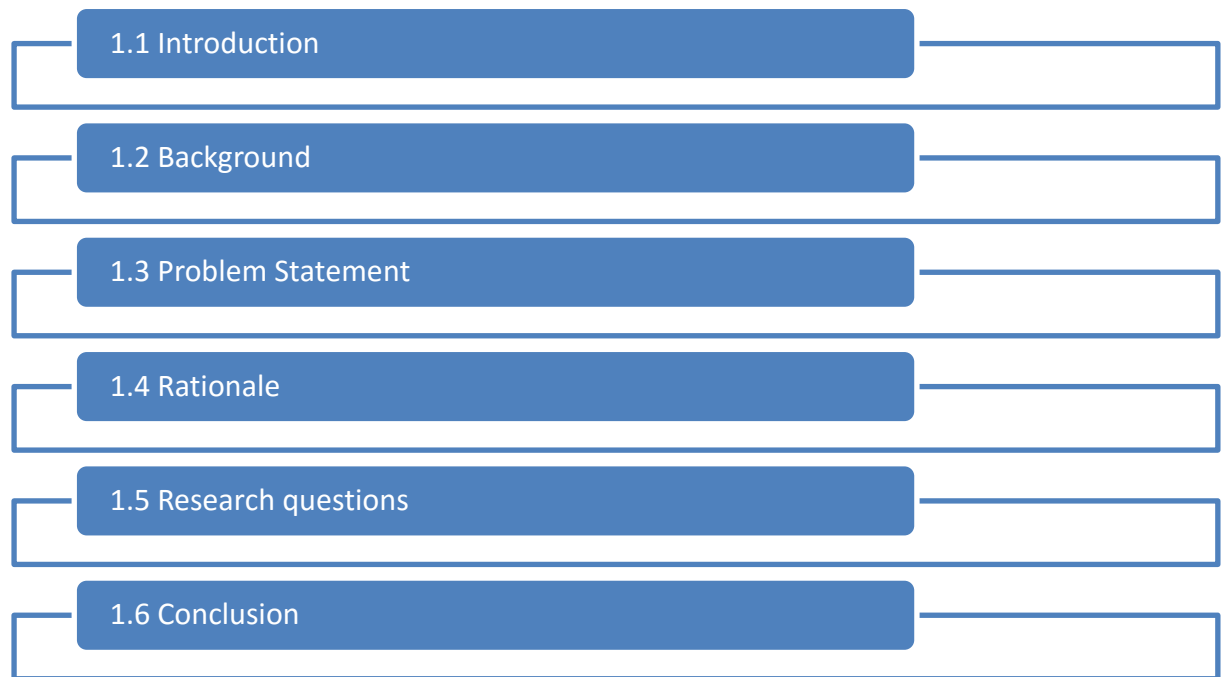


Figure 1.1: Introductory map

1.1 INTRODUCTION

The pervasiveness of modern technology can lead to a reasonable expectation that educators are familiar with some form of modern electronic technology and that they ought to display a willingness to accept technology as an extension of their academic duties at schools. Alharbi (2013) states that educators have access and are exposed to an abundance of the latest technological tools in the 21st century. They are not only transforming their way of teaching, learning and working, and making education more accessible, but also making it even more meaningful and customised.

Dividing and defining the user groups of technology into digital natives and digital immigrants holds very little to no value. The latter group have been fully absorbed into the mainstream while the former has come of age. Despite technologies being made readily available, the use, integration and relevance of technology at schools remains problematic. Poor/underprivileged schools are more often less resourced, and have very little to no access to technology, when compared to their more affluent counterparts. The common denominator in these two scenarios is the teacher who

largely influences and affects the assimilation and use of technology in the classroom (Souja, 2014).

This research study attempted to understand and explain some of those factors that prevent or are challenging to teachers from accepting and implementing ICT in their classrooms. I will, henceforth use the terms 'educator' and 'teacher' interchangeably in this document to refer to a person who was formally appointed to teach a group of learners in a formal school setting by the South African Department of Education (DBE).

In the modern world, many teachers own or are familiar with an electronic device such as a smartboard, computer, smartphone and/or a tablet. This familiarity does not necessarily translate into acceptance and willingness to use such technologies in the classroom. In addition, teaching technology as a stand-alone subject is limited, and contributes to embedding technology in the critical pedagogical process. The teacher, as facilitator, plays a vital role in the integration of technology and learner acceptance thereof in the classroom. As with any technological advancement, many teachers find accepting information, communication and technology (ICT) integration in the classroom a challenge (Isaacs & Hollow, 2012; Howard, Chan, & Caputi, 2014; Moyo, 2015). This study will refer to technology as Information Communication Technologies (ICTs) within the learning and teaching context at high school level.

The e-Learning Directorate (GDE, 2011, p.5) defines the integration and use of ICT into the education, training and development process as e-learning. It can also include learning that takes place via any form of electronic device or on the internet, which enables learning outside the traditional classroom environment, as well as bringing information and educational material directly to the learner (Clark & Mayer, 2016). These technologies, among others, enable educators to design and develop learning according to the specific requirements of the learner (Algahtani, 2011). For the purpose of this study, the teaching and learning environment will refer to the formal classroom setting.

Existing literature points out that technology acceptance is still a challenge among teachers (Isaacs & Hollow, 2012; Howard, Chan, & Caputi, 2014; Moyo, 2015). The shortcoming or lack of effective leadership in schools to integrate educational

technology into the school curriculum also impacts on the implementation of e-learning in schools (Vandeyar, 2015). If the support for teachers to implement or incorporate technology is not provided, or if managers at schools are unwilling to accept that ICT integration can enhance traditional pedagogical tools/practices, then this will negatively affect or influence buy-in from the staff. School governing structures in South Africa are still largely hierarchical (South African Schools Act, 1996) while decision-making powers remain with the leadership of the schools with little or no input from lower level staff members. Lower level staff members include post level one teachers, administrative staff and support staff. Lower levels of staff normally concentrate on curriculum matters (South African Schools Act, 1996) and when asked for input, are unable to help make decisions due to lack of knowledge of policies and procedures or regulations.

Although teachers are an integral part in the effective utilisation of ICTs in the classroom and educational systems, understanding the factors and/or dynamics that define, determine or propel their engagement with technology for teaching and learning is crucial. These would include adopting strategies that would resonate with the demands of the current and future society, teachers' innate abilities, how teachers engage and navigate the power relations at schools and the preparation of students to engage in lifelong learning (Zhao, Tan & Mishra, 2001; Howard & Thompson, 2016). Smarkola (2007, p.65) defines technology acceptance as "a user's willingness to adopt and use technology for the tasks it is designed to support".

1.2 BACKGROUND

In many modern societies, some form of ICT surrounds people daily (Gao, Yan, Zhao, Pan, & Mo, 2014). In these contexts, teachers can no longer regard modern technology as a foreign concept or escape the increasing influence or intrusion of electronic media. In this digital era, the teacher, in the classroom needs to compete with the broader classroom called social media. The view that technology is a panacea to all educational shortcomings is near-sighted and almost dangerous. Also, not knowing how to use these cutting-edge technologies in the highly contested space of the classroom will render it ineffective. The effective use of technology in the classroom will necessarily depend on situation and intent. This researcher is of the

opinion that teachers need to engage these modern technologies with the knowledge and skills (Souja, 2014).

Gu, Zhu & Guo (2013) state that over the past few decades ICTs have rapidly evolved, coupled with continuous efforts to introduce and incorporate ICT in education. Many of the traditional teaching methods are becoming obsolete and are being replaced by more advanced ones, which aligns or interlocks with ICTs (Negi, Negi & Pandey, 2011). Researchers such as Negi, Negi and Pandey (2011) and Higgins, Xiao and Katsipataki (2012) found that the inclusion of technology could be effective in improving teaching and learning. The challenge that remains is how to get teachers, as an important conduit in the education value chain, to accept, adopt and effectively implement these ICTs in their classrooms. It is reasonable to expect that technology acceptance and the use thereof in the classroom come with its own challenges. Some of these challenges will be explored later in this study.

According to Smarkola (2007, p.65), the success “of any technological initiative(s) may be substantially influenced by the degree to which the potential users are willing to use or adopt the acquired system or technology”. In that sense, modern technological systems are no different from other long-standing teaching tools such as books, chalk and “blackboards”. These tools prove only as effective or useful as the person using them (Cox, Preston and Cox (1999) in Mumtaz (2000). A study conducted by Kumar, Che, Rose and D’ Silva (2008, p.8) indicated that teachers who displayed a positive inclination to technology “demonstrated greater usage” while teachers who reacted negatively to technology “did not acquire and integrate knowledge and skills on computer technology in their classrooms”. This was confirmed in a previous study conducted by the researcher in 2015 that investigated the acceptance and use of technology in teaching and learning at a school in South Africa. The results indicated that the educators interviewed were able to see the potential that the use of technology holds in the teaching-learning environment. The researcher found that all the lesson plans of teachers contained some evidence of the incorporation of ICTs in their planning.

The findings of the research supported the principles contained in the TAM framework namely that the teachers who find technology easy to use and perceive its usefulness will include it frequently in their teaching. When asked, “If someone showed you how

to do it, would you complete a task using technology?” all the participants responded favourably. Educators are more willing or inclined to use technology when they are empowered. Regrettably, not all educators receive training in the use of technology in their classrooms. Some teachers reported that the last training in ICT they received was as students at tertiary institutions, this was before the use of ICT became widespread. This time lapse could also have affected their willingness and ability to integrate technology in their classrooms.

The participants interviewed did not see the Gauteng Department of Education as an effective enabler in using technology in the classroom successfully. There was agreement that there is little or no training initiatives from the District office of the Department. Most felt that the training sessions organised by the District were basic and ad-hoc while the school did not provide any such training. The teachers interviewed displayed a willingness to be trained but mentioned that the training needed to be individualised to their needs, level and availability. Perceived usefulness, perceived ease of use, educator’s competency and training, institutional factors, and technical support are some of the other challenges that underline the acceptance of ICT in the classrooms. Teo (2010) states that technology use in the classrooms is multi-faceted and that these numerous aspects are interconnected and influence technology use.

For technology integration to be successful, it is dependent on the perspectives of those involved in employing it in their teaching practice and learning. While schooling institutions make use of a wide range of ICT’s, it is not enough for the needs of the students learning in the 21st century, significantly in developing countries (Karaca, Can & Yildirim, 2013). Banas (2010) remarks that common barriers such as understanding or knowledge, confidence, skilfulness, time and accessibility, among others, should not hinder the integration of technology. Teachers are “the key to effective integration of technology” in schools and understanding “the factors that drive them to engage with technology for teaching and learning” (Zhao, Tan, & Mishra, 2000, p.212; Teo, 2011) is important.

1.3 PROBLEM STATEMENT

Several studies regarding educators' and principals' attitudes towards the integration of ICT have been conducted over the last twenty years with the wide growth of technology in schools (Mumtaz, 2000; Jimoyiannis & Komis, 2007; Teo, 2011; Hsu, 2016). In his results, Todman (2000, p.27) pointed out that a decent range of educators responded negatively to computers varying from "mild discomfort to extreme avoidance". In addition, Nikian, Nor, and Aziz (2013) identified a resistance towards the utilisation of technology by some teachers.

In a western context, there is an abundance of research papers on technology integration and many researchers have tried to find out why teachers' use of digital technologies varies so greatly (Mumtaz, 2000; Elston, 2013; Stockless, 2017). This work has led to the development of a range of theoretical perspectives that attempt to understand the reasons for teachers' use/non-use of digital technologies in their classrooms. Even though there has been a staggering increase in computer technological investments (Cuban, Kirkpatrick, & Craig, 2001; Ficklen & Muscara, 2001) hoping that teachers could incorporate the technological tools into their classroom instruction to boost student learning, teachers must be self-motivated, interested and willing to incorporate technology in their classrooms in order for these investments to yield results. Consequently, these investments have not yielded the desired results as teachers who are "the key to effective integration of technology" in schools, regardless of their pedagogy, were not made part of the process (Zhao, Tan, & Mishra, 2000, p.212; Hsu, 2016). Unless teachers have a comprehensive insight into the nature of the modern technologies, they cannot critically assess its use and usefulness in context. As contributors (and not spectators) to the body of knowledge, they can empower themselves and hold experts to account (Feynman, 1998; Shamos, 1995; Solomon & Thomas, 1999 in Compton and Jones, 2004).

1.4 RATIONALE

The rationale for this study arose from the researcher's experience within the school environment, where ICTs are available, but often not used and literally, 'gather dust'. The researcher is of the opinion that ICTs could be useful in making the learning and teaching environment more active, interactive, lively, relevant and applicable (Edmunds & Hartnett, 2014; Lu & Law, 2012; Psycharis, 2013). In the age of digital

and electronic communication, young people are at the forefront and define themselves in terms of the digital evolution (Druin, 2005; Lauricella, Cingel, Blackwell, Wartella & Conway, 2014). Studies conducted in Europe (Belgium, Czech Republic, Finland, Germany, Italy), Russia and the United Kingdom, identified children of up to eight years as digital natives; they easily and quickly acquire the basic ICT operational skills with the digital technologies in which they are engaged (Lauricella et al. 2014). In this age of digitization, educators who are unwilling to learn and adapt to this changing reality, will probably find engaging with their learners, who grew up with technology, very difficult (Chaudron, 2015).

In as much as the young people are natives of the digital age and more willing to accept ICTs in the learning environment, the teacher, more often than not holds the key to success in projects to promote the use of technology in schools. The researcher sought to find out to what extent technology is accepted or not accepted by teachers in four public schools in educational districts in the Gauteng Department of Education, Pretoria, South Africa, and the reasons for this. The insights gained from this research could, specifically or generally, assist and guide similar public schools in South Africa and elsewhere regarding perceived usefulness, perceived ease of use, the educator's competency and training, institutional factors and technical support.

The focus of this study sought to investigate technology acceptance in schools. My investigation aims to unpack some of the reasons why use of technology and acceptance thereof in the classroom remains a critical challenge at public schools and to this end make a positive, visible contribution in this area of study.

1.5 RESEARCH QUESTIONS

Main research question:

To what extent is educational technology accepted in teaching in public secondary schools in Pretoria?

Sub questions that will shape this research study are:

1. How useful do teachers perceive educational technologies?
2. How do teachers perceive the ease of use of educational technologies?
3. What are the teachers' attitudes towards the use of ICTs in teaching?

4. What are the obstacles to the implementation of ICT technological tools in teaching?

1.6 CONCLUSION

Teachers are “the key to effective integration of technology” in schools and understanding the “factors that drive them to engage with technology for teaching and learning” (Zhao, Tan, & Mishra, 2000, p.212; Woodbridge, 2004) is important. Fostering technology acceptance by South African teachers remains a critical challenge.

The objective of this study sought to investigate technology acceptance in schools. My investigation aimed to unpack some of the reasons why use of technology and acceptance thereof in the classroom remains a critical challenge at public schools. This chapter along with the research problem, the research questions and objectives provided an introductory overview and background to the study. The following chapter discusses the literature review that informed the study.

CHAPTER 2: LITERATURE REVIEW

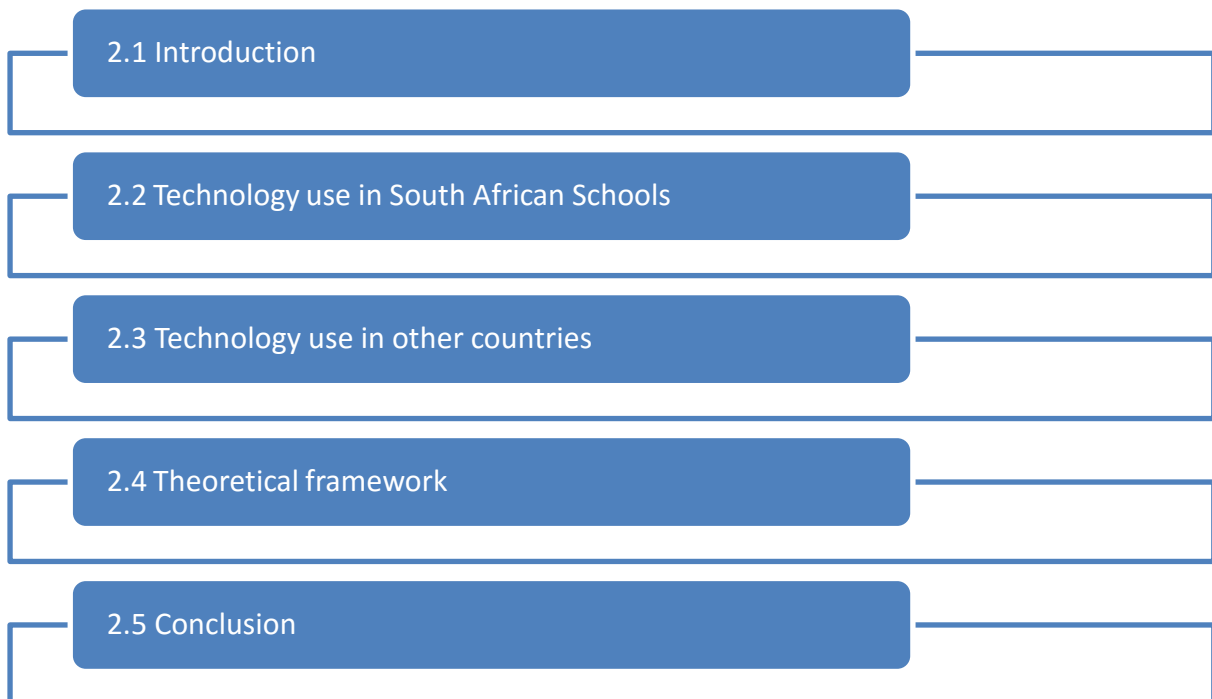


Figure 2.1: Literature review map

2.1 INTRODUCTION

“The rationale for compiling a literature review is to provide a theoretical framework for this study, to gain an in-depth understanding of the phenomenon under the spotlight, and to discover views of other scholars” (Strauss & Corbin, 1995, p.52). The literature review will provide a compilation and assessment of the studies conducted of scholars and researchers in the area of ICT integration in teaching and learning. In doing so, the researcher will aim to provide a theoretical understanding of the subject matter under investigation. Together with the theoretical framework and the literature review, the findings of this research study will either confirm or unconfirm the research questions/assumptions of this dissertation (Strauss & Corbin, 1995).

