

Senior Phase Technology teachers' experiences of the utilisation of
smartboards in Ekurhuleni District rural schools

By Rochley Bosman

Submitted in fulfilment of the requirements for the degree Philosophiae
Masters in the Faculty of Education, University of Pretoria

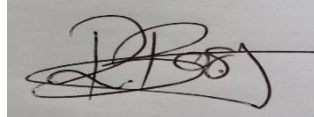
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September 2024

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“I declare that the dissertation, which I hereby submit for the degree of Philosophiae Masters in Computer Integrated Education 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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“The author, whose name appears on the title page of this thesis, has obtained, for the research described in this work, the applicable research ethics approval. The author declares that he/she has observed the ethical standards required in terms of the University of Pretoria’s *Code of ethics for researchers and the Policy guidelines for responsible research.*”

Dedication

I Rochley Bosman dedicate this study to the following family members:

the late Mr Koopman and Mr Kammies who passed on in 2023 and who have been my invisible mentors in completing this study.

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This study would not have been possible without the protection, guidance, and insight provided by the divine trinity.

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Abstract

This study aimed at exploring Senior Phase Technology teachers' experiences on the utilisation of smartboards in Ekurhuleni District rural schools. More specifically, the study sought to identify whether the utilisation of smartboards in South Africa catapults the teaching and learning in the classroom and, thus, contributes to improve the quality of the education provided. The study utilised a qualitative approach, conducting semi-structured interviews and drawing on the Unified Theory of Acceptance and Use of Technology (UTAUT) as a theoretical framework. Purposive sampling and convenience sampling were employed to select the research site and the participants through which data were collected. Manual thematic analysis was used to analyse the data, and this generated insights into teachers' experiences with the utilisation of smartboards, including the integration of this technology in the classroom. The study found that not all Senior Phase Technology teachers effectively use smartboards in Technology classrooms. The data analysis based on the UTAUT model indicated that while most teachers are positive about smartboard use in the Technology classroom, effective utilisation depends on having functional smartboards, uninterrupted power supply, stable internet access, and ongoing training. The study adhered to ethical considerations by ensuring informed consent, voluntary participation, confidentiality, and anonymity.

Keywords: Ekurhuleni District; ICTs; rural schools; Senior Phase Technology teachers; smartboards; Technology; utilisation; UTAUT.

Language Editors disclaimer

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List of abbreviations

DBE	Department of Basic Education
GDE	Gauteng Department of Education
UTAUT	Unified Theory Acceptance and Use Technology
TLA	Technology Learning Area
ICT	Information and Communication Technology
SMT	School Management Team
HOD	Head of Department
BEEd	Bachelor of Education degree
NEPAD	New Partnership for Africa Development
PSMI	Progressive Science and Mathematics Initiative

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CHAPTER ONE

Introduction to the study

1.1 Introduction

This study aims to explore the experiences of Senior Phase Technology educators regarding the utilisation of smartboards in rural schools within the Ekurhuleni District. More specifically, the study seeks to determine whether using smartboards in South Africa enhances the teaching and learning process in the classroom, thereby contributing to improving the quality of education provided. The study was primarily anchored in the belief that the utilisation of Information and Communication Technologies (ICTs) in education is a part and parcel of the modern teaching methods. Therefore, the proficient utilisation of smartboards, in particular, is expected to enrich the teaching and learning process in the Senior Phase Technology classroom and elevate the standard of Technology education for learners (Chakravorti and Chaturvedi, 2019). Scholars such as Blau and Hameiri (2017), Francisco and Swanson (2018), as well as Chakravorti and Chaturvedi (2019) and Rasool and Naidoo (2024) have argued that the introduction of smartboards as a modern innovation in Technology education has the latent to catapult teaching and learning in the 21st century classroom.

In the contemporary discourse, the utilisation of ICTs in education and smartboards, in particular, has forcefully permeated the writings of various scholars worldwide. In this regard, the South African Department of Basic Education (DBE) has made a significant effort to advance the incorporation of ICTs in teaching by providing smartboards to schools (RSA, 2004; Department of Education, 2006b; Padayachee, 2017; Butler-Adams, 2018; De Coito & Richardson, 2018; Chakravorti & Chaturvedi, 2019; Rasool, & Naidoo, 2024). This initiative aimed to modernise the education system to enhance the value of education for learners (Aluko et al., 2018; De Coito & Richardson, 2018; Fitriani, & Apriani, 2024). Therefore, understanding the dynamics surrounding the use of smartboards in the education landscape will assist teachers to benefit from the modern, advanced, and effective teaching and learning technologies to facilitate their work (Sikhakhane et al., 2021; Fitriani, & Apriani, 2024).

There is little doubt that peoples' lives are influenced by new technologies (Collins, & Halverson, 2018; Rasool, & Naidoo, 2024). Taking into account factors such as school type, curriculum, and national education system, the study examines the diversity of knowledge content in technology education across different contexts. There is a prodigious deal of adaptation in the content of technology education, which makes it difficult to understand, compare, and discuss it (Admiraal, et al. 2016; Rasool, & Naidoo, 2024). To address this, the practices of technology teachers in rural schools in the Ekurhuleni District are being studied. There is a deficiency of advancement of central knowledge components in the subject because of the intricacy of technological knowledge and the diverse range of technology curricula across national frameworks (Gumbo, 2020; Rasool, & Naidoo, 2024). Moreover, Technology teachers are not used to discussing knowledge components within the subject (Gumbo, 2020; Sikhakhane et al., 2021). This claim appears to suggest that there are several variables at play for the effective utilisation of ICTs in education, and one of them is the role of teachers. Hence, the purpose of this study is to investigate how teachers perceive the utilisation of smartboards in the classroom as a teaching and learning tool. By doing so, the study attempts to unpack how teachers internalise the execution of innovative teaching technologies and catch-up with new trends in developing the excellence of Technology education.

In Ekurhuleni District, Gauteng province in South Africa, five rural schools and ten Senior Phase Technology teachers were involved in the study, which examined the use of smartboards in technology classrooms. The study utilised a qualitative approach, employing semi-structured interviews and applying the Unified Theory of Acceptance and Use of Technology (UTAUT) as a theoretical framework. Manual thematic analysis was conducted on the data, resulting in insights into Senior Phase Technology teachers' experiences with the use of smartboards, including the integration of this technology in the classroom. The recent findings are anticipated to play a significant role in shaping strategies aimed at enhancing South Africa's education system. By integrating smartboards and other innovative educational resources, these developments seek to create a more interactive and engaging learning environment for learners. This approach not only aims to improve educational outcomes but also fosters a dynamic atmosphere where modern technology can support teachers and learners alike.

1.2 Background to the study

Internationally, technological advancement has been seen as a catalyst for educational change (RSA, 2004; Bıçak, 2019; Bladergroen & Chigona, 2019). Consequently, the utilisation of smartboards has brought about significant changes in technology education (Ifinedo & Kankaanranta, 2021). This, then, have effectively replaced traditional chalk-and-talk methods with ICT-assisted instruction (Nikolopoulou, 2018; Jang & Koh, 2019; Mihai, 2020; Sikhakhane et al., 2021; Brink et al., 2021; Kühn & Wohninsland, 2022). This paradigm shift results from the quest for enhancing learning outcomes and empower both teachers and learners to accomplish their objectives. Indeed, the evidence shows that smartboards create an inspiring and practical teaching and learning environment, enabling teachers to facilitate effective practices (Al-Mamary et al., 2018; Brink et al., 2021). Additionally, the use of smartboards in education is crucial for refining the excellence of technology education as well as preparing learners for the digital era (Mun et al., 2019; Nikolopoulou, 2020; Rice, 2021; Sikhakhane et al., 2021; Stoor & Popov, 2021; Zeichner, 2022; Rasool, & Naidoo, 2024). Resultantly, education systems worldwide have integrated smartboards in their curriculum, and South Africa is no exception.

Even so, although smartboards have proven useful in teaching and learning, many African countries face a crisis in implementing ICTs such as smartboards in public schools (Nikolopoulou, 2018; Mun et al., 2019; Mihai, 2020; Sabiri, 2020; Swanepoel & Bruwer, 2020; Saed, et al., 2023). South Africa's literature has also noted that smartboards have been used in technology classes in the education system, with very few studies examining their use in subject-specific teaching. (Cabus et al., 2017; Baharuldin et al., 2019; Bıçak, 2019; Mun et al., 2019; Tomczyk, 2020). Conversely, the government's goal is to develop learners who are proficient in Information Technology (IT) and technology through the Technology Learning Area (TLA) in the school curriculum (Padayachee, 2017; Oke & Fernandes, 2020; Rasool, & Naidoo, 2024). Consequently, incorporating smartboards into teaching requires teachers to change their mindset and challenges their technical skills and teaching expertise (Oke & Fernandes, 2020; Swanepoel & Bruwer, 2020; Saed, et al., 2023; Rasool, & Naidoo, 2024). Indeed, it has been demonstrated that "teachers' knowledge, skills, and attitudes towards the usefulness of smartboard resources influence their intention to

adopt smartboard learning, even when they do have access to these resources” (Cabus et al., 2017; Bladergroen, & Chigona, 2019; Rasool, & Naidoo, 2024). This calls for teacher preparedness to focus more specifically on the facilitating conditions as well as social conditions that enable the utilisation of smartboards in schools, hence this study.

The study aims to investigate the experiences of rural Technology teachers regarding the utilisation of smartboards to advance the teaching and learning process and enhance learning outcomes within their specific context. Undertaking a research into such a topic appears to be particularly relevant given that the utilisation of smartboards in poor socio-economic contexts can help to uncover possibilities and challenges in relation to smartboard utilisation (GDE, 2010; Bıçak, 2019; Bladergroen & Chigona, 2019).

The study aimed to explore Senior Phase Technology teachers' experiences with smartboard utilisation in teaching Grade 7, 8, and 9 Technology subjects in Ekurhuleni District rural schools, introduced in 2018. This subject was introduced into the education system curriculum in 1998 as part of Senior Phase and is taught in all schools from Grades 7 to 9 (RSA, 2004). In doing so, the research findings can potentially inform the stakeholders on adopting effective ways to integrate smartboards in rural schools. Likewise, the study adds a nuanced perspective from rural settings to the existing body of literature that has examined the use of ICTs in education, as well as extending the knowledge base.

1.3 Problem statement

South African schools have readily embraced the latest technological advancements such as smartboards to augment the teaching and learning development (Lawrence & Tar, 2018; Kalogiannakis & Papadakis, 2019; Bayar & Kurt, 2021; Ifinedo & Kankaanranta, 2021). The field of Technology education, which is the converge of this study, emphasises technological literacy, which involves the management, comprehension, and utilisation of technology in various forms and aspects (Admiraal et al., 2016; Botero et al., 2018; Zhang, 2019; Bayar & Kurt, 2021; Brink et al., 2021; Fahrman, 2021; Ifinedo & Kankaanranta, 2021). With technologies becoming integral to modern teaching methods, the DBE has been leveraging smartboards to amend the

value of education and address historical disparities in rural schools (Department of Education, 2006b; Mdlongwa, 2012; Mun et al., 2019; Zhang, 2019; Tomczyk, 2020; Brink et al., 2021; Fahrman, 2021; Saed, et al., 2023).

However, despite these achievements Senior Phase Technology teachers do not fully harness the benefits of technology such as smartboards in the classroom (Dlamini & Mbatha, 2018; Gumbo, 2020; Fitri & Putro, 2021; Sikhakhane et al., 2021). Furthermore, although there may be variations from school to school within the country, rural areas have not shown improvement in the utilisation and leverage of the full potential of smartboard technology and are still using traditional teaching methods to teach (Kühl & Wohninsland, 2022). The failure can be attributed to not having a thorough grasp of the technology and how it can be used to meet educational goals, such as computer literacy (Chakravorti & Chaturvedi, 2019; Sikhakhane et al., 2021). Scholars such as Blau and Hameiri (2017), Dlamini and Coleman (2017), Francisco and Swanson (2018), Chakravorti and Chaturvedi (2019), and Phoong et al. (2020) acknowledged the absence of resources in rural schools as the main issue regarding the utilisation of smartboards as well poor of ICT skills development among learners.

There has been a debate on how the utilisation of smartboards can enhance the acquisition of critical skills in learners and contribute to learning outcomes (Aluko et al., 2018; Gumbo, 2020; Sikhakhane et al., 2021; Rasool, & Naidoo, 2024). Scholars have raised worries about the difficulties and lack of clarity associated with implementing ICTs such as smartboards in the educational process (Dlamini & Mbatha, 2018; Fitri & Putro, 2021; Sikhakhane et al., 2021). If this issue is not addressed urgently, it can jeopardise the government's efforts in the incorporation of smartboards in the teaching process in public schools and worsen the Technology education crisis in the country. Therefore, the present study underscores its importance.

1.4 Study purpose

The purpose of this study aims to delve into the experiences of Technology teachers who are in the Senior Phase at rural schools within the Ekurhuleni District. It focuses on their perspectives concerning the implementation and effectiveness of smartboards in their classrooms. Specifically, the research intends to examine how the integration

of smartboards in educational settings across South Africa enhances the teaching and learning process. Furthermore, it seeks to assess whether this technological advancement plays a significant role in elevating the overall quality of education delivered to learners in these rural environments.

1.5 Research aim and objectives

1.5.1 Aim

The aim of this study was to investigate and analyse Senior Phase Technology teachers' experiences on the utilisation of smartboards in Ekurhuleni District rural schools.

1.5.2 Research objectives

Per the research aim, the study aimed to accomplish the succeeding:

- Interrogate Senior Phase Technology teachers' experience on the utilisation of and ease of use of smartboards to augment the teaching and learning process in Ekurhuleni District rural schools.
- Explore the practices of Senior Phase Technology teachers in the utilisation of smartboards for teaching and learning.
- Understand how available support tools are seeking to address the imperative of the utilisation of smartboards in Ekurhuleni District rural schools by Senior Phase Technology teachers.
- Analyse the way in which social conditions in Ekurhuleni District rural schools address the utilisation of smartboards in classrooms.

1.6 Research questions

1.6.1 Primary research question

What are the experiences of Senior Phase Technology teachers in the utilisation of smartboards in Ekurhuleni District rural schools?

1.6.2 Secondary research questions

This study addressed the subsequent research sub-questions:

- How do Senior Phase Technology teachers in Ekurhuleni District rural schools perceive the utilisation of smartboards to enhance the teaching and learning process?
- How easy is it for Senior Phase Technology teachers to use smartboards in teaching and learning?
- How do stakeholders in Ekurhuleni District rural schools address the utilisation of smartboards in classrooms?
- How do available support tools address the imperative of the utilisation of smartboards in Ekurhuleni District rural schools by Senior Phase Technology teachers?

1.7 Rationale for conducting this study

There are three domains that spurred the conduct of this study, which stemmed from personal, professional, and intellectual levels.

Firstly, the personal motivation is linked to the Bachelor of Education degree (BEd) at the University of Pretoria in which the researcher studied and was fortunate to teach in two prestigious schools in Pretoria as a part of in-teaching practice training. As an aspiring teacher of Technology, the researcher was exposed to ICTs support in those schools which allowed me to engage with smartboards. However, currently the researcher works as a teacher in Ekurhuleni District, which is mainly a rural area. Faced with those two different scenarios it was possible to notice significant differences in the availability and utilisation of IT support and smartboard technology in the schools in Pretoria and where the researcher currently works in the Ekurhuleni District rural schools. In the former, teachers have access to the internet and obtain regular training on how to utilise the smartboard in the Technology classroom. In addition, they also have IT support available from an IT specialist on the school premise, and the school supervision teams check on a consistent basis that teachers are actually using the smartboard in the teaching, a scenario which is absent in rural schools. Nevertheless, the researcher was keen to understand why disparities were accentuated between rural and non-rural areas. Moreover, the researcher was aware of the necessity of the utilisation of smartboards including other technology education systems to develop learners' digital competencies (Zeichner, 2021; Kühl &

Wohninsland, 2022). This experience inspired the researcher to undertake a study that would investigate the complexities of using smartboards in rural schools to address the requirements of technology education in the Senior Phase Technology classroom.

Secondly, professional background motivated the conduct of this study. In this regard, the underlying belief is that although smartboards may be present in schools in poor communities in South Africa, there is slight evidence to show that these technologies are effectively utilised into Senior Phase Technology classrooms (GDE, 2010; Boahen & Atuahene, 2021). In the light of this argument, there is little doubt that society heavily relies on technology in virtually all aspects of daily life (Butler-Adams, 2018; Kalogiannakis & Papadakis, 2019; Owoseni, et al., 2020 Ifinedo, et al., 2020). Thus, the implementation of smartboards in Senior Phase Technology classrooms presents an excellent opportunity to explore the prospective advantages and challenges of Technology education in Ekurhuleni district rural schools.

Thirdly, in terms of the intellectual motivation, a variety of studies examining the use of smartboards gave the researcher the idea to explore this phenomenon in a different environment. Zhang (2019) investigated “K-12 teachers' use of electronic boards in the classroom in the United States” using a multiple case study. As Zhang (2019) argued, schools in the 21st century had to rethink how they teach and develop curricula in order to become more efficient. In another study, Zeichner (2021) found that schools need to incorporate ICTs into teaching, including smartboards, in order to address real-world challenges and foster IT literacy. Using smartboards instead of traditional methods was more common among secondary school Technology Teachers in China (Wu & Ding, 2020; Ifinedo, et al., 2020).

It is interesting that the three aforementioned studies on the utilisation of smartboards focused on urban schools. It stands to reason, therefore, that much needs to be uncovered in rural schools regarding the utilisation of ICTs and smartboards, in particular, hence this study. A major influence of this study is its capacity to present valuable insights into how Senior Phase Technology teachers in rural schools in the Ekurhuleni District use smartboard technology in their classrooms. The research results can assist the Gauteng Department of Education (GDE) in identifying gaps in Senior Phase Technology teacher awareness and expertise related to the deployment of smartboards in the Technology classrooms. In the same vein, the study sheds light

on the enabling support systems for the utilisation of smartboards in rural schools, i.e., facilitating conditions and social conditions. This can lead to the development of targeted programmes to address these gaps.

1.8 Concept analysis

1.8.1 Smartboards

Smartboards are large touch screens that allow users to interrelate with digital contents in conditions that cannot be achieved with a simple “computer-projector-canvas setup” (Mdlongwa, 2012; Hassankiadeh, & Hassankiadeh, 2013; Jita, 2018; Rice, 2021). In the present study, smartboards refer to the same technology utilised by Senior Phase Technology teachers in Ekurhuleni District rural schools to guarantee the betterment of the Technology education process.

1.8.2 Smartboard experience

Smartboard experience denotes the extended period in which the Senior Phase Technology teacher has used the smartboard (Hassankiadeh, & Hassankiadeh, 2013; Boahen & Atuahene, 2021), and the training that has taken place to utilise the smartboard in the Technology teaching space (Cristia, et al., 2017; Herawati et al., 2023). The term smartboard experience examines the experience of Senior Phase Technology teachers with the utilisation of smartboards as well as both facilitating and social conditions in Ekurhuleni District rural schools.

1.8.3 Information and Communication Technologies (ICTs)

ICTs refer to the utilisation of technology in educational settings to augment the technology education process (Blau & Hameiri, 2017; Herawati et al., 2023). Examples of ICTs include the following “digital tools: word processors, data projectors, PowerPoint, Excel spreadsheets, search engines (e.g., Google, Safari, Bing), smartboards, mobile technologies such as smartphones (emails, blogs, podcasts, videos), tablets, instant messaging (WhatsApp, Facebook Messenger), podcasts, CD-ROMs, online encyclopaedias (e.g., Wikipedia), simulations, animations, and e-books” (Tarling & Ng'ambi, 2016; Bordoloi, et al., 2021; Herawati et al., 2023). For the object of this study, the focus is on smartboards.

1.8.4 Technology

Technology is a multi-faceted term that incorporates an extensive range of activities and practices (Aktas, & Aydin, 2016). It involves the “application of knowledge, creativity, and innovation to solve problems” and improve control over both natural and synthetic environments (Department of Education, 2006a; Hassankiadeh, & Hassankiadeh, 2013; Tarling & Ng’ambi, 2016; Karakoyun & Lindberg, 2020). By harnessing tools, resources, and systems, the technology aims to enhance human well-being in various ways (Daya & Laher, 2020; Rasool, & Naidoo, 2024). It can be used to improve communication, transportation, healthcare, education, and much more (Akar, 2020). Furthermore, technology has the latent to adopt global tasks such as climate change, poverty, and inequality. It is an ever-evolving field that continues to drive progress and shape the world we live in (Tarling & Ng’ambi, 2016; Otukile-Mongwaketse, 2018). In this study, the impression of technology is circumscribed to education to evolve the value of the Technology education process in Ekurhuleni District rural schools.

1.8.5 Technology Learning Area (TLA) (Senior Phase Technology Grade 7-9)

Technology Learning Area (TLA) is the application of technology in learning area (Fahrman, 2021). It has been identified and described in diverse countries with unique terms, such as Technology Education, Design and Technology, and Technological Education. Another key point is that TLA can also be considered as synonym of the term ‘learning area Technology’ (Department of Education, 2006b; Farella et al., 2020; Taghizadeh et al., 2020), a terminology adopted in this study alongside with Technology education.

1.9 Significance of the study

Although the results of this study are circumscribed to the South African rural schools and the Senior Phase Technology teachers in Ekurhuleni District, in particular, the knowledge generated in the study can be extrapolated to other comparable circumstances as well. The study explores new ways of understanding the utilisation of smartboards and narrates Technology teachers’ experiences from the South African perspective. Resultantly, the study identifies three broad domains in which the

research findings are expected to contribute, namely, policy, practice, and knowledge. These are discussed below.

Firstly, it is an established fact that research can potentially inform policy (Yin, 2009). In that sense, this study may be informative for stakeholders in basic education, particularly the GDE in South Africa. They should find it useful in addressing pressing issues that can inform the formulation of policies on the utilisation of smartboards in rural schools.

Secondly, research is also used to improve professional practice (Bos, 2020). In this context, the research outcomes of this study can be employed by teachers as the viable alternative to enhance the utilisation of smartboards in the classrooms for the betterment of the teaching process. Technology teachers working in rural schools, especially those teaching technology, can utilise this research to adjust their methods and approaches to establish inclusive atmospheres that effectively meet the literacy requirements of each learner.

Thirdly, Dissanayake (2013) states that research can provide “a definite solution which enriches the existing understanding of a phenomenon or the discovery of new information”. This study, in no small measure, enlightens the discourse on the utilisation of smartboards. It has been expository on issues raised about the discrepancies between rural and urban schools in South Africa. Therefore, the country could benefit from further research that builds on the foundations that this study has provided, and this intellectual nurturance could potentially further the body of knowledge.

1.10 Layout of the chapters

This study explored the experiences of Senior Phase Technology teachers in Ekurhuleni District rural schools on the utilisation of smartboards. In addition, the study also researched the enabling factors to the utilisation of smartboards in rural schools in the particular context of Technology teachers, and whether those contributed to enhance the teaching and learning process as envisioned. There are five chapters in this study.

Chapter one serves as an initiation to the study and lays the foundation for the following chapters. In this section, the research problem was outlined within the context of Ekurhuleni District rural schools and Senior Phase Technology teachers. These schools and teachers were chosen to provide insights into the use of smartboards. Consequently, this chapter presents the study, outlines the research problem, and provides the rationale for the study. It also offers a comprehensive examination of the fundamental concepts used throughout the study, along with the objectives, research inquiries, and purposes.

Chapter two presents a summary of the literature review and the theoretical framework regarding the utilisation of smartboards. It delves into the educational approach to Technology education in rural schools within the Ekurhuleni district. The literature review investigates the availability of smartboards for teaching Technology, their pedagogical utilisation, and their potential influence on effective teaching and learning in the Senior Phase. It also assesses the connection of smartboards with other technological systems and discusses the challenges of implementing smartboards in rural schools in the Ekurhuleni district. The literature review discovered that there is a substantial amount of research on the utilisation of smartboards, but there is limited research conducted in rural settings, particularly in rural schools. This underscores the importance of this study. Consequently, this research addresses this issue by amplifying the voices of technology teachers from rural areas operating within their specific social context. Additionally, the chapter outlines the theoretical framework utilised in this study, focusing on a detailed discussion of Venkatesh et al.'s (2003) UTAUT model, particularly in its role in explaining the research problem. Specifically, this theory was employed as a framework for understanding and elucidating the reasons why and how Senior Phase Technology teachers respond to the use of smartboards. Guided by the theoretical framework, the study advocates for improved strategies to enhance technology acceptance and usage in rural schools, particularly in the case of smartboards.

In chapter three, the study's research methodology and its implications for data collection, analysis, and presentation of the research results are rendered. The chapter commences by explaining the research approach, design, and the rationale behind their selection. To explore the experiences of Senior Phase Technology

teachers in rural schools in the Ekurhuleni District, a qualitative approach and case study research design were utilised. The methodology discussion encompasses sampling techniques, data collection strategies, data analysis, ethical considerations, and methods employed to ensure the credibility of the research findings. The study sample was drawn from Senior Phase Technology teachers who were using smartboards to teach Technology in Grades 7, 8, and 9. Pseudonyms were assigned to the participants, and interviews were conducted at their schools over a period of six months. Thematic analysis was applied for data analysis, leading to the affinity of several pertinent themes associated to the experiences of Senior Phase Technology teachers with smartboard utilisation, contributing to the findings.

Chapter four presents the findings of the research. These findings were analysed in relation to the literature review and the theoretical framework and were based on interpretivist research principles. This chapter addresses the main goal, which is to explore the experiences of Senior Phase Technology teachers in Ekurhuleni District rural schools regarding the use of smartboards. The findings are based on data collected from five participating schools and interviews with ten technology teachers. The study established the following results: Firstly, Senior Phase Technology teachers were knowledgeable about using smartboards and employed various methods to integrate them into their classrooms. Secondly, Senior Phase Technology teachers were confident in using smartboards, which enhanced interaction with their learners. Moreover, age influenced the attitudes of Technology teachers towards smartboard use in Ekurhuleni District rural schools. Thirdly, there was an absence or shortage of support from the DBE in schools to assist Senior Phase Technology teachers in using smartboards. Specifically, the slow response from the GDE hampered the sustainability of smartboard use in rural schools and impacted the teaching and learning processes. Lastly, the deprivation of internet connection and power outages posed significant challenges to the utilisation of smartboards among Technology teachers, negatively affecting the teaching and learning of the Technology discipline.

Chapter five serves as the final section of this research study, providing an overview of the main research findings. It also includes suggestions for enhancing the use of smartboards in rural schools and proposing areas for upcoming research. The chapter delves into how the principles of the UTAUT model impacted the implementation of

smartboards in Ekurhuleni District rural schools and its influence on the teaching and learning of learners. Lastly, the chapter addresses the constraints and contributions of this study. Following the chapter, there is a list of references and appendices, which signifies the conclusion of this dissertation.

CHAPTER TWO

Literature review

2.1 Introduction

The emphasis of this chapter is to discuss the literature on the utilisation of smartboards. Its main purpose is twofold; on one hand it aims to examine the processes involved in the execution, acceptance, and incorporation of these tools by Technology teachers in the classroom and, on the other hand, it positions the study in the body of research delimited for this niche area as named above. Therefore, the discussion of this chapter is split into two broad parts. The first centres on the utilisation of smartboards, whereas the second focuses on the theoretical framework. The chapter starts by discussing the education system of South Africa in section 2.2 with the focus on the Information and Communication Technologies (ICTs). Section 2.3 discusses the historical perspective on the utilisation of smartboards with the aim to present an outline of the origin, advancement, and utilisation of smartboards in the current dispensation. In addition, section 2.4 discusses current trends on the utilisation of smartboards in the international, African, and South African context. In that sense, different perspectives on the utilisation of smartboards are conferred in light of the theoretical framework. The subsequent sections of the first part of the chapter discuss, respectively, challenges of the utilisation of smartboards (section 2.5), advantages and disadvantages of the utilisation of smartboards (section 2.6), technology teachers' experiences on the utilisation of smartboards (2.7). The theoretical framework and its components, including how the selected model fit the research questions are discussed in section 2.8. The literature on the utilisation of ICT such as smartboards often emphasises the UTAUT model. This theoretical perspective provides a useful lens with which to analyse the Senior Phase Technology teachers' experiences on the utilisation of smartboards in Ekurhuleni District rural schools. The chapter ends off with a summary in a form of conclusion in section 2.9.

2.2 The educational context of South Africa: A technological view

This section discusses the educational context of South Africa from a historical point of view. The main changes in the school curriculum in the DBE and the reasons for incorporating ICTs into the education system are the main focus. By doing so, the

section seeks to position the debate around for the utilisation of smartboards in schools in the current dispensation.

The South African education system has experienced several modifications since 1994 democratic elections. The implementation of these changes aimed at empowering the underprivileged groups who were the majority as a consequence of the apartheid regime (RSA, 2004; Department of Education, 2006b; Ndlovu, 2016; Ifinedo, et al., 2020). Consequently, the education in the country “system shifted from a content-based to a learner-centred approach” (Ndlovu, 2016; Schmidt, 2017; Kaur, 2023). Similarly, it was also in the context of these changes that Technology was introduced in the school curriculum as one of the eight subjects taken by learners in Senior Phase (Grade 7-9) in 1998. One of the beliefs that spurred the shift of the education system was that before 1994 learners were not emancipated to partake actively in the education process. There is a contention that learners were not acquiring abilities such as problem-solving or critical thinking (DBE, 2006a; DBE, 2006b; Makgato, 2014; Boahen, & Atuahene, 2021; Kaur, 2023). In this respect, Chisango et al. (2020) believe that the Outcome Based Education (OBE) approach were implemented to respond to the international imperatives of education. In essence, the adopted outcome-based approach was founded on two pillars, namely, teaching based on competency and mastery learning (Schmidt, 2017; Kaur, 2023).

The inception of Curriculum 2005 was seen as a momentous breakthrough in the educational landscape and involved increasing teacher inputs. According to Schmidt (2017), this was perceived to be the most controversial historical reform in the South African educational landscape. Therefore, with the implementation of Curriculum 2005, there was an imperative for in-service training of teachers to upskill them for Technology education (Makgato, 2014; Lomos, et al., 2023).

There is a little doubt that education systems or schools have a mandate to equip learners for the dynamics changes of the world. In this context, a White Paper Seven on e-Education was published by the South African DBE in 2006, in which the utilisation of smartboards was contemplated as one of the tools to be incorporated in the school curriculum. Transitioning from the traditional 3Rs skills (Reading, Writing, and Arithmetic) to the modern 4Cs skills (communication, collaboration, critical

thinking, and creativity) in the educational system was the goal set out to be achieved (Motshekga, 2019; Lomos, et al., 2023).

The global prominence on incorporating ICTs into education has compelled the implementation of new guiding principles in South Africa's education system to meet the demands of the modern era. Consequently, teachers need to be open to shift, predominantly in light of the emergence of newfound trends in ICT-constructed teaching and learning (Chisango et al., 2020; Lomos, et al., 2023). In this context, smartboards have become indispensable, prompting the DBE to introduce the e-education policy (ibid.).

In the light of the above, the education authorities in Gauteng began to implement paperless classroom projects in 2015 and pioneered a programme in “schools in Tembisa and Hamanskraal” referred as ‘wire-for-life’ (Motshekga, 2019). Smartboards were among the vast array of technological devices provided to more than 300 schools. This program was thought to reduce the problem of recurring failures in delivering textbooks to schools on time by electronically loading learning materials onto smartboards. It is believed that integrating these tools into the school curriculum holds promise for the future. However, as noted by Makgato (2014) as well as Mooketsi, (2020), there is still a growing number of teachers who have not been trained to teach TLA, and much more is required in this respect. The present research study investigated the experience of Senior Phase Technology teachers on the utilisation of smartboards in Ekurhuleni District rural schools. The research findings can grant a nuanced insight of the circumstances that hinder the adoption of ICTs in rural schools as well as the utilisation of smartboards, in particular.

2.3 Historical perspective on the utilisation of smartboards

This section adopts a historical perspective to discuss the origin and evolution of smartboards as well as their utilisation in the education landscape. As discussed previously in section 1.2 of chapter one, the advent of ICTs has brought rapid changes in education, especially in classroom environments.

Consequently, education systems have been influenced by these technological advancements, especially in the teaching methods (Akar, 2020; Phoong et al., 2020; Rice, 2021). In this context, the inception and utilisation of smartboards is a

phenomenon that may be traced back to the period of 1990s with countries like America and Britain being the pioneers (Akar, 2020; Mooketsi, 2020). The rationale behind the investment in smartboard technology was fuelled by empirical studies that supported that these tools enhancing quality of teaching (Johnson, et al., 2016; Zincume & Marimuthu, 2022).

A smartboard is also known as an interactive whiteboard, or electronic board. This technology device was introduced in 1991 in the United States of America and was initially connected to LCD panels as computer screen displays in order to manipulate computer applications, thereby enhancing the learning and teaching experience (Scherer & Teo, 2019; Rice, 2021). It was manufactured by the Smart Technologies Corporation, which inspired the transformation of the name, interactive board to that of smartboard (Mooketsi, 2020; Nwokonko, 2023). Since then, the smartboard technology has evolved into various systems to improve user's experience. For instance, in 1992 it was introduced rear-projection smartboards, followed by in-wall rear-projection smartboards in 1997 (Ifinedo & Kankaanranta, 2021). In the same way, in 1998 it was released information management software and the smart Notebook, which was followed by the introduction of the first smartboard for plasma displays in 1999 (ibid.).

The 2000s were also marked by innovations on all fronts as far as smartboards are concerned. This involved the incorporation of wireless slate in smartboards for plasma displays in 2005, allowing users to manipulate real time teaching data (Ndlovu, 2016; Tondeur et al., 2017; Phoong et al., 2020; Wu & Ding, 2020; Eynel & Koc, 2023). In 2007 there was a release of smartboards that with innovations that included tracing learner performance in a built-in grade book (Eynel & Koc, 2023). Furthermore, in 2008, innovative features were introduced, such as a smart camera for document capture and collaborative learning software (Cabus, et al., 2017; Eynel & Koc, 2023).

Based on the above, it may be deduced that the utilisation of smartboards has gained traction worldwide. Several studies carried out recently focus on learner performance and show that these tools can improve the focus and attention in the classroom due to their visual peculiarity, thereby contributing to enhance academic achievement (Bıçak, 2019; Daya & Laher, 2020; Scherer & Teo, 2019; Boadu, 2021). In this regard, Cabus, et al., (2017) opine that the advancement of smartboard technology will result

in classrooms where information is readily accessible to all. For this reason, smartboards are seen as “an essential piece of the classroom of the future” (Aktas & Aydin, 2016). This includes a vision where teachers and students worldwide benefit from various learning methods and teams effectively collaborate and communicate, and South Africa is no exception.

In terms of their functionality, smartboards are controlled by touching the screen and can be updated quickly and easily, while allowing doing everything that can be done on any computer (Nwokonko, 2023). In other words, it can be compared to a computer which is manipulated with fingers instead of mouse. The technology enables both teachers and learners to interact with the computer by utilising touch input on the screen (ibid.). In addition, smartboards also allow teachers work through a particular lesson and save it for learners to view later. By doing so, learners can watch lessons when they are not at school and later come into class to discuss the lesson with their teacher (Amadin, et al., 2018; Fahrman, et al., 2020). Thus, there is a little uncertainty that the use of smartboards improves learning experience while making teachers lives better. In this respect, Eynel and Koc (2023) affirm that this can decrease the burden of teachers and, at the same time, increase learners’ engagement in teaching and learning process.

The study examines the experiences of Technology teachers in rural schools with the utilisation of smartboards. It is founded on the premise that well-prepared teachers can effectively use smartboards to create improved learning environments and better prepare their learners for the future. In this regard, the UTAUT model can help to explain the dynamics involvement in the embracing of smartboards by TLA teachers in the niche area of the study as name above. The incorporation of smartboards in the teaching as a visual equipment is believed to ensure permanent learning (Ndlovu, 2016; Mooketsi, 2020). This justifies the widespread utilisation of smartboards in the education landscape.

2.4 The utilisation of smartboards: Current trends

This section discusses the current trends on the utilisation of smartboards. It explores an array of literature and studies on conducted at three levels, namely, (i) internationally, i.e., “countries in Europe, Asia and other parts of the world,” (ii)

regionally, i.e., across the African continent and, (iii) locally, i.e., local studies conducted in South Africa. By doing so, the discussion provides a big picture of the experience of teachers on the utilisation of smartboards on one hand and helps to detect gaps in the literature on the other hand.

2.4.1 An international outlook

The literature seems to suggest that the utilisation of smartboards have become a widespread phenomenon in the international arena, especially in secondary education. Brink et al. (2021) claim that TLA teachers incorporate smartboards in the classroom to meet the demands of digital competence of the syllabus. Resultantly, the use of smartboards in most international countries serves both as a didactic tool and a teaching content, especially in a Technology classroom (Kaliisa, et al., 2019). Centred on that, the majority of studies conducted in the international arena have been in the “United Kingdom (UK), Australia, New Zealand, Ireland, Sweden, Turkey, among others” (Zincume & Marimuthu, 2022). The UK led the adoption of smartboards, and a significant part of this revolution was sponsored by the government (Deniz & Tezer, 2016; Stoor, & Popov, 2021; Zincume & Marimuthu (2022). In terms of education levels, it appears that the use of smartboards is more confined in primary and secondary schools than in higher education. As noted by Zincume and Marimuthu (2022), the international rate of usage is at 45% and 44% for primary and secondary levels, respectively.

A plethora of studies conducted in the international arena focus on secondary teachers’ experiences (Brink et al., 2021), student performance (Cabus, et al., 2017), teaching and learning process (Aktas & Aydin, 2016; Jang, & Koh, 2019), smartboard acceptance among teachers (Raman et al., 2024), teacher digital competence (Falloon, 2020) to name a few.

In Sweden, “Technology education in lower secondary schools is compulsory” (Brink et al., 2021; Zincume & Marimuthu, 2022). Research shows that the teaching of TLA with the use of smartboards varies according to the schools, as is the case within the same school (Hartell, 2015; Brink et al., 2021; Zincume & Marimuthu, 2022).

Conversely, the evidence from the Netherlands shows a different scenario. According to Cabus et al. (2017), students in Dutch secondary education benefited from teaching

with smartboards, which was effective in increasing learners' achievement in mathematics. This was influenced by the training teachers received on ICT use at school before smartboards were introduced in the Dutch education system (Cabus, et al., 2017). The data suggests that facilitating conditions exhibit a meaningful impact on the utilisation of smartboards by Technology teachers in schools. Additionally, Haelermans and Ghysels's (2015) research indicates that technology experience has an immediate positive stimulus on the innovative use of smartboards by teachers.

In the United Kingdom, the utilisation of smartboards is a widespread phenomenon in secondary schools, and it was materialised through a project known as smartboard expansion project (SWE). The study by Deniz, and Tezer, (2016) revealed that smartboards are well incorporated in the school curriculum and involve different teachers as well as subjects. Furthermore, the study also shows that smartboards "increased student engagement, peer collaboration, and strengthened student's comprehension" (Deniz, & Tezer, 2016; Mihai, 2020). The authors argued that smartboards also give teachers the ability to provide engaging lessons for a variety of students and diverse learners at any grade level. Based on that, it becomes clear that the use of smartboards by teachers cannot be separated from understandings of the unified theory of acceptance and use of technology (UTAUT) model, a view adopted in this study. Indeed, it is argued that the use of smartboards enriches students learning, serves as a motivation for understanding and provides students with the skills necessary to adapt in a highly technological society (Department of Education. 2006a; Nwokonko, 2023).

Consistent with the above, the evidence from Turkey corroborates that the utilisation of smartboards contributed to the learning of science and technology lessons and the information learned with this method was found to be more permanent (Aktas & Aydin, 2016). Smartboards in teaching Grade 7 secondary school students increased academic achievement and learning retention (ibid.). Similarly, the same results were found in a study undertaken in Costa Rica which evaluated the impacts of four alternative pedagogical treatments in seventh grade classrooms on mathematics (Berlinksi & Busso, 2015). The four treatments introduced were (1) a new curriculum, (2) the same new curriculum and a whiteboard, (3) the new curriculum and a computer lab, and (4) the new curriculum and a laptop for every child in the class. Students who

were in the treatment group with a whiteboard learned 15.5% more than those in the control group. In terms of the role of smartboards in improving cognitive skills, the study conducted in Peru found positive impacts on cognitive skills (Cristia et. al., 2017).

From a study conducted in Spain, Coyle et al. (2010) as quoted by Bahadur and Oogarah (2013, p. 20) mentioned that smartboards offer multiple possibilities that require specific knowledge of how best to exploit their versatility in the classroom, which reinforces the embedment of the unified theory of acceptance and use of technology (UTAUT) model in the phenomenon under investigation in this study. The authors further mentioned that smartboards alone do not have the potential for improving the quality of classroom interaction. Therefore, they requested that training should also focus on developing teachers' communication proficiencies.

In Malaysia, the utilisation of smartboards was strongly associated with acceptance factors by teachers (Raman et al., 2024). This acceptance was facilitated by the convenience of appropriate infrastructure and support from the key stakeholders as far as smartboards are concerned (Rempel & Mellinger, 2015). However, teachers reported difficulties in using smartboards (Raman et al., 2024), thus reinforcing the need for facilitating conditions such as trainings on the utilisation of smartboards.

Based on the above, it may be argued that the utilisation of smartboards in the international showground is not a new experience. However, challenges still persist in the way teachers deal with smartboards in their classrooms. It also appears that above any other factor, in-service training of teachers is critical for the successful utilisation of smartboards. The evidence from the international arena provides a durable foundation for understanding the way in which the utilisation of smartboards can be enhanced in the local context, that is, in rural schools as is the heart of this study. In addition, since the experiences from the international arena might differ from local contexts, the UTAUT model was helpful to compare how the utilisation of smartboards is adopted and accommodated by Technology teachers from different social and geographical contexts.

2.4.2 The utilisation of smartboards in the African context

Similar to the experiences from the international arena, the utilisation of smartboards in Africa has gained momentum over the past years (World Bank, 2016). However, despite the growing trend of use of these devices, there is still a dearth of studies that seek to understand teachers' experience on the utilisation of smartboards across the continent. Given the persistent low levels of quality education in many countries, the utilisation of smartboards and other ICTs is pictured as one of the proposed key solutions for increasing the eminence of education (DeCoito, & Richardson, 2018; Lehrer et al., 2019). This acknowledgement reveals the potential contribution of smartboards to the enhancement of education process as argued in this research.

In the light of the above, the World Bank has focused many of its education projects for Africa and in the utilisation of smartboards in schools (World Bank, 2016). In the same way, the New Partnership for Africa Development (NEPAD) has established a venture involving smartboards and other ICTs for secondary schools in Africa through e-Africa Commission in 2001. This project came to be known as e-schools initiative and was piloted in several countries that include Angola, Algeria, Burkina Faso, Benin, Congo, Cameroon, Ethiopia Egypt, Ghana, Gabon, Kenya, Lesotho, Mauritius Mali, Mozambique, Nigeria, Rwanda, Uganda, Senegal, and South Africa (Kinyanjui, 2007). The NEPAD's e-school initiative broadly addresses the deficiency of ICT infrastructure and the learning of ICT skills (ibid.). These facilitating conditions are the key enablers to connecting the gap in terms of digital knowledge in Africa. By examining the practices of TLA teachers on the utilisation of smartboards in rural schools, this study provides useful insights with which to facilitate the broader initiative on the continent as described above.

In this respect, different strategies involving the utilisation of smartboards in schools have been put forth to improve education and digital literacy in many countries. For example, the use of smartboards has been recommended as a way to increase learner and teacher spur (Lehrer et al., 2019). Hence, it is believed that they enhance the benefits of other ICTs used in education (Trucano, 2014; Lai, 2017). The effectiveness of interactive smartboards is contingent upon their proper integration into classrooms (Makgato, 2014).

In terms of empirical evidence regarding the success of smartboard interventions based on teachers' experience, it has been demonstrated that the acceptance as well as effectiveness of the utilisation of smartboards are largely concentrated in developed areas, as opposed to rural areas (Lehrer et al., 2019). Indeed, scholars have attempted to explain the absence of progressive results of such intermediations. This includes a misalignment connecting the smartboard interference and the curricular objectives, learners' needs, and limited training for teachers (Berlinski & Busso, 2015).

A recent study on the utilisation of smartboards was conducted by Lehrer et al. (2019) in Senegal involving Grades 1 and 2 of primary schools in a project known as Sankoré. This project resulted from the Franco-British Summit held in March 2008, which directed to bring about digital empowerment in Africa to achieve the Education for All (EFA) objectives (Bahadur & Oogarah, 2013). Lehrer et al.'s (2019) study employed a mixed-method approach and involved principals, teachers, and learners to track "changes in learning outcomes before and after the introduction of the project", and it had mixed results. The interviews indicated several challenges in the implementation of the smartboard programme, whereas the survey showed a positive impact of the utilisation of smartboards in urban areas. However, there was no evidence from rural schools in this study which shows the gap concerning the utilisation of smartboards in rural areas.

A study conducted in Ghana by Buabeng-Andoh (2012) on teachers' perception of the utilisation of ICTs adds an important layer on the body of research concerned with understanding the acceptance of smartboards among secondary teachers. This study involved 231 teachers selected from fourteen secondary schools and found that the use of smartboards was weak. The reason for the low utilisation of this technology included the poor access to ICT resources in the classroom and teacher skills to use smartboards. This suggests that the integration of smartboards has not improved educational delivery in Ghana. Furthermore, it implies that social conditions as well as facilitating conditions determined the utilisation of smartboard on the part of teachers.

In secondary schools of Nigeria, it was reported that the smartboards that are made available have not been used properly for the purpose they were provided (Nwokonko, 2023). This deficiency was because teachers were found to have insufficient time to learn innovative technology (ibid.). Thus, it is critical to explore how Technology

teachers experience the adoption of smartboards in order to unpack the uncertainties about the utilisation of new technological devices (Almaiah, & Al Mulhem, 2019). Although the advent of smartboards revolutionised the education landscape, as this discussion has shown, the inadequate utilisation of these devices by both the learners and teachers in schools could be a problem in the academic achievement of the learners (Fitri, & Putro, 2021). It is for this reason that Nwokonko (2023) recommends that “school managers, administrators, heads of schools and principals in secondary schools should make sure that there is an efficient and effective management and utilisation of smartboard for teaching in schools” (p. 59-60).

Several studies carried out in other segments of the African continent on the utilisation of smartboards have incarnated the UTAUT model. For example, in Mauritius smartboards were infused in secondary schools and teachers have been skilled in basic ICTs to ensure a smooth implementation of them in school curriculum (Subrun & Subrun, 2015; Dlamini, & Mbatha, 2018). It is important to note that Mauritius (and also Senegal) are among the few African countries where smartboards have been implemented in all primary schools (Bahadur & Oogarah, 2013). However, it is reported that a large number of schools are still lagging behind in the utilisation of these technological devices (Subrun & Subrun, 2015). This drawback stem from teacher fears as well as entrenched teacher beliefs on the traditional instructional methodologies, or as Bahadur and Oogarah (2013, p. 20) put it a “go with what you know” mentality. The study recommends that adequate training of teachers and the provision of resources are the key actions to be undertaken in the short term. This suggests that schools should mobilise conditions aimed at adoption of these technologies as emphasised in the UTAUT model.

In Gambia, the use of smartboards was assigned to selected secondary schools (Jammeh at al., 2022). They were introduced through a project known as Progressive Science and Mathematics Initiative (PSMI). As reported by Jammeh et al. (2022), the integration of smartboards in teaching was fundamental as it is the typical Technology classroom. Furthermore, it was also reported that the smartboards improved learning in chemistry Grade 12 students. However, the study observes the requirement for in-service training on the part of teachers to facilitate the use of these tools. As noted, teachers play a dire part in the incorporation of smartboards in schools (Maistry, &

Africa, 2020). This helps to strengthen the implementation of smartboard initiatives as well as other current modern instructional tools and ultimately encourage the student-centered approach to learning, active participation, and student motivation.

2.4.3 The utilisation of smartboards in the South African context

The South African National Technology education system aims to promote 21st century skills such as reasoning, problem solving, and learning strategies among learners (Department of Education, 2006b; Scherer & Teo, 2019; Rice, 2021). While many schools in the Gauteng Province have access to ICT resources such as smartboards and internet connectivity to help learners develop ICT skills confidently and creatively, not all schools have these resources (Dlamini & Coleman, 2017; Blau & Hameiri, 2017; Francisco & Swanson, 2018; Chakravorti & Chaturvedi, 2019; Phoong, et al., 2020). It is crucial to ensure that these facilities are adequately utilised in all schools (Blau & Hameiri, 2017; Daya & Laher, 2020; Boadu, 2021; Fahrman, 2021). As the experience from various global and local contexts demonstrates, smartboards are valuable tools that can facilitate learning and instruction at any time and place (Cha, & Kwon, 2018; Oke & Fernandes, 2020). However, it is important to understand that having a smartboard in the classroom does not necessarily lead to successful learning outcomes (Ndlovu, 2016; Tondeur et al., 2017; Wu & Ding, 2020; Phoong et al., 2020). Smartboard integration requires carefully planned and deliberate use of the technology to achieve specific learning outcomes (Lai, 2017; Mihai, 2020; Fitri & Putro, 2021). For this reason, this research is delimited to understand how adopting smartboards by teachers can contribute to bring about the desirable transformation in the classroom. This would enable, for example, to understand that smartboards should not be utilised as a substitute for activities that were possible without them (Swanepoel & Bruwer, 2020; Herawati et al., 2023).

Research designates that integrating technology into the Senior Phase classroom can have a constructive impact on learners and is an important aspect of contemporary Technology education (De Coito & Richardson, 2018; Otukile-Mongwaketse, 2018). Therefore, Technology teachers can aid learners to advance the aids and knowledge they want to prosper in today's world by using smartboards effectively. The South African government's e-education policy is an essential step towards ensuring that

every learner has the opportunity to use ICT assuredly and innovatively (DoE, 2008; Umugiraneza et al., 2018; Daya & Laher, 2020; Boadu, 2021).

Many studies performed in South Africa on the utilisation of smartboards focus on understanding issues surrounding the incorporation of these devices in the Technology classroom and challenges faced by schools, at large (Dlamini, & Coleman, 2017). This is the case of Makgato (2014) who was concerned with understanding this phenomenon in Mpumalanga province. This study concluded that teachers lack facilitating conditions such as infrastructure to enable a proper integration of smartboards in the Technology classroom. In furthering this study, Zincume and Marimuthu (2022) argue the need to adopt an all-inclusive approach to ensure the incorporation of smartboards in the curriculum, encompassing continuous involvement of stakeholders, infrastructure, and training of teachers. This calls for the attention of education managers to increase adoption of smartboards in schools. Based on the same goals, a research conducted by Khosa and Molotsi (2020) uncovered that the use of smartboards is linked with the efficiency of teachers' work. Admittedly, the evidence above reinforces the need to invest in teacher's acceptance and adoption of ICTs as part of the broader strategy of education policy.

The evidence on the utilisation of smartboards point to barriers related to the adoption these devices by teachers. In this regard, Chisango et al. (2020) reported poor infrastructure, internet issues, attitudes, and lack of expertise on the part of teachers as the main challenges. As an example, they mentioned the Khanya Project schools implemented in Cape Town in which the use of computers was hindered by overcrowded classes. As a result, this inhibited the acquisition of skills in using computers on the part of learners. In this sense, the adoption of smartboards is no exception. In a similar vein, the way teachers view and behave in relation to ICTs can determine the level of acceptance and usage of a particular technology in the classroom (Zincume & Marimuthu, 2022).

2.5 Challenges of the utilisation of smartboards

There is an agreement among scholars that teachers are key participants for the efficacious incorporation of ICTs in education (Makgato, 2014; Chisango et al., 2020; De Coito & Richardson, 2018; Zincume & Marimuthu, 2022). As indicated in section

1.9.4 of chapter one, technology itself does not have a value for education unless it is harness for education purposes. Research suggests that the utilisation of technology devices in the schoolroom correlates with the attitudes and knowledge of teachers (Makgato, 2014; Brink, et al., 2021). This correlation applies to the implementation of smartboards as well.

Teachers' acceptance towards ICTs in general is affected by their attitudes and information about the particular tool (Admiraal, et al. 2016; Chisango et al., 2020). In addition, other challenges include functionalities of the technological tool, age, and self-confidence (ibid.). Thus, it becomes evident one of the core considerations that affects the utilisation of smartboards concerns attitudes of teachers (Blau, & Hameiri, 2017; Falloon, 2020). This study investigated Senior Phase Technology teachers' experiences on the utilisation of smartboards in Ekurhuleni District rural schools. The study of Charlotta et al. (2022) demonstrates that views of teachers have a considerable sway on the operation of ICTs such as smartboards. This suggests that the way teachers view educational technologies (Cabus, et al., 2017), affect the response to the adoption and utilisation of smartboards. Therefore, more research on teachers' attitudes towards the utilisation of smartboards appears to be needed. This would focus, for example, on each of the three main components of attitudes, i.e., cognitive, affective, and behavioural (Padayachee, 2017; Charlotta et al., 2022) to "explore the experiences of teachers" on the utilisation of smartboards from a multidimensional perspective, rather than from unidimensional in itself.

With regard to the challenge concerning teacher training, it has been reported that the lack of in-service training can hinder the utilisation of smartboards (Juggernath & Govender, 2020). For example, since the implementation of Curriculum 2005 a large number of teachers had not received training that would allow them to incorporate ICTs in the classroom (Makgato, 2014). Similarly, the actual implementation of the Technology subject on the ground was further associated with challenges (ibid.). This claim corroborates that of Chisango et al. (2020) who state that the training programmes are often circumstantial and not done through a planning. Furthermore, the scholars noted that these trainings are not demand-driven which result in a mismatch in relation to teachers' needs (ibid.). Hence, the contexts of the schools were considered, and teachers did not benefit from this "blanket-fit all" type of approach

(Makgato, 2014; Karakoyun, & Lindberg, 2020). This research was concerned with schools from rural context in South Africa and this provided useful insights with which to compare the dichotomous urban-rural scenarios.

Another strand of challenge on the utilisation of smartboards is the ICT infrastructure support. Facilitating conditions are a key enabler for integration of ICTs in schools in an engaging manner with learners (Schmidt, 2017; Lawrence, & Tar, 2018). Resultantly, the ICT infrastructure in schools is a crucial resource for the effective use of smartboards (Orodho, et al., 2013). Thus, it becomes imperative that schools provide technology equipment to facilitate the success of digital learning integration through smartboards.

According to Chisango et al. (2020), the success in ensuring a smartboard programme lies in the provision of proper resources to schools before the implementation of such a programme. In this sense, the readiness of schools to procure adequate ICT infrastructure was identified as another challenge for the integration of smartboards (ibid.). This is particularly true in many countries in Africa that have struggled to invest in infrastructure for digital learning (Cuhadar, 2018; Zeichner, 2021). For example, in Kenya the integration of smartboards was hindered by a poor investment in schools (Orodho et al., 2013). In the same way, in Ghana teachers were constrained during the integration of smartboards because of the lack of necessary support, which affected the academic results (Skyi, 2012). This scenario almost defeated the idea of introducing smartboards in schools especially in lower secondary level where they were initially introduced (ibid.).

Furthermore, the incorporation of smartboards in schools has not progressed at the desired rate. Similar challenges are also evident in countries like Uganda and Rwanda. There is evidence from Uganda indicating that numerous public primary schools lack sufficient digital learning incorporation of tools (Nwokonko, 2023). Despite the availability of sound policies on ICTs, the adoption of smartboards was nearly phased out in some schools because of the lack of necessary infrastructure. This resulted in the poor outcomes in teaching and learning (Orodho et al., 2013). Hence, it becomes clear that in many African countries, the integration of smartboards into the school curriculum has not been adequately addressed due to the challenges described above.

In the light of the above, it may be deduced that workable policies combined with good management practices can provide an aiding environment for the successful incorporation of smartboards in the school curriculum. Such policies focus, for instance, on management strategies to ensure that resources allocated to schools prior to the programme's implementation are incorporated effectively. In South Africa, digital learning faces barriers due to a lack of resources, as indicated by several studies (Chakravorti & Chaturvedi, 2019; Mihai, 2020; Chisango et al., 2020; Phoong, et al., 2020; Zincume & Marimuthu, 2022).