The use of technology in schools is a highly contested and controversial area in which there exists as many views as researchers, commentators, educators and intellectuals (Teo, 2010). Educational thinkers such as Hargraves (2012), Cuban (1986) and Wenglinsky (2005) in Soujah (2014), caution on the overinvestment in and over-reliance on technology and electronic tools. They argue that technology is a sophisticated tool and will be rendered ineffective if improperly used (Souja, 2014).

John Hattie in Souja (2014) opines that the effectiveness of ICT integration is dependent on teaching strategies, ongoing opportunities for learning, control of the learning process, peer learning and feedback.

Much of the current research (Elston, 2013; Semerci & Batdi, 2015; Ngeze, 2017; Padayachee, 2017) focuses on examining, exploring and investigating the integration of technology in schools, with the primary aim of dissecting the various factors affecting this phenomenon. User acceptance of technology has become one of the most researched areas in recent times; however a careful/in-depth analysis of the multiplicity of issues and the manner in which they interact to influence those involved, remains scarce or elusive (Smarkola, 2007; Mumtaz, 2000; Jimoyiannis & Komis, 2007; Teo, 2011; Hsu, 2016).

Literature points to data collection tools that were developed in order to research the use of technology by teachers (Teo & Noyes, 2008; Teo, 2010). These instruments focused on the experiences of teachers using technology with minimal to little focus on recent usage and implementation measures. Teachers were requested to fill out a report on types, frequency and manner for which they employed these technologies (Teo, 2010). By employing the Theory of Planned Behaviour, the study involving 157 student teachers found that teachers' attitudes towards usage and other subjective norms, were significant predictors of behavioural intention to use technology. Other studies investigated the factors that influence teachers' use of technology, but only a "few instruments have been developed to explicitly measure technology acceptance" or attitudes towards computers (Teo, 2010, p.992).

The literature suggests that the acceptance and use of technology in classrooms is a complex phenomenon, which involves the interplay of various factors (Teo, 2010). This study will limit itself to those few factors influencing the willingness and ability of teachers to use ICT in the classroom setting. This study contends that teachers minimally require three basic things to be effective in teaching with technology. These are firstly, knowledge about technology, secondly, knowledge in technology and thirdly, general technological pedagogical knowledge (Moreland & Jones, 2000).

2.2 TECHNOLOGY USE IN SOUTH AFRICAN SCHOOLS

The success of technology integration in classrooms is dependent on numerous variables. These include the perspectives, views, support, predispositions of those involved in the teaching and learning process, the availability of infrastructure, effective policy frameworks and in-service teacher training and development (Hsu, 2016).

The South African Schools Act of No 84 of 1996 also underpins this principle. The Act stipulates that schools be run democratically, ensuring that parents, educators and community members should all get involved. The decision to integrate computer-aided technology as part of the traditional curriculum is a strategic decision on which the school governing body should decide.

In 2003, the South African government re-committed to improving its citizens' ICT skills by bridging the technological gap of those previously discriminated against under apartheid. This conforms with the United Nations Sustainable Development Goals (SDGs) of 2015 and the principles contained in the New Partnership for Africa's Development (NEPAD) to bring about sustainable growth in the 21st century" (Department of Education, 2003). Improving the quality of education and educational instruction can greatly assist in reversing the cycle of generational poverty of disadvantaged groups. These organisations (United Nations, 2019) continuously advocate for more investment in education, especially in the recent past when technology became almost ubiquitous in the modern world. The perennial question raised in many quarters is whether these investments yielded the desired results.

A wide range of studies conducted since the growth of ICTs twenty years ago, points to the attitudes of principals and teachers as a deciding factor in the use of technology integration in the classroom (Mumtaz, 2000; Jimoyiannis & Komis, 2007; Teo, 2011; Hsu, 2016). Teachers play a central role in the effective inclusion of technology in schools. Investigating the issues influencing their engagement with technology becomes very important.

Smarkola (2007, p.65) pointed out that the success of technological initiatives depends largely on whether potential users, educators and learners alike, "are willing to use or

adopt the acquired technology”. This could hold positive advantages for their teaching practice. Studies conducted in 2002 by Windschitl and Sahl showed that teachers who employ ICT in their lessons gradually change their instructional practice to a more constructivist pedagogy. In other words, both teachers and learners actively construct or create knowledge and find meaning in learning in a collaborative manner. Both become active agents in the learning and teaching process.

As teachers use ICTs with learners, the form, shape and manner of teaching practices may gradually lead them to imagine and re-imagine the creation of knowledge and meaning with their learners. In addition, teachers are able to administer and manage their workload/plans more efficiently when using ICT as the researcher will reveal in her findings of the interviews. This study will affirm that technology also enables them to communicate more effectively and speedily with their peers in their respective school communities (Bialobrzaska & Cohen, 2005).

In South Africa, the then Gauteng Provincial Member of the Executive Council (MEC) for Education, Panyaza Lusifi, launched the paperless education system pilot project at seven schools in Gauteng in January 2005. According to the Provincial Department of Education, each learner would receive a tablet and internet connection. By utilising the ICTs, this system would afford learners a gateway to learning material, workbooks and other subject related matter. Learners, reportedly, were excited about the prospect of using computer assisted learning. The project experienced many setbacks and challenges such as theft and loss of equipment, lack or no teacher training and timing, scheduling and preparation of implementation (Unknown, 2015).

Similar initiatives elsewhere point to similar weaknesses. The study commissioned by the European Union found that teachers use ICT primarily for lesson preparations but rarely during teaching classes and even less frequently to interact with parents (European Commission, 2013). Nevertheless, teachers are optimistic in utilising ICT in their teaching practice. This study also found that ICT training is rarely compulsory but the more confident teachers become, the more time is spent on training with an increased use of ICT based activities during lessons. The majority of heads of schools are in accord regarding the relevance of ICT in schools; the positive impact of students' motivation; and higher order thinking skills which are essential for preparing students for the 21st century (European Commission, 2013). Fatema (2013), contends that the

under-implementation of these technological initiatives is due to inadequate user acceptance studies, leading this researcher to assert that ICT is not a panacea for the challenges of education but can through scientific research, rigorous planning and application, overcome some of the barriers to successful implementation of ICTs at schools.

The availability of ICT does not translate into willingness and ease of use. The Department of Basic Education (DBE), in partnership with private sector companies, especially South African telecommunications companies such as Cell C, MTN and Vodacom has endeavoured to incorporate the use of technology in schools (DBE Annual report, 2015). These companies have made various donations such as tablets, laptops, a router, a projector, a server, two printers and a trolley unit to targeted primary and high schools. The then Deputy-President, Cyril Ramaphosa, reiterated in 2015 the importance of e-skills in the knowledge/electronic economy, advancement of businesses and economic growth. “The term e-skills encompasses a wide range of capabilities (knowledge, skills and competencies) which spans over a number of economic and social dimensions” (The European e-Skills Forum, 2004).

One such initiative was involved in setting up desktop laboratories in about 1200 schools as part of the Gauteng Online initiative. In other initiatives such as the “New Partnership for Africa’s Development (NEPAD) e-schools initiative”, the “Mindset Network and the Thutong Portal”, learners were also provided with learning support matter and curricula material (Moyo, 2015, p.7). These projects are not without challenges and according to Wilson (2013), an ‘e-learning solution’ of R396m that would take the place of the controversial R2,2bn Gauteng Online has been outlined by the Gauteng provincial government. It involved the roll-out to 2200 government schools of “88 000 Android-powered tablet computers made by China’s Huawei” (Wilson, 2013).

In addition, Stuart Lumka, the Provincial Head of Finance, stated that the Gauteng Online is a reminder of a costly, unrewarding venture and that it was a learning experience for the province of how not to implement a project of this nature and magnitude (Wilson, 2013). Elsewhere, the City of Tshwane installed free Wi-Fi spots around the city where people could have internet access. Learners could potentially benefit from this initiative if these spots included school premises where learners could

have access to Wi-Fi in the classroom (City of Tshwane, 2015). The school where the researcher is employed is also part of this project. In a previous study conducted by this researcher at her high school in 2016, it was found that educators' training on the donated technologies was either inadequate or non-existent. The project also lacked the necessary support of management. Some educators had difficulty accepting that they needed to adapt to changing circumstances. While ICTs have almost become part of the everyday life experiences of well-resourced schools, underprivileged schools are still lagging behind in the assimilation of ICT.

A study by Padayachee (2017), found that there are intermittent power failures and lack of network coverage, especially in the peri-urban and rural areas. Teachers decried the negative impact technology had on learners. They mentioned the lack of discipline, distraction and over-reliance on technology which can lead to complacency. Learners also used the technologies to play electronic games. Padayachee (2017), reported in some instances, teachers had to bear the cost of these technologies such as buying their own devices, especially mobile telephones, laptops and data projectors, using their personal data for downloads and subscriptions to relevant websites. They also mentioned that the school management does not allow enough time and opportunity for teacher training on how to use new technologies. Learners are not digitally literate and do not have access to, or own a smart device, which hampers integration of ICT into the lessons (Padayachee 2017). Technology use must be context driven. Some teachers displayed resistance to new technologies citing that they are too old to engage with digital or electronic equipment. Physical storage and safety of equipment, lack of space in the classrooms, lack of information, security and poor support for learners with special needs were amongst the concerns mentioned by teachers (Padayachee 2017).

In delivering the State of the Nation Address (SONA) in 2019, the president, Cyril Ramaphosa, made assurances that the education system in South Africa would be revised and that the government intends to equip learners with digital workbooks and textbooks in digital format for the next six years. At provincial level, the paperless classroom initiative, that sees high-speed broadband classrooms fitted with interactive smart boards, is being advocated by the Gauteng DBE (Mzekandaba, 2019).

The guidelines, established by the eLearning Directorate (GDE, 2011), emphasise that using ICTs, especially computers, is a requirement and that learners should become capable of using ICT and it can henceforth not be considered as an option but a requisite in teaching and learning. ICT literacy, ICT usage for administrative tasks, and integrating ICT in teaching and learning is the teacher's responsibility. Knowing how hardware and software works; finding and evaluating online information; planning ICT integrated projects and lessons; using ICTs for administration purposes such as typing examination papers; storing evaluation results electronically; and using email to communicate with learners and parents, are some of the skills teachers require, as specified in the guidelines (GDE, 2011). Table 1 is a summary of the development of ICT in South African schools in the past two decades.

Table 2.1: Summary of the development of ICT in South African schools

Date	Development
2003	Draft White Paper on Education: South African government re-committing to improve its citizens' ICT skills (DBE, 2003).
2004	White Paper on e-Education (DBE, 2004).
2011	Guidelines for schools developed by DBE: eLearning Directorate (DBE, 2011).
2013	Sunward Park High School (Boksburg, Gauteng) goes 100% digital, uses E-learning to achieve educational excellence (Macmillan Education, 2013).
2015	MEC Panyasa Lesufi launches paperless education system pilot project at schools in Gauteng (SANews, 2015). Western Cape Premier Helen Zille formally launched the Western Cape's eLearning "Game-Changer": Free high-speed internet at all Western Cape Schools by end-2016 (WCED, 2015).
2016	DBE and partners conduct a course on Managing and Leading Education Change with Digital Technologies to improve e-Learning in schools at the University of Johannesburg, Auckland Park Campus (DBE, 2016). Gafieza Ismail, an English Teacher at Spine Road High School, Rocklands, Mitchell's Plain, Western Cape Province, has won the National Teaching Award for Excellence in Technology-Enhanced Teaching and Learning (WCED, 2016)
2017	MEC states that Government will continue working very hard in ensuring that learners acquire the necessary skills required in the 21st Century at Education Imbizo in the Sedibeng West Education District (DBE, 2017). Western Cape Province Premier Helen Zille and MEC Debbie Schafer showcase eLearning model school in Gugulethu (WCED, 2017).

2019	President Cyril Ramaphosa said in his State of the Nation address that the government would be replacing school books with tablets over the next six years (SONA, 2019).
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2.3 TECHNOLOGY USE IN OTHER COUNTRIES

An eLearning Africa Report in 2012 (first of its kind) surveyed the experiences of eLearning professionals and related stakeholders on their experiences over the past five years. The report documented the views of 447 respondents on the benefits and impact of ICTs at participating schools. The range of views included: that learners are motivated to learn; learning becomes fun and encourages independent guided learning; learners produced their own knowledge; and respondents also reported finding more content on the internet (Isaacs & Hollow, 2012).

Elsewhere in Africa (Mbithi & Mathuva, 2018), the Kenyan government embarked on a programme to equip high schools with ICT equipment in line with the country's Kenya Vision 2030 programme. This is happening despite difficulties such as: classrooms that are overcrowded; high student - educator ratio especially in densely populated and semi - arid regions; educator shortages for certain subjects; and comparatively high cost of learning and teaching equipment. The National ICT policy (2006) and the National ICT Strategy for Education and Training emphasise ICT integration firstly, as a global educational and training imperative and secondly to improve access, learning and administration (Mbithi & Mathuva, 2018).

In 2002 Tanzania introduced ICT use in schools (URT, 2007) along with several regulating guidelines in an effort to enhance teaching and learning in Science and Mathematics. The Ministry of Education and Vocational Training (MoEVT) emphasised ICT integration as a pedagogical instrument in the fields of teaching and learning (URT, 2007). Swarts and Wachira (2010), noted in their study that many teachers were not acquainted with how to integrate ICT into teaching even though they had basic ICT knowledge. They contend that the MoEVT in Tanzania should focus on ICT deployment in the teacher training colleges.

In 2005, the Dar es Salaam University College of Education was established to address the acute shortage of secondary school teachers and to empower teachers on how to integrate technology into education. First year students were expected to

enrol for the introductory Computer Literacy for Teachers course with the aim to develop the basic teacher ICT skills and knowledge (Kafyulilo, Fisser, Pieters & Voogt, 2016). Ngeze (2017) reported on a study conducted on the readiness of schools to integrate ICTs in Tanzania. Data collected from 202 teachers at 32 schools in all the Educational Zones in Tanzania shows that most schools do not have ICT infrastructure and where ICT is present, the student to computer ratio is very high. Participating teachers were ready to use ICT only if given proper training; 77% of teachers in the study owned a laptop, smartphone, or both. The study recommended that the MoEVT increase teacher training in ICT, set up adequate ICT infrastructure at schools and provide a framework for implementation.

As shown above, the various projects to introduce ICTs in the school system did not deliver the intended outcomes, partly due to lack of infrastructure, poor or lack of project planning and implementation, but in the main because teachers, as key role players, were never or seldom consulted or trained.

The shortage or low levels of literacy, especially ICT literacy, will probably rate as one of the biggest societal challenges for low-income countries in the digital age. The so-called knowledge economy demands that role-players and participants are equipped with the requisite skills and competency. Education ought to enable and empower people to participate meaningfully in any economic dispensation, including a digital one (Wagner, Castillo, Murphy, Crofton & Zahra, 2014). For the purposes of this study, the author will also focus on the challenges as they relate to Information Communication Technology (ICT) integration in the classroom. As stated earlier the introduction of ICTs should not be regarded as the antidote for all educational shortcomings.

Padayachee (2017) contends that ICT integration in education in South Africa has been severely limited by operational, strategic and pedagogical challenges. Very little information exists on the practical implementation and application of ICTs in classroom settings. Addressing these challenges, requires an understanding of the current landscape of ICT integration in schools according to Padayachee (2017). The Department of Basic Education in South Africa conceded in a 2015 report that technology-enhanced learning has not advanced as envisaged. A gap also exists between government's expectations and the practices of teachers. Preliminary studies

to investigate and illuminate the practical enforcement of the e-Education policy to improve effective teacher ICT training seem to have escaped researchers and educators (Padayachee, 2017). At the same time, it should improve the critical understanding of concepts and definitions in learners. In doing so, the teacher-learner experience becomes more meaningful and relevant and contributes to the ongoing improvement of teacher training initiatives.

In studies conducted in South Africa (Padayachee (2017) and Uganda (Habibu, Abdullah-al-Mamun & Clement, 2012) teachers sited lack of infrastructure or the inadequacy of existing infrastructure as the most important barriers to the use of ICT in classrooms. Teachers reported that they had no internet access in the classroom and did not have the necessary tools such as data projectors. Another major concern was lack of adequate funding for these projects. They also pointed out lack of available time due to demanding workloads. The school programme is often disrupted by ad-hoc events during the year while the short periods are not conducive to focussed learning (Padayachee, 2017; Habibu, Abdullah-al-Mamun & Clement, 2012).

Ngeze (2017) states that the classroom and distance learning experience become enriched where the necessary infrastructure is in place and teachers are trained to effectively implement ICT integration. The National ICT policy of Tanzania accepts that the lack of teacher training in ICT tools and technologies is a major reason for variable results of effective delivery of education (URT, 2007).

According to a survey on technology in the classroom, Elston (2013) found that over half the Cambridge schools surveyed in Europe had a documented technology or e-learning strategy. Technology was widely used by almost all respondents. Some indicated basic challenges but generally teachers were confident in using ICT in classrooms. Furthermore, teachers agreed that ICT helps students develop real world skills. It also exposes them to a wealth of content. Among the major challenges reported by teachers are poor internet connection; security around student access; students knowing more than teachers about ICT and access to the latest hardware. In addition, 87% of the respondents were of the view that all lessons would be enhanced by some type of technological application within ten years while 96% were confident about using technology within the classroom. Connecting classrooms around the world was the most appealing solution to teachers (Elston, 2013).

A study, to analyse the availability and use of technology in public schools of the US by Gray, Thomas, and Lewis (2010), established that of the surveyed 3000 teachers, less than half utilise ICTs for educational outcomes. Technology was frequently employed for administrative functions such as grading, attendance, and reporting. According to Kopcha (2012), this gap was related to the barriers faced by teachers incorporating technology in their teaching practices. Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur and Sendurur (2012), noted that there are two types of obstacles in which teachers' use of technology is affected. The first is training, economic resources, equipment such as hardware and the necessary software followed by support of an administrative nature. The second is a lack of trust teachers have in themselves, their own views and perceptions of how students learn and their perception of the importance of teaching and learning with technology.

In a study conducted by Semerci and Batdi (2015), Turkish students who were taught using technology not only displayed improved confidence; they learnt, collaborated, cooperated more and displayed an increased willingness to engage in educational tasks. Lowther, Strahl, Inan and Ross (2008), reported in their study that students experienced their schoolwork to be effortless and that it raised their interest and attention.