The readiness and ease of access of ICT infrastructure in schools influences the integration of smartboards in the school curriculum (Zhang, 2019; Nwokonko, 2023). For example, for rural areas the availability of internet connection is an issue, which requires careful planning and management. In other words, if there is a lack of resources, the success of smartboard integration can hardly be achieved. There is little doubt that integration of smartboards in the school curriculum involves a coordination of multiple stakeholders who will contribute to harmonise policy guidelines, as well as leadership and management practices (Zang, 2019). In this regard, leadership teams have a critical role in championing the necessary resources to enable a successful implementation of the smartboard programme. Rempel and Mellinger (2015) identified "manipulative and non-manipulative school and teacher factors that influence smartboard utilisation". Non-manipulative factors are beyond the school's control, such as age, teacher experience, and government policy (ibid.). In contrast, manipulative factors, such as teachers' attitudes towards ICTs and their skills, are within the school's influence. By exploring the experience of Senior Phase Technology teachers on the utilisation of smartboards in rural schools, this study provided an aperture to understand factors that could inform policy on the utilisation of smartboards and other ICTs at large.

Many studies researching smartboard utilisation in schools mention a nonexistence of support for principals and teachers (*vide*, for example, Makgato, 2014; Rempel & Mellinger, 20215; Ndlovu, 2016; Collins & Halverson, 2018). In addition, other elements impelling ICT utilisation in schools involve electricity, the cost of equipment, the leadership, as well as the skills of teachers (Batdi, 2017; Meskhi et al., 2019). Thus, the researcher believes that, while there are several aspects that impede the

utilisation of smartboards in rural schools, many of them can be minimised or reversed, if proper intervention is adopted.

The discussion above indicates that there are multiple considerations that influence the thriving use of smartboards. These challenges are mostly faced in African countries and include a lack of adequate ICTs in schools, lack of government involvement, the attitudes of teachers, among others. Yet, teachers are forced to respond to policy guidelines on the integration of smartboard teaching in their classrooms.

2.6 Advantages and disadvantages of the utilisation of smartboards

The previous section discussed the challenges of the utilisation of smartboards. This section builds on the previous debate and points out the upsides and downsides that come with the utilisation of smartboards. By doing so, the section aims to present a refined insight of barriers as well as facilitations that teachers can encounter by incorporating smartboards in their classrooms.

As a technology tool, the utilisation of smartboards requires an awareness regarding ethical and legal concerns pertaining to the access and utilisation of information (Charlotta, 2022). Furthermore, it also involves social aspects of literacy in ICTs more broadly. This comes from understanding that in the current dispensation in which the world is digitally connected, individuals are required to have soft and hard skills to utilise ICT devices (Mihai, 2020). The utilisation of smartboards in classrooms by teachers is no exception. There is little doubt that the utilisation of smartboards in the Senior Phase Technology classroom offers numerous benefits for both teacher and learner. They provide convenient access to an ample span of training supplies, with electronic copies available for flexible and on-demand use (Collins & Halverson, 2018; Chisango et al., 2020). Collins and Halverson (2018) state that smartboards in the Senior Phase Technology classroom facilitate the rapid creation of knowledge at a condensed cost, transforming the teaching and learning method, and also expand communication between learners and teachers, thereby enabling immediate electronic feedback through online assessments. In other words, the utilisation of smartboards can afford teachers the easiness of doing their work and enhance productivity.

The UTAUT model bids a framework for understanding teachers' behaviours regarding the adoption and utilisation of smartboards in their classrooms (Venkatesh et al., 2003). Research has exhibited that teachers adopt and utilise technology tools because of their high expectation to develop teaching and learning productivity as well as ease-of-use experiences (Rempel & Mellinger, 2015; Tondeur et al., 2017). Indeed, the historical facts attest that smartboard teaching is more effective than traditional blackboard teaching, fostering creative thinking and active learning among learners (Cuhadar, 2018; Hardman, 2019). In the same way, smartboard teaching allows for seamless revision of material and creates a highly interactive learning experience (Cuhadar, 2018; Sabiri, 2020; Al-Emran & Granić, 2021). This contributes to the nurturance of education systems. In this regard, Chisango et al. (2020) believe that the utilisation of smartboards is critical for learners to easily connect their experiences from classroom to real-world situations. This urges a need for education systems to invest not only in smartboards, but also in digital literacies through ICTs in schools in the current technological era. This study adopts a view that education systems should invest in teacher training on ICTs in order for them to be able catch up with the current technological era. By doing so, the utilisation of smartboards could also be facilitated.

Another advantage of the utilisation of smartboards that remains silent in the literature is the potential to include special need learners into the whole spectrum of the teaching and learning process. Incorporating these technological tools can attend to the educational needs of learners with who, by their condition, require special needs in the classroom (Al-Emran & Granić, 2021). Smartboards can serve as personalised teaching tools that help engage learners with special didactic needs, according to Etcuban et al. (2020) and Kinyanjui (2007). Integrating smartboards into teaching has become a necessity in the 21st century, as highlighted by Nasim et al. (2024), and presents an opportunity for education systems to explore the potential benefits of these tools. Therefore, it is a view of this study that teachers should harness smartboards to enhance their work. Similarly, smartboards allow for inclusion in education by enabling teachers to support all types of learners while, at the same time, improving their academic performance (Scherer & Teo, 2019; Etcuban et al., 2020). When teachers employ smartboard teaching, they can stimulate creativity and participation on the part of learners, thereby enabling an inclusive class (ibid.). Thus, learners with special educational needs will not be left behind by using these devices.

This enables special schools to catch up with the current dispensation on technological innovation and ICT utilisation in the classroom, in particular.

On the flipside, there are also drawbacks to consider on the utilisation of smartboards in schools. They include limited amount of time teachers have to help learners using the smartboard, as there is often no smartboard available per class, load shedding, lack of Wi-Fi or technical problems with the Wi-Fi or with the smartboard (Hardman, 2019; Etcuban et al., 2020; Al-Emran & Granić, 2021). The niche area of this study focuses on rural schools where these drawbacks often are associated with the social context of rural areas. Thus, by exploring Senior Phase Technology teachers' experiences on the utilisation of smartboards in Ekurhuleni District rural schools, this study seeks to provide a detailed account on how smartboards can be harnessed for the betterment of teaching and learning considering the barriers faced in rural schools. Another key point is that the utilisation of smartboards requires the mastery of other ICT skills (Butler-Adams, 2018; Collins & Halverson, 2018; Umugiraneza et al., 2018). Hence, teachers' responsiveness to ICTs ought to be assessed in order to warrant the triumph of incorporating smartboards in the school curriculum. For instance, teaching learners the most basic word-processing skills can be time-consuming in such cases (Butler-Adams, 2018; Sacramento, 2019). Furthermore, the learning curve for teachers to become proficient in using advanced and complex software can be a significant challenge, as they may lack the obligatory awareness and skills to efficiently engage with the software (Umugiraneza et al., 2018; Al-Emran & Granić, 2021).

Inadequate and timely technical support also presents challenges to the employment of smartboards. The use of smartboards to enhance learning is challenged by teachers' lack of belief in their effectiveness, dysfunctional school contexts, and reluctance to change long-standing teaching methods (Hardman, 2019; Sabiri, 2020; Al-Emran & Granić, 2021). This concurs with Hardman's (2019) assertion that teachers are resistant to ongoing developments and changing their teaching practices.

2.7 Technology teachers' experiences on the utilisation of smartboards

This section explores the experiences of Technology teachers on the utilisation of smartboards. It draws on the empirical evidence from several studies conducted worldwide involving the utilisation of smartboards by both Technology teachers and

teachers from other subjects. This section aims to picture the broader spectrum of the utilisation of smartboards as experienced by Technology teachers to inform this study.

Classrooms are constantly changing, where teachers develop their pedagogical skills over time (Ifinedo & Kankaanranta, 2021). Therefore, in the perspective of Technology education complexity and multifaceted demands of ICT skills are required of teachers as their core competencies (Jita, 2018; Oke & Fernandes, 2020). As per the focus of this research, studies in this vicinity have used unique preliminary points and methodologies (Padayachee, 2017; Jita, 2018; Falloon, 2020). The role of Senior Phase Technology teachers in the modern world has become gradually more influential due to the demands of the macro economy and Technology Education (Johnson et al., 2016; Jita, 2018; Falloon, 2020; Chabalala, & Naidoo, 2021). To prepare learners for future challenges, Senior Phase Technology teachers must engage in continuous learning and be part of the network society (Ndlovu, 2016; Padayachee, 2017; Ifinedo & Kankaanranta, 2021).

The introduction of the TLA in South Africa has initiated discussions on technology and its conceptual understanding. As part of those discussions, there was a consensus that both teachers and learners benefit from using smartboards in different learning environments (Tondeur et al., 2017; Haixia et al., 2018; Mwapwele et al., 2019; Maledai & Awolusi, 2019; Mihelj et al., 2019; Meskhi et al., 2019). As reasoned in the previous discussions of this study, the integration of smartboards in the classroom helps to foster higher-order thinking, interactive learning, and self-directed learning, which can improve pedagogy (Saxena, 2017; Tondeur et al., 2017; Meskhi et al., 2019; Mihelj et al., 2019; Sabiri, 2020; Chabalala, & Naidoo, 2021). By using smartboards “to improve learners’ reading and writing skills while concurrently developing their thinking skill levels,” Technology teachers can create a new engaging and active learning setting (Cha & Kwon, 2018; Fahrman, 2021). In this context, smartboards are an effective tool for supporting learners by providing a learning environment with visual and auditory stimuli (Mabila, 2017; Sacramento, 2019).

Research indicates that Senior Phase Technology teachers’ confidence in using smartboards can have an optimistic influence on their lessons and learners’ engagement (Ran et al., 2018; Almaiah & Al Mulhem, 2019). Thus, by incorporating these technologies, Technology teachers can create interactive and learner-focused

environments (Chakravorti & Chaturvedi, 2019). However, integrating smartboards into the Senior Phase Technology curriculum requires investment in technology and trained personnel (Farella et al., 2020; Taghizadeh et al., 2020). It is commonly acknowledged that despite facing challenges, Technology teachers are progressively incorporating technology in their classrooms due to its rapid expansion and proven benefits in education (Bulman & Fairlie, 2016; Mihelj et al., 2019). Embracing these technologies can lead to a better learning environment for learners (Sikhakhane, et al., 2021). In the same vein, supporting Technology teachers in adopting these technologies as well as recognising their positive impact on both lessons and learner engagement is crucial (Wirch, 2021). Consequently, Technology teachers using smartboards can contribute to a brighter future for their learners (Bulman & Fairlie, 2016; Sikhakhane, et al., 2021).

In a study by Doyle et al. (2019), Irish Technology teachers noted a focus on technical competencies in Technology education. They also highlighted the need for professional development to integrate smartboards. Similarly, Wu and Ding (2020) found that Chinese secondary school Technology teachers perceive Technology education as either teacher-centred or student-centred. Additionally, teachers consider Technology vital for learners' future lives and learning. Fahrman et al. (2020) discovered that teachers prioritise problem-solving and project work in Technology education. Consistent with the two studies discussed above, it appears that Technology teachers perceive the incorporation of smartboards in the classroom as related to four themes concerning Technology teaching, namely, society, design, technical solutions, and engineering (Sabiri, 2020; Fahrman, 2021). This shows that Technology teachers should possess a broad view of knowledge on ICTs that allows them to perform in a particular context. Based on that, it makes sense that rural school Technology teachers are aware of the factors that surround the utilisation of smartboards.

Another area concerning experiences of Technology teachers towards smartboard utilisation concerns teachers' attitudes. According to Doyle et al. (2019) this is one of the aspects that determines the success in the incorporation of smartboards in the classroom. This means that the way teachers view ICTs can affect the acceptance of smartboards as an advantageous teaching tool. It is imperative to reminisce that the

notion of attitude denotes a situation in which an individual is inclined to respond to an event, person, or object, whether positively or negatively (Shen, et al., 2019; Rice, 2021; Charlotta, 2022). In this context, it becomes evident that understanding the attitudes of teachers towards ICTs is critical for the productive execution of a smartboard programme. In other words, the integration of a smartboard programme in the school curriculum differs largely in the way teachers view and warrant the use of these devices. It makes sense, therefore, that if teachers hold a positive point of view in relation to the utilisation of ICTs, they are more likely to accept and incorporate smartboards in the classroom.

In terms of empirical evidence, the study of Bulman and Fairlie (2016) is one of those, and it explored how teachers behave towards the utilisation of smartboards. The study showed that there was misalignment relating what teachers consider and the method they utilise ICTs in the classroom.

Concerning the acceptance of smartboards, in particular, the evidence shows that the attitudes of teachers towards ICTs influence the way they view it as useful and worth of incorporation in their classrooms (Buabeng-Andoh, 2012; Bordoloi, et al., 2021). This implies that the attitudes of teachers about ICT can be used to predict the way smartboards are utilised. As observed by Charlotta (2022), the views of teachers can either enable or disable the implementation of teaching based on ICTs. This claim corroborates that of Bulman and Fairlie (2016) who argue that teachers who are optimistic about ICTs are more expected to use it in their classrooms. In that sense, it may be argued that any successful adoption and integration of smartboard teaching requires the assessment of attitudes of teachers towards ICTs. Another key point is that teachers who are computer literate are beyond prone to warrant the idea of integrating smartboards in the school core curriculum (Doyle et al., 2019). Furthermore, teachers' avoidance to smartboards can be attributed to issues such as "hardware and software availability, poor technical assistance and training, technophobia, and lack of staying up to date with current ICTs advancements" (ibid.). This reinforces the view that facilitating conditions and social conditions are critical for the utilisation of technology such as smartboards by teachers, in particular, as emphasised by the UTAUT model. However, as observed by Chisango et al. (2020) there has been a low uptake of ICTs on the ground, and this means that training

programmes and other school investments in ICT resources, including smartboards, have not occurred at a desired level.

In conclusion, the discussion above shows that viewpoint is an essential belief in social views and behaviours. It is also reasonable to argue that attitudes influence teachers' thinking, motivation, and conduct (Tomczyk, 2020; Brink et al., 2021). Thus, successful educational practice transformation based on the utilisation of smartboards necessitates the establishment of positive teachers' attitudes towards these tools. By investigated experiences of Senior Phase Technology teachers on the utilisation of smartboards, it was possible to unpack an array of attitudes as well as other factors that were hidden in Technology education.

2.8 The UTAUT model

This section is devoted to discussing the UTAUT model and its fit for this study as the theoretical framework. Apart from providing a definition of this theory, the discussion identifies the main stages of its evolution, analyses its underlying assumptions, and also identifies its main components. This enables to examine and analyse processes embedded in the utilisation of smartboards in Ekurhuleni District rural schools as experienced by Senior Phase Technology teachers and substantiate the study. The reputation of a theoretical framework in an investigation cannot be overstated. Many scholars, *inter alia*, Pardamean and Susanto, (2012), Grant and Osanloo (2014), Kivunja (2018), Lederman and Lederman (2015), as well as Lynch et al. (2020) state that a study framework provides the blueprint for the research from which all knowledge is constructed. The theoretical framework indicated above allows the researcher to comprehend the research information and to investigate the issue under investigation in light of its purpose.

Based on the above, the section starts by describing the origin, evolution, and assumptions of the UTAUT model in section 2.8.1. This is followed by a discussion of its components (section 2.8.2) and, at the end, the argument centres on the integration of the components of the UTAUT model into this study in section 2.8.3.

2.8.1 Origin, evolution, and assumptions of the UTAUT model

The UTAUT model developed in the field of software adoption and use by Venkatesh et al. (2003). The theory originated from the “Technology Acceptance Model (TAM) created by Davis, Bagozzi, and Warshaw in 1989 to explain the general determinants of computer acceptance which will lead to an understanding of users’ behaviour across a wide range of end-user computing systems and user groups” (Omboto, 2022). It is in this context that the UTAUT model was created as a variant of the TAM as a way to understand how individuals can influence the adoption and use of technology (Rempel & Mellinger, 2015; Botero et al., 2018). For this reason, the UTAUT model is particularly relevant for this research because it allows contemplating education stakeholders from the niche area of the study on smartboards adoption alongside Technology teachers who are meant to adopt and integrate the modern technology.

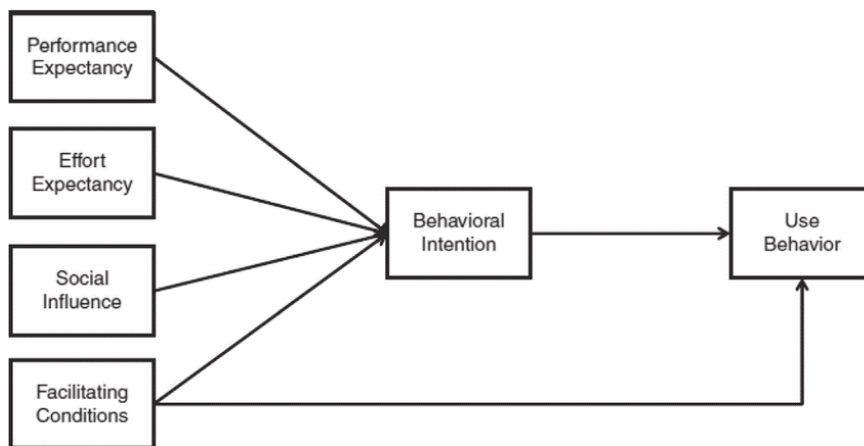
Since its development, the UTAUT model has been broadly accepted and employed in various research studies to analyse the acceptance and utilisation of different technologies (Rempel & Mellinger, 2015). It offers a comprehensive framework that considers several factors inducing the user’s behaviour and intent to utilise innovative technologies such as smartboards (Pardamean & Susanto, 2012; Venkatesh et al., 2012). The interlinkage of the fundamentals that form part of this theory confers on its powerful assumptions with which to understand how Technology teachers perceive and utilise smartboards. Furthermore, the UTAUT model provides valuable insights into analysing technology user behaviour and assists in developing strategies for its better adoption and utilisation (Wu et al., 2007; Haixia et al., 2018; Nikolopoulou, 2018). In fact, it has been validated by various studies for its usefulness in analysing technology use behaviour and adoption patterns (Ifinedo & Kankaanranta, 2021). Based on the discussion above, it may be argued that the UTAUT model has proven to be an essential tool in the field of technology adoption and has helped organisations develop better strategies to improve technology acceptance and usage including Ekurhuleni District rural schools.

2.8.2 Components of UTAUT model

The UTAUT model contains four main tenets of technology user behaviour, namely, “performance expectancy, effort expectancy, social influence, and facilitating

conditions” (Venkatesh et al., 2003) (Figure 2.1). Consequently, the employment of this theoretical model in this study empowered the researcher to unpack the dynamic relations encapsulated in the utilisation of smartboards in Ekurhuleni District rural schools based on the experience of Technology teachers. By doing so, the study adds a new layer on the extensive body of research that has explored possibilities of the use of this theory.

Figure 2.1: The UTAUT model 1



Source: Venkatesh et al. (2003)

Based on the above, it may be argued that the UTAUT model depicted in Figure 2.1 helps to understand its suitability for this study as it offers a detailed perspective with which to examine and analyse the behaviour of Senior Phase Technology teachers towards utilising smartboards in Technology education. The researcher is of the view that the UTAUT model was highly beneficial in comprehending the various forms of knowledge required by Technology teachers to effectively utilise smartboards and enhance their grasp of the content they teach. In this respect, this theory is particularly relevant for understanding how users engage with technology and is especially suitable for studies focusing on human factors (Venkatesh et al. 2003; Doyle et al., 2019; Marikyan & Papagiannidis, 2021), making it an excellent option for the conduct of research in the Ekurhuleni District rural schools on TLA. Furthermore, this recognises the significance of smartboards in society more broadly, which underwrites nurturing the discipline of Technology education. In this light, the DBE and the GDE in South Africa have been emphasising the need to adopt and use technology such as smartboards in Technology education since 1998 to address historical inequalities

(Tarling & Ng'ambi, 2016; De Coito & Richardson, 2018; Umugiraneza et al., 2018; Butler-Adams, 2018; Doyle et al., 2019; Farella et al., 2020; Marikyan & Papagiannidis, 2021).

The following subsections discuss in detail the four constructs of the UTAUT model. This offers a compacted foundation to incarnate the phenomenon under investigation into the theoretical lens of this model.

2.8.2.1 *Performance expectancy*

Performance expectancy is the extent to which a person have confidence in that employing a technology system such as smartboards will help the person to achieve advances in accomplishment (Venkatesh et al. 2003; Rempel & Mellinger, 2015; Owoseni et al., 2020). In the perspective of this study, this concept denotes teachers' belief that incorporating technology such as smartboards into their Technology teaching and learning process will improve performance (Wong et al., 2013; Marikyan & Papagiannidis, 2021). Furthermore, it concerns teachers' perceptions about how smartboards can enhance learning and teaching in rural school Technology classrooms.

Performance expectancy has been extensively studied and documented by several scholars. For instance, the study conducted by Sung et al. (2015) utilised the UTAUT model as a framework to explore the influence of mobile learning in South Korea focusing on performance expectancy. The results revealed a considerable influence on behavioural intentions. In fact, other studies on performance expectancy consistently show an optimistic association between this determinant and the focused to utilise technology. For example, Almaiah and Al-Mulhem (2019), Botero et al. (2018), and Francisco and Swanson (2018) have demonstrated that performance expectancy affects teachers' willingness to utilise technology tools such as smartboards. Research conducted by Sabiri (2020) and Al-Emran & Granić (2021) has shown that the utilisation of smartboards is significantly influenced by performance expectancy. Based on that, it becomes evident that performance expectancy is a crucial factor in encouraging Senior Phase Technology teachers to effectively utilise smartboards in the Senior Phase in the Ekurhuleni District rural schools.

2.8.2.2 *Effort expectancy*

As defined by Rempel & Mellinger (2015), effort expectancy implies to the extent of ease connected with utilisation of a technology system. Thus, in this study this concept denotes teachers' perceived ease of using smartboards for Technology Education in rural schools, which could influence their intention to choose to use them (Fahrman, et al., 2017; Al-Mamary et al., 2018; Nikolopoulou, 2020). In this sense, there is a little doubt that effort expectancy is a key indicator that speaks to the utilisation of technological tools such as smartboards by teachers. As Venkatesh et al. (2012, p. 171) put it "it is a key component of the UTAUT model, which influences users' likelihood of adopting such tools".

Regarding empirical evidence, scholars have attempted to demonstrate how effort expectancy shapes intentions of users towards modern technology, especially learning technologies (Meskhi et al., 2019; Shen et al., 2019; Oke & Fernandes, 2020; Lu et al., 2020; Tefo, & Goosen, 2024). For instance, Jang and Koh (2019) argue that this indicator significantly influences the way teachers accept ICTs. Similarly, Kaliisa et al. (2019) concluded that effort expectancy is crucial in shaping users' intentions towards modern technology. Other studies, such as those by Shen et al. (2019) as well as Oke and Fernandes (2020) have also used the UTAUT model to connect effort expectancy with behavioural intention. It is important to recognise that when using technological tools like smartboards, effort expectancy positively influences behavioural intention (Williams, 2017; Francisco & Swanson, 2018; Saed et al., 2023). Therefore, developers should prioritise creating smartboards and other tools that are user-friendly, intuitive, and easy to use to enhance their adoption by teachers and learners (Venkatesh et al., 2003).

2.8.2.3 *Social influence*

Venkatesh et al. (2003) identify social influence as the notch to which a person understands that influential others trust that a person should utilise a modern technology system. In this study, social influence is classified as how a teacher perceives the support from other stakeholders (e.g., principal, department head, and colleagues) view his/her use of smartboards.

In this study, social influence in relation to the utilisation of smartboards by teachers cannot be overstated. This claim was initially emphasised by Venkatesh et al. (2003) and later supported by several studies such as those by Wu et al. (2007), Cha and Kwon (2018), Shen et al. (2019), Karakoyun and Lindberg (2020), as well as Al-Emran and Granić, (2021). It is worth noting that Senior Phase Technology teachers are more prone to implement and utilise smartboards for teaching and learning if they have the chance to network with other teachers who are already using this technology (Saxena, 2017; Shen et al., 2019; Tefo & Goosen, 2024). This suggests that Senior Phase Technology teachers' collaboration and exchange of ideas with their peers from local, provincial, nation or international level can play a crucial role in the efficacious adoption and integration of smartboards in the classroom.

2.8.2.4 *Facilitating conditions*

Facilitating conditions refers to the extent to which an individual trusts that an organisation and appropriate arrangement is accessible to support utilisation of technology (Venkatesh et al., 2003; Rempel & Mellinger, 2015; Tefo & Goosen, 2024). The research focuses on capturing the experiences of a Senior Phase Technology teacher in a rural school regarding the available mandatory resources and support to utilise smartboards.

It is believed that facilitating conditions are crucial in improving the efficiency of organisational and technological systems (Venkatesh et al., 2003). This means that proper training and support are essential for adopting workplace technology (DoE, 2008; GDE, 2010; Sabiri, 2020; Tefo & Goosen, 2024). This study aims to assess the facilitating conditions for Senior Phase Technology teachers in obtaining necessary resources and support for using smartboards. By understanding the Technology teachers' experiences based on their practises (Baharuldin et al., 2019; Bayar & Kurt, 2021), the study will help Ekurhuleni District rural schools and the South African DBE identify gaps in current facilitating conditions and develop strategies to address them. This will contribute to enhance the educational process and improve Senior Phase Technology teachers' productivity. In the same way, empowering Senior Phase Technology teachers to use smartboards effectively through training and support will craft a supplementary engaging and immersive learning experience for learners (Webb & Welsh, 2019; Etcuban et al., 2020; Tefo & Goosen, 2024). Ultimately, the

research outcomes will support the GDE and DBE in developing and executing a thorough framework to improve facilitating conditions in the education sector. This will benefit Technology teachers and aid to the overall enrichment of learners and the society.

Based on the discussion above, the Table 2.1 provides a configuration of each component of the proposed theoretical framework in relation to the research questions.

Table 2.1: Link for research

UTAUT model component	Definitions	Research questions
Performance expectancy	The level to which a person trusts that using a technology system such as smartboards will help him/her to achieve improvements in performance (Venkatesh et al.2003).	How do Senior Phase Technology teachers in Ekurhuleni District rural schools perceive the utilisation of smartboards to enhance the teaching and learning process?
Effort expectancy	The level of user-friendliness of a technology system (Venkatesh et al., 2003)	How easy is it for Senior Phase Technology teachers to use smartboards in teaching and learning?
Social influence	The magnitude to which a person trusts that noteworthy others think they should utilise an innovative technology	How do stakeholders in Ekurhuleni District rural schools address the utilisation of smartboards in classrooms?

	system (Venkatesh et al., 2003).	
Facilitating conditions	The level to which a person trusts that an organisation and technological infrastructure will be present to provide a technology. system (Venkatesh et al. 2003).	How do available support tools address the imperative of the utilisation of smartboards in Ekurhuleni District rural schools by Senior Phase Technology teachers?

Source: Author's own

2.9 Conclusion

The intent of this study was also to investigate and analyse the body of literature on the utilisation of smartboards to help understand how Technology teachers go about incorporation of smartboards in their classrooms in Ekurhuleni District rural schools. Therefore, this chapter concentrated specifically on the argument of the utilisation smartboards and its linkage with the UTAUT model. Indeed, the body of literature reviewed provided a compact foundation with which to uncover the research problem. Furthermore, the literature also enabled to enhance the methodology for the study and the research questions. By exploring different perspectives on the utilisation of smartboards as experienced by teachers worldwide, this chapter enabled to capture the richness and multiplicity of theoretical foundations required to adopt the research problem. In the same vein, the chapter was underpinned by the UTAUT model to establish linkages with utilisation of smartboards by Technology teachers.

Briefly, this chapter provided useful insights with which to understand the integration of smartboards into school curriculum and in the classroom, in particular. Furthermore, it informed the interview questions to create data needed from the research participants of this study.

CHAPTER THREE

Methodology

3.1 Introduction

The discussion in this chapter focuses on the methodology utilised in the research. Specifically, it discusses various methods and techniques that were deemed necessary and utilised to gather the data to answer the research questions elevated in the study on the Technology teachers' experiences on the utilisation of smartboards in Ekurhuleni District rural schools. Essentially, the chapter discusses in detail the journey taken in the fieldwork, including the choices, underlying assumptions, and their justification. It follows chapter two which addressed the literature review on the utilisation of smartboards, as a manifestation of the UTAUT model, for Technology teachers needed to fulfil the mandate of incorporating smartboards in their classrooms as required by education authorities. Further, it outlines the research methodology used to attain the research objectives. It starts by introducing the research paradigm underpinning the study and then proceeds to cover the research site and participants, sample and sampling techniques, data collection methods, data analysis, strategies to ensure the trustworthiness of the study, and deliberations concerning ethics (Bloor & Wood, 2006; Etikan et al., 2016). The fulfilment of these methodological procedures was foregrounded on a selected research paradigm. Additionally, the discussion of the literature review and theoretical framework in the previous chapter honed the methodology to be employed, and this shaped the study. The chapter concludes by providing an overview of the key points regarding what was learned in employing the particular research methodology and design selected in this study.

3.2 Research paradigm

This section discusses the researcher's worldview, philosophical beliefs, and assumptions regarding the phenomenon under investigation, referred to as research paradigm. This, in turn, informs the researcher about what signifies the "abstract beliefs and principles that shape how he sees the world and how interprets and act within that world" (Kuvunja & Kuyini, 2017, p. 35). This, then, was critical to guide the research actions (Guba & Lincoln, 1994; Maree, 2016) so as to form meaning entrenched in the research data.

The study employed an interpretivist paradigm; this is underpinned by four assumptions, namely, epistemology, ontology, axiology, and methodology. Interpretivism is a philosophical tradition that focuses on meaning, understanding and interpretation (McBurney & White, 2009; Arthur et al., 2012; Nieuwenhuis, 2016a). It emanated from hermeneutics in the 19th century, which is “the study of theory and practice of interpretation” (Porteous & Machin, 2018). In addition, according to this tradition, the researcher endeavours to comprehend a specific occurrence through the significances that persons give to it (Bless et al., 2013; Padilla-Díaz, 2015). The research paradigm used the UTAUT model to explore the phenomenon under study and addressed the mandate in South Africa. In this sense, the study treated the context and schools involved as unique, including the associated circumstances as well as the participating Technology teachers. This required a fluidity to understand that each participant constructed reality differently. Interpretivism proposes that participants in a research study develop individual significances of their experiences (Creswell, 2014; Nieuwenhuis, 2016b). This enabled to build a diverse and holistic knowledge base that profiles the collective smartboard acceptance model of Technology teaches for this study.

Epistemologically, the interpretivist tradition conceives that reality depends greatly on the participant’s viewpoint of the experience under study (Creswell, 2014). Therefore, the research findings resulted from common shared experiences of Technology teachers as they offered their localised knowledge to inform the research questions.

Ontologically, the interpretivist tradition supports that reality is constructed through human experience (Kim, 2001; Leedy, et al., 2019). Furthermore, reality is grounded in principles of social construction on a phenomenon under study (Boyland, 2019) and, therefore, a universal and absolute truth is unattainable. Therefore, the researcher considers that reality or truth is not objective, but rather it is a product of constructed experiences of people within the boundaries of a particular context. In this admiration, the experiences of Technology teachers on the utilisation of smartboards constituted a place for construction of the truth for this study.

Axiologically, interpretivism values and appreciates multiple realities and facets embedded in this study, which includes the research participants, the data as well as the audience to which the findings shall be reported (Nieuwenhuis, 2016c; Curry,

2020). Thus, this study promotes both general and specific values of empowerment. By doing so, the study seeks to impact to the ethos of empowerment of Technology teachers in rural schools on the utilisation of smartboards.

Methodologically, the researcher incorporated the Technology teachers' voices and adopted an interpretive lens from their grounded knowledge and applied it to the principles from the literature.

3.3 Research approach and design, and their justification

This study employed a qualitative research approach. This choice was informed by the disposition of the research questions (Merriam & Tisdell, 2016; Aluko et al., 2018), which are intended to achieve a contextualised understanding about the adoption and incorporation of smartboards into the classroom teaching among Technology teachers (Sefotho, 2018).

It follows that qualitative research approach is holistic in natural surroundings and studies a phenomenon in its natural background in order to recognise and clarify it, embedded in the meanings of the research participants (Trede & Higgs, 2009). For this reason, this approach is better placed in this study to explore, illustrate, and decode the understandings of smartboard utilisation among Technology teachers. This is because the qualitative research approach includes gathering data from research participants in their environment and analysing such data inductively, moving from specific interviews to general themes and, therefore, applying the interpretation according to the perspective of the inquirer (Cresswell & Poth, 2018). This enabled me to obtain an in-depth understanding on the interplay around smartboard incorporation in the classroom. To sum up, the qualitative approach was prioritised for the reason that the researcher aimed to explore Senior Phase Technology teachers' experiences on the utilisation of smartboards in Ekurhuleni District rural schools. This approach enabled the sharing of personalised, subjective narratives and explanations, providing a range of experiences. From these diverse experiences, practical solutions were suggested.

In the current study, I used a case study as a research design. A case study is an empirical investigation that looks at a phenomenon in its actual setting (Rashid et al., 2019). It entails an in-depth examination of a phenomena. As Rashid et al. (2019)

pointed out, a case study is not a technique for gathering data, but rather a plan or strategy for researching a social group. Case studies are a qualitative research method where a program, event, activity, process, or one or more people are thoroughly investigated. Researchers gather comprehensive data over an extended period of time utilising a range of data collecting techniques for the case(s) that are constrained by time and activity (Sparkes & Smith, 2013).

According to Creswell (2014), case studies are time and activity bound; therefore, this study provides a detailed account of a unique instance of real people in real situations. In other words, the researcher focused on studying a specific entity in its natural setting, namely Ekurhuleni District rural schools. Furthermore, the study was restricted by the location and activities of the schools as well as the number of participants involved within the selected schools.

I explored the experiences of Technology teachers on the utilisation of smartboards and interpreted their localised perspectives. Due to insufficient information in addressing the dynamics involved in the incorporation of smartboards by TLA teachers in rural schools, a case study design was employed to provide an interesting context that may produce different results from previous research. Additionally, as rural schools, they may offer insights that differ from urban schools and other subjects, given that this study focused specifically on Senior Phase Technology teachers.

Ekurhuleni is one of the five districts in Gauteng, and it stands as one of the eight metropolitan municipalities in South Africa. For this study, the term "rural" is employed to contextualise the present circumstances at five schools within the Ekurhuleni district. While these schools are situated in an urban area, they grapple with significant challenges typically associated with rural settings. These challenges include high levels of poverty, inadequate internet connectivity, and a lower overall cost of living. Such conditions adversely affect the educational experience and opportunities available to the learners in these schools.

3.4 Research site, sample, and sampling techniques

There is a little doubt that the selection of appropriate sample establishes the quality of data required in an investigation.

In the light of the above, the selection of the sample in this study involved three levels, namely, (i) the range of the geographical research site, (ii) the range of the schools, and (iii) the selection of the research participants within the schools (Table 3.1). In the same way, the study employed two distinct types of sampling techniques to select the geographical research site, the schools as well as the Technology teachers who could furnish relevant information to illuminate the research questions, namely, purposive sampling, and convenience sampling.

Table 3.1: The selection of the population and sample

Levels of sample	Elements
Level one	<ul style="list-style-type: none"> • Ekurhuleni District
Level two	<ul style="list-style-type: none"> • Five rural schools
Level three	<ul style="list-style-type: none"> • Ten Technology teachers

Source: Author's own

Thus, in using the purposive sampling strategy the researcher selected a sample based on his judgement (Etikan et al. 2016). In this regard, it was first critical to decide what needs to be established in the study and then, set out to select the sample that could enable to generate the required information and shed light on the concerns of the study. In contrast, the convenience sampling consisted in selecting participants "by convenience due to their proximity, availability, accessibility or other way that the researcher decided" (ibid.). The following table presents the levels of the selection of sample as indicated above, and they are discussed in detail thereafter.

3.4.1 Level one sample: The Ekurhuleni District

The level one of the sample (population) is the geographical research site which was the Ekurhuleni District in Gauteng province in South Africa. Accordingly, convenience sampling was utilised to select this research site and, apart from suitability to enlighten the problem under investigation, this was justified by considerations of geographical proximity to the researcher's location so as to reduce economic costs. The rural schools to be studied are within the same area, and the distance to the researcher's

location is ten km; it was easy to visit the schools for the reasons of the collection of data.

3.4.2 Level two sample: Five rural schools

At level two, five public no-fee-paying resourced rural schools within the Ekurhuleni District were targeted for this study purposive sampling (Table 3.2). This consisted in the deliberate choice of three primary and two secondary schools in the geographical research site as mentioned above due to the qualities and/or features that these schools possess to address the concerns of this study (Etikan et al., 2016). For the sake of ethical considerations, the names of the schools will remain anonymous in this study. Moreover, due to their high population density, the selected schools face similar problems such as crowded classrooms with an average of over 50 learners per class in the Senior Phase. In addition, the schools were selected purposefully based on the circumstance that the Senior Phase Technology teachers were already using smartboards in teaching the Technology subject.

Table 3.2: Schools used in the study

School	Primary	Pseudonym	Teacher participants	Secondary	Pseudonym
A	X	PS-1	T1 and T2		
B	X	PS-2	T3 and T4		
C	X	PS-3	T5 and T6		
D			T7 and T8	X	SS-1
E			T9 and T10	X	SS-2

Source: Author's own

3.4.3 Level three sample: Ten Senior Phase Technology teachers

The level three of the sample was formed by selected teachers within the schools pertinent to this study as declared above. In this light, the study targeted ten teachers

(three males and seven females) who teach this subject through purposive sampling (Table 3.3). The common inclusion criteria for this sample size was that at the time of this study, the selected Senior Phase Technology teachers were already utilising smartboards in their classrooms and were chosen based on their potential to provide detailed accounts on the research problem based on their experiences with these technology tools. Thus, it was considered that selecting such a diverse group of knowledgeable research participants would provide rich, holistic, and relevant repertoire of interpretative perspectives by Senior Phase Technology teachers on smartboards utilisation entrenched in the notion of UTAUT model. All ten participating Technology teachers were assigned pseudonyms following ethical guidelines. I assigned the pseudonyms T1-10 linked to the primary and secondary schools I visited. By employing different sampling strategies this study expected to underwrite the development of Technology in the education system through the identification of effective teaching practices and the provision of beneficial understandings into the trials Technology teachers face when using smartboards in teaching in the Senior Phase classroom.

Table 3.3: Research participants

Technology teacher	Pseudonym	Gender	Age	School	Grade	Smartboards usage experience
1	T1	Female	20-30	Primary	7	1
2	T2	Male	30-40	Primary	7	3
3	T3	Female	20-30	Primary	7	1
4	T4	Female	20-30	Primary	7	3.5

5	T5	Female	20-30	Primary	7	4
6	T6	Male	30-40	Primary	7	6
7	T7	Female	20-30	Secondary	8	4
8	T8	Male	30-40	Secondary	9	3
9.	T9	Female	40-50	Secondary	8	7
10	T10	Male	40-50	Secondary	9	16

Source: Author's own

3.5 Data collection techniques and instruments

This section discusses the data collection techniques and instruments utilised in this study. It is widely acknowledged that the methods used for data collection in an investigation should be closely aligned with the specific problem being investigated and suitable for addressing the research questions (Baxter & Jack, 2008; Creswell, 2013). For this reason, a sound judgement was applied in selecting the data collection techniques and apparatuses in this study.

Accordingly, the study employed semi-structured interviews as the focal method of data gathering. The data assembled through these conversations was used to develop themes for understanding the smartboard utilisation by Senior Phase Technology teachers. According to the interpretivist nature that guided this inquiry, the utilisation of semi-structured interviews provided a space of aperture for the Senior Phase Technology teachers to verbalise their experiences in detail on smartboard utilisation, thereby enabling to yield richer and in-depth data to address the research questions (Sefotho, & Haupt Du Plessis, 2018). The decision for using this style of interview was

informed by two main considerations, as follows. Firstly, since the study is concerned with exploring the individual experiences of Senior Phase Technology teachers on smartboard utilisation, qualitative semi-structured interviews did not restrict the interviewer (Campbell et al., 2013; Creswell, 2014). Secondly, the semi-structured interviews allowed for additional elaboration and clarification on the answers provided by the research participants through probing and follow-up questions (Grinyer, & Thomas, 2012; Adams, 2015). Arguably, this flexibility would aid the researcher to gather in-depth data to address the assumptions of the UTAUT model.

Based on the preceding discussion, the interview guides were developed taking into account the research questions, the acknowledgment of the researcher as a medium of data collection (Campbell et al., 2013; Saldana, 2013), as well as the exact context and research participants involved in the study.

In terms of content, the interview questions were informed by the UTAUT model previously discussed in section 2.8 of chapter two. The researcher included both insights of this theoretical framework which was arrived at based on the literature review and the particular context of the study. Consequently, the interview questions captured the core areas embedded in the UTAUT model to address the research questions raised in the inquiry. In this respect, the questions requested information pertaining to the four broad dimensions of UTAUT model, (i) namely, performance expectancy, (ii) effort expectancy, (iii) social influence and (iii) facilitating conditions.

Furthermore, the researcher probed Senior Phase Technology teachers' responses to accumulate comprehensive knowledge and information on smartboard utilisation in rural schools. These face-to-face interviews lasted between 40-60 minutes during which the researcher asked predetermined questions to the ten selected Senior Phase Technology teachers. Probing techniques were also used to obtain additional clarity while asking predetermined questions (Campbell et al., 2013).

To ensure that all information could be captured, a mobile phone voice recorder was utilised all through the interviews. Additionally, field notes were also used to capture any unexpected information such as body language, emotions, and teacher values, skills, and knowledge (Leedy et al., 2019) to enrich the body of empirical evidence that the researcher tried to uncover in this investigation. As a naturalistic inquiry, semi-

structured interviews with participating Senior Phase Technology teachers took place at the five Ekurhuleni District rural schools where the participants work after negotiating their convenient period, and the researcher travelled to these locations to assemble the data.

3.6 Data analysis strategies

The purpose of this section is to discuss the procedures that were employed to evaluate the data in this study. The process of data analysis implies the thorough examination and interpretation of qualitative data to uncover underlying patterns and themes (Creswell, 2014; Neuman, 2014). According to Saldana, (2013) and Watkins (2012) data analysis is a major step in finding the solutions to the problems under study. As suggested in the previous section, the type of data accumulated for the purposes of this study consists of textual and non-numerical information on smartboard utilisation.

The data generated through interviews with Senior Phase Technology teachers was voice recorded and later transcribed and organised. Throughout the data gathering process, the researcher focused on capturing the words of the research participants verbatim. By doing so, the use of the exact words and phrases of Senior Phase Technology teachers allowed to gain extra insights into the meaning of the constructed experiences on smartboard utilisation in the particular circumstances of this study.

The study utilised thematic analysis to classify relevant themes in the data, as defined by Willig (2014b). This method was chosen for its tractability in “research question, sample size, data collection method, and meaning generation approaches” (Victoria & Virginia, 2017). Thematic analysis helps distinguish patterns within and through “data related to participants' experiences, views, perspectives, behaviours, and practices, enabling a comprehensive understanding of what participants think, feel, and do” (ibid., p. 297). Therefore, by using thematic analysis it was possible to glean the Senior Phase Technology teachers' perspectives on the smartboard utilisation based on their interpretive experiences.

In the light of the above, the data analysis entailed five steps as proposed by the framework of Creswell (2014) as follows:

- First: the researcher familiarised himself with the research data by reading and re-reading the transcripts.
- Second: The data were coded.
- Third: Based on the coding, the researcher identified themes and sub-themes that spoke to the research questions.
- Fourth: The researcher presented the generated themes.
- Fifth: The researcher analysed and interpreted the findings.

The initial stage is text familiarisation. At this stage, the transcripts were read numerous times to get an impression of what the participants said orally. Thus, the researcher observed the following steps: (i) reading the interview data numerous times, and listen to the interview audio recordings, (ii) transcription of the data, (iii) write down the whole conversation and, (iv) add the non-verbal information that was taken through field notes.

The second stage is coding. The researcher analysed the transcriptions several times and highlighted relevant passages according to what the research questions sought to uncover. Consequently, the identified words and phrases were assigned codes.

The third stage is theme and sub-theme generation, and this followed the coding process. This process consisted in clustering codes that are similar into groups sharing similar features in terms of pattern and meaning in the dataset (Nieuwenhuis, 2007; Leedy et al., 2019). By doing so, the codes that seemed to relate to each other were grouped into meaningful units and named.

The fourth (and fifth) stages affect presentation of themes and interpretation of findings. At this phase, the researcher identified themes that referred to the Senior Phase Technology teachers' experiences of the utilisation of smartboards in Ekurhuleni District rural schools. Such themes were linked to encapsulate the tenets of the theoretical framework, that is, the UTAUT model and supported by relevant quotations that were extracted from the research participants, allowing for an all-inclusive understanding of the participants' answers.

The process of data analysis was carried out manually, instead of using computer aided data analysis software. Furthermore, it was entrenched in an inductive and

personal process, thus reflecting the researcher's personal style and worldview. The themes were arranged and displayed systematically to respond the research questions, and this was the culminating aspect of data analysis. Overall, this approach provided valuable insights and ensured that the data were rigorously analysed to draw meaningful conclusions.

3.7 Trustworthiness of the study

The study employed various strategies to guarantee its reliability, including the establishment of protocols and procedures to guarantee the quality of the data, understanding, and methods utilised. This process involved actively engaging the research participants in the data analysis and explanation, and their feedback were considered to correct errors (Maree & Pietersen, 2016; Sefotho, 2018). This study utilised a constructive approach, collecting data via semi-structured interviews and field notes. By doing so, the study ensured the accuracy of their responses of the research participants and the understanding of the outcomes.

Furthermore, according to Lincoln and Guba (1986) advance four dimensions to ensure the trustworthiness of a qualitative research, namely, "credibility, dependability, transferability, and confirmability" (Lincoln & Guba, 1986). Therefore, this research employed techniques to attend to each one of these dimensions in order to strengthen the study findings. The following subsections will discuss these strategies.

3.7.1 Credibility

Credibility is the self-assurance that can be retained in the truth of the research results (Maree, & Pietersen, 2016; Nowell et al., 2017). In this study, this dimension was reached by employing techniques and procedures enabled that the research outcomes signify acceptable information pulled from the Senior Phase Technology teachers' original data. To that end, the study employed triangulation, member checking and sustained engagement in the research site. In triangulation, the data gathered from the ten participating teachers were confronted and corroborated by using semi-structured interviews and field notes. In member checking, the researcher involved the Senior Phase Technology teachers in the data exploration and explanation. After the data analysis was finalised, the researcher selected the best piece of analysis and invited the teachers to confirm whether the interpretation was

consistent with what they had shared during the interviews. The teachers, then, read and gave their feedback which was used to correct the errors.

In prolonged engagement, the researcher spent six months of regular visits to Ekurhuleni District rural schools everywhere the research was conducted. This extended period empowered to build rapport and trust with the culture of participating schools and teachers. It further allowed to develop familiarity with the study participants and to gain adequate understanding of the smartboard utilisation.

3.7.2 Dependability

According to Creswell and Poth (2018), dependability is the stability of the research conclusions over time. The dependability in this study was achieved by using data triangulation (using semi-structured interviews and field notes) and an audit trial. In using an audit trial, the researcher kept recorded audios, transcripts, and field notes for cross checking the inquiry process in case where results are vital to be assessed for authenticity. This enables to display how the data were accumulated, documented, and scrutinised, thereby ensuring that the study findings are dependable.

3.7.3 Transferability

Transferability is concerned with adapting study results to different settings or groups of people (Maree & Pietersen, 2016). In the context of this investigation, this meant that the researcher not only analysed the results, but also evaluated the characteristics of the teachers chosen for the study's context. Thus, the study employed thick description. This involved providing an analysis of biographical data of the participating Senior Phase Technology teachers as well as a thick portrayal of the research methodology and design commissioned in the study. Furthermore, the researcher similarly provided a detailed and comprehensive description of the five rural schools studied. The description included bringing in details pertaining environmental or social factors that could influence the research findings. By doing so, another researcher can replicate this study to their contexts or groups of people.

3.7.4 Confirmability

Confirmability in qualitative research denotes to the point to which discoveries can be supported by other researchers (Maree & Pietersen, 2016; Sefotho, 2018). This approach allowed the participating Senior Phase Technology teachers to voice their thoughts and experiences without restrictions or any limitations. The researcher is confident that this approach helped him to gain significant insights into the teachers' experiences and voices. Furthermore, to enhance the confirmability of the conclusions, the researcher provided copies of the transcribed interviews to the research participants a few days after the interviews (Campbell et al., 2013; Creswell, 2014). This enabled them to confirm verbally that all the information was gathered correctly and not misinterpreted. By so doing, participants' confirmation also helped to enhance the confirmability of the study. After that, I started decoding the information gathered and organising it into themes to answer the research questions. This was also a part of the data analysis process, which involved reading, coding, and categorising all the information generated from the interviews. This approach helped to identify patterns, themes, and trends that derived from the original data. In summary, the researcher was committed to using a constructive approach that ensured that the research findings are confirmable, and accurately represented the Senior Phase Technology teachers' experiences. I was excited to gain understandings into the research questions and look forward to sharing the solutions with the University and the DBE community.

3.8 Ethical considerations

The intention of this section was to expand on the ethical concerns in this study. In the setting of a scientific investigation, research ethics refers to “norms, values, and practices concerning the collection, analysis, and dissemination of scientific findings” (Aluko et al., 2018). Ethical considerations, therefore, entail a technique of being susceptible to people and respecting the privileges, obligations and liability of people who are participating in a study (Creswell, 2014). More specifically, this concept deals with protecting the well-being of research participants from any impairment or threat that would alter them “whether physically or psychologically as a result of their involvement in the study” (ibid.).

There was strict adherence to ethical standards during the study. In this process, the ethical considerations encompassed two distinct stages, namely, at the institutional

level and at the fieldwork level. Regarding the institutional level, this study underwent distinct stages of review at the Faculty of Education of the University of Pretoria. This included the review of the research proposal at departmental level in the Department of Science Education, Technology and Mathematics, and the subsequent application for ethical clearance before the data collection. The ethical clearance has been granted, identified by the following reference number: EDU206/23. Before initiating data collection from participants in the selected Ekurhuleni District rural schools, the researcher first secured ethical clearance from the University of Pretoria and obtained the necessary permission from Gauteng Department of Education (Appendix A).

Regarding the fieldwork level, this study attended to specific ethical practices, which are discussed below.

3.8.1 Permission from school principals

Permission from the principal was the first and pivotal step for the success of this research and this took place before embarking on data collection. The permission was obtained upon request to the concerned institutions through a permission letter. This letter was endorsed by the Faculty of Education Ethics Committee of the University of Pretoria. It provided details about the determination of the study, the sample, the way in which the data would be handled as well as the potential practical applications of the research findings (Boadu, 2021). Therefore, the researcher only accessed the rural schools investigated and Senior Phase Technology teachers after the approval of the permission by the principals concerned. The consent letter is in Appendix B.

3.8.2 Informed consent from participants

A researcher has the obligation to ensure that participants have proper information regarding their involvement in the research, make sure that they are competent of understanding the data and have the competence of free adoption. In this regard, Creswell (2014) states that it is imperative that all prospective participants be fully informed of the study's objectives, benefits, and potential drawbacks prior to their enrolment. The informed consent for this study was obtained by inviting the chosen Senior Phase Technology teachers to participate through informed consent letters (see Appendix C). These letters were endorsed by the Faculty of Education Ethics Committee of the University of Pretoria and delivered to the research participants

individually to request their participation in the study. The letter contained necessary information regarding their involvement in this investigation, namely, the determination of the study, their right to voluntary participation and withdrawal, the details regarding the semi-structured interviews, as well as the way their data would be dealt with. Senior Phase Technology teachers were also provided sufficient time to recite the informed consent letters and to sign it as a testimony of their consent.

3.8.3 Voluntary participation

According to Webb and Welsh (2019), participating in research studies should be voluntary. Therefore, through informed permission acquired from all participants in this study as discussed above, voluntary participation was achieved. In this regard, the participating teachers were given the right to withdraw from the research at any time without any consequences (Aluko et al., 2018). As per the informed consent agreement, all the gathered information involving the research participants will be destroyed immediately. The participating Senior Phase Technology teachers did not obtain any rewards for their involvement in the study.

3.8.4 Confidentiality

Confidentiality is defined as the caution in warranting data and information from participants secretly (Webb & Welsh, 2019). In Nieuwenhuis' (2016b) view, it concerns the researcher's bond to provide the guarantee to the research participants and the way to keep the foundation of information undisclosed. With that in mind, the researcher observed principles of dignity, sensitivity, and privacy in dealing with the research participants, and that was bound through the implementation of a confidentiality agreement. This ensures that the participants is inaccessible. Another key point is that the researcher believes that it is incumbent upon him to rigorously adhere to ethical guidelines that pertain to the conduct of research. This ensured that all data collected during the study were securely stored to prevent any unauthorised disclosure of confidential information to any individual within the different schools covered by this study. The data gathered were only accessible to the researcher and his supervisor.

3.8.5 Anonymity

In the setting of scientific research, anonymity indicates the process of hiding the real identity of research participants to protect them (Maree, 2016). This means to mask the identity of research participants and not connecting any raw data to a unique participant. In this study, anonymity was warranted by the utilisation of pseudonyms. In this respect, the following pseudonyms were adopted (also refer to Table 3.2):

- The ten Senior Phase Technology teachers were addressed as T1, T2, up to the T10.
- The five Ekurhuleni District rural schools were addressed as PS-1, PS-2, and PS-3 for the three primary schools, and SS-1 and SS-2 for the two secondary schools.

The use of these codes enabled me to mask the identity of the participating schools and Technology teachers and guarantee that any person who studies this research project will not be able to connect a particular teacher to his/her response.

3.9 Conclusion

The methodology adopted enabled me to unpack the Senior Phase Technology teachers' experiences of the utilisation of smartboards in Ekurhuleni District rural schools. The chapter covered the paradigm, research approach and design, the population and sampling. It also deliberated on data collection methods, analysis, development, and applicability of research instruments, and their use in the study. Additionally, thematic data analysis and a designated explanation of trustworthiness were provided, along with the ethical considerations related to the inquiry.

The employment of this particular research methodology allowed the researcher to learn a sum of lessons. The first lesson was that the success in realising research objectives lies in the selection of suitable methods and strategies. For example, in this study apart from gathering data through semi-structured interviews (Adams, 2015), the researcher also captured field notes throughout all interviews, which enriched the collected data. It also emerged that the researcher subjectivity performs a pivotal function in conduct a qualitative research. This study is entrenched in an interpretivist-

based inquiry; thus, researcher subjectivity enabled to interpret the meaning embedded in the data provided by the Senior Phase Technology teachers, which facilitate the data analysis. Another key point is that qualitative inquiry encapsulates the notion that researchers should act as the mechanism of data collection process, in particular, and the whole research more broadly. Lastly, it makes sense that qualitative research is complex in nature given its peculiarity in dealing with peoples' worldview. Thus, qualitative researchers should embody the idea that knowledge results from co-construction processes. This chapter drew and explained the research methodology, leading smoothly into chapter four which will be devoted in presenting the information analysis and research develops of this study.

CHAPTER FOUR

Data analysis and research findings

4.1 Introduction

The next section exhibits research discoveries on the utilisation of smartboards by Senior Phase Technology teachers in rural schools in the Ekurhuleni District. Data was accumulated via semi-structured face-to-face meetings with ten teachers from five schools, including three primary and two secondary schools. The primary schools were named PS-1; PS-2; and PS-3, whereas the secondary schools were named SS-1; and SS-2. The selected ten teachers in the five schools were named T1; T2; until T10. Field notes were also taken during afternoon visits to the rural schools (Campbell, et al., 2013), and the resultant data is infused into the discussion in order to substantiate the interview responses and fully contextualise the findings through the theoretical lens that underpins this study. The participating teachers were verbally interviewed at their workplaces and their responses were voice recorded. The collected data was thoroughly analysed to acquire a comprehensive interpretation of the experience under scrutiny from the participants' perspectives. Additionally, the data were scrutinised through the lens of the UTAUT model. These components served as building blocks for understanding how smartboards were adopted in the Technology classroom and implemented in the five rural schools in the Ekurhuleni District in Gauteng.

Consistent with the data analysis method utilised in this study, several themes and sub-themes emerged commencing the analysed data to address the research questions. The rest of this chapter is devoted to discussing those themes which constitute the research findings.

4.2 Senior Phase Technology teachers' perception of the utilisation of smartboards

This section discusses the findings concerning the perception of Senior Phase Technology teachers on the utilisation of smartboards in Ekurhuleni District rural schools. In this regard, three sub-themes emerged, namely, (i) experiences in the use of the smartboards; (ii) factors that influence the utilisation of smartboards; and (iii)

smartboard integration in the classroom. Utilising the UTAUT model, these results pertain to performance expectancy, which in the circumstances of this study represents to a teacher's belief that using technology like smartboards will help him/her to improve performance.