The experiences, challenges and obstacles of Europe, USA, Turkey and developing countries pursuant to ICT integration in schools showed some distinct differences. Whilst the developed countries did not have significant infrastructural and funding challenges, they did have generational (digital natives vs digital migrants) and confidence or self-efficacy challenges. The problems and burdens obtained in developing countries covered a wide range – infrastructure, budgetary and funding, training and development and lack of effective policy guidelines and implementation.

Despite these challenges, all these countries are committed to improving the digital literacy of their citizens and appreciate that they must prepare the younger generation for a digital society by incorporating ICTs in the classroom. In terms of policy, funding and infrastructure commitment and support these countries found themselves at different levels of implementation. An early achievement is that at least they made a start with the potential to advance later.

2.4 THEORETICAL FRAMEWORK

The theoretical framework is capable of producing or supporting a research study theory. It establishes and describes the theory of why the research problem is being studied (Swanson, 2013).

A number of theories which include the Theory of Reasoned Action (TRA), the Theory of Planned Behaviour (TPB), the Extended Technology Acceptance Model (TAM2), the Combined TAM and TPB (C-TAM-TPB), the Model of PC Utilization (MPCU) and Innovation Diffusion Theory (IDT) among others, have been introduced to explain user adoption of technology. The theoretical framework will assist in exploring “the research problem under study”, which is user adoption of technology. The Technology Acceptance Model (TAM) by Davis (1989) will be utilised to explore the acceptance of educational technology in teaching in secondary schools in South Africa. Currently, the Technology acceptance model (TAM) “is a well-established model and is widely accepted among researchers in the field of information technology” (Ahmad, Madarsha, Zainuddin, Ismail & Nordin, 2010, p.268). Through the validation and examination of multiple studies, TAM ranks as one of the most efficient models to explain the adoption of recent technologies (Leong, Ibrahim, Dalvi-Esfahani, Shahbazi, & Nilashi, 2018). Figure 2.2 is a representation of the Technology acceptance model.

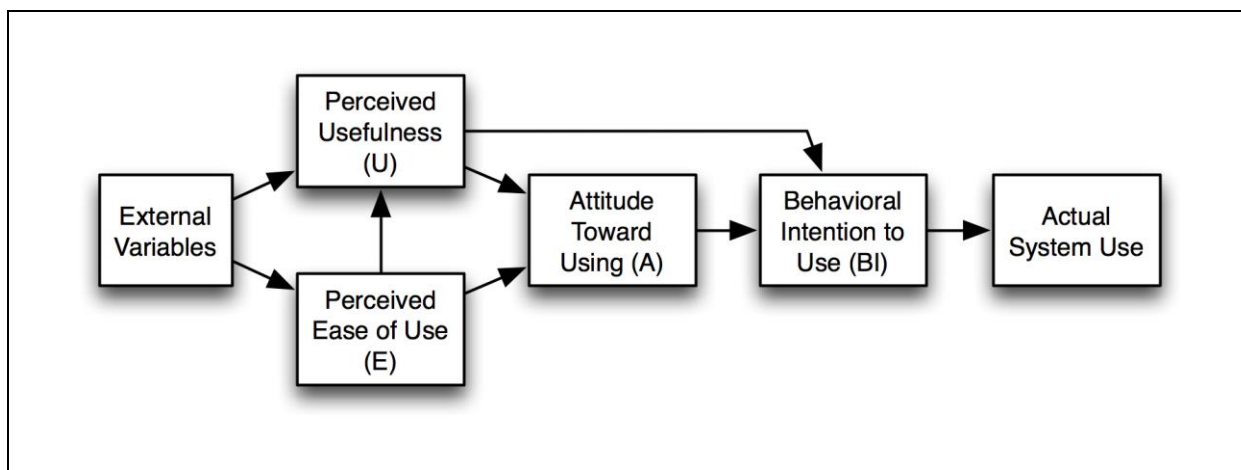


Figure 2.2: Technology acceptance model (Davis et al. 1989)

TAM is made up of six separate yet interrelated elements/building blocks which are external variables, perceived ease of use (PE), perceived usefulness (PU), attitude (A) towards using, behavioural intention to use (BI) and actual system use (Davis,

Bagozzi & Warshaw, 1989; Koh, Prybutok, Ryan, & Wu, 2010). An individual's attitude, intention and perceived usefulness of technologies leads to actual use of a technology/system. These form the basis of the theoretical model with its different, inter-connected parts under study.

In TAM, PE and PU determine the adoption of an individual's information systems (Lee, Kozar & Larsen, 2003; Surendran, 2012) by determining their attitudes towards using and subsequent behavioural intent, leading to real use of the system (Wu & Wang, 2005). PE, A and BI "represent the core components of TAM" (Erasmus, Rothmann, & Van Eeden, 2015, p.3). Figure 2.2 illustrates TAM "as a theoretical framework and its internal construct associations" (Erasmus, Rothmann, & Van Eeden, 2015, p.3).

The technology acceptance model (TAM) seeks to understand the factors that may influence users' decisions to accept or reject a system. The model suggests that users will embrace a system if they think it will enhance the efficiency of their job. This study will investigate whether all the theoretical tenets of this framework are present and operational and if technology will be accepted as part of the teaching environment in schools. The external variables that could impact PU and PE for this particular situation under study could be: support from management, training, educators averse to ICT, age and qualifications.

If the Department of Basic Education is not an effective enabler of the use of technology in the classroom and educators are not trained in technology usage in teaching and learning it can impact negatively on the acceptance of educational technology (Zhao et al, 2000; Teo, 2011; Hsu, 2016). Age, qualifications and educators that are averse to ICT could also impact PU and PE (Hsu, 2016). According to the guidelines, developed by the e-Learning Directorate, educators are expected to be computer literate on a basic level, albeit for administrative purposes, regardless of age or qualification, for the completion of marks on an electronic mark book, the South African Schools Administration Management System (SA-SAMS), and Excel spreadsheet and setting of tests and exams (GDE, 2011). However, this does not guarantee willingness or an inclination to use technology for teaching or learning. Equipping schools with computer technologies without considering whether educators are at ease using the devices would be a waste of time and money (Carlson & Gadio,

2003). “Perceived Ease of Use is expected to influence Perceived Usefulness and Behavioural Intention, either directly or indirectly, through its effect on Perceived Usefulness” (Liao, Palvia & Chen, 2009, p.309; Agarwal & Prasad, 1999; Davis, Bagozzi & Warshaw, 1989; Venkatesh & Davis, 1996).

TAM accepts that BI to use a certain technology is an important factor that determines whether it will actually be used. Individuals may find these technologies advantageous but difficult to use and these may overshadow uptake or integration in schools. As stated above, usefulness is a key predictor of technology usage. Teachers will use ICT if their use improves their teaching or efficiency (Lee, Kozar & Larsen, 2003).

This study makes use of the constructs of the TAM to determine technology adoption in teaching in classrooms, and the study will attempt to define limiting factors that contribute to negative or indifferent attitudes in teachers, in relation to their willingness to accept technology and why such changes are important. It is generally understood that for the model to be successfully implemented, all the pillars of this theoretical framework must be present and operational in the classroom. This case study, which is based on interviews conducted with teachers, my personal observations as an educator, and documents analysed pertaining to ICT projects undertaken by the Gauteng Department of Education, seeks to illuminate this model as an example or framework of this reality. Further, it aims to unpack some of the reasons why acceptance of technology in the classroom remains a critical challenge.

2.5 CONCLUSION

This chapter lays the groundwork for the discussion in the rest of this study. How South Africa compares to other countries in the world regarding technology used in the classroom was explored. The model used to outline the research framework for the study is described and explained. The next chapter explains the study's research methodology.

CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY

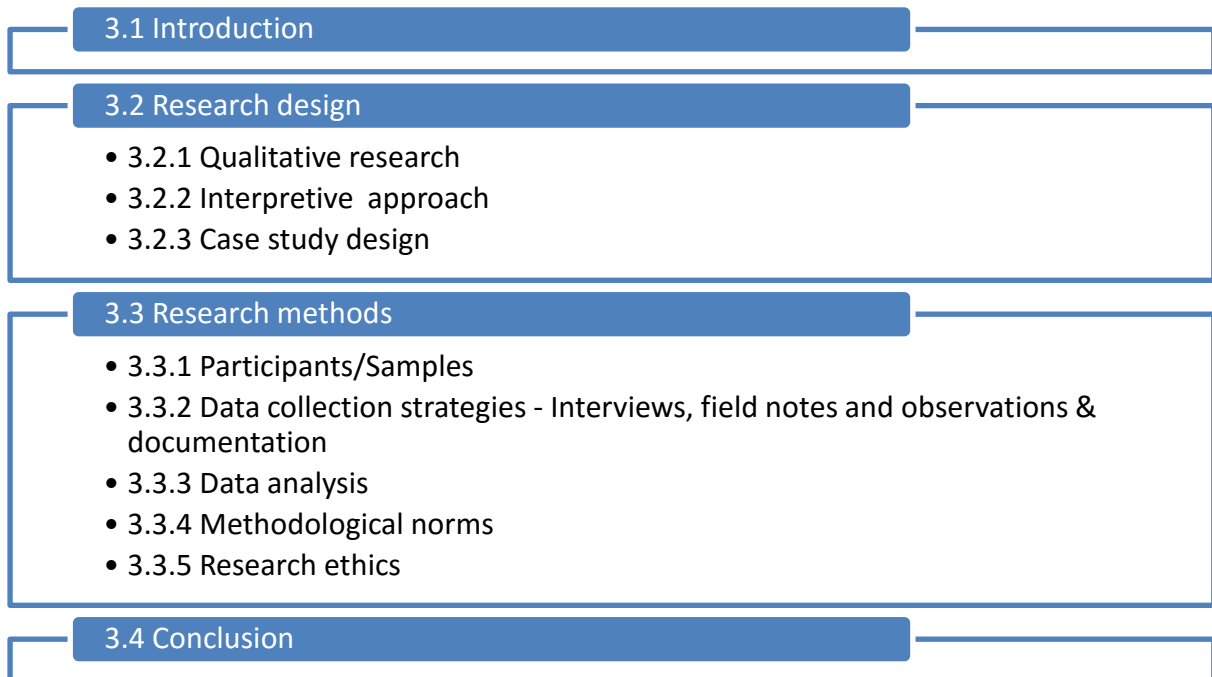


Figure 3.1: Research methodology map

3.1 INTRODUCTION

Maree (2007, p.70) states “that a research design is a plan” or approach moving from the fundamental “philosophical assumptions” to the selection of participants, the methods being used to collect information and the data to be evaluated. This chapter will give a comprehensive overview of the design and methodology of the qualitative case study.

Merriam-Webster defines interpretation as the ‘act or result of interpreting’, in other words, an explanation or explanatory information. The strength and power of the interpretivist approach/philosophical theory lies in its ability to address complexity and meaning of situations (Black, 2006, p.5; Maree, 2007, p.58). Any interpretation of the human phenomenon is necessarily contextually bound, subjective and rich in detail.

This is where the ‘why’ and ‘how’ questions come into play. The researcher wanted to gain insight of a situation, through interpretation and observation of how teachers make sense of technology and in their daily encounters with technology, whether it is a smartphone, a projector, a smartboard or computer.

Through the interpretivist design, the researcher attempted to understand the teachers' behaviour and perspectives without generalising about the findings and outcomes. The researcher became the facilitator and instrument through which the data was collected and analysed (Maree, 2007, p.60). The overriding value of this approach is the efficacy with which it can elicit detailed information from a small sample of people.

The researcher is “not an objective, authoritative, politically neutral observer standing outside and above the text, but instead is historically positioned and locally situated as an observer of the human condition” (Denzin & Lincoln, 1994, p.1049). In order to make sense of the participants' worlds, the researcher interacted with them, appreciated and clarified the meanings they ascribe to their experiences. The researcher was primarily a “data-gathering instrument” using carefully constructed questions aimed at understanding constructions of reality through interviews with the participants involved and in their context (Kirk & Miller, 1986, p.9).

3.2 RESEARCH DESIGN

The general design of this study was a qualitative method in order to explore the extent/degree to which ICTs are accepted and used in teaching at schools in South Africa. Qualitative research is a social research method that focuses on how individuals interpret and give significance to their experiences (Holloway, 2002).

3.2.1 Qualitative research

The research conducted followed a qualitative approach to the research method. Creswell (2007, p.37), defines a qualitative research study as “one in which qualitative researchers study things in their natural setting, attempting to make sense of or interpret phenomena in terms of the meanings people bring to them”. Merriam (2002, p.11) asserts “in conducting a qualitative study, the researcher seeks to discover and understand a phenomenon, a process, the perspectives and worldviews of the people involved”. Creswell (2013) summarises that the objective of the researcher is to investigate, comprehend and present participants' views in their natural environment. According to Merriam (2002, p.11), “interviews, observations and documents are the three traditional sources of data in a qualitative research study”.

Five key characteristics of qualitative research are summarised by Denzin & Lincoln (2011, p.8-10): “reducing the utilisation of positivist or post positivist outlooks; postmodern sensitivity acceptance; capturing the point of view of the individual; examination of daily life constraints and securing descriptions that are rich”. Creswell (2014) states that the perceptions and interpretations of the researcher become part of the research, resulting in a subjective interpretation flowing throughout the investigation. In order to manage subjectivity, the researcher takes a reflexive stance employing memo and journaling techniques that assist this stance (Yin, 2014).

3.2.2 Interpretive approach

Maree (2007) states that interpretivism was developed as a theory of meaning and understanding in the 19th century. It usually tries to “understand phenomena by the meanings people assign to them” (Maree, 2007, p.59). The paradigm of interpretation is based on observation and interpretation - Observation is the gathering of data or information concerning events, whereas interpreting is to clarify data or information by concluding or determining the correspondence between that information and some abstract pattern (Aikenhead, 1997, p.26). By employing the interpretive approach, the researcher is awarded bigger scope to handle problems “of influence and impact”, to raise queries such as ‘why’ and ‘how’, and developing specific technological pathways (Deetz, 1996, p.191). Ultimately, through interpretivist research, the goal is to provide insight into, and evaluate the situation being studied, that one may render perspective on how a certain demographic understands the phenomena experienced by them or their situation. The wealth and depth of explorations and descriptions it yields is one of its greatest strengths. Effectively the “researcher becomes the tool through which data is collected and analysed” (Maree, 2007, p.60).

3.2.3 Case study design

Case study investigation employs a qualitative method that encompasses the investigation of “a bounded system (a case) or multiple bounded systems (cases) over time; in-depth data collection involving multiple sources of information such as interviews, observations and reports; a case description; and case-based themes” (Creswell, 2007, p.73). By employing a case study approach, the researcher was able

to carefully study the information in a particular context. A small geographical region or a small number of people is selected as the subjects of the study in the vast majority of cases (Yin, 1984). Case study research is defined by Bromley (1990, p.302) as a “systematic inquiry into an event or a set of related events which aims to describe and explain the phenomenon of interest”. From an interpretivist perspective, case studies pursue a thorough knowledge of how respondents in a certain situation identify and communicate with one another and how they derive meaning of a phenomenon being studied. The objective is to obtain greater knowledge of a certain situation's dynamics (Maree, 2007). For many years, the case study research approach was used by researchers, across a variety of disciplines, to respond to "how" and "why" queries (Maree, 2007).

Yin (2003), points out that one of the biggest strengths of the case study design is its ability to adapt to distinct kinds of research questions and contexts (Yin, 2003). Various information collection techniques namely interviews, surveys, documentation review, observations and archival records, are being used in the case study method resulting in ‘thick descriptions’ of the situation being studied (Yin, 2003). Another major strength of this design according to Yin (2009) is the use of multiple sources of proof which permits triangulation of findings. Additionally, case studies supply the advantage of learning phenomena under study very well and in context, particularly in which there are far too many variables of concern than observations (Yin, 2003).

Instead of logic sampling, the multiple-case design shows varied sources of proof by replication. Multiple-case design, according to Yin (1994), strengthens and promotes previous results which helps to increase the degree of confidence in the reliability of the method. An argument against case study research is that, as a small number of subjects are used, it provides very little basis for scientific generalisation (Yin, 1984). The common concern is how to generalise from a single case. Yin (1984), points out that most often case studies are categorised as lengthy, difficult to carry out and massive documentation is being produced. The threat exists once information or documentation is not systematically controlled and arranged. Dependence on a single case study makes a general conclusion troublesome (Tellis, 1997). It is for these reasons that the multiple-case study method was regarded as the most suitable approach to use, as it offers a detailed and comprehensive means of collecting data,

analysing information and reporting outcomes, and, in doing so, provides understanding, to a large extent, of a specific issue or situation. Detailed qualitative accounts explain the intricacies of actual life circumstances that might not be recorded through experimental or survey studies. The use of a multiple-case study, which involves four schools within a particular geographical and administrative area in Pretoria, Gauteng, South Africa within a limited time, allowed the researcher to detect things that could be hidden or go undetected in the large-scale, broader, longitudinal studies described above.

3.3 RESEARCH METHODS

3.3.1 Participants/sample

Merriam (1998) states that the aim of purposeful sampling is to select a sample from which to learn the most with a particular purpose in mind. In order to be able to select respondents according to a list of specific criteria, purposeful sampling was preferred for this study. Purposeful sampling includes the researcher's selection of respondents based on specific features in order to create a sample that is adequate and yet has the defined features (Black, 1999).

The e-Learning advisor for the Gauteng Department of Education provided the researcher with a list of public schools in the province divided according to No-fee paying, Fee-paying and full ICT schools. Four schools in the Pretoria region, Gauteng, were identified where stratified purposive sampling and criterion sampling was used. Of the four schools, the researcher selected one no-fee paying school in a certain educational district, two fee-paying schools from the same educational district and one full ICT school in another educational district. All the schools selected are reasonably close to the researcher's workplace.

The sample consisted of twenty participants, five per school, from three different educational districts in the Pretoria region "according to pre-selected criteria relevant to a particular research question" (Maree 2010, p.79). The researcher decided on the characteristics of the participants to be included. Demographic variables such as age, gender, education level and job level, were criteria that were considered in the selection. All the participants taught at governmental public schools situated in the

same geographical area, i.e. Pretoria, Gauteng, and had the same organisational setup and hierarchy, that made no official difference between the responsibilities and role of teachers in their schools. Table 3.1 reflects the criteria the researcher used to obtain a representative sample of all the participants.