4.2.1 Experiences in the utilisation of the smartboards

The research findings suggest that Senior Phase Technology teachers utilise smartboards regularly. Some teachers interviewed showed that they were familiar with the smartboard software applications and knew how to use them. Furthermore, they believe that smartboards can contribute to improve classroom instruction. It was consensual among the research participants that the utilisation of smartboards is convenient and makes the work easier. This finding suggests that smartboards encourage the teaching and learning process among Senior Phase Technology teachers. The following statement from T9 confirms how utilising smartboards contributed to enhance his performance:

“Smartboards made teaching easier and interesting (exciting). My positive experiences are that the smartboard enhanced engagement and interactivity. Saving time from writing on the chalkboard allows me to teach and explain concepts thoroughly. It makes the lessons more learner-friendly, and it picks up the pace of the lesson. It stops me to give all the learners the same teaching experience. And at the same time my lessons are done fast in the classes with the smartboard”.

Similarly, most participants found that utilising smartboards saved time and helped the learners grasp content easily. When analysing the interview data, it became obvious that the participating teachers welcomed smartboards and that they were familiar to their utilisation. In this regard, T5 stated the following:

“Smartboards have improved my teaching and saves time since I do not have to spend time writing on the chalkboard. I see the use of smartboard as positive in the sense that learners can see and view and listen to the slides. The smartboards have made teaching more efficient in teaching learners. They relate better to these resources rather than physical textbooks”.

The statements above show that performance expectancy was the most instrumental factor in determining the intention to utilise smartboards among Senior Phase Technology teachers in Ekurhuleni District rural schools. Most participants reported that their experiences with smartboards significantly influenced their usage behaviour, allowing them to work more efficiently and explore new teaching methods.

Senior Phase Technology teachers found it effective to interact with their students through visual content, namely videos. Therefore, most research participants believed that this element maximises the performance in the teaching and learning process in smartboards. T2 shared his experiences as follows:

“Learners are more interactive as they see a different form of representation of the content. As a teacher, I get to touch on a deeper content knowledge through the use of videos and colourful pictures. Helps teaching a lot. I am able to use work time efficiently due to the smartboard. It allowed my lessons to be interactive, whereby learners can directly participate. It is easier for learners to learn if it is visual learning”.

In the same vein, this experience was corroborated by T8 in the following terms:

“The positive aspect of using a smartboard is that it allows learners access to visuals through videos. I can create interactive lessons, demonstrate real life examples, create, or combine videos and other websites into the lesson as well as manipulate the text on the screen”.

While the utilisation of smartboards expands the learning process, most research participants often appreciated the ability of these tools to contribute to inculcating critical skills in learners. This was remarked by T4 in the following terms:

“Smartboards encourage learners to participate in classroom activities; they instil critical thinking abilities in learners, while creating better communication and improve creativity”.

Based on the above, it may be argued that the utilisation of smartboards is linked to positive experiences among Senior Phase Technology teachers. During the interviews, most participants expressed that these tools were valuable in saving time,

reducing duplicate efforts, and enhancing overall work management. They reported positive experiences with smartboard utilisation, emphasising its contribution to effective learning and instruction.

4.2.2 Factors that influence the utilisation of smartboards

When Senior Phase Technology teachers responded on the issues that influence the utilisation of smartboards, the majority highlighted the negative impact of load shedding and unreliable internet access on their teaching. In this regard, T2 contended:

“These factors have a negative impact on my teaching as I would not be able to use the smartboard and present a lesson during load shedding. Experiencing load shedding is a struggle as the board requires electricity”.

Most teachers found it difficult to utilise smartboards in their classrooms due to internet access problems. They found that these factors represented a challenge to the use of smartboards given their prevalence. T5 was captured saying this:

“The negative aspects are load shedding and access to Wi-Fi. You may find that oftentimes we get stuck in using smartboards due to these issues. I feel like these are the main challenges in our school”.

At the same time, most teachers expressed their concern on the transition back to physical chalkboard when smartboards do not work. This was the case of T7 who stated that:

“When the smartboard does not work, the transition back to physical chalkboard is more challenging and affects the learner’s discipline”.

It appears that the lack of smartboards or the insufficient number of these tools add to the factors that affects their utilisation in Ekurhuleni District rural schools. Some of the teachers expressed concerns for the fact that not all classes have smartboards and that this limited their incorporation in the classroom. Hence, a significant obstacle remained: not all five schools were equipped with smartboards. As a result, those teachers at schools lacking this technology found themselves unable to utilise it, limiting their ability to engage learners in innovative ways. The individuals also

possessed a significant amount of teaching experience and had insights into the utilisation of smartboards for teaching and facilitating learning among learners. T6 voiced this concern by stating the following:

“The negative aspect is that not all the classes have smartboards. While I was waiting to receive my own classroom, I was using other teachers’ classroom with smartboards. Literally I don’t have a smartboard in my classroom”.

Based on the statements above, it is obvious that a sum of factors impact the utilisation of smartboards in Ekurhuleni District rural schools.

4.2.3 Smartboard integration in the classroom

The data indicated that there are several ways in which Technology teachers incorporate smartboards in their classrooms. Most participants recognised the importance of having ICT skills to enable proper smartboard incorporation in the Technology classroom. By integrating the smartboard into their lessons, Senior Phase Technology teachers believe that smartboards facilitate learner-to-learner communication, enhance learner performance, capture learners’ devotion, and influence them, and spark inquisitiveness in the learning process. T1 recalled this experience as follows:

“I integrate various learning styles into one experience. Learners are able to learn by seeing, hearing, and interacting with the smartboard through touch, and capture great ideas. I create multimedia presentations, teach collaborative problem-solving skills, keep all learners involved in learning and leverage online resources”.

In the same vein, Senior Phase Technology teachers utilised smartboards as a source of information. They considered smartboards highly beneficial as they motivated learners to develop an interest in the subject of Technology, improve their understanding, and reduce teaching time and workload. Most participants also highlighted how smartboards facilitated various learning styles and provided opportunities for interactive learning experiences, multimedia presentations, collaborative problem solving, and accessing online resources. Additionally, they

noted using smartboards to demonstrate real-life examples of the content being covered in class. In expressing this contentment, T10 remarked:

“I use the smartboard as the main source of information since it is preloaded with the content of the subject and having a variety of resources. I show videos, show different writing techniques and learners adapt to different modes of teaching. In my class the smartboard is used to show learners real life examples of the content being covered in class at that specific time”.

In addition, most teachers incorporated smartboards in their classrooms by using PowerPoint presentations as they felt excited when giving presentations in the classroom. Some participants in the five rural schools recognised the integration of smartboards with YouTube as a valuable tool for enhancing engagement and facilitating interactive learning experiences during presentations. T5 recalled the experience of applying unique styles of learning in his classroom by using smartboards:

“I use PowerPoint presentations of the lesson. Sometimes I will show images and videos. Or use a website for teaching and learning. I use Power Point slide shows and YouTube”.

These teachers believed that ICT skills had an influence on their professional development as Technology teachers because they could integrate smartboards effectively in their classrooms to improve the teaching and learning process. They found themselves working without pressure when they were able to apply ICT skills. As a result, most teachers with advanced ICT skills were able to integrate smartboards in their classrooms. It is argued that in order to incorporate smartboards in the school curriculum, it is essential to study and gauge teachers' approachability to improvement and the procurement of ICT competences (Butler-Adams, 2018). Thus, teachers who possess an advanced level of ICT are in a competent standing to integrate smartboards in their classroom.

Another dimension of smartboard integration in the classroom unpacked by this study which is silent in the literature is the pragmatic aspect. Some teachers used smartboards for practical tasks in the classroom. This benefitted the learners who struggled to grasp content with the use of chalkboards. Teachers regarded this as a

secret that contributes to leverage teaching and learning in the classroom. Teachers also felt that the utilisation of smartboards created an enabling classroom atmosphere for learners who did not understand theoretical content. This was attested by T2, who stated the following:

“I use the smartboard to show learners visuals of practical tasks. These videos can guide them when they make their models. While I was floating, I used the respective classes who have smartboards in order to record our enabling tasks for practical’s”.

The discussion above adds a nuanced layer on the performance expectancy in UTAUT model. The pragmatic element of performance expectancy is rarely discussed in the literature that explores this theoretical model. Furthermore, the separate ways the Technology teachers integrated smartboards in the classroom reinforces the role of these tools in catapulting the teaching and learning process by catering for different learning needs of students.

4.3 Easiness for Senior Phase Technology teachers to use smartboards

Venkatesh et al. (2003) argue that effort expectancy refers to the effortlessness of utilisation associated with technology. This is evident when technology teachers use smartboards in their classrooms, potentially influencing the adoption process. For the purpose of this study, four sub-themes were encapsulated in effort expectancy in the utilisation of smartboards, namely, (i) confidence in the utilisation of smartboards; (ii) easiness of utilising smartboards; (iii) usefulness of using smartboards in the teaching of Technology; and (iv) the effect of age.

4.3.1 Confidence in the utilisation of smartboards

Senior Phase Technology teachers were asked to share their experiences regarding the level of confidence in utilising smartboards in the classroom. Many observed that they were confident in utilising these tools which boosted their interaction with students. For this reason, most teachers were able to easily incorporate smartboards in their classrooms and improve communication with learners. T8 maintained that this confidence in utilising smartboards allowed him to access several types of learning resources:

“I am noticeably confident due to the fact that I am familiar with the use of the smartboard and know how to access different types of resources through different digital applications. I can say I am confident using the smartboards because this new era needs technology and better understanding of its applications. My confidence is because I understand technology very well”.

Some teachers believed that their confidence in using smartboards enabled them to improve communication with their learners, conducting further research and improve the assessment methods for them. This expanded their knowledge as Technology teachers. For this reason, some teachers were encouraged to break traditional teaching styles and embrace a new paradigm through incorporation of smartboards in their classrooms. In this regard, T1 mentioned that:

“My confidence with smartboards is good; through smartboards I am able to maintain improved communication with my learners, advanced research, fun learning, and effective assessment. I feel confident in using smartboards as it is applicable to the subject technology”.

However, there were few teachers who verbalised their lack of confidence in the utilisation of smartboards. These teachers maintained that it was difficult for them to familiarise themselves with smartboards due to the technicalities involved in setting these tools up. From this finding it appeared that the lack of in-service training for Technology teachers was a hindrance to the incorporation of smartboards in the classroom. In this regard, T7 was captured saying the following:

“As for the use of smartboards I am moderately confident, I know how to set it up and use it. However, sometimes the technicalities can be a hindrance to the teaching and learning. I am not that familiar with the technicalities”.

Similarly, this experience was corroborated by T3 who felt that his confidence was eroded by the smartboard system. However, he believed that this challenge will be overcome with time, which emphasises the role of working experience for teachers in dealing with smartboards. He said the following:

“At first, I did not feel confident using smartboards because it might be complex in the beginning, but you get used to it and learn new ways to use it with time.

It takes a while to get used to it. As soon as you understand it, then you realise all the splendid features that come with it”.

Interestingly, T9 was not confident at all in using smartboards. She often relied on assistance from her colleagues. She said:

“I am not confident in using smartboards as I always received assistance from our young fellow colleagues”.

Based on the discussion above, it may be argued that Senior Phase Technology teachers generally showed confidence in the utilisation of smartboards. For those who lack confidence, the findings reveal that lack of experience and in-service training were the main reasons.

4.3.2 Easiness of utilising smartboards

The easiness in utilising smartboards is at the centre of their acceptance, adoption, and proper integration in the classrooms by teachers. Most of the Senior Phase Technology teachers intend to incorporate smartboards in their teaching. Additionally, the depth of knowledge of Technology teachers is intricately linked to their confidence in using smartboards in the Senior Phase classroom. This assertion was found in this study when teachers were asked to elaborate on the easiness of using smartboards. In this regard, T1 remarked:

“I find it easier to use smartboards. It is part of my skills as a Technology teacher. I believed being familiar with distinct kinds of technologies was part of my training as a Technology teacher. Using smartboards enables me to create quizzes, polls or interactive lessons and allows learners to respond directly on the screen using touch. This promotes immediate feedback to both me and learners thus helping me to identify their strengths and weaknesses. Hence, for me smartboards are easy to use and make it easier for me to teach my students”.

Most Senior Phase Technology teachers believed that smartboards could improve their effectiveness and reduce administrative burden, leading to increased effort expectancy in using them. T4 mentioned that integrating various teaching techniques,

such as videos and images helps keep learners focused and engaged. He was captured saying the following:

“Yes, for me it is easy to use smartboards like the traditional method. With smartboards I can integrate different teaching and learning techniques such as videos, images etcetera, thus helps to keep learners more focused and engaged in the lesson. Time taken to write on the board for learners is minimised because I am now projecting the work and they copy from the smartboard”.

In the same way, smartboards were found to be easier to use by teachers for being time efficient. This allowed teachers to save their time and dedicate it to other learning activities. T10 recalled this advantageous element of smartboards in the following terms:

“The fact that everything is done electronically it helps me accomplish my task quicker and easily since there is not paperwork like we used to do. As mentioned, it saves time from writing on a chalkboard. I can go back and review lessons because they are stored digitally, and it allows me to include multiple sources within a lesson. With smartboards I don’t have to write on a blackboard, I can now focus that time on other learning activities. The smartboard enables me to cast the work instantly, no need to write from the scratch”.

However, some participants had different opinions. They cited challenges such as limited internet access and class time, as well as power outages, which hindered their ability to effectively utilise smartboards. This made it challenging for some teachers to incorporate smartboards in their classrooms since they felt it is inconvenient. T2 described his experience with regard to these difficulties as follows:

“No, it is not easy to use smartboards as there are challenges that hinder me from presenting a constructive lesson, such as the lack of internet access on the smartboard, limited class time and load shedding”.

The discussion above reveals that most Technology teachers found it easy to incorporate smartboards in their classrooms. As the findings demonstrate, for those teachers who noticed it challenging to incorporate smartboards in their classrooms it

was because of extrinsic reasons, i.e., factors beyond their capacity as Technology teachers.

4.3.3 Usefulness of using smartboards in the teaching of TLA

During the interviews, participants were asked to share their experience on the usefulness of using smartboards in the teaching of TLA. Most of the participants unanimously agreed on the benefits of utilising smartboards in the Technology classroom. They indicated that they had greatly enjoyed the usefulness of smartboards especially in the promotion of an enabling learning environment. T1 confirmed his excitement in such usefulness, when mentioning:

“Yes, smartboards are very useful, they boost learners’ engagement, and it helps me to accommodate different learning styles. I am also able to save, share and send lessons to learners; it makes the classroom atmosphere work for everyone and learners to succeed”.

Some teachers expressed feelings of appreciation for the fact that smartboards aid in the Technology curriculum which assisted them in tackling certain content. They felt that these benefits assisted their students in facilitating the grasp of content in the Technology subject. They suggested that education authorities should prioritise the adoption of smartboards in schools; this would improve learning outcomes. Teachers also maintained that their students were more engaged in a smartboard classroom compared with a traditional chalkboard. T10 expressed his feelings in this way:

“It is very useful to use smartboards in the teaching of technology since some of the concepts like systems and control, structures, electricity etcetera; they need visual illustrations and videos as well. I find it useful as it helps promote a different learning environment for learners as they are more interested in the lesson compared to using the traditional chalkboard”.

Similarly, T6 indicated that the use of smartboard alone is an example of technology. He stated the following:

“The use of the smartboard alone is an example of technology already, but it allows learners to engage more actively in the lesson. They are very useful.

Using smartboards makes teaching easier and more fun for the learners. It provides learners with an experience to interact more with one another and with concepts”.

Senior Phase Technology teachers who were involved in the use of smartboards believed that integrating these devices in their classrooms made them better Technology teachers. Ultimately, this contributed to uplift the ethos of professional practice in Technology education. As T5 recalled his achievement, he stated:

“Yes, it makes me a better teacher. For example, in the Technology subject some drawings are difficult to do. So, a smartboard helps to show learners a more accurate depiction of the content”.

The discussion above suggests that teachers also relied on smartboards to teach Technology content to their learners so as to enhance the learning process. Effort expectancy was achieved through the usefulness teachers found in incorporating smartboards in their classrooms. As can be noticed, this finding points to the benefits towards the learning process through enhanced learner performance.

4.3.4 The effect of age

Even though ICTs and smartboards, in particular, are meant to break the barriers related to age, this study found that the age of Senior Phase Technology teachers affected their attitudes towards smartboard utilisation. Consequently, the integration of these devices in the classroom was somehow compromised. In this respect, the merit of this research lies in the fact that it interviewed participants from different age groups, i.e., ranging from 20 to 50 years old, as pointed out in the previous chapter (refer to Table 3.3 in chapter three).

Some teachers shared their experiences and expressed concerns regarding the way the use of technology was affected by age. They believed that older teachers tend to stick to traditional methods, while younger teachers are more prone to utilise smartboards. T7 was very worried when his fellow colleague struggled to use a smartboard at school and asked him for assistance. The participant perceived this as an age-related issue:

“Being young helps you to understand the usage of smartboards. The elders find it difficult to operate smartboards because it was not there during their time. Being on the younger side of life allows me to explore the many ways to be creative in the classroom and reach more learners in terms of engagement”.

This view was corroborated by T2. This participant also observed elements of age from Technology teachers who did not incorporate smartboard technology in their classrooms. The participant recalled this experience by remarking:

“Yes, age does affect the use of smartboards as the older teachers are firmer on the traditional teaching methods and the younger teachers try to implement the use of the smartboard. I am still very young, and the use of the smartboard makes teaching fun. Due to my age, I am more computer savvy and familiar with how these devices work”.

As a result, participants felt that age had the potential to affect attitudes towards the use of smartboards. This means that effort expectancy of teachers towards smartboards increased with time as they age. T4 believed that this was the case in his school as he remarked:

“The older teachers tend to not use smartboards. A younger teacher is more inclined to use new ways of teaching. I am familiar with the newer digital applications and technology, and I believe it is because of my young age”.

In contrast, other teachers had different views. It also emerged that participants felt that their age did not affect the way they utilised and viewed the adoption of smartboards in their classrooms. Furthermore, participants cited that their age did not hamper their proficiency to learn innovative technologies. This experience was supported by T9 who mentioned that:

“Age does not affect the use of smartboards; not at all! I believe that practice makes perfection. Always remember, I quote “what we do with our hands we will remember, what is heard with our ears we tend to forget.”

What encouraged some participants was that learning innovative technologies and smartboards, in particular, had nothing to do with age. In this regard, T5 remarked:

“No, I don’t believe age is a factor because you are never too old to learn”.

Furthermore, some teachers mentioned that even though they were of old age, they could learn complex skills that enabled them to incorporate smartboard technology in their classrooms. T1 narrated his experience:

“No, for me age does not affect smartboard use. I have learnt and understood complex ICT skills, and this helps me explain complex ideas to my learners while using 3D modelling, animated graphs, and other various interactive activities”.

Based on the discussion above, the following may be deduced. Firstly, for some, age affected attitudes towards their use of smartboards in Ekurhuleni District rural schools. Secondly, most Technology teachers were open-minded enough to overcome challenges linked to the use of smartboards and their incorporation in their classrooms.

4.4 Stakeholders’ involvement in the utilisation of smartboards

From the literature review it became apparent that the integration of smartboards in the school curriculum not only rely on teachers who are key players, but also requires the involvement of several other stakeholders to ensure a successful implementation. Technology teachers need support from relevant parties such as their schools, the DBE, fellow colleagues, and learners if they are to successfully integrate smartboard teaching in their classrooms. In the UTAUT model, the involvement of stakeholders in the utilisation of technology underlies on social influence, explores the extent to which an individual perceives that other players believe he/she should use an innovative technology system (Venkatesh et al., 2003). In this study, the social influence sought to explain how the interaction of Senior Phase Technology teachers with knowledgeable others was significant in the utilisation of smartboards in schools. Three themes emerged as the findings namely, (i) lack of support of Department of Basic Education, (ii) support among fellow teachers, and (iii) learners’ feelings. These factors had an influence on the use of smartboards in Ekurhuleni District rural schools.

4.4.1 Deficiency of support of DBE

Technology teachers who participated in this study found themselves far from the support of the DBE, who in normal circumstances would provide appropriate support whenever needed. The findings reveal that the involvement of the DBE was not sufficient enough to ensure that smartboards could be integrated by teachers in schools. They found it difficult to obtain key skills that would allow them to incorporate smartboard teaching in their classrooms due to lack of interaction with the DBE. The teachers indicated that the interaction with the DBE is insufficient and that it did not allow promoting the successful implementation of smartboard programmes in schools. The teachers who received the training regarded it as a basic training and that it did not fulfil their professional needs. T10 said:

“The Department of Education officials does the training, and it takes about one hour and 30 minutes or less. I received basic training on the use of the smartboard and some applications that come with the smartboard. For me I don’t think the time is enough to learn key aspects of smartboard use. I personally could not grasp what I was expecting during that abbreviated time. Another issue is the frequency of their visits; you may find that we only receive training once in a while”.

This sentiment was echoed by other participants as well. They lamented the fact that the interaction with the DBE is not sufficient to address their needs as far as the use of smartboards is concerned. T4 was one of the participants who felt he needed much more involvement of the DBE officials in schools. He was captured saying the following:

“We have been relying on the training of the Department of Basic Education. Last training was in 2022. When the smartboard was introduced to my school, there was a basic training for the teachers to attend. It took only about 1 hour in one afternoon. My expectations were not fulfilled”.

Other teachers also indicated that the interaction with the DBE occurred only once when smartboards were introduced for the first time at school. They voiced their need to receive support constantly on how to use the smartboard technology effectively. Teachers also believe that more support from the DBE would deeply influence the

successful incorporation of smartboards in the classrooms. In support of this view, T7 remarked:

“The training from the Department of Basic Education was done once only. I have not received more training since then. I don’t know what is going on, but I really believe more support is needed in schools. This would bring about positive changes in the way we use smartboards”.

Similarly, T8 corroborated this view and remarked that he felt unappreciated as a Technology teacher. He struggled to believe that the DBE really wants the smartboard programme to be implemented in schools when it does not interact sufficiently with teachers who are primarily in charge of their use in the classrooms. He also wondered why after the initial training from the DBE when smartboards were introduced, the visit has not been constant. In this regard, he stated that:

“Training was only provided when the smartboard technology was introduced. I only remember that interaction with officials from the Department of Basic Education. The trainings are limited. I was more focused on how to use a specific programme and not multi programmes. That is not enough. I wonder why they have not been providing us with further trainings. I feel like our work with smartboard teaching is not being appreciated”.

The concern about the lack of enough interaction with the DBE was further verbalised by T2 who also corroborated that the training on smartboard use was only provided once and took only 30 minutes. Even though he benefited from the training, he felt like that abbreviated period was far from equipping him with skills and knowledge that are needed for the use of smartboards, adding that currently there is no one who is interacting with Technology teachers on the use of smartboards. He stated:

“I only received training once. The company that brought smartboards provided training and 30 minutes was spent on the training. Can you image, only 30 minutes, image! I did not grasp the training content at all. Honestly, I still need training on how to use smartboards. At the moment there is no one who provides training for us. As Technology teachers, training from the Department of Basic Education is a part and parcel of our work”.

While some teachers complained about the lack of presence of the DBE in schools for providing training, others did not receive training to use smartboards at all. They were frustrated with this situation although they found ways to upskill themselves with knowledge to go about incorporating these tools in the classrooms. In this regard, T9 said the following:

“I am sorry but unfortunately, we are two Senior Phase Technology teachers who did not have the privilege of training on how to use these smartboards in our classrooms as yet”.

However, despite this scenario they are still hopeful and expectant for receiving training that is lacking. This sentiment was voiced by T3 who stated:

“No, I have never received training for using smartboards. I am still waiting for that workshop to happen”.

The findings of this study showed that the involvement and support of the DBE in the use of smartboards in schools was weak. This influenced the adoption of smartboards and their integration in the classrooms by Senior Phase Technology teachers.

4.4.2 Support among fellow teachers

The findings of this study exposed that in order for Technology teachers to overcome the weakness associated with the lack of stakeholders' involvement in the use of smartboards; they resorted to support among themselves. When the participants were asked concerning the role of peer support, they permitted that they would utilise the smartboard for teaching and also educate their colleagues on the advantages of using the smartboard in all classroom subjects. Many researchers believe that school principals and their management teams should effectively lead instruction with decisiveness and visibility, acting as strong advocates for curriculum implementation to successfully improve their schools (Chabalala & Naidoo, 2021). The majority of teachers counted on their colleagues for support when going through the challenges of incorporation smartboards in the classroom, since they were far away from specialised people who could assist them such as the DBE officials. They found it easier to establish relationships with colleagues, because they were going through the same experience in terms of smartboard use, sharing the same difficulties and

professional backgrounds. It was evident that most teachers supported each other as a strategy to overcome the lack of stakeholder involvement in the use of smartboards in schools. T1 said:

“I support my colleagues by promoting the proper use of technology such as the smartboard through conversations, encouraging them to think about the benefits and to familiarise themselves with smartboards”.

This was essential to ensure the incorporation of smartboards in the classroom. Technology teachers supported each other because they shared challenges. Some who were more knowledgeable preferred to mentor their colleagues who were most in need because they acknowledged the lack of support from other stakeholders. In addition, they believed that by doing so, the way smartboards are integrated in classrooms among Technology teachers would be improved. In this regard, T6 was captured saying:

“I have educated my fellow colleagues on how to use the smartboard because I’ve mastered its use myself. Once they are familiar with how easy it is to use in terms of accessing resources, it will be used more”.

Some Technology teachers remarked that they preferred to spend most of their time with their fellow colleagues supporting each other in the use of smartboards because they could share ideas that nurtured their professional development. As a result, they did not have to struggle on their own without someone to share their challenges. Most importantly, Technology teachers appreciated each other and believed that they should use smartboards as teachers from the modern era. T8 said:

“We share ideas about different usage of the smartboard and how to better use it in lessons. I find it very interesting because we’ve been greatly supporting each other. This also has helped us because we’ve been able to overcome many challenges we face in the use of smartboards in the classrooms. We push each other because as Technology teachers we should not fall behind in this era of technological revolution”.

Some teachers explained that in order to overcome the weakness of the lack of stakeholder involvement in the use of smartboards in the school, they are willing to

provide continuous support to their fellow colleagues. This suggests that Technology teachers believed the fact that smartboard technology has the potential to leverage the teaching and learning process as they integrated it in their classrooms. The following quote from T2 captures the essence of this sentiment:

“I will encourage my colleagues to use the smartboard by providing them with a presentation on how to use the smartboard and also give continuous support when they need help. I would bring them to my class and show them how I teach with the smartboard. I would also show them how flexible it is in teaching methods”.

By supporting each other, Technology teachers believed in the need for stakeholder involvement in the use of smartboards in schools. They emphasised the necessity of supplying professional development for teachers, including training on the technical use of these devices and their integration into Technology education. T10 voiced this concern by emphasising the positive impact of the smartboard on lesson planning in which he highlighted the advantage of having access to all important documents, thus reducing the risk of misplacing hard copies in class and eliminating the need to bring a laptop to class. He said it in the following terms:

“I think it is important and fellow colleagues must be encouraged and to be given more training on how to use the smartboard. I would highly recommend the use of the smartboard as it enhances regular prior planning. You would have access to all your important documents as one, and that way your hard copies don't get misplaced in class, as it is not safe to have a laptop in class”.

The data collected points to a dispute over the eminence of professional growth training and support for teachers in South African schools, which is categorised as an influencing factor to the ineffective utilisation of smartboards in technology education.

4.4.3 Learners' feelings

When smartboards were introduced in schools and integrated in the classrooms, learners responded positively to the new way they were taught. This response reinforced the belief among Senior Phase Technology teachers that the use of smartboards was indeed necessary and that it had come with educational advantages.

Teachers shared their experiences regarding the ways their learners felt enthusiastic and motivated when using smartboards. T9 remarked he could teach his learners skills that would not be possible with the use of textbooks alone as a resource. He said that his learners learned skills that go beyond the borders which came with enthusiasm among them.

“I think it is useful to use smartboard in my classroom. I can assist my learners to acquire some skills that go beyond the borders of which wouldn’t be possible only with the single use of the textbook as a resource. My learners have become much more motivated. They are very happy as smartboards makes them eager to learn”.

This sentiment was echoed by T2 who, in corroboration, indicated that his learners were eager to participate in the lessons since the smartboards were introduced in the classroom. He was captured saying the following:

“When the smartboard is used, learners are eager and excited to participate in the lesson, as it provides an interesting learning environment different from traditional teaching methods. The difference between the two classroom environments concerning learners is noticeable and by no means can be denied”.