Table 3.1: Demographics of participants

Interviewees	Age	Gender	Education level	Job level
1	45 -50+	Male/Female	Degree/Post graduate	Educator
2	40 -50	Male/Female	Post graduate	Deputy principal
3	30+	Male/Female	Degree/Post graduate	HOD
4	30-40	Male/Female	Degree/Post graduate	Educator
5	20+	Male/Female	Degree/Post graduate	Educator

The participants in this study comprised of three educators, one Head of Department (HOD), and one Deputy Principal for each school. Among the participants were males and females. The educators' ages ranged from 20 – 50 and above, whereas the HOD's age ranged from 30 and above, and the Deputy Principal's age ranged from 40 and above. One of the participants, a female educator, who is close to retirement age, eventually did not give consent to the interview. The education level of all the participants ranged from degree to post graduate. The assumption was that educators with post graduate qualifications are inclined to use technology.

3.3.2 Data collection strategies

The distinctive strength of a case study analysis is that it enables researchers to use different types of data collection methods (Yin, 1994). Creswell (2007) states that the main feature of qualitative research is the collection of data by speaking to individuals and observing their behaviour and contextual actions. The primary data collection instruments used in this study were interviews conducted with teachers, observations and the analyses of documents. Two letters were used to request permission to gather data at the schools. The circuit managers of the respective educational districts (see Appendix A) received one letter and the other was addressed to the principals of the schools (see Appendix B). A third (see Appendix C), is a letter requesting consent from the participants to be interviewed.

3.3.2.1 Interviews (Semi-structured)

Semi-structured interviews allowed the researcher to investigate individuals' opinions, their experiences, beliefs and/or possible motives regarding certain subjects. Maree (2007, p.87) states that “the aim is to see the world through the eyes of the participant”. Semi-structured interviews are especially suitable to investigate delicate subjects where participants feel at ease to discuss such topics. This instrument for collecting information allowed for more open-ended questions and is less structured (Merriam, 2001). The questions for this study were decided in advance to allow for an open, conversational format. This afforded the researcher flexibility, the freedom to probe, go deeper and clarify any misconceptions. Therefore, for the most part, the interviews were semi-structured for this research.

The interview schedule (Appendix D) was designed to address the research questions focusing on:

- how useful the teachers perceive the received technologies to be;
- how easy the teachers perceive the received technologies to be;
- what the teachers' attitudes are towards the use of technological tools in teaching;
- to what extent technological tools are used in teaching; and lastly,
- what the obstacles are for the implementation of effective use of technological tools in teaching.

Interviews were used as a primary data collection source. This conversational approach allowed the researcher to collect information first hand and to gain an understanding of the realities and challenges of the way participants experienced their environment. These dialogues also allowed the interviewees to critically reflect on their respective positions. In so doing, the responses obtained provided evidence in support of the assumptions made above.

The interview questions were divided into different categories. The first category focused on the demographics of the participant, the second focused on perceived usefulness, the third concentrated on the use of classroom technology, the fourth on perceived ease of use, the fifth on teacher competency/training, the sixth on institutional factors, and the seventh on technical support. These categories enabled

the researcher to systematically analyse the responses. Do variables such as gender, age, experience and background have an impact on the use and acceptance of technology in classrooms? And to what extent does an individual agency play a role in teachers' use of modern technologies? Human beings tend to respond to and are largely affected by their physical conditions (Miller, 1996). The responses assisted the researcher to provide evidenced-based, practical, inclusive, contextually and textually informed conclusions and recommendations.

A total number of 19 teachers were interviewed. These interviews were conducted after the formal teaching and learning hours, and each one was scheduled to take 30–45 minutes. For subsequent study, the researcher made use of a voice recorder to document the responses since it had the benefit of securing the entire interview.

3.3.2.2 Field notes & Observation

Field notes comprise of descriptions of reflections of the researcher relating to discussions, interviews, moments of uncertainty, intuitions, as well as the encouragement of latest concepts throughout the research (Mayan, 2001). The researcher utilised field notes to include any observations noted during the interview process. The interpretive paradigm, which is based on observation and interpretation, allowed observation of the subjects under study and in doing so, the gathering of information. The researcher toured classrooms randomly to observe any fitted technological devices such as a smartboard or data projector, and the teacher's computer centre was visited to determine technological infrastructure. At three of the four schools visited, the researcher observed whether the school had facilities for an e-learning system. In addition, safety measures for donated technologies stored at school had also been considered.

The researcher recorded “both verbal and non-verbal behaviour” (Maree, 2007, p.86) and reflections of these observations were done after the interviews. At two of the four schools, educators demonstrated their lessons on the smartboard and at another school, the educator demonstrated how to operate the visualizer. Additionally, educators' lesson plans were observed to verify the incorporation of technology as demonstrated by the educators. An HOD demonstrated how she was able to access the marks and keep track of the marking process of the teachers in her department

through Excel and an electronic mark book, SA-SAMS, on her laptop. The deputy principal of another school demonstrated how to track the management plans of HODs in the various departments, and how much easier it was for the district officials to track the academic aspects of the school through SA-SAMS. In addition to the interviews as a primary data collection instrument, direct and participant observations, assisted in the result of dense “thick descriptions” of the topic being researched (Yin, 2003). Moreover, utilising multiple sources of proof allowed triangulation of findings (Yin, 2009).

3.3.2.3 Documentation

Documentation as a component of the “data gathering technique focuses on all types of written communications that may shed light on the phenomenon that is investigated” (Maree, 2007, p.82). Primary sources of data that were obtained included official communications from the National and Provincial Department of Education with regards to policy, memoranda and ICT training notices for teachers. The purpose or intent of the document was analysed. The schools’ ICT policy, minutes of ICT meetings held at school and teachers’ lesson plans were also requested to be scrutinised. In doing so, the researcher sought the “main points or arguments put forward” and their relation to the study Maree (2007, p.83). In addition, the purpose was to verify the incorporation of technology and whether goals and objectives set by the school for the inclusion of ICT were met. Maree (2007, p.83) states that “in the interest of the crystallisation of data, documents could serve to corroborate the evidence from other sources”. The content analysis of these documents enabled the researcher to explore the data closely and garner a greater knowledge but also contribute to the trustworthiness of the research.

3.3.3 Data analysis

McMillan & Schumacher (2001) state that data analysis involves integrating information, the organisation, analysis and interpretation thereof. Having collected the data, the researcher analysed it using the Atlas.ti programme in order to understand the information which involved the selection, categorisation, comparison, synthesis and re-presentation of the data. In short, “it is a process of bringing order and meaning to the data collected” (Moyo, 2015, p.95).

Various dedicated, computer-assisted qualitative data analysis programs have been developed that can help the researcher store and manage data. These programs not only make it easier to code and retrieve text but can also add other functions like searching and enumerating. Currently, popular qualitative data analysis packages include Ethnograph, NVivo, NUD*IST, and Atlas.ti (Maree, 2007). The researcher opted to use the Atlas.ti programme to prepare and organise the data for analysis as it is also one of the most popular, established and multi-functional tools. The most useful feature of this program is that it assisted the researcher with the process of coding and recoding by using categories for the retrieval of coded text. Figure 3.2 is a summary of the research design and methodology.

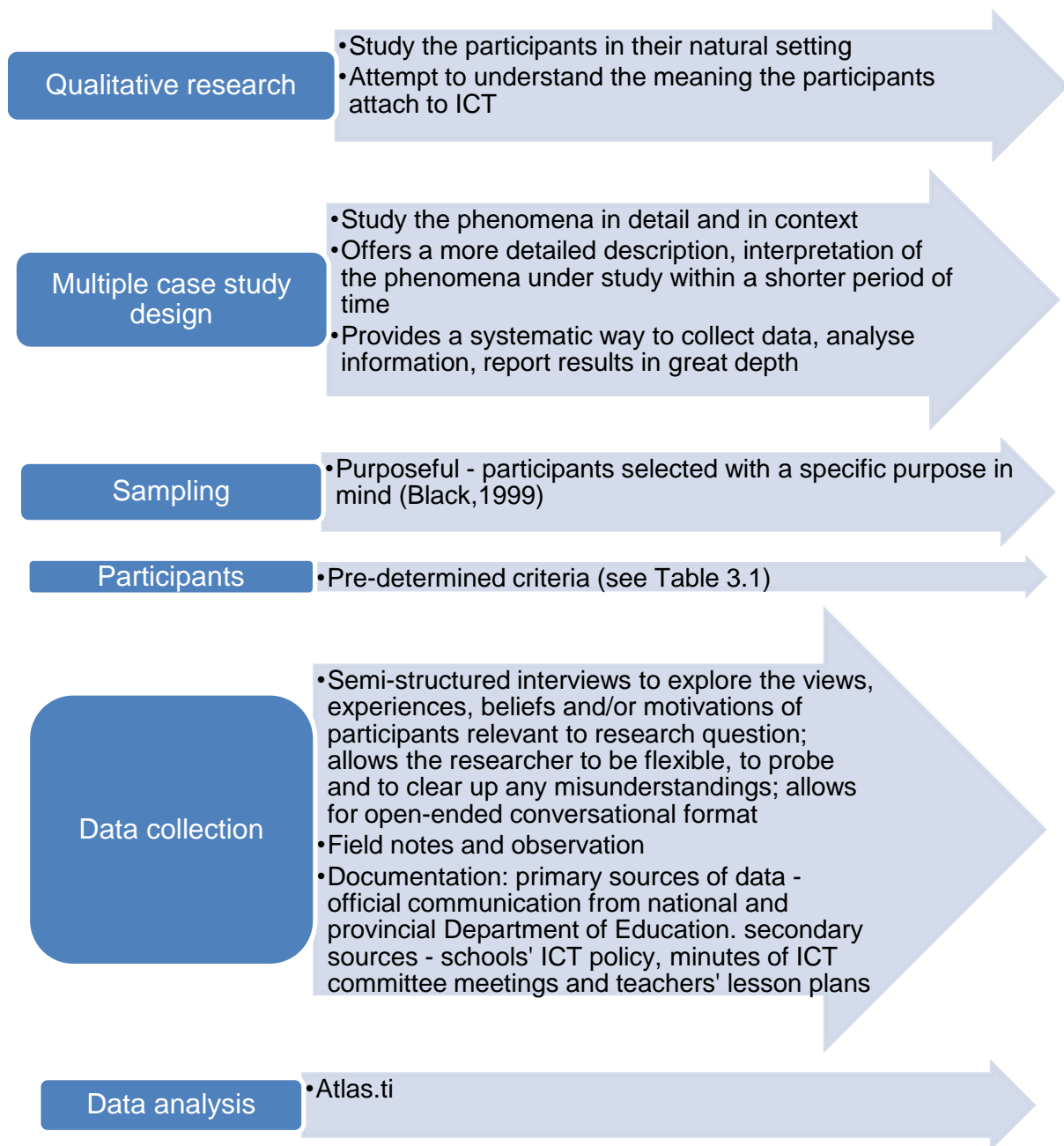


Figure 3.2: Research design and methodology

3.3.4 Methodological norms

Trustworthiness is achieved by preserving “confidentiality and anonymity” and by recognising the study's constraints (Mphahlele, 2013, p.55). In order to provide reliable findings, the researcher triangulated interview responses with field notes and documentation to search for prevalent themes (Cresswell, 2003). Vithal and Jansen (1997) describe validity as an effort to ‘verify’ whether the significance and interpretation of a case is sound or whether a specific measure accurately reflects

what you plan to discover. Durrheim and Wassenaar (2002) label credibility as the assurance that the results of the researcher are derived from the data. By introducing triangulation to the data collection techniques and data analysis, the researcher developed credibility to assess whether the results differed (Maree, 2007). Furthermore, the researcher endeavoured to produce believable and convincing findings (Maree, 2007). Maree (2007), states that generalisability is believed to be the way the audience is capable of observing the results and transferring them to alternative environments. Yin (1994), argues that multi-case design amplifies and promotes previous results which helps to increase the extent of trust in the soundness or vigour of the method. An argument against case study research is that it uses a small number of topics and offers very little basis for scientific generalisation (Yin, 1984). This study is not aimed at generalising the results, but instead at exploring the acceptance and use of educational technology and the variables that drive teachers to participate and incorporate technology in their teaching practice (Zhao, Tan, & Mishra, 2000). The researcher sought to remove any prejudice or preference that could be introduced to the research by reflecting continuously on the research method.

3.3.5 Research ethics

The researcher requested ethical clearance for the approval of the intended study and the interview questions from the University of Pretoria's Faculty of Education: Research Ethics Committee. In addition, the researcher applied to the Gauteng DBE and circuit managers of the three districts for authorisation to undertake research studies at the schools. The principal and the participants were provided with letters of informed consent and voluntary participation, informing them about the proposed study, its purpose, their right of choice to participate and to withdraw at any time if they chose to do so. Participants were assured of confidentiality and anonymity of their information, that there would be no costs involved for taking part, and that no participant would receive any reward for participation in this study. The interviews would only commence once the participants have signed the consent form.

3.4 CONCLUSION

This section focused on the research method applied and described the methods used for obtaining findings in the study. Those findings will be presented and analysed in the following chapter.

CHAPTER 4: DATA ANALYSIS AND RESULTS

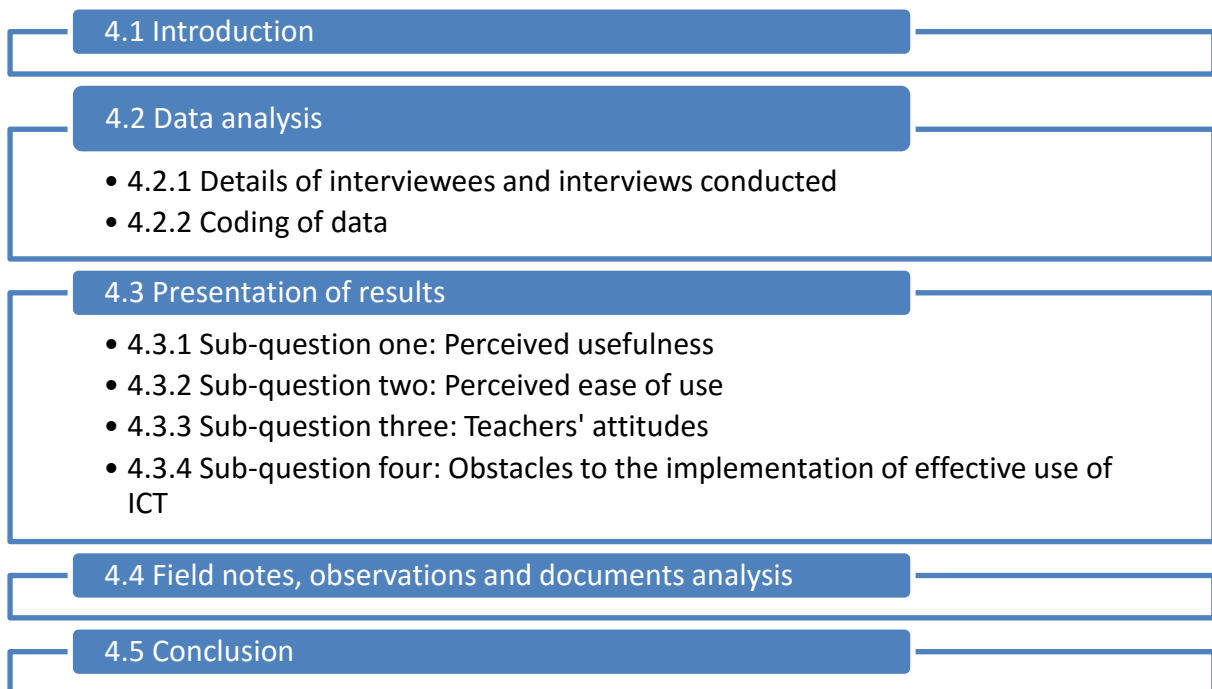


Figure 4.1: Data analysis map

4.1 INTRODUCTION

The analysis to address the research questions are presented in this chapter. Qualitative data analysis is largely based on a philosophy of interpretation intended to examine “meaningful and symbolic content of qualitative data” (Maree, 2007, p.99) with the main objective to enable “research findings to emerge from the frequent, dominant or significant themes inherent in raw data” (Maree, 2007, p.99). Data was analysed according to the objectives of the study. The objective of this study sought to investigate technology acceptance in schools and to unpack some of the reasons why use of technology and acceptance thereof in the classroom remains a critical challenge at public schools. The chapter provides a summary of the interviews conducted, field notes, observation, document analysis and overview of participants and discussion of the results to provide credible findings. The results are further elaborated and discussed in relation to the literature review in the next chapter.

4.2 DATA ANALYSIS

Data was collected through a qualitative approach using semi-structured interviews, field notes, observation and document analysis. The data was indicative of reaching saturation and provided insight into the readiness of teachers to accept and integrate technology into their teaching practice, within the South African context.

4.2.1 Details of interviewees and interviews conducted

In total, 19 interviews were conducted in order to achieve accurate and credible results. The demographics of the participants (see Table 3.1, Chapter 3 page 27) were varied in terms of age and subjects taught and a representation from both genders and post levels were considered. All participants were teachers. The interviews were conducted over a period of five weeks, and almost 12 hours of recordings were obtained. The longest interview lasted 69 minutes and the shortest one 11 minutes.

4.2.2 Coding of data

All the interviews were transcribed by utilising the recordings taken during the interviews. The accuracy of the transcriptions was verified by re-listening to the recordings. The transcriptions were then fed into the qualitative analysis tool, Atlas.ti, in order to be coded and analysed. Friese (2014) suggests that codes should be developed in layers in order to identify similar constructs easily. Hence, this strategy was followed when coding the data that was collected. The codes consisted of three numbers: the first number represented the main research question; the second number indicated the sub-questions, while the third number was assigned to a specific theme that emerged. The full code-list is represented in Appendix E.

4.3 PRESENTATION OF RESULTS

The results are presented in line with the research questions and their linking sub-questions for ease of flow and analysis. The purpose of the study was to explore the extent to which educational technology is accepted and integrated in teaching within South African public secondary schools in Pretoria. The study has a total of four sub questions – hence results for each research question will be identified. For the purpose of this study and to ensure the anonymity and confidentiality of the

participants, the letter “P” followed by a number will be used to indicate the different participants.

The frequency count is an indication of the number of times a certain theme/construct was mentioned by the participants, i.e. a frequency count of 10 shows that 10 out of the 19 participants that partook in the interview brought up that specific construct. In each research question, there were clear themes that emerged. The results are presented in the sections that follow.

4.3.1 Addressing sub-question one: Perceived usefulness

Research question one looks at how useful the participants perceived the technological devices to be. The following results were obtained:

4.3.1.1 Technologies used in teaching and preparation

As mentioned earlier Alharbi (2013) states that teachers have access and are exposed to an abundance of the latest technological tools in the 21st century. In the modern world, many teachers own or are familiar with an electronic device such as a smartboard, computer, laptop, smartphone, projector and/or a tablet.

The technological device that is most commonly used is the laptop/computer with a frequency of 16. Wi-Fi and internet which has a frequency of ten is mainly used for research as Participant 14 mentioned (*“Internet for research”*). The smartboard is ranked third with eight participants mentioning that they use it for teaching purposes. The smartphone is used by only six participants and the projector by only four of the 19 participants. The visualizer and cloud have been ranked last with a frequency of just one. Table 4.1 reflects the technologies used by the participants.

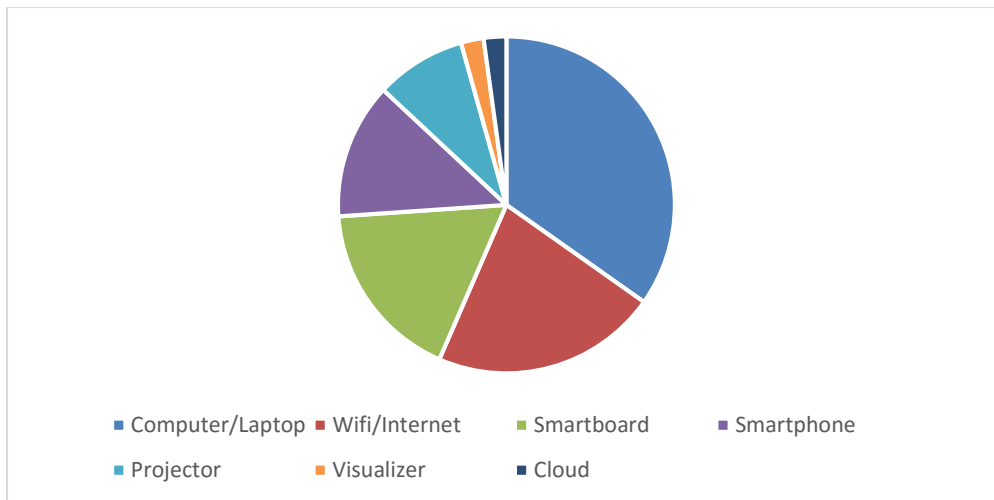


Figure 4.2: Technologies used for teaching and preparation

4.3.1.2 Reasons for using technology

The majority of participants prefer using technology as it makes their jobs a lot easier. Making teaching easier comes up with a frequency of 16, while appealing to learners have a frequency count of eight and cleanliness of one.

The theme 'makes things easier' has occurred the most with the frequency of sixteen. Participant 2 said that using technology *"makes teaching easier"*. The same is also said by Participant 12 *"Because things are easier now..."* and Participant 19 *"I think that learning becomes much easier when they enjoy"*.

The use of technology helps save time as mentioned by Participant 7. It helps with the preparation and keeps the learners attentive. Participant 9 said: *"It is easier to prepare in it and on top of that, it makes lessons interesting for the learners"*. Learners find it easier to understand as opposed to writing on the board as mentioned by Participant 3, *"If something is written down, they find it hard to understand but at least if they can see and read then it can become easy for them"*. Participant 18 said: *"I think it's quicker. It's quicker than writing on the board and it saves time and then you are able to, say, maybe reverse and be able to show them again"*.

The use of technology is more appealing to learners and they enjoy learning with technology more. Participant 2 mentioned: *"... to the benefit of the learners as well because they enjoy"*. Participant 19 also mentioned: *"I think that learning becomes much easier when they enjoy"*.

It allows for the development of new teaching methods and helps the learners think outside the box. Participant 8 said: *“it assists you to be able to make your kids more open minded and to be taught with different methods”*.

It is also preferred by the learners as mentioned by Participant 6: *“Learners usually prefer technology because they are always on their smartphones. So if you use something related to them, they get to listen to you in class”*. Learners understand the content better while enjoying the learning experience. Participant 16 said: *“It’s simple and the learners love it and they enjoy and understand much better and then there are a lot of things”*.

Cleanliness was mentioned by Participant 3. This is because chalkboards do not need to be erased as smartboards are being used. *“For me, besides the cleanliness because at least you are clean the whole day”*.

4.3.1.3 Reasons for not using technology

Lack of technological resources is the theme that occurs most often with a frequency of 14. Theft is ranked second with a frequency of two, distracting to learners and lack of technological skills only one.

Most participants mentioned that the reason why certain technological devices are not being used is because the schools do not have access to these resources. Participant 6 said: *“The resources at this school is the one that- like tablets, we cannot use Tablets in class because the school doesn’t have those things. So that’s the limitations”*. Participant nine also mentioned *“Availability of resources. Ja, so we don’t have quite a lot of resources”*. Participant 15 felt that resources are available only in some of the classes, so there is a shortage. *“Some of the classes don’t have a smartboard. Like in school, other classes have a smartboard, some don’t have. So if you are in a class without a smartboard, then you use the blackboard”*.

Due to theft, most of the resources were taken away to prevent theft from taking place. Participant 3 mentioned: *“With the smartboard, as I’m saying, we were using it but now they were getting stolen”*. Participant 1 also mentioned: *“they stole my - that projector. It was in my class. Somebody came in and broke in and they took it”*.

Participant 5 commented that technology at schools just serves as a distraction. *“So it’s easy for learners to get disturbed while they’re on ‘Whatsapp’ and they are learning, messages will be coming in and so on. So, it’s better to use a platform that is isolated, like Google Class, which is isolated from social media. So that when the learner is on the platform, it’s only academic”*.

Participant 13 said: *“I don’t have the skills to use them...”* and this is the reason he does not make use of technology.

4.3.1.4 Administrative tasks currently performed with the assistance of technology

The majority of participants prefer using technology for the preparation of class material and recording of marks. Communication with parents and checking progress on syllabus covered, comes up with a frequency of one.

Most participants use the technology available to help make study material for the class. Tests and exams where applicable, are prepared and portrayed through the use of technology. Participant 19 mentioned: *“Tests and exams because I’m currently the grade head for grade ten. So all the tests that I need to set, that’s the ones where I’ll use the WiFi at school and typing on my laptop”*. Participant 5 mentioned: *“Word for setting tests then I’m gonna print them out, obviously and then... ja. Tasks and some activities that- I source them from a different book and it means I have to put them on Word to be able to print them out for the learners”*. Participant 15 said that the technology is utilised to make lesson plans and create class activities. *“Maybe to do a lesson plan, so I will type, or class activity”*. Participant 6 commented: *“Lesson preparation basically and preparing of worksheets. Typing of exam questions and worksheets for the class”*.

The teachers record marks using Excel and various other software available to them. Participant 1 said: *“I do my marks because we have a system called Principal Plus”*. Participant 5 mentioned: *“Okay, in terms of reporting their assessments. I use Excel for data capturing. The marks and all that...”*. Participant 7 also mentioned: *“we take the marks, we punch them on a spreadsheet and then we can analyse those marks per question and then we can tell Excel to show, you know, low performing marks*

using colours and then if you use red for low performing, if you see a lot of red, you can already see in this topic there is a problem”.

Participant 2 commented: *“With the computer, it’s the SA SAMS. It’s a matter about getting more of management issues, management- you get most of them off the computer”*. Participant 17 uses Excel to record the absentees of the day. *“Worksheets and then together with register periods, I’m using Excel to type in the learner’s number of days absent and present.”* Participant 18 also said: *“And also, you know, as a HOD it means that there are these management plans and assessment programmes”*.

Participant 9 makes use of technology to make contact with parents with information of the performance and daily routines of the respective learners. *“We are able to communicate with the parents and- learner’s parents, SMSs with regards to maybe misbehavior or some information they need about the school”*.

Participant 2 makes use of technology to help keep track of what has been covered throughout the year. *“Instead of going through papers, with the computer it’s easy for you to check also your pace, as far as teaching is concerned. Are you on par with your syllabus, are you behind or you on par with your syllabus with the correct time? So, you can make use of that. It helps”*.

4.3.1.5 Technology advancing teaching

The majority of participants prefer using technology as it makes their jobs a lot easier. The theme “makes teaching easier” occurs with the highest frequency of 12. The use of less resources has a frequency count of four. Two participants are of the opinion that it increased their technological awareness and one participant said it promoted better health.

Participants mentioned that the use of technology has simplified teaching as it helps save time. Participant 7 remarked: *“It has advanced our teaching so much that, like I said, in terms of the speed that we are able to complete the topics and then the quality of understanding that the learners are having”*. Participant 17 mentioned: *“It saves time because remember you can prepare- you are prepared in advance”*.

More information is available as Participant 13 mentioned: *“I think it makes me smart. It makes me- it makes my job easier and like I said, it makes me access information that I would basically would- I would- if not for technology...”*.

Participant 1 mentioned that resources such as paper is saved and that he does not have to use chalk that much as he can type notes for the learners on his computer. Participant 8 mentioned, *“everything is on the smartboard so I use less books”*.

The use of technology according to Participant 3 has helped broaden views on technology that is available for use. Participant 6 also said: *“Maybe you didn’t know how to perform certain stuff using a computer, then suddenly you have to create it for learners and you have to- and then “okay, I don’t know how to do this” and then you also research about that and then now you can do that”*.

Participant 12 mentioned that using technology reduces exposure to dust from chalk and thus helps with better health.

4.3.1.6 Hindrances as a result of technology

Technology is not a hindrance is the theme that occurs most often with a frequency of seven. Load shedding and not having electricity ranked second with a frequency of six and distractive to learners with a frequency of two. Time wasting, too much admin, natural disasters, lack of technological skills and adjusting to old technology when new technology is unavailable comes up with a frequency of one.

Technology is not a hindrance as Participant 1 mentioned: *“Not necessarily... you just have to use whatever there is available to you but if you do have it, well the better”*. Participant 14 mentioned that there are more advantages than disadvantages.

Participant 13 said that the use of technology is prone to disruption due to electricity shortages. *“With the electricity problems that we have in the country”*. Participant 7 supported this with *“... you find that there’s no electricity. So many times. Per month, maybe ten to 11 times you’ll find that there’s no electricity around the area”*.

Participant 15 and 16 mentioned that the use of technology in schools can be hindered by learners getting distracted. Participant 16 mentioned: *“No maybe because of the learners may misuse their tablets and it’s just that to remind them. It hinders but a little*

bit because to make sure to remind them that they don't use their tablets while they are busy because the tablets are distracting the learners”.

Participant 19 mentioned: *“Now that I was depending on that(technology) and now I find that it's not the standard that I was expecting, now I have to start it all over and maybe for the day I have to postpone whatever that I had to do, improvise something else and then do the actual planning,”* meaning that the technology can be time wasting.

Participant 9 remarked: *“It's a lot of administration”*. Participant 13 was of the opinion that technology is prone to damage by natural disasters. *“.... Tsunamis and all these things. The computers crushed, they get damaged by rain by, what do you call it, the global warming ...”*. Participant 6 commented that not having the skills for technology would be a hindrance.

Participant 3 mentioned that when the new technology suddenly becomes unavailable *“you must switch back to the old methods and then it becomes difficult to also adapt because now that means you must spend more time on the photocopying machine”*.

4.3.1.7 Learners' responses towards technology

The majority of participants mentioned that the learners' responses towards technology is positive. This theme has occurred the most with a frequency of 16. Two participants are of the opinion that the learners' responses towards technology are negative.

Most participants responded that learners are positively inclined towards technology. Participants mentioned that the learners love the technology and get excited when it is used. Participant 1 and 2 said: *“They get excited”* and *“They love it. They respond positively”* respectively. Participant 7 mentioned: *“They become very excited to learn with technology and they really appreciate it”*. Participant 12 said: *“They are fascinated by how brilliant it is”*. Participant 16 commented that learners are attentive, listen in class and they respond positively to the lesson. Participant 18 said: *“They are so active when you are in a lesson. Everybody...even the slower ones, they can take part. They are active”*.

Participant 1 also mentioned that the technology can be distracting at times. Participant 8 said that learners tend to not respond to the use of technology well. They tend to misuse it. *“They don’t respond to it the way that we expect them to. They use it for pornography sometimes. They use it for music”*.

4.3.1.8 How technology can help learners learn

Participants responded positively. This theme ‘increased attentiveness’ occurs with a frequency of 9. *“It can. It can in the sense that our children are not book based”* (Participant 1). *“Some take interest in IT from there, because maybe they may find it interesting when you are busy collecting, oh. There is such a thing like this, that we can actually do. Uh... some - there’s this other projector that actually projects directly from their textbook”* (Participant 9). Participant 7 is of the opinion that learners are able to download work and in doing so are able to solve their questions. Participant 16 says that learners have access to new resources. Participant 8 mentioned that technology can help if used correctly. Participant 15 commented that *“They can but they need to be supervised because if you going to just give them some task without being supervised”*.

4.3.1.9 New things learnt through using technology in a class

The theme ‘learn new applications’ occurs with a frequency of 13. Participant 4 mentioned: *“I’ve learnt a lot...I can see now those 3D shapes in real...oh this is rectangular”*. Participant 2 commented that through research, they learn daily. *“On a daily basis I learn, maybe I guess a term I don’t get clearly, the interpretation of it then through Smartboard I can Google and then check it on the spot and then give the learners the correct answer”*. Participant 12 mentioned that it simplified work as memos and question papers are available online.

4.3.1.10 How technology helps to cover key concepts in learning areas

Six participants commented that it is easier for learners to relate to. Participant 2 said: *“Absolutely, with smartboard, they have been fitted with all subjects. For every teacher, once you click on your subject, you go through and you get all your textbooks”*.

Participant 5 is of the opinion that it assists in keeping information up to date. *“Yes, it helped me a lot because as a teacher, I don’t know everything. So the use of videos*

sometimes, watching a video with the learners, I'm also learning something and improving on what I already know". Participant 19 commented that technology has constraints such as covering the ATP and sometimes it helps. Participant 7 is of the opinion that it saves time, *"It helps you cover them very, very quickly. Unlike when there is no technology at all"*.

4.3.1.11 What teachers still want to learn regarding teaching with technology

The theme 'learn whatever is available about technology' occurs with a frequency of nine. Participants mentioned that they want to learn whatever is available in technology. Participant 3 said: *"Everything"*. Participant 17 commented: *"A lot. I'm still struggling in doing the columns but I'm there. Then I'm still struggling to do the pie charts but the Maths and Science teachers are helping us a lot"*.

There are also participants that want to learn different technological applications. Participant 9 mentioned: *"Ja, I'd like to learn how to use a smartboard"*. Participant 2 said he wants to *"learn the interpretation of layering in GIS... then I'll be fine"*.

Learning how to integrate different technological devices and more about software occurred with a frequency of two respectively. Participant 6 mentioned that he still needs to learn more about the use of electronic textbooks and how to use Google Classroom. Participant 1 wants to set and mark tests online using an application while Participant 5 wants to learn how to programme.

4.3.1.12 Resources or teaching and learning materials created with technology

The theme 'quizzes and class activities' was ranked first with a frequency of 14. Participants mainly use technological devices to create class activities as well as to set tests. Participant 4 mentioned that by using technology he creates an interactive class activity. Participant 6 sets question papers, worksheets and activities in class. Participant 17 mentioned control tests, assignments and informal tests.

Visual aids were ranked second with a frequency of five. Visual aids include graphs, charts and pictures. Participant 2 said: *"There are some graphs that are already in there in the smartboard but I can still draw others and then put them on. I can save*

them and then use them in the next lesson or next year". Participant 8 used visual aids in Geometry to help learners understand better what was being taught.

Participants created their own videos and audio notes for learners to make use of. Videos are also used as a teaching aid by participants. Participant 1 makes use of technology to create homework activities for the learners. Participant 19 creates rubrics for the various assignments and learning activities.

4.3.1.13 Devices that learners use

The theme "None" occurs the most with a frequency of eight. Most schools have strict rules regarding the technological devices that learners are allowed to use in the classes. This is because they are often seen as a distraction to the learners. Participant 13 mentions: *"No, no. We only allow them to bring smartphones if there's a need but given the fact that we, even ourselves, don't have the stuff, then we don't allow them to bring smartphones because they are a distraction to them"*. The use of tablets in classes has a frequency of five while smart phones have a frequency of four. Participant 15 mentioned that the use of phones is helpful in class.

4.3.1.14 Aspects of teaching that are enhanced due to the incorporation of technology

The theme "visual aspects" occurred the most with a frequency of nine. Participant 1 mentioned that in the absence of a dance studio at school, the visual aspect of a dance studio is appealing and the learners understand the concept better as they do a lot of dancing. Participant 4 commented that he draws diagrams in Mathematics by using the smartboard and *"if I go back to the old method it would be tough for me to draw using those rulers, doing the measurements"*.

Planning and preparation had become easier according to five participants. Participant 17 commented that he enters the learners' marks after a test and does diagnostic analysis which will then enable him to plan his lessons carefully, *"...you do diagnostic analysis then immediately see which topic needs more attention"*.

Participants used videos to help increase understanding among the learners to demonstrate how practical experiments may be performed. Participant 6 mentioned:

“We have to do an experiment and we don’t have the resources. So you can show them a video on a smartboard”.

Participant 8 used the technology to prepare notes for the learners, *“maybe I can just Google and from there, attach to a certain thing that I want to show learners...even after work, one could prepare and use a memory stick and save everything, your lesson in that memory stick”.*

Participant 19 used audio to teach learners pronunciations, *“... they listen to how the word is pronounced. That’s fascinating for them because they try to imitate it and then they learn it”.*

4.3.1.15 Things that technology brought to the teaching practice that was not possible before

Five of the participants mentioned that the use of technology brought about new information about the subjects they are dealing with and that it was helpful for research purposes for both the teachers and the learners. Participant 1 said: *“More information, I guess. Multiple sources. Exposure, I guess to the learners and even to me”.* Participant 5 mentioned: *“I can improve on my work and so on but in terms of the learners, I think introducing, for example, tablets can or rather it should help them learn or study on their own because they have all these learning websites”.*

Participant 4 commented that finishing her lesson was difficult to achieve and writing up notes for the learners was time consuming. By using the smartboard or projector she can project the notes which saves a lot of time. Participant 15 said that it is simpler and makes it easier. *“So for now, you can download a book on a smartboard, then you go through it, it’s so simple, even to you and learners, you can save time that way”.*

Participant 13 mentioned that it enhances *“my professionalism”, like I said because when I print out that thing, it comes in nicely, you know”.* Participant 16 said before you had to rely on the textbook and may find that not all the information needed is in the textbook, *“Then in our smartboards, there’s everything”* and as a result they appear professional to the learners.