Teachers also indicated the acceptance of smartboard technology by learners. They recognised that learners are more engaged when these tools are incorporated in the classrooms. In this regard, T7 ventilated his contentment in the following terms:

“They are happy and accepting of the smartboard. They are more engaged and interact more when the smartboard is used as a main resource of teaching and learning in Technology. The learners enjoy the opportunity to actively participate in lessons. The visual appeal excites the learners”.

In the same vein, teachers believed that smartboards create an interesting learning environment which empowers learners. T2 remarked that his learners became more active and empowered since smartboards technology formed part of his classes. He said the following:

“The learners are eager and excited to engage in a lesson when the smartboard is used, as it creates an interesting learning environment different to the traditional forms of teaching. I am sure that my learners have become very excited and empowered. They are very enthusiastic about the use of the smartboard”.

Another key component is that smartboards enabled learners to acquire computer skills. T6 remarked that his learners became more computer literate. He was satisfied with the fact that smartboards allowed learners to familiarise themselves with different learning resources. He said:

“It equips learners to become more computer literate and familiarise them with different learning resources. That’s how I feel my learners are becoming”.

Based on the above, it may be deduced that the incorporation of smartboards in the school curriculum had a positive influence on learners in Ekurhuleni District rural schools.

4.5 Available support tools to ensure optimal use of smartboards

Another finding of this study pertains to the available support tools that addressed the imperative of the use of smartboards in Ekurhuleni District rural schools, known as facilitating conditions. The literature suggests facilitating conditions, as one facet of the UTAUT model, measures the extent to which a person who is a technology user believes the available technical infrastructure and organisation exists to support use of a technology system (Remper & Millenger, 2015). During the interview conducted with the selected Senior Phase Technology teachers, three sub-themes emerged from the answers regarding the way these teachers believed a range of resources in their schools enabled them to incorporate smartboards in the classrooms. These sub-themes include (i) relevance of the available resources for the utilisation of smartboards; (ii) challenges in the utilisation of smartboards in teaching and learning; and (iii) technology available to learners.

4.5.1 Relevance of the available resources for the use of smartboards

When smartboards were introduced in schools, the DBE provided resources to facilitate the utilisation of these tools by teachers in their classrooms. These resources enhanced the incorporation of smartboards in the school curriculum. The participants found the available resources relevant for the teaching and learning in their subject. They also indicated that these resources are easily accessible in an extensive range of formats. However, it is significant to note that these resources consist mainly of educational and instructional resources, such as YouTube videos, guiding guides, and related materials available for teachers if they wished to use them in their work with smartboards. T4 confirmed that by using these resources, he began to accommodate diverse learning styles of his learners:

“On the Department of Basic Education website and Open Internet there are many resources available, for example, YouTube provides multiple ways of teaching a concept and ways to appeal to the different learning styles of the learners. I have been using those”.

Similarly, the relevance of the available resources in accommodating different learning styles of learners was corroborated by T5. This participant agreed that the available resources made it easier for him to work with students. He remarked:

“For my subject, I am able to customise my teaching approach depending on the topic I will be working on with learners. The available resources also allow me to take into consideration the learners’ different learning styles. This makes my work easier”.

T10 appreciated the available resources provided by the DBE and added that they align with the annual teaching plan. He believed that awareness is important to improve use the available resources among Technology teachers. This implies that the resources available in secondary schools contributed to the realisation of the goals in Technology subject. T10 said:

“The availability and relevancy of resources in the subject is exceptional, for example the Department of Basic Education has provided planning, and it is relevant to the annual teaching plan”.

Technology teachers believed that the available resources not only contributed to the utilisation of smartboards in teaching and learning, but also were relevant for Technology education. This, in turn, would enable learners to easily understand the content they were being taught. T6 said that this would encourage learners to be more engaged:

“The resources made available for teaching Educational Technology with smartboards is very relevant in my specific subject. All smartboards come with different books, preloaded study guides, learners’ books, and other relevant resources. The resources are easily accessible because it is preloaded, and internet search engines make it easier. These resources help a lot as the content is relatable to technology”.

In addition, libraries were also used by some teachers as one of the resources with which the use of smartboards was facilitated. Furthermore, libraries were used by learners to consult information interrelated to the utilisation of technology, which would facilitate the incorporation of smartboards in the classrooms. This was voiced by T4 from in the following terms:

“We are still applying all technological skills manually. My learners go to library for research, and designing models occurs in the classroom. In using libraries, the learners can get to learn stuff related to technology which will assist them when they are in a smartboard classroom”.

The discussion above suggests that the available resources in schools were relevant for the use of smartboards. Most of these resources consisted of open and easily accessible electronic materials provided by the DBE for Technology teachers. Teachers used those available resources to facilitate the integration of smartboards in their classrooms, which was found to be relevant for the Technology subject as well.

4.5.2 Challenges in the utilisation of smartboards in teaching and learning

It is widely agreed that rural schools still face challenges in providing internet access to all classrooms (Hardman, 2019; Etcuban et al., 2020; Al-Emran & Granić, 2021). Since this study was conducted in rural areas, this premise was not an exception. The findings of the study expose that the absence of internet presented the biggest

challenge to use smartboards among Technology teachers since most participants emphasised their struggle to incorporate these devices in the classroom. It was evident that the teaching and learning of TLA was negatively affected, as was their learning outcomes expected for learners. They also found it challenging to utilise smartboards due to the lack of equipment that connects personal computers to smartboards to ensure a smooth usability of this technology. For this reason, during interviews participants expressed the necessity for the educational authorities to improve the conditions in schools in order to facilitate the implementation of smartboard technology. This was essential to the teaching and learning process. In this regard, T7 said the following:

“The school does not provide Wi-Fi for the use of the smartboard; teachers still face limitation to fully use smartboards. All classrooms need Wi-Fi, laptops, and the proper software for smartboards”.

Similarly, the same sentiment was ventilated by T6. He added that frequent load shedding and lack of training hindered the use of smartboards in his school. He urged that these factors should be attended to if the use of smartboards is to be successful.

“The changes needed for maximal use of smartboards include the use of an external power source, for example like a generator, Wi-Fi access, more time usage, and more training. Experiencing load shedding is a struggle as the board requires electricity. We have been facing these challenges. A stable Wi-Fi connection would be important so that the smartboard can be used to maximum capacity”.

T4 also echoed this deficiency. This suggests that these challenges affected the use of smartboards in teaching and learning in a profound manner. He stated:

“What is needed is more training. Number two, teachers need access to laptops from the school. All teachers should be using the smartboard. Internet is also lacking in the school as it would also be nice to have it to use and access more educational resources”.

Schools also faced the challenge of lacking smartboards installed in some classrooms. They felt frustrated with the struggle they face whenever they needed to utilise these

tools for teaching and learning. T5 mentioned the issue of social justice saying that the way in which teachers are treated, is unfair. He remarked the following:

“Not all of the classrooms have smartboards and I feel like that is unfair towards the teachers”.

In the same vein, this sentiment was echoed by his colleague from SS-2 (T10). This participant expressed concerns for the fact the smartboards are not installed in all the classrooms and indicated that he would be satisfied if at least two classes were sharing the same smartboard. He stated:

“There is still a need for more rooms to be installed since some are not installed yet. We would love to have smartboards installed in one of the two Technology classes as we work perfectly together as a team”.

Thanks to the technology kit provided by the DBE which assisted in the teaching of Technology content and provided the information crucial for the utilisation of the tools, some teachers’ lives are easier. This was indicated by T7 who stated the following:

“We received apparatus from the Department of Basic Education in the form of a technology kit. The resources in this kit supported learners in building forklifts for project 1, formal assessment task 1”.

There were other teachers who found alternatives by creating a WhatsApp group to share resources and overcome the challenges associated with the incorporation of smartboards in the classroom. This was the case of T4 who indicated:

“The resources are provided to us by the Department of Basic Education, and we have also had a Technology WhatsApp group where we share resources and to stay on the same page. Sometimes I use Google for free resources. I Google concepts relevant to my subject and I have subscribed to a teacher database of resources called e-classroom”.

This finding indicates that there is still prevalence of challenges in rural schools concerning the use of smartboards, although there were some alternatives that allowed teachers to ensure the integration of smartboards. The main challenges are related to the particular socio-economic context in which the schools are located. This

is a wakeup call for the Government to pay more attention to rural areas and improve overall conditions in schools.

4.5.3 Technology available to learners

The data reveal that learners do not utilise smartboard technological tools in schools. During the interviews none of the teachers specifically stated that learners use the smartboard during Technology classes, but they did mention that learners do receive some form of technology education through computer classes or tablet sessions. As a result, learners resorted to use their own mobile phones for investigation once they were at home since the school policies do not allow the utilisation of mobile phones in class. This information was shared by T10 who added that learners were not exposed to computer literacy.

“Our learners are using their own mobile phones at home for investigation tasks as it is not allowed in class. There is little exposure to computer literacy or technological devices in class. Learners have computer class once a week where they do English quizzes and games of which is not enough”.

For this reason, teachers indicated that the technology available to learners is limited. T8 from the same school lamented for the fact learners only relied on textbooks as they do not have access to technologies in school. This affected the academic achievement of these learners. He remarked the following:

“The learners’ resources are limited as they only have access to textbooks, they do not have or use smart technologies like iPad or Laptops. Learners have computer class for an hour a week and they are thought basic computer use, but this is not enough for them to learn the necessary skills needed”.

The schools received technological devices such as tablets from Clicks Foundation for learners. However, despite the presence of these tools, learners have not been able to benefit fully from technology use due to overcrowded classes, which limits the acquisition of skills. T6 said that the learners have had access to these tablets for use once a week:

“Clicks foundation offered tablets for the school and they are available and used weekly. But it is very limited because of the too many learners in a class. They use them to reinforce reading skills; learners learn to navigate digital platforms, use productivity tools, collaborate online, and communicate effectively”.

The discussion above suggests that there is no exposure to computer literacy or electronic devices in the classroom for learners. This represents a hindrance for the implementation of smartboard technology in the school curriculum. There is, therefore, a need for the education authorities to rethink the strategies to warrant the accomplishment of implementation of smartboard technology in schools.

Overall, the data of this study divulge that upon introduction of smartboards in schools, teachers were confident about the utilisation of these technologies and found it useful in teaching and learning. However, there was a weak stakeholder involvement, especially the DBE, to support teachers in schools. Lack of such support forced them to resort to supporting among themselves. Load shedding and internet issues emerged as an obstacle to the utilisation of smartboards in schools. The data also revealed that the integration of smartboards in the classroom was welcomed by learners. However, there is still a limitation in the access and use of both these devices and other ICT equipment in schools by learners. The study argues that in order to warrant optimal functioning of smartboards programmes in schools, both teachers and learners should be placed at the centre of such an intervention.

4.6 Discussion of the research findings

The section offers an analysis of the research outcomes regarding the experiences of Senior Phase Technology teachers in Ekurhuleni District rural schools in using smartboards. In the discussion, the findings are examined taking into account the research questions, the UTAUT model and the previous literature.

4.6.1 Senior Phase Technology teachers' perception of the utilisation of smartboards

The literature examined in this study indicated that the use of smartboards is closely associated with acceptance factors by teachers (Mwapwele et al., 2019; Raman et al., 2024). The findings revealed that Senior Phase Technology teachers demonstrate an encouraging outlook towards the utilisation of these devices. Most teachers reported

that they believe that the utilisation of smartboards can help to improve the teaching and learning and the teaching performance. It has been determined that rather than using a standard set of practices, teaching encompasses sequences of pedagogical conclusions that are context specific (Tefo & Goosen, 2024). In this study, the teachers continuously reflected on their work, observed their learners to assess their learning progress, and modified their teaching methods accordingly. Furthermore, the Senior Phase Technology teachers engaged in extensive discussions about their teaching approaches using smartboards. The positive school atmosphere was attributed to the favourable attitudes towards the utilisation of smartboards as an instructional instrument. This perception is in line with findings from other studies in South African rural schools, which indicate that the incorporation of technologies in the classroom is associated with teachers' attitudes and knowledge levels (Makgato, 2014; Chisango et al., 2020; Zincume & Marimuthu, 2022).

The Senior Phase Technology teachers from the Ekurhuleni District rural schools were familiar with the smartboard software applications and knew how to use them. For instance, it was evident in the way teachers accepted the idea of integrating smartboards in their classrooms. These tools encouraged them and fuelled their confidence in teaching and learning of the TLA. Chisango et al. (2020) indicate that teachers' acceptance towards ICTs in general are affected by their attitudes as well as other important factors such as their information about, and experience with the particular ICT tool. The confidence and optimism of teachers towards the use of smartboards allowed them to incorporate the device in planning, teaching, and engagement with their learners.

The study also found that smartboards were easily accepted among teachers for their flexibility in enhancing engagement and interactivity in the classrooms. Teachers reported that these devices allowed them to save time from writing on the chalkboard and to teach and explain concepts thoroughly. They verbalised the fact that the use of the smartboards makes the lessons more learner-friendly, which emphasises the learner-centred pedagogical approach as one of the positive aspects of this technology. This would help their learners grasp content easily and enhance the teaching experience in the classroom. This finding corroborates with that of Haelermans and Ghysels (2015) who identified that a student-oriented pedagogical

approach, positive attitude towards smartboards, and technology experience positively influence the innovative use of smartboards by teachers.

Since the perception of teachers was that smartboards have made teaching more efficient, in terms of the UTAUT model, this study illustrate that performance expectancy was the utmost dominant factor in determining the intention to utilise smartboards among Senior Phase Technology teachers in Ekurhuleni District rural schools. Teachers reported that their experiences with smartboards significantly influenced their usage behaviour, allowing them to work more efficiently and explore new teaching methods. Therefore, it has been reported that teachers' willingness to incorporate smartboards in their classroom is greatly influenced by performance expectancy (Botero et al., 2018; Almaiah & Al-Mulhem, 2019; Francisco & Swanson, 2018).

Given that smartboards are essentially visual tools; their utilisation in the classroom is also linked to the triggering of visual senses to students, thereby enabling permanent learning (Aktas & Aydin, 2016; Ndlovu, 2016). In this study, Senior Phase Technology teachers discovered that using visual content was effective in engaging with their learners, enhancing the teaching, and learning process. The teachers perceived that videos and colourful images in smartboards encouraged learners to participate in classroom activities while creating better communication and improving creativity. Indeed, the literature has demonstrated that teachers adopt and utilise technology tools because of an expectation of enhanced teaching and learning productivity as well as ease-of-use experiences (Rempel & Mellinger, 2015; Mun, et al., 2019). This suggests the need to rethink the strategies for implementation of these tools in Ekurhuleni District rural schools.

As in agreement with other studies conducted on the African continent and in South Africa on the utilisation of smartboards (Berlinski & Busso, 2015; Lehrer et al., 2019; Chisango et al., 2020; Nwokonko, 2023), poor internet access and electricity issues proved to be the main challenge faced by Senior Phase Technology teachers in Ekurhuleni District rural schools with regard to the incorporation of smartboards in the classroom. As in other studies, this study confirmed that these factors have an adverse bearing on teaching and learning. The literature shows that load shedding and lack of Wi-Fi are among the main drawbacks of the utilisation of smartboards (Al-Emran &

Granić, 2021). It is interesting to note that these factors were found in this study as a result of the niche area of rural context in which the investigated schools were located.

One finding that is not salient in the literature is the teachers' use of smartboards for practical tasks. These previous ICT skills the teachers possessed enabled them to effectively integrate smartboards in their classroom to augment the teaching and learning process. This furthers the previous studies that explore various ways in which teachers incorporate smartboards in their classrooms (Butler-Adams, 2018; Baharuldin et al., 2019; Tefo & Goosen, 2024).

4.6.2 Easiness for Senior Phase Technology teachers to use smartboards

The study conducted by Charlotta (2022) has found that teachers' attitudes towards ICTs govern their acceptance of smartboards' utility as well as their self-confidence. This claim is supported by the conclusions in this study which revealed that Senior Phase Technology teachers were confident in utilising smartboards. These teachers believed that their confidence in using smartboards enabled them to improve communication with their students and expanded their knowledge. For this reason, some teachers easily embraced the incorporation of smartboards in their classrooms.

The study also found that some teachers did not have confidence in using smartboards. This was because of the technicalities associated with these devices. Furthermore, the data analysis establishes that the weak confidence of Technology teachers to use smartboards was hindered by the lack of in-service training on smartboard incorporation in the classroom. In this sense, the results confirm Doyle et al.'s findings (2019). Among the factors contributing to teachers' confidence in ICTs include the convenience of hardware and software, an absence of technical backing, a deficiency of training time, technophobia, and staying current with technology and how it is utilised in the classroom (ibid.). However, some teachers indicated that they got used to smartboards with time, which contributed to overcome their weak confidence. This implies that working experience plays a fundamental role in equipping teachers with confidence to use smartboards. It is for this reason that Bulman and Fairlie (2016) argue that teacher' beliefs towards the use of smartboards can affect the adoption of these devices and their integration in their classrooms.

Most of Senior Phase Technology teachers found it easy to use smartboards. They believed that incorporating smartboards in their teaching can boost learners' confidence in classroom activities. They found it easy to use smartboards due to their previous knowledge and skills about technology. For this reason, they used smartboards in their classrooms for creating quizzes, polls, or interactive lessons and to accommodate the different learning styles of their learners. The fact that smartboards are used electronically helped teachers to accomplish their tasks in a time efficient manner. In this regard, the data also revealed how teachers saved time from writing on a chalkboard and included multiple sources within a lesson, thereby capitalising their time (Nishanthi & Ravindran, 2020). Indeed, the literature attests to the fact that smartboard teaching is more effective than traditional blackboard teaching, allowing for seamless revision of material and creating a highly interactive learning experience (Cuhadar, 2018; Hardman, 2019; Sabiri, 2020; Al-Emran & Granić, 2021), thereby corroborating with the findings of this study.

Furthermore, the usefulness of using smartboards in teaching and learning was another finding unpacked by this study. Teachers unanimously agreed on the advantages of utilising smartboards in the technology classroom. They indicated that they had greatly enjoyed the usefulness of smartboards especially promoting of enabling learning environment. Moreover, some teachers indicated that smartboards are important in the Technology curriculum due to the related contents of the Technology subject and the functionalities of these devices. This assisted learners to grasp contents in Technology and created a favourable atmosphere work for learners to succeed. This finding mirrors the study conducted by Eynel and Koc (2023) who found that smartboards fostered technology skills among secondary school learners. In the same vein, the study reveals that the usefulness of smartboards was associated with ability of these tools to augment the teaching and learning process. It may be argued, therefore, that in terms of the UTAUT model, effort expectancy was achieved through the usefulness teachers found in incorporating smartboards in their classrooms. As can be noticed, this finding points to the benefits towards the learning process through enhanced learner performance. This is in alignment with the body of knowledge that has supported the idea that smartboards increase the concentration of learners due to their visual characteristics, thereby contributing to the enhancement

of their learning and academic triumph (Bıçak, 2019; Daya & Laher, 2020; Scherer & Teo, 2019; Boadu, 2021).

Another finding uncovered by this study which was not prominent in the literature is the effect of age in the utilisation of smartboards. The data uncovered that the belief of Senior Phase Technology teachers towards age affected their attitudes towards smartboard utilisation. Consequently, the integration of these devices in the classroom was somehow compromised since some teachers believed that older teachers tend to stick to traditional methods, while younger teachers are more prone to keep abreast and utilise new technologies. Among the psychological constructs of the UTAUT model and the intention to use a technology, gender and age play an important role as conducting variables, according to Venkatesh et al. (2003). According to Kini & Podolsky (2016), despite contradictory evidence, teachers' effectiveness increases with experience. In furthering this view, this study found that Senior Phase Technology teachers' attitude towards age was a strong predictor of classroom smartboard utilisation. This affected the way they integrated and implemented these tools in the Technology classroom.

4.6.3 Stakeholders' involvement in the utilisation of smartboards

Venkatesh et al.'s (2003) UTAUT model was utilised to verify the influence of stakeholders (i.e., social influence) on the use of smartboards by Technology teachers. According to this theory, the utilisation of technology is motivated by other people, which in the context of this study include key education stakeholders. In this study, the involvement of the DBE, teachers' support, and learners' feelings are the indicators identified for social influence. Venkatesh et al. (2003) further indicate that social influence becomes possible when there is sufficient interaction between technology users and knowledgeable stakeholders. When translated into the circumstances of this study, this ensures the belief and adoption of innovative technologies by Technology teachers, as is the case of smartboards.

This study discovered that there was a lack of assistance from the DBE. The data revealed that the involvement of this institution was not sufficient enough to ensure that smartboards could be integrated by teachers in schools. Most teachers indicated that the training provided to use smartboards occurred only once and consisted in

basic content which did not suffice their professional needs. Apart from the sporadic visits, teachers indicated that the time during the session of training was short, ranging between thirty minutes and an hour and a half. It also emerged that most of the training's teachers received took place when the smartboards were introduced in schools for the first time. Teachers voiced concerns about the weak support provided by the DBE and believed that more support would greatly contribute to the thriving incorporation of smartboards in the classrooms. This finding affirms the argument made by Tiba and Condy (2021) that the triumphant adoption and functioning of educational technology in the school curriculum depends convincingly on the teachers' verification. In the same vein, research by Dlamini (2022), Kolobe and Mihai (2021), and Wirch (2021) emphasise that participants in their studies exhibited a lack of readiness to utilise interactive activities due to inadequate professional development initiatives. Therefore, this study aligns with the aforementioned findings and emphasises the need for professional development programs to empower teachers to excel in their practice through continuous professional progress opportunities, as opposed to sporadic, one-time workshops that offer minimal benefits towards enhancing classroom practice.

Another finding uncovered by the study is the support among fellow teachers as a way to enhance the use of smartboards. Teachers intentionally supported each other as a response to the weak involvement of other stakeholders, especially the DBE. By doing so, many challenges faced regarding the use of smartboards were overcome among peer support which was essential to guarantee the amalgamation of smartboards in the classroom. This reinforces the view that social influence plays a critical role in ensuring the acceptance and implementation of technologies as emphasised in the UTAUT model.

Another facet in which social influence was attained in this study was through learners' feelings towards the use of smartboards. The data indicate that the reaction of learners as an effect of smartboard teaching motivated teachers to utilise these tools. They were enthusiastic and motivated with smartboard teaching. At the same time, when smartboards were used learners became eager and excited to participate in the lessons. This response reinforced the belief among Senior Phase Technology teachers that the integration of smartboards is fundamental in schools. The previous

literature shows that incorporating technology like smartboards into the curriculum can arm learners with essential competences for the increasingly technology-driven workplace and education facilities (Fahrman, 2021; Gumbo, 2020). The literature also concurs that the advent of smartboards came with proven benefits in terms of triggering better learning environment for learners (Bulman & Fairlie, 2016; Tondeur et al., 2017; Mihelj et al., 2019). It is an established fact that these means have an encouraging sway on learner engagement (Francisco, & Swanson, 2018; Mihelj et al., 2019; Kolobe, & Mihai, 2021). However, during the interview with teachers there was no evidence that shows learners are actually using the smartboards during Technology classes. This could raise questions for further research.

4.6.4 Available support tools to ensure optimal utilisation of smartboards

This study found that schools did not have enough infrastructure to facilitate the utilisation of smartboards by Senior Phase Technology teachers. The data revealed that the absence of internet and load shedding were the main challenges to utilisation smartboards in schools. Teachers of Senior Phase Technology encountered difficulties such as limited resources, inadequate training, lack of Wi-Fi connectivity, power outages, and lack of technological support in using the smartboards. As a consequence, these teachers could only occasionally display digital content and were unable to fully utilise the smartboards in the Technology classroom. It was evident how the incorporation of smartboards in the classrooms was compromised and negatively affected the teaching and learning in the Technology subject. This finding is in agreement with many scholars who affirm that rural schools still face challenges in providing internet access to all classrooms (Hardman, 2019; Etcuban et al., 2020; Al-Emran & Granić, 2021). For this reason, this study emphasises the important role of resources, training, and support in effectively using smartboards in Senior Phase Technology classrooms in rural schools in the Ekurhuleni District. Despite the presence of smartboards, the study found that some teachers did not fully utilise them due to the challenges mentioned above.

The study further highlighted the deficiencies related to technology available to learners. In this regard, the findings showed that learners do not utilise smartboard technology in schools and that they have limited access to technology in the classroom. One of the main reasons is the shortage of sufficient technological devices

to accommodate all learners. They only have access to computer classes once a week. As a result, these learners' resort to use their own mobile phones to compensate for the limited exposure of technology in schools. The expected scenario was that smartboards could improve learner performance, encourage learner-to-learner collaboration, and assist in developing critical thinking skills (Taghizadeh et al., 2020). It was also expected that this would reduce the administrative burden on Senior Phase Technology teachers and make instruction more engaging compared to traditional methods (Nikolopoulou, 2020; Boadu, 2021; Fitriani, & Apriani, 2024). Thus, this deficiency hindered the employment of smartboard technology in the school core curriculum in the studied schools.

Overall, this investigation revealed that inadequate training, and limited availability of smartboards in classrooms contributed to the experience that the utilisation of smartboards hinders teaching and learning. The findings align with that of Fitri and Putro (2021) who emphasised the positive perception of integrating ICT tools like smartboards due to their user-friendly nature. Thus, it stands to reason that the actual classroom smartboard usage in Ekurhuleni District rural schools remains limited. The data indicates that the slow response time from the GDE is hindering the sustainability of smartboards, thus affecting the teaching, and learning processes.

4.7 Field notes

During the interviews, the Senior Phase Technology teachers displayed a diverse spectrum of responses to the questions posed. The teachers showed confidence and provided quick responses when discussing the utilisation of smartboards for teaching and learning. However, the dynamics changed when the conversation shifted to how smartboards enhanced their content knowledge. At this juncture, there was a noticeable pause in their responses, indicating a need for additional contemplation. The teachers' reactions varied widely, with T9 appearing puzzled due to limited experience with smartboards, while others seemed to become less engaged as the interviews progressed. Notably, T7 stood out for her active and enthusiastic participation, injecting energy into the discussion. Despite the evident seriousness reflected in their facial expressions, the teachers maintained a sense of calm and composure throughout, utilising subtle gestures to convey their responses. These

keen observations correlate closely with the insights gleaned from the data analysis of the interviews.

4.8 Conclusion

The responses of the Senior Phase Technology teachers were cited in this chapter, and this was followed by the findings linked to the literature. A brief description was provided on how the Senior Phase Technology teachers reacted when questioned about their use of the smartboard, their responses throughout the interviews, and their body language and gestures. The aim of this study was to explore how experienced Senior Phase Technology teachers perceive their skills and teaching techniques utilising the smartboard, analysing them within the UTAUT framework. All participants were experienced Senior Phase Technology teachers in rural schools in the Primary and Secondary Ekurhuleni District, with several years of teaching experience. Through an examination of these teachers' practices, the study illustrated how they approach the field of technology, draw on their experiences, and incorporate these experiences into their teaching approaches. The findings exposed that Senior Phase Technology teachers utilise smartboards to deliver technology content, particularly for Senior Phase Grades 7-9 in South African Technology education. When using smartboards in the classroom, it is critical to contemplate various important aspects such as balancing practical and theoretical elements, assessment methods, subject content areas, design skills and communication, adaptability and real-world scenarios, smartboards, and interaction (Kolobe & Mihai, 2021; Wirch, 2021). To summarise, the incorporation of smartboards involves striking a balance between theory and practice, addressing challenges, and ensuring that digital tools enhance learners' understanding and engagement. This approach has the capability to aid to the establishment of a more effective learning atmosphere for learners.

CHAPTER FIVE

Conclusions and recommendations

5.1 Introduction

This chapter provides the suggestions of this study. The chapter begins by providing a summary as well as general idea of the main research findings, and then moves on to discuss the theoretical implications. The chapter presents specific recommendations based on research outcomes. These recommendations are gained from a systematic analysis of the data and are intended at informing future actions and decisions. In this respect, the recommendations involve the following domains: (i) the Department of Basic Education (DBE); (ii) school leadership teams; and (iii) suggestions for further research. Furthermore, the theoretical implications, limitations, and contributions of the study are also discussed separately. The chapter wrap up by summarising the main points and implications of the study, ensuring that the reader gains a comprehensive understanding of the research significance.

5.2 Summary of the research findings

This section identifies the key findings that emerged from the study and articulates how they align with the research objectives. These findings are specific to each research questions and are, thus, argued individually in the following subsections.