Two of the participants mentioned that the use of technology has improved their technological interactions in general. Participant 18 commented: *“I can type the minutes from the meeting and submit them. I am able to type my management plan and print it out, it was, you know, a problem ...”*. Participant 6 mentioned the use of tablets, cellphones, the smartboard and projector in class with the learners which assists in their daily teaching practice.

The participants mentioned that the use of videos helped demonstrate certain experiments to the learners. Participant 3 mentioned: *“Videos because the schools that I worked for, they would hardly have TV, where you could demonstrate and show the kids videos”*.

4.3.2 Addressing sub - question 2: Perceived ease of use

Research question two looks at how teachers perceive the ease of use of educational technologies within the classroom. The following results were obtained:

4.3.2.1 How the implementation of technology changes the attitudes of learners

Learners' attitudes towards the use of technology in class is positive according to 14 participants. The learners begin to look at the subject with more positivity according to Participant 2. *“It changes them because it brings them to be more focused to have to develop that positiveness towards the subject”*. Learners show a greater interest towards technology. Participant 10 mentioned: *“I can say positively so because like I said before, they are more interested in technology”*.

According to Participant 9, *“Most of the time, the learners would sit still and concentrate, others would just be interested in seeing exactly what is it that you do when you are setting up and as you go through your laptop and what you are pressing”*.

A negative attitude towards technology was noted three times. The participants mentioned that the learners tend to get distracted as mentioned by Participant 8. *“Not really because sometimes you'll be in class and you'll be saying do this on the tablet and when you go out of the classroom, the person is doing something totally different”*.

4.3.2.2 How the implementation of technology changes teachers' attitudes towards technology

The theme "positive attitude" toward the implementation of technology was observed with a frequency of 15. Participant 5 believed it saves time. *"Ja. It makes me happy because it covers a lot of things within a short period of time."* Participant 18 agreed and feels encouraged as it *means that less time is needed to do his work, "...but when you do it traditionally you take time because you have to write on the board and erase, again the other class come and again, you start again"*. He also remarked *"You are able to manage your time when you complete your work schedule"*. Participant 14 said it is a more efficient way of working. *"But I am for technology. I don't even want to write if I don't have to. So I am for that, it's more effective, efficient way of doing things"*.

Participant 2 mentioned that age may be influencing his negative attitude towards technology. *"Unfortunately, at my age it's like it's moving fast so I'm little bit behind"*. According to Participant 9, it can be time consuming, *"No... I don't exactly have a problem with it, although at times if you have a single period, it's sometimes time consuming and it can be a little problematic"*.

4.3.2.3 How the implementation of technology impacts teachers' workload

Sixteen participants mentioned that the use of technology helps reduce the workload. According to Participant 4, it makes things easier. *"It makes things easier and there's less paperwork because a lot of the things I submit via email. If they need mark sheets, I just do it on my computer and send it to my HOD. It's much easier"*. Participant 8 mentioned that it was tough at first but simplified with time. *"At first it was not easy"*. Participant 16 concurred: *"The workload is there but with technology, it makes it easier"*.

Participant 2 mentioned: *"Unfortunately, it doesn't help us that much on workload because, like in my case here, remember my workload as a teacher and as a deputy is huge. So it's a matter of human resources shortages but after all, as far as technology is concerned, it doesn't reduce my workload"*.

4.3.3 Addressing sub-question 3: Teachers' attitudes

Research question three looks at teachers' attitudes towards the use of ICTs in teaching. The following results were obtained:

4.3.3.1 Teachers' willingness to use technology when shown by another

Participants responded positively. This theme occurred with a frequency of 18. Teachers were willing to try to use technology. Participant 1 said: *"I would. I would try. Even if I don't understand, I would keep going back and learning on my own until I get it right"*. Participant 5 concurred: *"Definitely and I think for everyone, before you can be able to use something, someone has to show you how to use it"*.

4.3.3.2 How teachers observe the willingness of their colleagues to accept technology

Eight of the participants had a mixed reaction to accepting technology. Participant 3 mentioned: *"So it was becoming easy and wanting to learn how to use it but then they were really taking time because you needed to create time in order to learn that but they were delaying"*. Participant 7 said: *"I think what I've observed, those with age, the older ones are still scared of technology and they really think that it's not for them but for younger teachers, but the willingness is very high"*.

Participant 15 mentioned that all his colleagues are willing to accept technology *"They want even more... we're running short of resources. We feel like we should have everything now so that it would be bit smoother"*. Participant 18 said: *"I think they are positive. Everyone is willing to learn nowadays because if, maybe say, you don't learn, it means that you'll be left behind"*.

Participant 2 said that age may be a reason for not accepting technology. *"So it's a matter of age and some of them, their attitude to say "I'm on my exit"*. According to Participant 6, *"Not all of them are willing to accept technology because others they are old school"*.

4.3.3.3 Teachers' concerns about teaching with technology

Participant 1 is worried about the wrong usage of technology, *"For instance, I wanted to see how protected our servers are, in terms of sexual things and I typed in Google,*

“nude women” and they showed pictures of naked women”. Participant 19 said that learners *“become distracted, downloading games and taking selfies and they just busy with their own thing”*.

Four participants had no concern with the use of technology. *“I don’t have any worries of using technology”* (Participant 17). Participant 14 commented: *“I don’t really have concerns about technology. I think we can just improve the situation at school so that we can fully go the technology route, ja”*.

Three of the participants were concerned that the learners were not given enough training to use the technological devices. *“My concern... they introduced this technology in Grade 12 ... we expect them to see a tablet as a learning device. So my concern is why didn’t they start them maybe in Grade eight, even in Grade ten?”* (Participant 5).

Participant 18 is concerned about the lack of resources: *“If we can get enough resources because some of us, sometimes we want to teach using technology but because of not having resources we resort to the traditional way of teaching”*.

Participant 2 is concerned that educators do not have the knowledge to keep up with the learners: *“my concern is if we can improve from where we are and try to ensure that it’s not one sided with learners”*.

Lack of electricity and load shedding is a concern for Participant 16. *“I accept that maybe there isn’t electricity”*.

4.3.3.4 Technological devices that are easy to use

From the study it was evident that the laptop is the technological device that is easiest to use among the participants – it occurred with a frequency count of 12. The smartphone was ranked second with a count of ten, the smartboard third with seven, followed by the projector (six) and tablet (four). Only two participants mentioned that the visualizer and the Wi-Fi are easy to use.

4.3.4 Addressing sub-question 4: Obstacles to the implementation of effective use of ICT

Research question four looked at the obstacles to the implementation of effective use of ICT in teaching. The following results were obtained:

4.3.4.1 Training received to support teachers' development in teaching with technology

Eleven of the participants received training from the Department of Education. Six of the participants had received earlier training from the tertiary institutions at which they were enrolled. Participant 1 mentioned: *"I had done my training during undergraduate varsity classes"*. Four participants received training organised by the District. Participant 1 attended workshops at the school. *"Okay they had these workshops where they were teaching us about smartboards but not necessarily how to use a projector, they just teach you how to go into the system, create questions papers"*. Two participants claimed that they had not received any training. Ten participants mentioned that the training was adequate, while four said the training was not adequate and three participants said it depended on the person if it was adequate. *"I guess for beginners, yes, it was"* (Participant 3).

4.3.4.2 Reasons why participants did not receive training

Three of the participants mentioned that they were not sure why training was not given to them. One participant mentioned that she was new at the school *"I've never attended. Maybe there are workshops here, since then I'm new then I wouldn't know"*. Lack of interest from the educators also had a frequency of three. Participant 5 mentioned: *"If they are not interested in using whatever resources that they have then there won't be any training done for them and sometimes, I remember, unfortunately by the time they trained us how to use a Visualizer, I already knew how to use because I took it and I trained myself but ja..."*. Participant 15 mentioned that the lack of resources may be the reason for no training. *"Maybe with less resources in school. So it has to go hand in hand with training. So let's say you train people for smartboards, if there are no smartboards at school, there'll be no rush to train"*.

4.3.4.3 Technologies available for teaching in the teachers' environment

Laptops and smartboards were ranked first with a frequency of 13 each. The projector was ranked second with a frequency of seven, the visualizer five, tablets four, computer labs, wi-fi and printers three and the smartphone only one.

4.3.4.4 The status of the technological infrastructure in the schools

Eleven participants mentioned that the technological infrastructure was available when required. The remaining eight mentioned that it was not available.

4.3.4.5 School's status as an e-learning system

Eight of the participants mentioned that e-learning facilities were not available while nine participants agreed that the school had all the facilities needed for an e-learning system.

4.3.4.6 Support from the SGB and the management team

Ten of the participants agreed that the SGB and the management were supportive and enthusiastic about the use of technology. *"They all on board, yes"* (Participant 12). Five of the participants were not sure if they were or not. Participant 13 said: *"Ja I think the management team is. I can't tell about the SGB, but I think the management team is also discouraged by our attitudes as teachers towards technology and the SGB, I'm not sure but I don't think they're willing to spend much money on technology"*. Four participants said they were not on board. *"I have never, ever heard them wanting to engage in the school's technology"* (Participant nine).

4.3.4.7 The schools' vision for teaching with technology in the future

Increased usage of technology and a paperless education were ranked first with a frequency of six while staff with technological knowledge, increased security and better results with technology were ranked second respectively with a frequency of two.

Six participants would like the use of technology to be increased to the extent that resources such as paper isn't even used. Participant 1 said: *"When we were creating a policy last year, is that we want a paperless kind of education. Where learners can just go online and do their homework..."*. Participant 16 mentioned: *"We see ourselves not having any books. We see ourselves not having any textbook in front of us, just*

using the smartboard, the laptop and the learners' tablets and we see ourselves to be having good results because everything we learn is at our fingerprints".

Participant 2 mentioned: *"So the newly appointed should be someone who has got the basics of technology. So that the teacher can easily adapt to technology in the classroom".*

Participant 6 mentioned: increasing security so that technological resources do not get stolen. *"Well since the school every time had a break in and then they steal, so they decide not to use the smartboards - to install the smartboards in the classroom. So they keep them in one place because they always steal them. Every time they lock up, they break in and they steal".*

"I think we were underperforming when we were that side, in the containers, but now when we come here we underperform a year and then two years again we got 68% then last year we got 84%. Now that's how we are developed" (Participant 12).

"It will be nice if all the classrooms would have smartboards and the smartboards would be connected to the internet and the learners will have tablets or cellphones that we are able to communicate to them" (Participant 7).

Participant 8 commented: *"That's what I wish to see from them. For them, to stop undermining themselves (students)".* Participant 9 mentioned that he was not sure if the school had a vision for teaching with technology in the future.

4.3.4.8 What teachers would like to see in the future regarding technology

The theme 'increased technological resources' occurred with a frequency of seven, while 'more training' and 'maximising the use of technology' had a frequency count of three respectively and 'increased security' two.

Participant 13 mentioned that he would like to see smartboards and projectors permanently connected, ready to be used. Participant 19 said: *"What I would like to see is the integration of the learners' tablets - because I feel like for now, it's very limited... the minute that they are integrated or they are linked, then the learners are going to enjoy the full facilities of technology"*. Participant 14 commented: *"I would like*

the whole school to be a full ICT school, in terms of smartboards for everybody and ja... tablets for learners”.

Participant 1 mentioned the need for more training for learners. Participant 15 said: *“computers are there but I also think there should be training or a trainer for computers, to learners”*. In order to maximise the use of technology Participant 13 was of the opinion that *“they (smartboards and digital projectors) should just be put there and be used readily and uploaded with information and connected permanently”*. Increased security was a concern for Participant 8, *“At the end government spends a lot of money but our community... they think ‘when are we going to break in?’ ”*. Participant 16 was of the opinion that they have everything the school needs, *“The availability of the internet always. Otherwise everything is there”*. Participant 10 expressed the need for a computer centre and lastly, Participant 15 said the school needed Wi-Fi *“Ja. I think Wi-Fi”*.

4.3.4.9 Staff support and the nature of the support

Sixteen participants mentioned that there was competent staff at the school for support while two participants expressed that there were no competent staff to give support. Sixteen participants said that the nature of support provided was technical and three said that it was in the form of training or instructors and that the support was provided willingly.

4.3.4.10 Other comments added by participants

When asked to elaborate on further suggestions about the use or acceptance of technologies into school, the following responses were prominent.

Three of the participants mentioned that the technology made educators’ lives easier. Participant 1 said: *“It would make our lives easier. It would make our jobs easier and then it would educate the learners as well”*. Participant 2 commented that security must be improved because *“At school, those things are stolen and the laptop and the smartboard gets stolen”*. Participant 3 mentioned: *“What I want to add is that, maybe not in our school because we have people who are older and they don’t feel the need of learning - which actually can help them, it’s just I don’t know how to motivate them to get into learning these things because they are not really interested. Some are but*

others are not interested but it's not only those who are older, even some young ones, they don't really show interest in using that. You'd normally see those things whenever they are doing a lesson or a test, they don't type things, they just write with a hand and after they photocopy and give to kids, you ask 'Why are you not typing this?' if you've got a computer, so that it can look neat and professional. So that's the concern".

Training for the learners to use technological devices for the right reasons, training for educators, basic introduction to technology and increased development of technological structures was also noteworthy. Participant 4 mentioned: *"I think so far it's fine but the challenges, our learners they don't use these tablets for academic, that's the challenge. They use it for their personal purposes"*. Participant 5 remarked: *"Yes. For us to have an ICT committee. I think it was something that was suggested by the District when they introduced ICT equipment, so we can have people who can drive the vision in the school. People who can - because we can't attend the workshop, like the whole staff cannot attend the workshop, at least when you have a committee..."*.

Participant 9 mentioned: *"It's still lacking. Ja, there's more that can be done, in terms of acceptance of technology because learners are not even allowed to use phones in the schoolyard. So sometimes it's - especially if you are teaching Life Orientation, there are things that one can do, using a phone and learners can just check over their phones but it becomes a problem"*. In closing, Participant 15 said: *"Well maybe I can put a stamp on saying, if the vision of the Department of Education in South Africa is willing to improve our education about technology, then I wish the pace could increase then we will see if there is a future for our learners"*.

4.4 FIELD NOTES, OBSERVATIONS AND DOCUMENTS ANALYSIS

4.4.1 Field notes

The researcher toured classrooms randomly to observe any fitted technological devices such as a smartboard or data projector, and the teacher's computer centre was visited to determine technological infrastructure. All four schools had some form of ICT resources such as laptop and desktop computers, data projectors, printers, scanners, smart boards, Wifi and internet. Teachers had access to computers for administrative tasks, preparation for lessons and own skills development and the

conclusion was that teachers were able to use them efficiently. The principals and most HODs had computers or laptops of their own. It was noted that all four schools had some form of ICT support from their respective districts, the nature of support provided was technical. At two of the schools, learners had access to a computer centre outside the classroom, although it was shared by learners and staff at one of the two schools.



Figure 4.3: Teachers' computer centre

All the schools had reasonable safety measures in place for their ICT resources. One of the schools is a “container” school which means that ICT resources had to be locked away in a strong room and retrieving it for use could be a daily demanding operation. There was a strong room for safekeeping of the received technological devices at the other three schools, but the fitted smartboards are vulnerable to public theft as there was no alarm system in the school. Each school had an ICT coordinator. The researcher found that the schools had e-learning platform facilities and an ICT-supporting infrastructure.

4.4.2 Observations

Teachers presented their lessons on the smartboard at two of the four schools and another showed how she incorporated the visualizer. The lesson plans of teachers had been studied and the application and use of ICT had been found apparent as the teachers demonstrated. An HOD demonstrated how she was able to access the marks and keep track of the marking process of the teachers in her department through Excel and an electronic mark book, SA-SAMS, on her laptop. The deputy principal of another school demonstrated how to track the management plans of HODs in the various departments, and how much easier it was for the district officials to track the academic

aspects of the school through SA-SAMS. Through “both verbal and non-verbal behaviour” (Maree, 2007, p.86) the researcher observed teacher confidence in these displays. The researcher also observed teachers demonstrating basic computer literacy skills and integrating ICTs into their teaching and learning practices when she visited the computer centres at two of the schools.

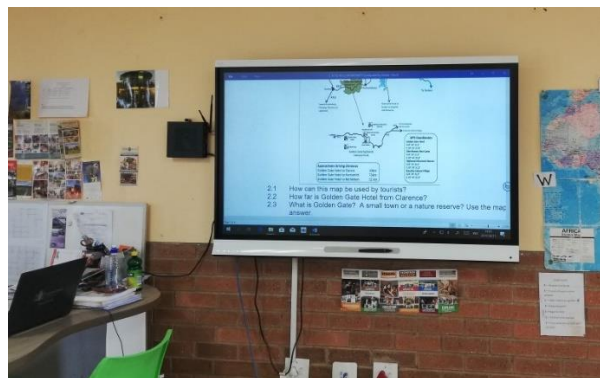


Figure 4.4: Smartboard

4.4.3 Document analysis

All the schools had ICT policies that represented the efforts of the schools to incorporate and use technology. The researcher found that meetings were not held regularly. The last ICT meeting took place at one school in September 2018. Quarterly meetings were held at the other three schools. The minutes reviewed reflected the continuing efforts and incorporation of ICTs. In-service training such as teacher training in using smart boards and data projectors, participation at basic computer skills training sessions to incorporate ICTs into teaching and learning, was also visible in meeting minutes. Memoranda from the Department of Education on district level with regards to policy, memoranda and ICT training for teachers were also scrutinised. At two schools it was found that most of these notices did not reach the schools in time for teachers to make the necessary arrangements to attend those training sessions. Teachers' lesson plans also reflected the inclusion of ICT.