5.2.1 How do Senior Phase Technology teachers in Ekurhuleni District rural schools perceive the utilisation of smartboards to enhance the teaching and learning process?

The research results confirm that Senior Phase Technology teachers were familiar with the use of smartboards. They believe that smartboards contributed to improve classroom instruction and made their work easier. The teachers also affirmed that using smartboards saved time and helped the learners grasp content easily. For this reason, they welcomed smartboards in their classrooms. In this sense, the researcher agrees that Technology teachers in the Senior Phase play a crucial role in influencing learners' learning (Bayar & Kurt, 2021; Nishanthi & Ravindran, 2020). In terms of the UTAUT model, the findings show that performance expectancy was the greatest

effective factor in determining the intention to utilise smartboards among Senior Phase Technology teachers in Ekurhuleni District rural schools. This was evident when teachers alluded to the fact that interacting with their learners through visual content, namely videos maximised the performance in the teaching and learning process. Furthermore, Technology teachers reported that their experiences with smartboards significantly influenced their usage behaviour, allowing them to work more efficiently and explore new teaching methods. This token of appreciation meant that the research participants perceived smartboards as important resources that contribute to enhance the teaching and learning process. However, it was also found that Technology teachers are aware of the issues surrounding the utilisation of smartboards and, in this regard, load shedding and internet access emerged as the most influential factors. In addition, teachers raised concerns about the limited number of smartboards in schools for the purposes of teaching and learning.

A further key idea is that Technology teachers used various ways to incorporate smartboards in their classrooms. They used these tools to impart ICT skills to their learners and asserted that this facilitated communication and enhanced learner performance. Furthermore, smartboards were also used as a source of information. This provided opportunities for interactive learning experiences, multimedia presentations, collaborative problem solving, and accessing online resources. Some teachers believed that their previous knowledge and ICT skills had an optimistic influence on the way smartboards were integrated in their classrooms. The previous literature establishes that the content of learners' learning greatly depends on the Senior Phase Technology teachers' skills and knowledge (Lai, 2017; Almaiah & Al Mulhem, 2019; Bladergroen & Chigona, 2019; Al-Emran & Granić, 2021). Therefore, understanding the diverse competencies that Senior Phase Technology teachers may possess is essential.

5.2.2 How easy is it for Senior Phase Technology teachers to use smartboards in teaching and learning?

The easiness in utilising smartboards is at the centre of their acceptance, adoption, and proper integration in the classrooms by teachers (Dlamini, 2022). Senior Phase Technology teachers were confident in using smartboards in the classroom, which boosted the interaction with their learners. This enabled them to use the student

assessment methods and expanded their knowledge as TLA teachers. Bladergroen and Chigona (2019) assert that the teaching methods of experienced Senior Phase Technology teachers provide valuable insights into the subject's potential. For this reason, some teachers were encouraged to break traditional teaching styles and embraced a new paradigm through incorporation of the smartboards in their classrooms. However, the interview responses suggest that some teachers did not have confidence in the using of smartboards due to the technicalities associated with these tools. In addition, the shortage of in-service training for Technology teachers on the utilisation of smartboards contributed to the decreased levels of confidence. Teachers' beliefs towards the utilisation of ICTs can affect the adoption and integration of smartboards in their classrooms (Bulman & Fairlie, 2016; Fitriani, & Apriani, 2024). The interview responses indicated that teachers believed that smartboards could improve their effectiveness and reduce administrative burden. This, then, increased the effort expectancy under the UTAUT model. The study also uncovered that the utilisation of smartboards was useful to Senior Phase Technology teachers. These devices helped teachers to accommodate different learning styles, save time for more tasks, and improve the classroom atmosphere. In the same vein, it also emerged that smartboards were linked to certain contents in the Technology curriculum. Some participants mentioned certain underlying topics such as systems and control, structures, electricity which allowed learners to be more drawn and active in the classroom. Subsequently, the incorporation in the classroom by Technology teachers of these devices contributed to the ethos of professional practice in Technology education.

The study also unpacked that age affected views of Technology teachers towards the utilisation of smartboards in Ekurhuleni District rural schools. The data suggests that younger teachers tend to believe that their age allows exploring and use more ICT and smartboards, in particular, whereas older teachers tend to stick to traditional methods. In terms of the UTAUT model, this means that effort expectancy was altered by the age of teachers in the use of smartboards.

5.2.3 How do stakeholders in Ekurhuleni District rural schools address the utilisation of smartboards in classrooms?

The research findings reveal that there was a scarceness of support of the DBE in schools to assist Senior Phase Technology teachers in using smartboards. The research participants indicated that the interaction with the DBE was limited, and that it did not enable them to promote a successful implementation of the smartboard programme in schools. Most teachers received training on the use of smartboards only once when these devices were first deployed in schools while others did not receive training at all. Furthermore, the interval of the training provided stretched between thirty minutes to an hour and a half which was perceived to be far from fulfilling teachers' needs and expectations. In contrast, they believed that more support from the DBE would greatly contribute to the successful integration of smartboards in the school curriculum. As a result, in terms of the UTAUT model the social influence in schools was weak because of the perceived insufficient support for teachers to use smartboards (Venkatesh et al., 2003). It was apparent from the interview reactions the concerns and frustrations among teachers for the limited support of the DBE on the use of smartboards.

However, in order to overcome this limitation, teachers resorted to supporting each other. In this regard, the research findings suggest that the support among fellow teachers was very effective in addressing the weakness associated with the poor involvement of the DBE on the use of smartboards in schools. Because they shared common challenges, some teachers who were more knowledgeable mentored their colleagues who were in need, in acknowledgement of the lack of support from other stakeholders, especially the DBE. This contributed to both ensuring the incorporation of smartboards in the classroom and nurturance of their professional development. The researcher concludes that the efficient adoption and execution of educational technology in the school program depends heavily on the teachers' assistance (Tiba & Condy, 2021).

The study also uncovered that the positive learners' response to the utilisation of smartboards in the classroom reinforced the trust among Senior Phase Technology teachers that smartboards are fundamental tools to be incorporated in the school curriculum. Teachers mentioned feelings of enthusiasm, motivation, enhanced

learning environment through eagerness in participating in the lessons, and acquisition of skills on the part of learners. They indicated that this response would not be made possible only with the single use of the traditional chalkboard and textbook as resources. This acceptance of smartboards on the part of learners enhanced social influence among Senior Phase Technology teachers in Ekurhuleni District rural schools.

5.2.4 How do available support tools address the imperative of the utilisation of smartboards in Ekurhuleni District rural schools by Senior Phase Technology teachers?

According to Rice (2021), the existence of ICT infrastructure in schools is a clear key element for teachers to express a willingness to integrate smartboards into their teaching practices. In terms of the research findings, a common notion was that the available resources in schools were relevant and facilitative for the use of smartboards. Such resources were provided by the DBE when smartboards were introduced in schools and included open educational and instructional resources, such as YouTube videos, guiding books, and related materials available for teachers for use. According to the research participants, the available resources were in line with the annual teaching plan for the Technology subject. They believed that these resources not only supported the utilisation of smartboards in teaching and learning, but also were relevant for Technology education, allowing teachers to cater to different learning styles. This finding contrasts with the findings of Ngoungouo (2017), who found that some teachers still hold the belief that instruction enhanced by ICT is not more valuable than conventional chalk and talk methods.

Furthermore, the study also highlighted the challenges involved in the use of smartboards. In this regard, it is needed to say that most of the challenges that emerged are associated with the socio-economic context of rural areas where this study was conducted. The deficit of internet connection and load shedding were the biggest challenge to the use of smartboards among Technology teachers. Because of constant load shedding and unstable internet connection teachers struggled to incorporate smartboards in the classroom. The data suggests these challenges adversely disturbed the teaching and learning of Technology subject. Indeed, it has been widely reported that rural schools still face challenges in providing internet

access to all classrooms (Hardman, 2019; Etcuban et al., 2020; Al-Emran & Granić, 2021), and this study was no exception. For this reason, participants expressed the need for the educational authorities to tackle these challenges in order to accelerate the implementation of smartboard programmes.

The study also found that learners have limited access to technology in schools. In terms of exposure to computers classes, the data indicates that they have computer class for an hour in a week, which was not enough for them to learn the skills needed. Despite the fact that schools received tablets from the Clicks Foundation as well as technology kits from the DBE for learners, they have not fully benefited from these devices due to overcrowded classes. As a result, learners resorted to use their own mobile phones for investigation purposes at home and not in the classrooms since the school policies did not allow the utilisation of mobile phones in the classrooms. This scenario limited the acquisition of ICT skills on the part of learners and, therefore, hindered the adoption and integration of smartboards in the school curriculum. This finding suggests the need to rethink the adoption of holistic approaches for the use of smartboards in education.

5.2.5 Overview of the research findings

Based on the research findings discussed above, the following overview has been established:

- Senior Phase Technology teachers are accustomed with the utilisation of smartboards in schools. They believe that smartboards contribute to improve classroom instruction and make their work easier.
- Senior Phase Technology teachers are aware of the issues that surround a proper integration of smartboards in the school curriculum, such as internet connectivity and load shedding.
- The age of Technology teachers affects their views towards the utilisation of smartboards.
- There is an absence of stakeholder involvement in schools to support teachers on the use of smartboards.
- The support provided by the DBE and the GDE, in particular, for teachers to use smartboards in schools is ineffective.

- There is a scarceness of training in schools designed for Senior Phase Technology teachers on the use of smartboards.
- Rural schools are still not optimally infusing the utilisation of smartboards as a result of internet connectivity, load shedding, limited number of these devices in the classrooms, and lack of proper infrastructure.
- The assurance of teachers to incorporate smartboards in the school curriculum is enhanced by their knowledge of, and about, other ICTs.
- Learners have limited exposure and access to technology in schools. This could affect the expected outcomes of the execution of smartboard programme in the school curriculum. At the same time, smartboards have an excellent possibility to boost the teaching and learning process.

5.3 Theoretical implications

This study employed the UTAUT model as lens in order to further comprehend the dynamics surrounding the utilisation of smartboards by Senior Phase Technology teachers in Ekurhuleni District rural schools. The theory has been used to explain the processes involved in the acceptance, adoption, and use of different technology systems (Rempel & Mellinger, 2015; Ran, et al., 2018).

In the UTAUT model, performance expectancies, effort expectations, social influences, and facilitating conditions determine technology user behaviour (Wu et al., 2007). As a result, users' acceptance and usage of technology depend on how they perceive the influence of these factors (ibid.). Based on the experiences shared by Technology teachers, the study found that these tenets are applicable to the utilisation of smartboards in schools. The data shows that the acceptance, adoption, and integration of smartboards in the classrooms by teachers depended on the intricacies of each component of the UTAUT model as indicated above. For this reason, the researcher partly agrees with Williams (2017), Bladergroen and Chigona (2019), and Graham et al. (2020) who are of the opinion that some Senior Phase Technology teachers are hesitant to use smartboards in teaching. It may be deduced, therefore, that the presence of smartboard devices in schools alone is not sufficient to ensure their proper acceptance, adoption, and integration in the classrooms.

5.4 Recommendations for policy and practice

This study is premised in the belief that the use of ICTs has gained traction in the modern teaching methods in the education landscape. This is a consequence of the global knowledge economy that has led to the widespread adoption of smartboards, positively impacting education by fostering problem solving, creativity, productivity, and collaboration (Dlamini, 2022; Kühl & Wohninsland, 2022). The introduction of smartboards in education as a part of modern teaching methods has the great capacity to progress teaching and learning in the modern era and in the future. Despite all these premises, South African rural schools seem to be struggling with the incorporation of smartboards in the school curriculum (Rasool, & Naidoo, 2024). It is on this basis that this study makes the subsequent suggestions stemming from the research findings.

5.4.1 Recommendations for the DBE

Drawing from the reviewed literature and the research findings in this study, it is needed to say that the DBE should reconsider its strategies for implementing smartboards in rural schools, with a focus on both teachers and learners. The study indicates a need for more thorough initial planning to improve the implementation of these strategies in rural school settings. Previous research on the adoption of smartboards in South Africa provides a strong foundation for future initiatives (Mihai, 2020). The efficient utilisation of smartboards in Senior Phase Technology classrooms in rural schools in the Ekurhuleni District hinges on continuous professional development. It is suggested that even though Senior Phase Technology teachers are proficient in using smartboards, they should continually enhance their skills through regular workshops and training. In addition, rural schools in the Ekurhuleni District require IT support teams for connectivity, and smartboards should be installed in all classrooms. In this respect, the primary responsibility should be taken by the DBE as the institution that is in charge of the education sector in the country. Furthermore, the study recommends the enactment of improved teacher professional growth initiatives related to smartboards by the DBE, with Heads of Departments (HoDs) taking responsibility for empowering post level-one teachers in the utilisation of smartboards to augment classroom learning. Last but not least, the researcher calls for enhanced service delivery from GDE technicians/teacher trainers, with accountability for fulfilling their roles. The study suggests that the GDE should identify best practices to hold

HoDs, GDE employees, and contractors accountable for inadequate ICT implementation, support, and training.

5.4.2 Recommendations for SMT

It is worth noting that although school-specific leadership may not have direct authority over decisions made by the DBE, they do have the discretion to allocate and manage resources provided by the DBE within their schools. This includes overseeing how teachers are utilising those resources. Moreover, school leadership also has the leeway to make their own purchases, particularly in relation to ICTs like smartboards, based on the priority assigned to them in their annual budgets. In this regard, research accentuates the standing of continuous teacher training in smartboard utilisation and advocates that schools optimise their existing resources by setting specific usage goals (Mihai, 2020; Zeichner, 2021; Kühn & Wohninsland, 2022). Thus, schools could, for example, prioritise training teachers in smartboard usage or seek external expertise to support ongoing teacher development in order to enhance the involvement of stakeholders. This could be done through partnerships and collaborations with companies from the communities, and support from donors, among other strategic ways.

5.5 Suggestions for further research

The magnitude of the argument on the utilisation of smartboards in education is undoubtedly pervasive both on the global and national levels. In this context, there is a need to explore the specific training programmes and workshops offered by universities and the DBE that teachers need in order to generate valuable insights into how they utilise smartboard technology in their teaching practices. Future research could also delve into how factors such as disciplinary background and academic status of teachers influence the utilisation of smartboard tools. Additionally, expanding the study to a larger participant pool could facilitate comparisons of the utilisation rates as well as utilisation patterns of specific smartboard tools. This will concrete the way for the evaluation of broader dimensions of the use of smartboards in education.

Furthermore, there is potential for research to explore whether mandating or recommending regular and sustained use of smartboard tools (Dlamini, 2022; Kolobe & Mihai, 2021). In this sense, future research could explore whether incorporating

smartboards into lessons at least three times a month following a training session leads to increased long-term utilisation of these resources.

Finally, future research could look into the correlation between resource allocation and technological proficiency as far as smartboards are concerned, particularly in the context of Senior Phase Technology teachers. This could be done by using a different methodology, such as a quantitative approach.

5.6 Limitations of the study

This study has certain drawbacks that warrant attention. Firstly, the study employed only qualitative methods to offer a thorough description and analysis of teaching practices in Technology education and in the utilisation of smartboards, in particular. However, the limited number of participants means that any generalisations made about the statements of Senior Phase Technology teachers should be approached with caution. In addition, a further limitation of the study was that data was accumulated solely via interviews with Senior Phase Technology teachers and field notes by the researcher. In interpreting the study, it is valuable to admit that learners' opinions and experiences were not considered. The study involved ten participants who were interviewed to gather data and, through their data, to generate the research findings. Despite the in-depth quality of the interviews (Lu, et al., 2020), it is foremost to mention that the data was gathered exclusively from only five Ekurhuleni District rural schools. Although primary and secondary schools were involved, the teachers had the same opinions. This limited scope may have influenced the results as a broader sample could have yielded different findings. In the same way, it is foremost to note that the conclusions are exclusive to the researched schools and may not apply to all schools in poor socio-economic communities in the Ekurhuleni District in Gauteng.

5.7 Contributions of the study

The study aimed to report the deficiency of information in South African literature by offering context-based insights into the implementation of smartboards in rural schools. It sought to examine the trials encountered by Senior Phase Technology teachers in using smartboards by utilising the UTAUT model. The study's findings contribute to the existing expertise by identifying areas for improvement and the

specific needs of Senior Phase Technology teachers in rural schools, to enhance the assimilation of smartboards into the education system. The study also provides suggestions for policy and practice, along with implications for further research to improve the use of smartboards.

5.8 Conclusion

In today's educational landscape, there is a growing demand for innovative approaches to enhance classroom learning. The reviewed literature suggests a shift towards a learner-centred approach in technology education, highlighting the need to move away from conventional teacher-centred methods (Baharuldin et al., 2019; Hardman, 2019; Jadhav & Takale, 2020). With that in mind, this study explored the experiences of Senior Phase Technology teachers in Ekurhuleni District rural schools on the utilisation of smartboards for teaching and learning. The study used the UTAUT model to examine how knowledge of smartboard utilisation contributes to more effective Technology teaching. Embedded in an interpretivist paradigm, the research used a qualitative approach with semi-structured interviews and field notes involving ten Senior Phase Technology teachers from five Ekurhuleni District rural schools.

The study produced several findings on the acceptance, adoption, and incorporation of smartboards in rural schools. Firstly, the trials combatted by Senior Phase Technology teachers on the use smartboards in Ekurhuleni District rural schools affected their integration in the classrooms somewhat negatively. Nevertheless, notwithstanding the reality that various teachers lacked technological skills and not all classrooms were equipped with smartboards, they demonstrated significant adaptability and a willingness to learn. The interviews mainly emphasised the essential role of teacher training in improving the effectiveness of smartboard utilisation in the Technology classroom. Secondly, the utilisation of smartboards enhanced the teaching and learning process, and the learning environment at large. In dealing with challenges, Senior Phase Technology teachers developed strategies that assisted them in ensuring the use of these devices such as support among themselves. The study's findings signalled that mutually teachers and learners found motivation in the advantages of integrating smartboards in the classroom.

The study found that the DBE needs to provide platforms to assist Technology teachers in successfully integrating smartboards into the school curriculum. According to the study, these teachers face challenges in integrating smartboards due to limited support and interaction from relevant stakeholders.

6 References

- Adams, W. (2015). Conducting Semi-Structured Interviews. In *Handbook of Practical Program Evaluation*. San Francisco: Jossey-Bass.
- Admiraal, W., Van Vuget, F., Kranenburg, F., Koster, B., Smit, B., Weijers, S., et al. (2016). Preparing preservice teachers to integrate technology into K-12 instruction: Evaluation of a technology-infused approach. *Technology, Pedagogy and Education*, 26(1), 105–120.
- Akar, H. (2020). The effect of smart board use on academic achievement: A meta-analytical and thematic study. *International Journal of Education in Mathematics, Science and Technology*, 8(3), 261-273.
- Aktas, S., & Aydin, A. (2016). The effect of the smart board usage in science and technology lessons. *Eurasian Journal of Educational Research*, 64, 125-138.
- Al-Emran, M., & Granić, A. (2021). Is it still valid or outdated? A bibliometric analysis of the technology acceptance model and its applications from 2010 to 2020. In M. AlEmran & K. Shaalan (Eds.), *Recent advances in technology acceptance models and theories*, (335), 1–12. Springer. https://doi.org/10.1007/978-3-030-64987-6_1
- Al-Mamary, Y., Al-nashmi, M., Shamsuddin, A., & Hassan, Y. A. G. (2018). Development of an Integrated Model for Successful Adoption of Management Information Systems in Organizations. *Progress in Machines and Systems*, 7(1), 1–27.
- Almaiah, M. A., & Al Mulhem, A. (2019). Analysis of the essential factors affecting of intention to use of mobile learning applications: A comparison between universities adopters and non-adopters. *Education and Information Technologies*, 24(2), 1433–1468.
- Aluko, R., Omidire, F., & Mampane, R. (2018). Quality assurance in distance education and ethical imperatives. In M. M. Sefotho (Ed.), *Philosophy in Education and Research. African Perspectives*, 131-147. Pretoria: Van Schaik.

- Amadin, F. I., Obienu, A. C., & Osaseri, R. O. (2018). Main barriers and possible enablers of Google apps for education adoption among university staff members. *Nigerian Journal of Technology*, 37(2), 432–439.
- Arthur, J., Waring, M., Coe, R., & Hedges, L. V. (2012). *Research Methods and Methodologies in Education*. Sage Publications.
- Bahadur, G. K., & Oogarah, D. (2013). Interactive whiteboard for primary schools in Mauritius: An effective tool or just another trend? *International Journal of Education and Development using Information and Communication Technology*, 9(1), 19-35.
- Baharuldin, Z., Jamaluddin, S., Shaharom, M.S.N. & Zaid, S.M.R. (2019). The Role of Teacher Readiness as a Mediator in the Development of ICT Competency in Pahang Primary School. *Journal of Educational Research and Indigenous Studies*, 2(1), 1-15.
- Batdi, V. (2017). Smart Board and Academic Achievement in Terms of the Process of Integrating Technology into Instruction: A Study on the McA. *Croatian Journal Educational/Hrvatski Casopis za Odgoj I Obrazovanje*, 19(3).
- Baxter, P., & Jack, S. (2008). Qualitative case study methodology: study design and implementation for novice researchers. *The Qualitative Report*, 13(4), 544-559. [http:// nsuworks.nova.edu/tqr/vol13/iss4/2](http://nsuworks.nova.edu/tqr/vol13/iss4/2)
- Bayar, M. F., & Kurt, U. (2021). The Effect of Using Smart Boards in Science Lessons on Middle School Learners' Attitudes towards Smartboards and Reflective Thinking Skills. *Educational Policy Analysis and Strategic Research*, 16(3), 23-38.
- Berlinski, S., & Busso, M. (2015). *Challenges in Educational Reform: An Experiment on Active Learning in Mathematics*. IDB Working Paper Series IDB-WP-561.
- Bıçak, F. (2019). Investigation of the views of teachers toward the use of smart boards in the teaching and learning process. *Journal of Pedagogical Research*, 3(1), 15-23.
- Blau, I., & Hameiri, M. (2017). Ubiquitous mobile educational data management by teachers, learners, and parents: Does technology change school-family

- communication and parental involvement? *Education and Information Technologies*, 22(3), 1231-1247.
- Bladergroen, M.C. & Chigona, W. (2019). Managing information and communication technology in South African classrooms: Pre-service teachers' experiences. *Africa Education Review*, 16(3), 22-35.
- Bless, C., Higson-Smith, C., & Sithole, S. L. (2013). *Fundamentals of Social Research Methods: An African Perspective* (5th Ed.). Juta.
- Bloor, M., & Wood, F. (2006). *Keywords in Qualitative Methods: A Vocabulary of Research Concepts*. Sage Publications.
- Boadu, G. (2021). Giving voice to teachers through interpretative phenomenological research: a methodological consideration. *Qualitative Research Journal*, <https://doi.org/10.1108/QRJ-08-2020-0090>.
- Boahen, E. & Atuahene, E. (2021). The Effects of ICT Integration in Kumasi High Schools, Ghana—Teachers' and Learners' perspective. *European Journal of Education Studies*, 7(12), 783-800.
- Bordoloi, R., Das, P., & Das, K. (2021). Perception towards online/blended learning at the time of Covid-19 pandemic: academic analytics in the Indian context. *Asian Association of Open Universities Journal*, <https://doi.org/10.1108/AAOUJ-09-2020-0079>
- Bos, J. (2020). *Research Ethics for Students in the Social Sciences*. <https://doi.org/10.1007/978-3-030-48415-6>
- Botero, G. G., Questier, F., Cincinnato, S., He, T., & Zhu, C. (2018). Acceptance and usage of mobile assisted language learning by higher education learners. *Journal of Computing in Higher Education*, 30(3), 426–451.
- Boyland, J. R. (2019). A social constructivist approach to the gathering of empirical data. *Australian Counselling Research Journal*, 30-34.
- Brink, H., Kilbrink, N., & Gericke, N. (2021). Teaching digital models: secondary technology teachers' experiences. *International Journal of Technology and Design Education 2022*, (32), 1755–1775. <https://doi.org/10.1007/s10798-021-09659-5>

- Buabeng-Andoh, C. (2012). An Exploration of Teachers' Skills, Perceptions and Practices of ICT in Teaching and Learning in the Ghanaian Second-Cycle Schools. *Contemporary Educational Technology*, 3(1), 36-49.
- Bulman, G., & Fairlie, R. W. (2016). *Technology and education: Computers, software, and the internet* (No. w22237). National Bureau of Economic Research.
- Butler-Adams, J. (2018). The Fourth Industrial Revolution and education. *South African Journal of Science*, 114(5/6).
<http://dx.doi.org/10.17159/sajs.2018/a0271>
- Cabus, S. J., Haelermans, C., & Franken, S. (2017). SMART in Mathematics? Exploring the effects of in class level differentiation using SMART board on math proficiency. *British Journal of Educational Technology*, 48(1), 145-161.
- Campbell, J. L., Quincy, C., Osserman, J., & Pedersen, O. K. (2013). Coding in-depth semi structured interviews: problems of unitization and intercoder reliability and agreement. *Sociological Methods and Research*, 42(3), 294-320.
- Cha, K., & Kwon, S. (2018). Understanding the adoption of e-learning in South Korea: Using the extended Technology Acceptance Model approach. *KEDI Journal of Educational Policy*, 15(2).
- Chabalala, G. & Naidoo, P. (2021), 'Teachers' and middle managers' experiences of principals' instructional leadership towards improving curriculum delivery in schools', *South African Journal of Childhood Education* 11(1), a910.
<https://doi.org/10.4102/sajce.v11i1.910>
- Chakravorti, B., & Chaturvedi, R, S. (2019). Research: How Technology Could Promote Growth in 6 African Countries. <https://hbr.org/2019/12/research-how-technology-could-promote-growth-in-6-african-countries>
- Charlotta, N., Gunnar, H., & Jonas, H. (2022): Technology teachers' talk about knowledge: from uncertainty to technology education competence. *Research in Science & Technological Education*.
<https://doi.org/10.1080/02635143.2022.2070150>
- Chisango, G, Marongwe, N, Mtsi, N, & Matyedi, TE, (2020). Teachers' Perceptions of Adopting Information and Communication Technologies in Teaching and

- Learning at Rural Secondary Schools in Eastern Cape, South Africa, *Africa Education Review*, 17(2), 1-19, DOI: 10.1080/18146627.2018.1491317
- Collins, A. & Halverson, R. (2018). *Rethinking education in the age of technology: The digital revolution and schooling in America*. New York: Teachers College Press
- Creswell, J. W. (2013). *Qualitative inquiry and research design: choosing among five approaches*. Thousand Oaks: SAGE Publications.
- Creswell, J. W. (2014). *Research Design: Qualitative, Quantitative and Mixed Research Approaches*. 4th ed. Thousand Oaks: Sage.
- Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry & research design. Choosing among five approaches*. 4th ed. Thousand Oaks, CA: SAGE.
- Cristia, J., Ibararán, P., Cueto, S., Santiago, A. & Severín, E. (2017). Technology and Child Development: Evidence from the One Laptop per Child Program. *American Economic Journal: Applied Economics*, 9(3), 295-320.
- Cuhadar, C. (2018). Investigation of Pre-Service Teachers' Levels of Readiness to Technology Integration in Education. *Contemporary Educational Technology*, 9(1), 61-75.
- Curry, D. S. (2020). Interpretivism and norms. *Philosophical Studies*, 177(4), 905-930.
- Davidovitch, N., & Yavich, R. (2017). The Effect of Smart Boards on the Cognition and Motivation of Students. *Higher Education Studies*, 7(1), 60-68.
- Daya, A., & Laher, S. (2020). Exploring the Influence of Educators' Access to and Attitudes towards Educational technology on the Use of Educational Technology in Johannesburg Schools. *Africa Education Review*, 17(1), 159-180. Doi: 10.1080/18146627.2018.1490154
- DeCoito, I. & Richardson, T. (2018). Teachers and Technology: Present Practice and Future Directions. *Contemporary Issues in Technology and Teacher Education*, 18(2), 362-378. Waynesville, NC USA: Society for Information Technology & Teacher Education. <https://www.learntechlib.org/primary/p/180395/>