4.5 CONCLUSION

This chapter focused on the analysis of the interviews as presented by the respondents, field notes, observations and document analysis. These results are an indication of what is happening at these schools regarding technology use and the

acceptance thereof. The extent to which educational technology is used in a school is a result of many factors such as teacher and learner perceptions on educational technology tools, the availability of these tools, and the support provided by school management and the school districts for the usage of these tools.

CHAPTER 5: FINDINGS AND DISCUSSION

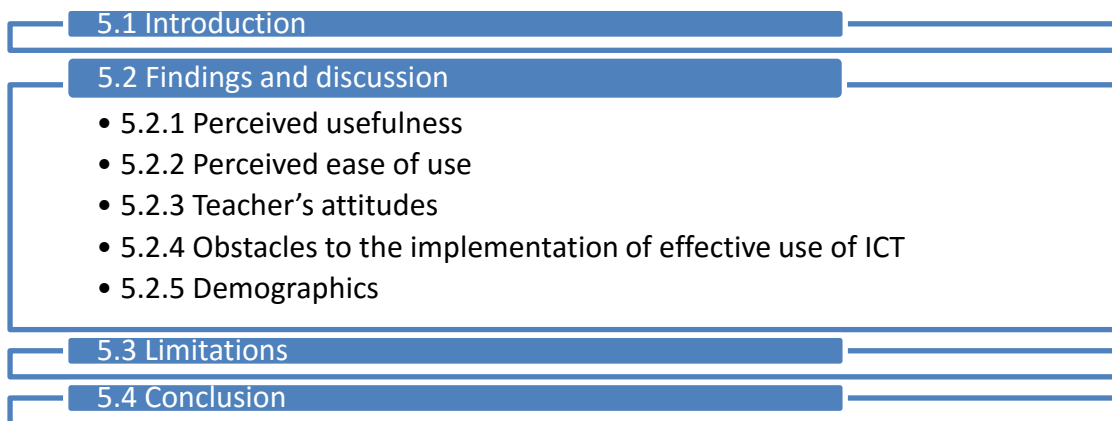


Figure 5.1: Findings and discussion map

5.1 INTRODUCTION

The findings and discussion in relation to the literature review are presented in this chapter. The analysis and results of the interview questions, field notes, observations and document analysis in the previous chapter covered issues around the research questions posed.

5.2 FINDINGS AND DISCUSSION

The findings from the interviews, field notes, observations and document analysis confirmed that all educators interviewed could see the potential that the use of technology holds in the teaching-learning environment.

As stated previously, the TAM, as a conceptual process, consists of six closely connected building blocks, “namely external variables, perceived ease of use, perceived usefulness, attitude towards using, behavioural intention to use and actual system use” (Davis, Bagozzi & Warshaw, 1989, p.982; Koh, Prybutok, Ryan, & Wu, 2010, p.177). It is generally understood that, for the model to be successfully implemented, all the pillars of this theoretical framework must be present and operational in the classroom. The following findings, which are based on interviews conducted with teachers, field notes, my personal observations as an educator, and analysis of documents, sought to highlight this model as an abstraction of reality. My

investigation aimed to unpack to what extent educational technology is accepted in teaching in public secondary schools in Pretoria.

Specific questions that were addressed were:

1. How useful do teachers perceive educational technologies?
2. How do teachers perceive the ease of use of educational technologies?
3. What are the teachers' attitudes towards the use of ICTs in teaching?
4. What are the obstacles to the implementation of ICT technological tools in teaching?

5.2.1 Perceived usefulness

The effect of perceived usefulness has also been explored in previous studies and in 2002 Windschitl and Sahl showed that teachers who employ ICT in their lessons gradually change their instructional practice to a more constructivist pedagogy. Learners actively construct or create knowledge and find meaning in learning in a collaborative manner. The findings indicated that teachers use technology to help make study material such as tests and exams for the class, create lesson plans, class activities, quizzes, set question papers and worksheets. This is similar to the European Commission (2013) findings that teachers use ICT primarily for lesson preparations but rarely during teaching classes.

The majority of participants preferred using technology as it made their jobs a lot easier. The findings showed that the majority of participants preferred using technology for the preparation of class material, recording of marks, communication with parents and checking progress on syllabi covered and record marks using Excel. This is in line with the DBE (2011) guidelines.

Overall, there was a seemingly positive attitude towards the use of ICT technology, and the findings indicated that educators were willing to incorporate technologies into their current operations. Technology was used for research to obtain more information. The visual aids were greatly used to help improve teaching and learning. This is corroborated by the eLearning Africa Report in 2012 - learners are motivated to learn; learning becomes fun and encourages independent guided learning; learners produce their own knowledge (Isaacs & Hollow, 2012). Most schools do not allow the use of

technological devices during lessons. However, some do allow tablets and smartphones to be used. The finding that students learnt better with technology as it enabled them to download work and in doing so they were able to answer their questions, is consistent with Elston (2013) that ICT helps students develop real world skills and also exposes them to a wealth of content. It is also noteworthy that learners who are positively inclined towards technology, are attentive; they listen in class and they respond positively to the lesson (Lowther et al, 2008).

Teachers made use of the technology in setting up class activities, quizzes and rubrics. Videos and lectures created by educators were also a tool for the learners to make use of. It can be concluded from the findings that the educators perceived the received technologies to be useful as it made teaching easier and helped them prepare teaching material. Technology also enabled them to communicate more effectively and speedily with their peers in their respective school communities (Bialobrzaska & Cohen, 2005). Also, the introduction of technologies allowed teachers the opportunity to have all resources available to them on a single platform, which has proven advantageous as well. Teachers were able to administer and manage their workload/plans more efficiently when using ICT. At the same time however, it was mentioned that it would be more advantageous if the teachers knew more about a certain application or technology as well.

5.2.2 Perceived ease of use

The study revealed that all the teachers interviewed had computer skills and there was a positive attitude towards the use of technology. Teachers thought that technology is easy to use and were inclined to use it. The findings indicated that educators were incorporating technologies into their daily operations to help make study material such as tests and exams for the class, create lesson plans, class activities, quizzes, class activities, set question papers and worksheets. This is in line with Carlson and Gadio (2003), who noted that equipping schools with computer technologies without considering whether teachers are at ease using the devices would be a waste of time and money. The findings revealed that some teachers displayed resistance to new technologies citing that they are too old.

The results of this study showed that perceived ease of use had a strong influence on the perceived usefulness and consequent behavioural intent of teachers to use technology. The positive relationship between perceived ease of use and actual use of the system meant that the degree to which a teacher finds technology to be user-friendly has a positive effect on its actual use of the system. As a result, teachers are inclined to accept a technology simply because it is easy to use (Davis, Bagozzi, & Warshaw, 1992).

5.2.3 Teachers' attitudes

There was a positive consensus among the participants that the technologies received are not difficult to use, and have in fact, reduced the workload of the teachers. Further, there was a seemingly positive attitude from both learners and teachers towards the technology as well.

The findings of this study indicated that teachers who viewed computer technology as positive have been able to demonstrate greater use of technology, while those who viewed technology from a negative perspective have not acquired and integrated ICT knowledge and skills in their classrooms. This positive relationship points out that as the perceived usefulness by secondary school teachers increases, they are determined to make good use of the system. The results are consistent with previous findings of other researchers (Venkatesh & Morris, 2000) that an individual's attitude, intention and perceived usefulness of technologies leads to actual use of a technology/system. PE and PU determine the adoption of an individual's information systems (Lee, Kozar & Larsen, 2003; Surendran, 2012) and subsequent behavioural intent, leading to real use of the system (Wu & Wang, 2005). The teachers' attitudes towards technology were substantially positive, and their belief in technology's impact on teaching, student learning, and attitudes were also largely favourable.

5.2.4 Obstacles to the implementation of effective use of ICT

It can be concluded that training had been received from the DBE and this training was adequate. Lack of interest in the usage of the technological devices may be a reason why training had not been provided in some cases. The findings revealed that lack of resources was another reason: "*if there are no smartboards at school, there'll be no rush to train*" (Participant 15). This is consistent with the DBE in South Africa's

report of 2015 that technology-enhanced learning had not advanced as envisaged. A gap also exists between government's expectations and the practises of teachers and can impact negatively on the acceptance of educational technology (Zhao et al, 2000; Teo, 2011; Hsu, 2016).

Most schools do have the infrastructure for e-learning along with the support from the SGB and management. Ngeze (2017) states that the classroom and learning experience become enriched where the necessary infrastructure is in place and teachers are trained effectively to implement ICT integration.

An external variable that could impact PU and PE is support from management. The findings revealed that the SGB and the management were supportive and enthusiastic about the use of technology. Security of devices must also be improved. This is in tandem with Elston (2013) and Padayachee's (2017) findings that security was one of the major challenges.

The findings indicated that support for the technological devices were available. The aim of bringing ICTs into the learning environment, was not simply to use them to become computer literate. It is not enough to have basic computer skills. You need to learn how to use ICTs more efficiently as a platform for teaching and learning. Regardless of how good the infrastructure may be in a school, and regardless of how wide the range of software the school has, these are only as good as the teacher employing them.

In spite of all these challenges, all these schools were committed to improving the digital literacy of its teachers and appreciating that they must prepare the younger generation for a digital society by incorporating ICTs in the classroom and that teachers are at the forefront of the drive to incorporate ICT in the classroom.

5.2.5 Demographics

The researcher found no significant disparities with regards to teaching experience and gender. This study showed that younger teachers demonstrated a high level of confidence about the use of technology and saw the positive value technology brings to their profession. Participant 7 said: *"I think what I've observed, those with age, the*

older ones are still scared of technology and they really think that it's not for them but for younger teachers, the willingness is very high".

The study also found that the teachers integrated technology across most subjects. The smartboard and the computer/laptop were found to be the emerging tool used in the classrooms. Regardless of their post level, the educators shared a similar perception of the benefits of technology integration in their classrooms. The majority of participants preferred using technology as it made their jobs, which included administrative tasks such as preparation of class material and recording of marks, a lot easier. This is in line with TAM which accepts that BI to use a particular technology is an important factor that determines whether it will actually be used by users. Hsu (2016), contends that teachers who placed a more positive value on technology tended to use technology more frequently in their instruction. Sixteen participants mentioned that the use of technology helped reduce the workload. *"Because things are easier now..."* (Participant 12). Deputy principals and HODs found the use of technology beneficial in the management of school and checking the progress on syllabi covered. Participant 18, an HOD, said: *"And also, you know, as a HOD it means that there is these management plans and assessment programs"*. The latter programs are departmental management and administrative plans to make monitoring and reporting easier. However, Participant 2 mentioned that technology did not ease the workload because her challenge is the lack of human resources, *"Unfortunately, it doesn't help us that much on workload because, like in my case here, remember my workload as a teacher and as a deputy is huge. So, it's a matter of human resources shortages but after all, as far as technology is concerned, it doesn't reduce my workload"*.

5.3 LIMITATIONS

The findings of this study should not be generalized to all public secondary school teachers in Pretoria, Gauteng, as the respondents involved were public secondary school teachers in four educational districts in Pretoria, Gauteng. It is also limited to four areas of technology integration in teaching as reflected in the questions of the study. This population was selected due to ease of accessibility.

5.4 CONCLUSION

This chapter focused on the findings from interviews as presented by the respondents, field notes, observations and document analysis. These findings are an indication of what is happening at these schools regarding technology acceptance. The extent to which educational technology is used in a school is a result of a great many factors such as educators' and learners' perceptions of educational technology tools, the availability of these tools, and the support provided by school management and the school districts and the DBE for the usage of these tools. The following chapter focuses on recommendations and conclusions, as well as aspects of further study.

CHAPTER 6: RECOMMENDATIONS AND CONCLUSION



Figure 6.1: Conclusion and recommendations map

6.1 INTRODUCTION

The focus of the previous chapter was the findings and discussion of data collected through interviews, field notes, observations and document analysis, with the intent to make sense of, or understand answers to the research questions posed. The study revealed important insights into the teachers' minds and helped to understand their attitudes to the acceptance and use of teaching with technology. Teachers were aware of the importance of teaching with technology and were using the technology positively.

6.2 RECOMMENDATIONS

Access to educational technologies does not necessarily translate into use. The focus of integration of technology should be on increasing teachers' acceptance and use of technology. The following recommendations are offered to educational stakeholders, decision makers and teachers, based on the analysis and discussion of the findings. The recommendations are presented below to address the problems identified in the themes.

The focus needs to be on providing students and teachers with ubiquitous access to new technology and educational resources. Teachers need to make more effort to improve their use of ICTs. The SGB and the management should lead the way in promoting teachers' technological development as this study established perceived ease of use, perceived utility, attitude to use, and behavioural intent to use as relevant factors in influencing their actual system use. The school needs to hold internal

workshops where educators could come together to find and share better strategies to integrate technology use in their classrooms. This recommendation is informed by the finding that some educators struggle with technology use while others are fairly able, or even highly proficient in the use of technology. In this way, the educators that are proficient, willing and motivated to integrate technology in teaching and learning can serve as models and mentors for their reluctant colleagues (Ringstaff & Kelley, 2002).

Teachers must be asked constantly if they need to attend ICT courses and training and feedback for further action must be sent to the DBE. Skills development programs need to be developed and rolled out in every district to build the capability of educators in effective use of technology. In this way, teachers will be equipped with the appropriate skills and knowledge to evaluate the software available to them and be able to design activities that are more learner-centred and involve higher order thinking skills. If the ICT courses and training gained is put to good use, teachers should be observed. If the teacher concerned does not use the acquired skills, the teacher should be sent for further training until he or she is confident and considers the actual system use simple and compliant. For the efficiency and effectiveness of this process, the school should have guidelines or a policy on training of teachers in educational technology usage. These guidelines should state clearly defined approaches on the development of educational technology competencies of teachers. Without guidelines or a policy, it is difficult for the school to provide logical and effective plans on how to use educational technology in the classroom environment. For those demonstrating good use of technology, there should be rewards or incentives to attend advanced conferences or courses not offered by the DBE.

While teachers interviewed acknowledged that the technological infrastructure was in good condition for use, it is necessary to increase the quality of the infrastructure. Funds should be made available from the DBE to ensure the storage and security of technological equipment.

6.3 FURTHER RESEARCH

The acceptance and use of technology that was identified and researched revealed new questions that compel further research. The first issue calls for an investigation into the lack of support from the DBE at district level, and the second issue is the inadequate training and skills development programmes for teachers. Another concern is security. Further research is required to investigate the issue of integration of technology as well as the extent to which technology is being used to teach on a wider scale and in different contexts and settings. This research could be expanded to include more schools in the districts or Gauteng province in order to have a larger sample size and thus the research could yield different results.

6.4 CONCLUSION

This study investigated the acceptance and use of educational technology in teaching in four South African public schools by employing a qualitative research design. The research findings have been able to answer the research questions posed in Chapter 1 of this study and confirm the articulations made by the different authors in the literature review. The data collected and subsequent findings revealed that continuous improvement and revision is important. This chapter concludes an investigation into the acceptance and use of educational technology.

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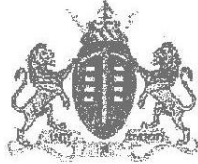
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APPENDICES

Appendix A: Research approval letter



GAUTENG PROVINCE

Department: Education
REPUBLIC OF SOUTH AFRICA

8/4/4/1/2

GDE RESEARCH APPROVAL LETTER

Date:	05 December 2018
Validity of Research Approval:	05 February 2019 – 30 September 2019 2018/365
Name of Researcher:	Alexander HP
Address of Researcher:	708A Piering Street Elardus Park 0181
Telephone Number:	083 260 2560
Email address:	hbaileya@yahoo.com
Research Topic:	Technology acceptance in Secondary Schools
Type of qualification	Masters
Number and type of schools:	Four Secondary Schools
District/s/HO	Tshwane North, Tshwane West and Tshwane South

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 to conduct the research. A separate copy of this letter must be presented to both the School (both Principal and SGB) and the District/Head Office Senior Manager confirming that permission has been granted for the research to be conducted.

The following conditions apply to GDE research. The researcher 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:

1. The District/Head Office Senior Manager/s concerned must be presented with a copy of this

GA 4012/2018
Making education a societal priority

Office of the Director: Education Research and Knowledge Management

7th Floor, 17 Simmonds Street, Johannesburg, 2001

Tel: (011) 355 0488

Email: Falth.Tshabalala@gauteng.gov.za

Website: www.education.gpg.gov.za

1. The District/Head Office Senior Manager/s concerned must be presented with a copy of this letter that would indicate that the said researcher/s has/have been granted permission from the Gauteng Department of Education to conduct the research study.
2. The District/Head Office Senior Manager/s must be approached separately, and in writing, for permission to involve District/Head Office Officials in the project.
3. A copy of this letter must be forwarded to the school principal and the chairperson of the School Governing Body (SGB) that would indicate that the researcher/s have been granted permission from the Gauteng Department of Education to conduct the research study.
4. A letter / document that outline the purpose of the research and the anticipated outcomes of such research must be made available to the principals, SGBs and District/Head Office Senior Managers of the schools and districts/offices concerned, respectively.
5. The Researcher will make every effort obtain the goodwill and co-operation of all the GDE officials, principals, and chairpersons of the SGBs, teachers and learners involved. Persons who offer their co-operation will not receive additional remuneration from the Department while those that opt not to participate will not be penalised in any way.
6. Research may only be conducted after school hours so that the normal school programme is not interrupted. The Principal (if at a school) and/or Director (if at a district/head office) must be consulted about an appropriate time when the researcher/s may carry out their research at the sites that they manage.
7. Research may only commence from the second week of February and must be concluded before the beginning of the last quarter of the academic year. If incomplete, an amended Research Approval letter may be requested to conduct research in the following year.
8. 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.
9. It is the researcher's responsibility to obtain written parental consent of all learners that are expected to participate in the study.
10. The researcher is responsible for supplying and utilising his/her own research resources, such as stationery, photocopies, transport, faxes and telephones and should not depend on the goodwill of the institutions and/or the offices visited for supplying such resources.
11. The names of the GDE officials, schools, principals, parents, teachers and learners that participate in the study may not appear in the research report without the written consent of each of these individuals and/or organisations.
12. On completion of the study the researcher/s must supply the Director: Knowledge Management & Research with one Hard Cover bound and an electronic copy of the research.
13. 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.
14. Should the researcher have been involved with research at a school and/or a district/head office level, the Director 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



Mr Gumani Enos Mukatuni
Acting CES: Education Research and Knowledge Management

DATE: 10/12/2018

Appendix B: Permission letter to the principal of the school



Faculty of Education

The Principal.....High School

Dear Sir/Madam,

INVITATION TO FOR YOUR SCHOOL TO PARTICPATE IN RESEARCH PROJECT - Technology Acceptance in Secondary Schools.

I am currently enrolled for a Master's degree at the University of Pretoria. Part of the requirements for the awarding of this degree is the successful completion of a significant research project in the field of education.

The title of my approved research study is "**Technology Acceptance in Secondary Schools**".

This study is concerned with the extent to which educational technology is accepted in teaching in South African schools.

Your school is hereby invited to participate in this research project, which aims to:

- Understand how useful teachers perceive educational technologies?
- Understand what the teachers' perceptions are of the degree of difficulty in the use of technologies.
- Understand what the teachers' attitudes are towards the use of ICTs in teaching.
- Understand what the obstacles are to the implementation of ICT technological tools in teaching.

Below is the scope and responsibility of your participation. To gather information I require to approach teachers with an individual invitation to participate. Those who do agree to participate will be interviewed about certain aspects of educational technology in

Room 4-1.7, Level 4, Building
University of Pretoria, Private Bag X20
Hatfield 0028, South Africa
Tel +27 (0)12 420 1234
Fax +27 (0)12 420 6878
Email name.surname@up.ac.za
www.up.ac.za

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Lefapha la Thuto

teaching. This interview should take no longer than 60 minutes, and can be conducted at any location the participants suggest. I have included here for your information a schedule of interview questions.

Please understand that the decision for your school to participate is completely voluntary and that permission for your participation will also be protected by the Gauteng Department of Education. Please also note that each individual's participation in the study will be completely voluntarily and will in no way either advantage or disadvantage them. Each participant will be free, at any stage during the process up to and including the stage at which they authenticate the transcript of their interview, to withdraw their consent to participate, in which case their participation will end immediately without any negative consequences. Any and all data collected from them up to that point in the study will then be destroyed.

All the information obtained during the research study will be treated confidentially, with not even the Department of Education having access to the raw data obtained from the interviews. At no time will either your school or any of the individual participants be mentioned by name or indeed be allowed to be identified by any means in the research report.

At the end of the research study you will be provided with a copy of the research report containing both the findings of the study and recommendations. This research study presents a unique opportunity for your school to get involved in the process of research aimed at Investigating technology acceptance in South African schools. If you decide to allow your school's participation, kindly show this by completing the consent form at the end of this letter.

Thanking you in anticipation.

Yours in service of education,

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Yours in service of education,

H. Alexander
Student Researcher
University of Pretoria

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(083) 2602560

Dr K. Moodley
Co- Supervisor
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kimera.moodley@up.ac.za
(073) 455 9573

Dr M. Mihai
Supervisor
University of Pretoria

maryke.mihai@up.ac.za
(082) 430 2928

LETTER of CONSENT

SCHOOL AS PARTICIPANT

**VOLUNTARY PARTICIPATION IN THE RESEARCH PROJECT ENTITLED
Technology Acceptance in Secondary Schools.**

I, _____, the principal of

_____ hereby voluntarily and willingly agree to allow my school to participate in the above-mentioned study introduced and explained to me by Helena Alexander, currently a student enrolled for an MEd degree at the University of Pretoria.

I further declare that I understand, as they were explained to me by the researcher, the aim, scope, purpose, possible consequences and benefits and methods of collecting information proposed by the researcher, as well as the means by which the researcher will attempt to ensure the confidentiality and integrity of the information she collects.

Full name

Signature

Date

School stamp

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Appendix C: Permission letter to the participants



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Teacher

.....High School

Dear Sir/Madam,

INVITATION TO PARTICIPATE IN RESEARCH PROJECT – Technology Acceptance in Secondary Schools

I am currently enrolled for a Master's degree at the University of Pretoria. Part of the requirements for the awarding of this degree is the successful completion of a significant research project in the field of education.

The title of my approved research study is "**Technology Acceptance in Secondary Schools**".

This study is concerned with the extent to which educational technology is accepted in teaching in South African schools.

You are hereby invited to participate in this research project, which aims to:

- Understand how useful teachers perceive educational technologies?
- Understand what the teachers' perceptions are of the degree of difficulty in the use of technologies.
- Understand what the teachers' attitudes are towards the use of ICTs in teaching.
- Understand what the obstacles are to the implementation of ICT technological tools in teaching.

Below is the scope and responsibility of your participation. To gather information I require for this research, I request permission to interview you as a teacher about certain aspects

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of educational technology in teaching. This interview should take no longer than 60 minutes, and can be conducted at any location you suggest. I have included here for your information a schedule of interview questions.

Please understand that the decision for you to participate is completely voluntary and that permission for your participation will also be protected by the Gauteng Department of Education. Please also take into account that each individual's participation in the study will be completely voluntarily and will in no way either advantage or disadvantage them. Each participant will be free, at any stage during the process up to and including the stage at which they authenticate the transcript of their interview, to withdraw their consent to participate, in which case their participation will end immediately without any negative consequences. Any and all data collected from them up to that point in the study will then be destroyed.

All the information obtained during the research study will be treated confidentially, with not even the Department of Education having access to the raw data obtained from the interviews. At no time will either you as an individual or your school be mentioned by name or indeed be allowed to be identified by any manner or means whatsoever in the research report.

At the end of the research study you will be provided with a copy of the research report containing both the findings of the study and recommendations. This research study presents a unique opportunity for you and your school to get involved in the process of research aimed at investigating technology acceptance in South African schools. If you decide to participate in this research study, kindly indicate this by completing the consent form at the end of this letter.

Thanking you in anticipation.

Yours in service of education,

H. Alexander
Student Researcher
University of Pretoria

hbaileya@yahoo.com
0832602560

Dr K. Moodley
Co- Supervisor
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Dr M. Mihai
Supervisor
University of Pretoria

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(082) 430 2928

LETTER of CONSENT

INDIVIDUAL PARTICIPANT

**VOLUNTARY PARTICIPATION IN THE RESEARCH PROJECT ENTITLED
Technology Acceptance In Secondary Schools**

I, _____, hereby voluntarily and willingly agree to participate as an individual in the above-mentioned study introduced and explained to me by Helena Alexander, currently a student enrolled for an MEd degree at the University of Pretoria.

I further declare that I understand, as they were explained to me by the researcher, the aim, scope, purpose, possible consequences and benefits and methods of collecting information proposed by the researcher, as well as the means by which the researcher will attempt to ensure the confidentiality and integrity of the information she collects.

Full name

Signature

Date

Appendix D: The interview questions

The interview questions

The age group of the educator.

- 20 +
- 30 +
- 30 – 40
- 40 – 50
- 45 – 50

Gender

- Male
- Female

Teaching experience in years

- 1 – 3
- 4 – 8
- 9 – 15
- > 15

Highest educational level attained

- Diploma
- Degree
- Postgraduate degree

Subject Area _____

What grade do you teach? _____

Do you have a computer at home?

Yes / No

If yes, is it connected to the internet?

Yes/No

How do you define computer skills?

Which of the following technologies are you using for your teaching?

	Computer/Laptop
	Mobile device
	Data Projector
	Smartboard
	WiFi
	Internet
	Cloud services
	Learning Management System (Moodle, Blackboard)
	Other

Which of the following technologies are you using for your lesson preparation?

	Computer/Laptop
	Mobile device
	Data Projector
	Smartboard
	WiFi
	Internet
	Cloud services
	Learning Management System (Moodle, Blackboard)
	Other

Perceived usefulness ...the usefulness of the technology, your acceptance thereof and preferences

1.1 Which of the (received) technology(ies) do you use in your teaching and preparation?

1.2 What inspires you to teach using technology?

1.3 What prevents you from using a specific technology?

1.4 Which administrative tasks do you currently perform with the assistance of technology?

1.5 In what way is the technology

- advancing your teaching?

- hindering your teaching?

1.6 How do the learners respond to the technology?

1.7 Do you think that the technology can help learners to learn? If so, how?

1.8 Did you learn anything new by using the technology in your class? What did you learn?

1.9 Does the technology help you cover the key concepts in your learning area?

1.10 What would you still like to learn with regard to teaching with technology?

1. Use of Technology in the classroom

2.1 Which resources or teaching and learning material do you create with technology?

2.2 What devices do your learners use (smart phones, cell phones, tablets) in your classes? Specify.

2.3 How does the implementation of technology in your classes change the attitudes of the learners?

2.4 How does the implementation of technology in your classes change your attitude towards technology?

2.5 How does the implementation of technology impact your workload?

2.6 Which aspects of your teaching are enhanced due to the incorporation of technology?

2.7 What did technology bring to your teaching practice that was not possible before?

3. Perceived ease of use ...whether you think technology is easy to use and your inclination to use it

3.1 If someone showed you, would you complete a task using technology?

3.2 How do you observe the willingness of your colleagues to accept technology?

3.3 What are your concerns about teaching with technology?

3.4 Which technological devices do you find easy to use? Specify the device.

External Variables

4. Educator's Competency/Training

4.1 What training did you receive to support your development in teaching with technology?

4.2 Was the training adequate?

4.3 If you did not receive training, why not?

5. Institutional Factors

5.1 What technologies are available for teaching in your environment?

5.2 Is the technological infrastructure in the school readily available when needed?

5.3 Does the school have all the facilities needed for an e-learning system?

5.4 Are the SGB and the management team supportive and enthusiastic about the implementation of technology?

5.5 What is the vision in your school for teaching with technology in the future?

5.6 What would you like to see implemented in your school in future for teaching with technology?

6. Technical Support

6.1 Is there competent staff to give support in the school?

6.2 What is the nature of the support that is provided?

6.3 Is this support provided willingly?

7. Is there anything that you can add about the use or acceptance of technology in your school?

Appendix E: Code meanings

What each number of the code represents

- The first number represents the research question number
- The second number represents sub question within the research question
- The third number is the theme

Example

Code 1 2 1 represents the second sub question of research question 1, theme 1

Research Question	Sub Question	Code(s)	Theme	Frequency
1. Perceived usefulness ...the usefulness of the technology, your acceptance thereof and preference	Which of the received technology(ies) do you use in your teaching and preparation?	1 1 1	Laptop	16
		1 1 2	Projector	4
		1 1 3	Wifi/Internet	10
		1 1 4	Smartphone	6
		1 1 5	Smart Board	8
		1 1 6	Visualiser	1
		1 1 7	Cloud	1
	What inspires you to teach using technology?	1 2 1	Appealing to learners	8
		1 2 2	Makes teaching easier	16
		1 2 3	Cleanliness	1
	What prevents you from using a specific technology?	1 3 1	Lack of Resources	14
		1 3 2	Stolen Resources	2
		1 3 3	Distractive to learners	1
		1 3 4	Lack of Technological Skills	1
	Which administrative tasks do you currently perform with the assistance of technology?	1 4 1	Recording of Marks	10
		1 4 2	Communication with parents	1
		1 4 3	Preparation of Class material and tests	12
		1 4 4	Management of the school	3
		1 4 5	Checking progress on syllabus covered	1
	In what way is the technology - advancing your teaching?	1 5 1 1	Use of less resources	4
1 5 1 2		Makes teaching easier	12	
1 5 1 3		Increased technological awareness	2	
1 5 1 4		Better health	1	

	In what way is the technology? - hindering your teaching?	1 6 2 1	No hindrance	7
		1 6 2 2	No electricity, Load Shedding	6
		1 6 2 3	Adjusting to old technology when new technology unavailable	1
		1 6 2 4	Lack of Technological skills	1
		1 6 2 5	Too much admin	1
		1 6 2 6	Natural Disasters	1
		1 6 2 7	Distracting to learners	2
		1 6 2 8	Time wasting	1
	How do the learners respond to the technology?	1 7 1	Respond Positively	16
		1 7 2	Respond Negatively	2
	Do you think that the technology can help learners to learn? If so, how?	1 8 1 1	Yes, Not book based, increased attentiveness	9
		1 8 1 2	Yes, Usage of technology positively	2
		1 8 1 3	Yes, Access to new resources	4
		1 8 1 4	Yes, Helps with supervision of learners	1
		1 8 2	Somewhat helps	2
	Did you learn anything new by using the technology in your class? What did you learn?	1 9 1	Yes	2
		1 9 1 1	Yes, learn new applications	13
		1 9 1 2	Yes, for research	2

		1 9 1 3	Yes, simplified work	1
	Does the technology help you cover the key concepts in your learning area?	1 10 1	Yes	5
		1 10 1 1	Yes, easier for learners to relate to	6
		1 10 1 2	Yes, keeps the information up to date	3
		1 10 1 3	Yes, saves time	1
		1 10 2 1	No, technology have constraints	2
		1 10 3 1	Sometimes	2
		What would you still like to learn with regard to teaching with technology?	1 11 1, 1 11 3	Learn different technological applications
	1 11 2		Making online tests and online marking	1
	1 11 4		Learn whatever is available about technology	9
	1 11 5		Learn more about software	2
	1 11 6		Learn Programming	1
	1 11 7		Learn how to intergrate different technological devices	2
Use of Technology in the classroom	Which resources or teaching and learning material do you create with technology?	1 12 1	Quizzes and class activities	14
		1 12 2	Homework Activities	1
		1 12 3	Visual Aids	5
		1 12 4	Videos and audio	4
		1 12 5	Rubrics	1
	What devices do your learners use (smart phones, cell phones, tablets) in your classes? Specify.	1 13 1	Smartphones	4
		1 13 2	None	8
		1 13 3	Tablets	5
		1 13 4	Smartboard	1

	Which aspects of your teaching are enhanced due to the incorporation of technology?	1 14 1	Visual Aspects	9	
		1 14 2	Practical Aspects	2	
		1 14 3	Theoretical Aspects	1	
		1 14 4	Planning and Preparation	5	
		1 14 4	Audio Aspects	1	
	What did technology bring to your teaching practice that was not possible before?	1 15 1	More information	5	
		1 15 2	Visual aids	2	
		1 15 3	Time saving	4	
		1 15 4	General use of technology	2	
		1 15 5	Increased professionalism	3	
2. Perceived ease of use ...whether you think technology is easy to use and your inclination to use it	How does the implementation of technology in your classes change the attitudes of the learners?	2 1 1	Positive Attitude	14	
		2 3 2	Negative Attitude	3	
		2 3 3	Mixed Reaction	1	
	How does the implementation of technology in your classes change your attitude towards technology?	2 4 1	Positive Attitude	15	
		2 4 2	Negative Attitude	3	
	How does the implementation of technology impact your workload?	2 5 1	Reduces Work Load	16	
		2 5 3	No reduction in work load	2	
	3. Teacher's attitudes	If someone showed you, would you complete a task using technology?	3 1 1	Yes	18
		How do you observe the willingness of your colleagues to accept technology?	3 2 1	Not willing	3
3 2 2			Mixed reaction	8	
3 2 3			Willing	7	
What are your concerns about teaching with technology?		3 3 1	Wrong usage of Technology	8	
		3 3 2	Lack of technological knowledge	1	
		3 3 3	Lack of resources	2	
		3 3 4	No electricity, Load shedding	1	
		3 3 5	Training for students	3	
	3 3 6	No concern	4		

	Which technological devices do you find easy to use? Specify the device.	3 4 1	Smartphones	10
		3 4 2	Smartboards	7
		3 4 3	Computer/Laptops	12
		3 4 4	Tablet	4
		3 4 5	Projector	6
		3 4 6	Visualizer	2
		3 4 7	Wifi/Internet	2
4. Obstacles to the implementation of effective use of ICT Educator's Competency/Training	What training did you receive to support your development in teaching with technology?	4 1 1	Training at Tertiary Institutions	6
		4 1 2	Workshops at school	1
		4 1 3	Training from the Department of Education	11
		4 1 4	Training from the district	4
		4 1 5	Training from an unnamed organization	3
		4 1 6	None	2
	Was the training adequate?	4 1 1	Yes	10
		4 1 2	No	4
		4 1 3	Depends	3
	If you did not receive training, why not?	4 2 1	Not sure	3
		4 2 2	Lack of interest from educators	3
		4 2 3	Training are mostly for educators with no technological skills	1
		4 2 4	Lack of resources	2
Institutional Factors	What technologies are available for teaching in your environment?	4 3 1	Projector	7
		4 3 2	Laptop/Computer	12
		4 3 3	Smartboards	12
		4 3 4	Computer labs	3
		4 3 5	Wifi/internet	3
		4 3 6	Tablets	4
		4 3 7	Smartphones	1
		4 3 8	Visualizer	5
		4 3 9	Printers	3
	Is the technological infrastructure in the school readily available when needed?	4 4 1	Yes	11
		4 4 2	No	7
	Does the school have all the facilities needed for an e-learning system?	4 5 1	Yes	8
		4 5 2	No	8
	Are the SGB and the management team supportive and	4 6 1	Yes	10
		4 6 2	No	4

	enthusiastic about the implementation of technology?	4 6 3	Not Sure	5
	What is the vision in your school for teaching with technology in the future?	4 7 1	Increased usage of technology, paperless education	6
		4 7 2	Staff with technological knowledge	2
		4 7 3	Increased security	2
		4 7 4	Communication with technology	1
		4 7 5	For students not to undermine themselves	1
		4 7 6	No vision	1
		4 7 7	Better results with technology	2
	What would you like to see implemented in your school in future for teaching with technology?	4 8 1	Increased technological resources	7
		4 8 2	More training	3
		4 8 3	Maximising use of technology	3
		4 8 4	Increased security	2
		4 8 5	Computer centre	1
		4 8 6	None	2
		4 8 7	Internet/wifi	1
Technical Support	Is there competent staff to give support in the school?	4 9 1	Yes	16
		4 9 2	No	2
	What is the nature of the support that is provided?	4 9 1	Technical	16
		4 9 2	Instructors/Training	3
	Is this support provided willingly?	4 9 1	Yes	16
	Is there anything that you can add about the use or acceptance of technology in your school?	4 10 1	Makes educators lives easier	3
		4 10 2	Safety and security must be improved	3
		4 10 3	More motivation for the older educators to use technology	1
		4 10 4	training for the learners to use technological devices for the right reasons	1
		4 10 5	Training for educators	1
		4 10 6	Nothing to add	7
		4 10 7	Basic introduction to technology	1
		4 10 8	Increased development of technological structures	1