- Deniz, K. A. & Tezer, M. (2016). The Effect of Using an Interactive Board in Mathematics Course on The Learning of Equation Solving, Hacettepe University, 9. *International Education Science Conference*, 6(8), 500-506.
- Department of Education (DoE). (2008). *National Reading Strategy*. Pretoria: Government Printers.
- Department of Education. (2006a). *The National Policy Framework for Teacher Education and Development in South Africa: "More teachers; Better teachers."* Pretoria: Government Printers.
- Department of Education. (2006b). *Orientation Programme Grade 8 & 9 National Curriculum Statement Grade R-9 Participants Manual. Part B: Technology*. Pretoria: Government Printers.
- Dissanayake, D. (2013). Research, Research Gap and the Research Problem. *Munich Personal RePEc Archive*, 47519, 1-5.
- Dlamini, R. (2022). Factors constraining teacher integration of ICT in Gauteng schools. *The Independent Journal of Teaching and Learning*, 17(2), 28–43. <https://journals.co.za/doi/epdf/10.10520/ejc-jitl1-v17-n2-a3>.
- Dlamini, R., & Coleman, E. (2017). Guest editorial: ICT in Education [Guest Editorial]. *South African Computer Journal*, 29(2), vii–x. <https://doi.org/10.18489/sacj.v29i2.547>
- Dlamini, R., & Mbatha, K. (2018). The discourse on ICT teacher professional development needs the case of a South African teachers' union. *International Journal of Education and Development using ICT*, 14(2), 17-37.
- Doyle, A., Niall, S., Donal, C., & Jeffrey, B. (2019). Agendas, Influences, and Capability: Perspectives on Practice in Design and Technology Education. *International Journal of Technology and Design Education*, 29(1), 143–159.
- Doyle, A., Seery, N., & Gumaelius, L. (2019). Operationalising Pedagogical Content Knowledge Research in Technology Education: Considerations for Methodological Approaches to Exploring Enacted Practice. *British Educational Research Journal*, 45(4), 755–769. doi:10.1002/berj.3524

- Elliott-Mainwaring, H. (2021). Exploring using NVivo software to facilitate inductive coding for thematic narrative synthesis. *British Journal of Midwifery*, 29(11), 628-632.
- Elma, M., Küçük, S., & Samancı, O. (2024). The Effect of Using Web 2.0 Tools on Smart Boards on Primary School Students' Mathematics Lesson Achievement, Anxiety, and Attitudes towards Smart Boards. *Instructional Technology and Lifelong Learning*, 5(1), 86-115.
- Etikan, I., Musa, S. A., & Alkassim, R. S. (2016). Comparison of convenience sampling and purposive sampling. *American journal of theoretical and applied statistics*, 5(1), 1-4.
- Etcuban, J.O., Marcial, D.E., Dinauanao, A.M., Patindol, D.B. & Abellanos, C.S. (2020). Information and Communication Technology Readiness of Teachers in Cebu, Philippines. *UNP Research Journal*, 25(1), 1-17.
- Eynel, O., & Koc, M. (2023). *Teachers' Use of Smart Boards in the Schools: A Review of Graduate Thesis Conducted in Türkiye*. International Society for Technology, Education, and Science.
- Fahrman, B., Gumaelius, L. & Norström, P. (2017). "It is mainly about problem solving ..." Knowledge of instructional strategies expressed by Swedish Technology Teachers. In *34th PATT conference, technology and engineering education, Philadelphia PA*, 10–14 July 2017 (247–256).
- Fahrman, B. (2021). *To know a subject - Teachers' views about the subject of technology: How the subject of technology is described and approached by teachers in the lower secondary school. (Licentiate dissertation, KTH Royal Institute of Technology)*. <http://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-294564>
- Fahrman, B., Per, N., Lena, G., & Inga-Britt, S. (2020). Experienced Technology Teachers' Teaching Practices. *International Journal of Technology and Design Education*, 30(1), 163-186.
- Falloon, B. (2020). From digital literacy to digital competence: the teacher digital competency (TDC) framework. *Education Technology Research Development*, 68, 2449–2472. <https://doi.org/10.1007/s11423-020-09767-4>

- Farella, M., Arrigo, M., Taibi, D., Todaro, G., Chiazzese, G., & Fulantelli, G. (2020). *ARLectio: An Augmented Reality Platform to Support Teachers in Producing Educational Resources*. Proceedings of the 12th International Conference on Computer Supported Education (CSEDU 2020), 2, 469–475.
<https://doi.org/10.5220/0009579104690475>
- Fitri, Y., & Putro, N. H. P. S. (2021). EFL teachers' perception of the effectiveness of ICT-ELT integration during the COVID-19 pandemic. In *International Conference on Educational Sciences and Teacher Profession (ICETeP 2020)* (pp. 502-508). Atlantis Press. <https://doi.org/10.2991/assehr.k.210227.086>
- Fitriani, D., & Apriani, L. (2024). The impact of using smart boards on improving the academic performance of fifth-grade students in Pancasila education. *Journal Review Pendidikan Dan Pengajaran (JRPP)*, 7(3), 6744–6747.
<https://doi.org/10.31004/jrpp.v7i3.29216>
- Francisco, K., & Swanson, D. (2018). The supply chain has no clothes: Technology adoption of blockchain for supply chain transparency. *Logistics*, 2(1), 1–13.
<https://doi.org/10.3390/logistics2010002>
- Gauteng Department of Education (GDE). (2010). *Gauteng Mathematics, Science and Technology Education improvement strategy: 2009 – 2014. January 2010*. Johannesburg: GDE.
- Gil-Flores, J., Rodríguez-Santero, J., & Torres-Gordillo, J.-J. (2017). Factors that explain the use of ICT in secondary-education classrooms: The role of teacher characteristics and school infrastructure. *Computers in Human Behavior*, 68, 441-449.
- Graham, M.A., Stols, G. & Kapp, R. (2020). Teacher Practice and Integration of ICT: Why Are or Aren't South African Teachers Using ICTs in Their Classrooms. *International Journal of Instruction*, 13(2), 749-766
- Grant, C., & Osanloo, A. (2014). Understanding, selecting, and integrating a theoretical framework in dissertation research: Creating the blueprint for your “house.” *Administrative issues journal: connecting education, practice, and research*, 4(2), 7.

- Grinyer, A., & Thomas, C. (2012). *The value of interviewing on multiple occasions or longitudinally*. The Sage handbook of interview research: The complexity of the craft, 219-230.
- Guba, E. G., & Lincoln, Y.S. (1994). *Competing paradigms in qualitative research*. Newbury Park, CA: Sage.
- Gumbo, M.T. (2020). Professional development of technology teachers: Does their training meet their needs? *Perspectives in Education*, 38(1), 58-71.
- Gündüz, S., & Kutluca, T. (2019). A meta-analysis study on the effect of the use of smart board in the teaching of mathematics and science to students' academic achievements. *Journal of Computer and Education Research*, 7(13), 183-204.
- Haelermans, C. & Ghysels, J. (2015). *The effect of an individualized digital practice on math performance-evidence from a randomized experiment on whether and why it works*. TIER Working Paper, WP15/01.
- Haixia, L., Koehler, M.J., & Wang, L. (2018). The Impact of Teachers' Beliefs on Their Different Uses of Technology. In *Society for Information Technology and Teacher Education International Conference*, edited by E. Langran and J. Borup, 1468–1477. Washington: Association for the Advancement of Computing in Education.
- Hardman, J. (2019). Towards a pedagogical model of teaching with ICTs for mathematics attainment in primary school: A review of studies 2008–2018. *Heliyon*, 5(5), e01726
- Hartell, E. (2015). *Assidere Necesses Est : Necessities and complexities regarding teachers' assessment practices in technology education* (PhD dissertation). Stockholm. Retrieved from <http://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-160092>.
- Hassankiadeh, M. G., & Hassankiadeh, S. G. (2013). Smart boards in language classes. *International Journal of Language and Linguistics*, 1(4-1), 48-52.
- Herawati, S., Sundari, H., & Suciati, S. (2023). Teachers' Experiences and Perceptions in Using Interactive Whiteboards in EFL Classrooms. *Journal on Education*, 5(4), 11592-11603.
<https://jonedu.org/index.php/joe/article/view/2109>.

- Ifinedo, E., Rikala, J. & Hämäläinen, T. (2020). Factors affecting Nigerian teacher educators' technology integration: Considering characteristics, knowledge constructs, ICT practices and beliefs. *Computers & Education*, 146, 103760.
- Ifinedo, E., & Kankaanranta, M. (2021). Understanding the influence of context in technology integration from teacher educators' perspective. *Technology, Pedagogy and Education*, 1-15.
- Jadhav, J.M. & Takale S, N. (2020). *Multidimensional use of ICT in Higher Education*. ISSN: 2394-3114, Vol-40, Special Issue-05. NAAC sponsored two days National Conference on New Accreditation Process and Quality Enhancement for rural colleges.
- Jammeh, A. L., Karegeya, C., & Ladage, S. (2022). The Smartboard in Chemistry Classrooms: What is Its Effect on Chemistry Teaching and Learning in Selected Topics in Grade 11? *International Journal of Learning, Teaching and Educational Research*, 21(9), 217-231.
- Jang, H., & Koh, J. (2019). The Influence of the Perceived Value of the Elderly on the Intention of Smart Device Internet Usage: A Lifelong Learning Perspective for the Elderly. *Journal of Practical Engineering Education*, 11(1), 87–103.
- Jansen, J. (2016). Introduction to the language of research. In K. Maree (Ed.), *First Steps in Research 2* (2nd ed., pp. 16-24). Pretoria: Van Schaik.
- Jita, T., (2018). Exploring pre-service teachers' opportunities to gain experience to teach science with ICTs during teaching practice. *Journal of Education*, 71(71), 74–90. doi:10.17159/2520-9868/i71a05
- Johnson, A. M., Jacovina, M. E., Russell, D. G., & Soto, C. M. (2016). *Challenges and solutions when using technologies in the classroom*. Adaptive Educational Technologies for Literacy Instruction.
- Kaliisa, R., Palmer, E., & Miller, J. (2019). Mobile learning in higher education: A comparative analysis of developed and developing country contexts. *British Journal of Educational Technology*, 50(2), 546–561.
- Kalogiannakis, M., & Papadakis, S. (2019). Evaluating pre-service kindergarten teachers' intention to adopt and use tablets into teaching practice for natural

- sciences. *International Journal of Mobile Learning and Organisation*, 13(1), 113-127.
<https://www.inderscienceonline.com/doi/abs/10.1504/IJMLO.2019.096479>
- Karakoyun, F., & Lindberg, O. J. (2020). Preservice teachers' views about the twenty-first century skills: A qualitative survey study in Türkiye and Sweden. *Education and Information Technologies*, 25(4), 2353–2369.
<https://doi.org/10.1007/s10639-020-10148-w>
- Kaur, K. (2023). Teaching and Learning with ICT tools: Issues and Challenges. *International Journal on Cybernetics & Informatics*, 12(3), 15-22.
- Khosa, C., & Molotsi, A. R. (2020, October). Teachers' perspectives on the use of smart boards in teaching business studies in the Tshwane West District. In *Proceedings of the South Africa International Conference on Education (SAICEd)* (pp. 297-306).
- Kim, B. (2001). Social Constructivism. In M. Orey (Ed.), *Emerging perspectives on learning, teaching, and technology*.
http://epltt.coe.uga.edu/index.php?title=Social_Constructivism.
- Kinyanjui, P. E. (2007). Development of NEPAD e-schools initiative. *Commonwealth Education Partnerships. Cambridge: Nexus*, 179-85.
- Kivunja, C., & Kuyini, A. B. (2017). Understanding and Applying Research Paradigms in Educational Contexts. *International Journal of Higher Education*, 6(5), 26-41.
- Kivunja, C., 2018. Distinguishing between theory, theoretical framework, and conceptual framework: A systematic review of lessons from the field. *International Journal of Higher Education*, 7(6), 44-53.
- Kolobe, L., & Mihai, M. (2021). The integration of technology in supporting progressed learners in English first additional language comprehension. *Perspectives in Education*, 39(2), 303–323.
<https://doi.org/10.18820/2519593X/pie.v39.i2.21>
- Kühl, T., & Wohninsland, P. (2022). Learning with the interactive whiteboard in the classroom: Its impact on vocabulary acquisition, motivation, and the role of foreign language anxiety. *Educational Information Technologies*, 27, 10387–10404 (2022). <https://doi.org/10.1007/s10639-022-11004-9>

- Lai, P. C., (2017). The literature overview of technology adoption models and theories for the novelty technology. *Journal of Information Systems and Technology Management*, 14(1), 21-38.
<http://www.scielo.br/pdf/jistm/v14n1/1807-1775-jistm-14-01-00021.pdf>
- Lawrence, J. E., & Tar, U. A. (2018). Factors that influence teachers' adoption and integration of ICT in teaching/learning process. *Educational Media International*, 55(1), 79-105.
- Lederman, N. G., & Lederman, J. S. (2015). What is a theoretical framework? A practical answer. *Journal of Science Teacher Education*, 26(7), 593-597.
- Lehrer, K., Mawoyo, M, & Mbaye, S. (2019). *The impacts of interactive smartboards on learning achievement in Senegalese primary schools*. Grantee final report.3ie International Initiative for Impact Evaluation.
- Leedy, P. D., Ormrod, J. E., & Johnson, L. R. (2019). *Practical research: planning and design* (Twelfth edition. ed.). NY: Pearson.
- Lincoln, Y. S., Lynham, S. A., & Guba, E. G. (2011). *Paradigmatic controversies, contradictions, and emerging confluences, revisited*. The Sage handbook of qualitative research, 4, 97- 128.
- Lincoln, Y. S., & Guba, E. G. (1986). But is it rigorous? Trustworthiness and authenticity in naturalistic evaluation. *New directions for program evaluation*, 1986(30), 73-84.
- Lincoln, Y. S., & Guba, E. G. (2013). The Constructivist Credo. *In The Constructivist Credo*. <https://doi.org/10.4324/9781315418810>
- Lomos, C., (Hans) Luyten, J.W. & Tieck, S. (2023). Implementing ICT in classroom practice: what else matters besides the ICT infrastructure? *Large- Scale assessments in education*, 11 (1), 1-28.
- Lu, L., Yuan, Y., Chen, X., & Li, Z. (2020). A hybrid recommendation method integrating the social trust network and local social influence of users. *Electronics*, 9(9), 1–27.

- Lynch, J., Ramjan, L. M., Glew, P. J., & Salamonson, Y. (2020). How to embed a conceptual or theoretical framework into a dissertation study design. *Nurse researcher, 28*(3).
- Mabila, J. (2017). *A sustainability framework for mobile technology integration in resource-constrained schools: a case study in South Africa*. University of South Africa, Pretoria. <http://hdl.handle.net/10500/24853>.
- Maistry, S.M. & Africa, I.E. (2020). Neoliberal stratification: The confounding effect of the school poverty quintile ranking system in South Africa. *South African Journal of Education, 40*(4), 1-9.
- Makgato, M. (2014). The challenges of teaching and learning technology subject at schools in South Africa: A case of INSET teachers in Mpumalanga Province. *Procedia-Social and Behavioral Sciences, 116*, 3688-3692.
- Meladi, O. & Awolusi, O.D. (2019). The Influence of Information Communication Technology (ICT) integration on teaching and learning in South African Schools. *Journal of Education and Vocational Research, 10*(2), 47-64.
- Maree, K. (2016). *First steps in research* (Second edition.). Pretoria: Van Schaik.
- Maree, K., & Pietersen, J. (2016). Sampling. In K. Maree (Ed.), *First steps in research 2* (2nd ed., pp. 191-202). Pretoria: Van Schaik.
- Marikyan, D., & Papagiannidis, S. (2021). Unified Theory of Acceptance and Use of Technology: A review. In S. Papagiannidis (Ed), [TheoryHub Book](http://open.ncl.ac.uk).
<http://open.ncl.ac.uk>
- McBurney, D., & White, T. (2009). *Research methods*. Ohio: Cengage Learning.
- Mdlongwa, T. (2012). Information and communication technology (ICT) as a means of enhancing education in schools in South Africa. Policy Brief, *Africa Institute of South Africa*. 1-8.
- Merriam, S. B., & Tisdell, E. J. (2016). *Qualitative Research. A Guide to Design and Implementation*.
- Mesghi, B., Ponomareva, S., & Ugnich, E. (2019). E-learning in higher inclusive education needs, opportunities, and limitations. *International Journal of*

- Educational Management*, 33(3), 422-437. <https://doi.org/10.1108/IJEM-09-2018-0282>
- Mihai, M. A. (2020). The use of interactive whiteboards in urban Gauteng classrooms. *Perspectives in Education*, 38(2), 318-336. <https://doi.org/10.18820/2519593X/pie.v38.i2.21>
- Mihelj, S., Leguina, A. & Downey, J. (2019). Culture is digital: Cultural participation, diversity, and the digital divide. *New Media & Society*, 21(7), 1465-1485.
- Mooketsi, B. E. (2020). Factors affecting the integration of information and communications technology in teaching and learning in senior secondary schools in Botswana. *Mosenodi Journal*, Vol. 23(1): 42-56
- Motshekga, A. (2019). *Speech by the Minister of Basic Education, Mrs Angie Motshekga, MP, delivered at the 9th SADTU National Congress*. <https://www.sadtu.org.za/content/speech-minister-basic-education-mrs-angiemotshekga-mp-delivered-9th-sadtu-national-0>
- Mun, S. H., & Abdullah, A. H. (2016). A review of the use of smart boards in education. In *2016 IEEE 8th international conference on engineering education (ICEED)* (pp. 120-125). IEEE.
- Mun, S., Abdullah, A., Mokhtar, M., Ali, D., Jumaat, N., Ashari, Z., Samah, N. & Rahman, K. (2019). Active Learning Using Digital Smart Board to Enhance Primary School Learners' Learning. *International Association of Online Engineering*. <https://www.learntechlib.org/p/216524/>.
- Mwapwele, S. D., Marais, M., Dlamini, S., & van Biljon, J. (2019). Teachers' ICT adoption in South African rural schools: A study of technology readiness and implications for the South Africa Connect broadband policy. *The African Journal of Information and Communication*, 24(24), 1–21. doi:10.23962/10539/28658
- Nishanthi R., & Ravindran, V. (2020). Smart Board Learning - A Review. *International Journal of Pharmaceutical Research*, 12(2), 2816–2821. <https://doi-org.uplib.idm.oclc.org/10.31838/ijpr/2020.12.02.376>
- Nasim, S. M., Mujeeba, S., AlShraah, S. M., Khan, I. A., Amir, & Ali, Z. (2024). Exploring pedagogical perspectives of EFL instructors: advantages,

- disadvantages, and implications of Blackboard as an LMS for language instruction. *Cogent Social Sciences*, 10(1), 2312659.
- Ndlovu, N. (2016). *The pedagogical integration of ICTs by seven South African rural secondary school teachers* (Doctoral dissertation, Johannesburg: University of the Witwatersrand).
- Neuman, W. L. (2014). *Social research methods: qualitative and quantitative approaches* (Seventh edition. Pearson new international edition). Harlow, Essex: Pearson.
- Ngoungou, A. (2017). The use of ICTs in the Cameroonian school system: a case study of some primary and secondary schools in Yaoundé. *International Journal of Education and Development using Information and Communication Technology*, 13(1), 153-159.
- Nieuwenhuis, F. J. (2007). Introducing qualitative research. In K. Maree (Ed.). *First steps in research*. Pretoria: Van Schaik Publishers.
- Nieuwenhuis, J. (2016a). Analysing qualitative data. In K. Maree (Ed.), *First Steps in Research 2* (2nd ed., pp. 103-131). Pretoria: Van Schaik.
- Nieuwenhuis, J. (2016b). Introducing qualitative research. In K. Maree (Ed.), *First Steps in Research 2* (2nd ed., pp. 50-70). Pretoria: Van Schaik.
- Nieuwenhuis, J. (2016c). Qualitative research designs and data-gathering techniques. In K. Maree (Ed.), *First Steps in Research 2* (2nd ed., pp. 71-102). Pretoria: Van Schaik.
- Nikolopoulou, K. (2018). Mobile learning usage and acceptance: Perceptions of secondary school learners. *Journal of Computers in Education*, 5(4), 499–519.
- Nikolopoulou, K. (2020). Secondary education teachers' perceptions of mobile phone and tablet use in classrooms: benefits, constraints, and concerns. *Journal of Computers in Education*, 7(2), 257-275. <https://doi.org/10.1007/s40692-020-00156-7>
- Nowell, L. S., Norris, J. M., White, D. E., & Moules, N. J. (2017). Thematic analysis: Striving to meet trustworthiness criteria. *International Journal of Qualitative Methods*, 16, 1-13. Doi: 10.1177/1609406917733847
<https://journals.sagepub.com/doi/pdf/10.1177/1609406917733847>

- Nwokonko, R. N. (2023). Management and Utilization of Smart Board on Academic Achievement of Junior Secondary School Students in Ibeju Lekki LGA of Lagos State. *ESUT Journal of Education*, 6(2), 52-61.
- Oke, A., & Fernandes, F. A. P. (2020). Innovations in teaching and learning: Exploring the perceptions of the education sector on the 4th industrial revolution (4IR). *Journal of Open Innovation: Technology, Market, and Complexity*, 6(2), 1–22.
- Omboto, C. M. (2022). *Teachers' preparedness in implementing digital literacy programme in public primary special schools in Nairobi County, Kenya*. (PhD thesis). The Catholic University of Eastern Africa. Kenya.
- Orodho, A. J., Waweru, Ndichu & Nthinguri, (2013). Teaching and learning resources, availability and teachers' effective classroom management and content delivery in secondary schools in huge district, Rwanda. *Journal of Education and Practice*, 5(9), 111-122.
- Otukile-Mongwaketse, M. (2018). The teacher centred dominated approaches: Their implications for today's inclusive classrooms. *International Journal of Psychology and Counselling*, 10(2), 11-21.
- Owoseni, A., Ibem, E., & Opoko, A. (2020). Socio-Economic Profiling of Learners and its Impact on Learning Outcomes. *International Journal of Emerging Technologies in Learning (IJET)*, 15(19), 213–222.
- Padilla-Díaz, M. (2015). Phenomenology in Educational Qualitative Research: Philosophy as a Science or Philosophical Science? *International Journal of Educational Excellence*, 1(2), 100-110.
- Padayachee, K., (2017). A Snapshot Survey of ICT Integration in South African Schools. *South African Computer Journal*, 29(2), 36–65.
<https://doi.org/10.18489/sacj.v29i2.463>
- Pardamean, B., & Susanto, M. (2012). Assessing user acceptance toward blog technology using the UTAUT model. *International Journal of Mathematics and Computers in Simulation*, 1(6), 203-212.
- Phoong, S. W., Phoong, S. Y., Moghavvemi, S., & Sulaiman, A. (2020). Measuring the influence of hedonic value, social presence, and teaching presence on

- leaners' cognitive presence through the implementation of the smart classroom. *International Journal of Learning Technology*, 15(2), 130-149.
- Porteous, D. J., & Machin, A. (2018). The lived experience of first year undergraduate student nurses: A hermeneutic phenomenological study. *Nurse Education Today*, 60, 56-61.
- Raman, A., Don, Y., Khalid, R., Hussin, F., Omar, M. S., & Ghani, M. (2024). Technology Acceptance on Smart Board among Teachers in Terengganu Using UTAUT Model. *Asian Social Science*, 10(11), 84-91.
- Ran, K., Greenwood, J., Fox-Turnbull, W., & Wise, S. (2018). A shift from traditional pedagogy in Nepali Rural Primary Schools? Rural teachers' capacity to reflect ICT policy in their practice. *International Journal of Education and Development using Information and Communication Technology*, 14(3), 149-166.
- Rashid, Y., Rashid, A., Warraich, M. A., Sabir, S. S., & Waseem, A. (2019). Case study method: A step-by-step guide for business researchers. *International journal of qualitative methods*, 18, 1609406919862424.
- Rasooll, K. N., & Naidoo, P. (2024). The sustainability of information and communication technology (ICT) in previously disadvantaged public schools in Gauteng, South Africa. *South African Journal of Education*, 44(1), 1-14.
- Rasooll, K. N., & Naidoo, P. (2024). Bridging the Digital Generation Gap: Instructional and Visionary Leadership for a Cohesive ICT School Culture. *Journal of Educational Studies*, 23(2), 9-27.
- Razak, N., Ab Jalil, H., & Ismail, I. (2019). Challenges in ICT integration among Malaysian public primary education teachers: The roles of leaders and stakeholders. *International Journal of Emerging Technologies in Learning*, (IJET), 14(24), 184-205.
- Rebecca, W., & Marshall, S. (2012). *A new face of Education: Bring technology into the classroom in the developing world; Global Economy and Development, Brookings*. <https://www.brookings.edu/research/a-new-face-of-educationbringingtechnology-into-the-classroom-in-the-developing-world/>

- Rempel, H. G, & Mellinger, M. (2015). Bibliographic Management Tool Adoption and Use: A Qualitative Research Study Using the UTAUT Model. *Reference & User Services Quarterly*, 54(4), 43-53.
- Rice, M. F. (2021). Reconceptualizing teacher professional learning about technology integration as intra-active entanglements. *Professional Development in Education*, 47(2-3), 524-537., DOI: 10.1080/19415257.2021.1891953
- RSA (Republic of South Africa). (2004). "Draft White Paper on e-Education: Transforming Learning and Teaching through Information and Communication Technologies (ICTs)." <http://www.gov.za/documents/white-papers>.
- Sabiri, K. A. (2020). ICT in EFL Teaching and Learning: A Systematic Literature Review. *Contemporary Educational Technology*, 11(2), 177–195.
- Sacramento, J., (2019). Critical collective consciousness: Ethnic studies teachers and professional development. *Equity & excellence in education*, 52(2-3), 167-184.
- Saed, H., Al-Refai, A., Aladwan, D., Abu-Rahme, M., Alnajjar, E., Masalha, F., & Basheti, I. (2023). Factors influencing academic staff attitudes towards smart boards use in education process in Applied Science University in Jordan Pegem. *Journal of Education and Instruction*, 14(1), 20–28.
<https://doi.org/10.47750/pegegog.14.01.03>
- Saldana, J. (2013). *The Coding Manual for Qualitative Researchers* (2nd ed.). London: SAGE Publications Ltd.
- Saxena, A. (2017). Issues and Impediments Faced by Canadian Teachers while Integrating ICT in Pedagogical Practice. *The Turkish Online Journal of Educational Technology*, 16(2), 58-70.
- Scherer, R., & Teo, T. (2019). Unpacking teachers' intentions to integrate technology: A meta-analysis. *Educational Research Review*, 27, 90–109.
<https://doi.org/10.1016/j.edurev.2019.03.001>
- Schmidt, M. J. (2017). The perils of outcomes-based education in fostering South African educational transformation. *Open Journal of Political Science*, 7(03), 368-379.

- Sefotho, M. M. (2018). *Philosophy in education and research: African perspectives* (First ed.). Pretoria, South Africa: Van Schaik Publishers.
- Sefotho, M. M., & Haupt Du Plessis, A. (2018). Paradigms, theoretical frameworks, and conceptual frameworks in educational research. In M. M. Sefotho (Ed.), *Philosophy in Education and Research. African Perspectives* 17-33. Pretoria: Van Schaik.
- Shen, C., Ho, J., Ly, P. T. M., & Kuo, T. (2019). Behavioural intentions of using virtual reality in learning: Perspectives of acceptance of information technology and learning style. *Virtual Reality*, 23(3), 313–324.
- Sikhakhane, M., Govender, S., & Maphalala, M. C. (2021). South African teachers' perspectives on using the computer as a tool for teaching and learning. *International Journal of Education and Practice*, 9(1), 93-104. Doi: 10.18488/journal.61.2021.91.93.104.
- Sparkes, A. C., & Smith, B. (2013). *Qualitative research methods in sport, exercise, and health: From process to product*. Routledge.
- Stoor, M., & Popov, O. (2021). Societal Aspects of Technology: The Swedish Lower Secondary School Curricula in International Comparison. *Techne Series: Research in Sloyd Education and Craft Science*, 28(2), 140–148.
- Subrun, L., & Subrun, V. (2015). The Digital World of Education in Mauritius: Adapting the Mauritian Education System with the Pace of Technology. *International Journal of Learning, Teaching and Educational Research*, 13(4), 14-19.
- Sudár, A., & Csapó, Á. (2022). *Interaction patterns of spatial navigation and smartboard use in workspaces. In Accentuated Innovations in Cognitive Info-Communication* (pp. 149-166). Cham: Springer International Publishing.
- Sung, H.N., Jeong, D.Y., Jeong, Y.S., & Shin, J.I. (2015). The relationship among self-efficacy, social influence, performance expectancy, effort expectancy, and behavioural intention in mobile learning service. *International Journal of U-and eService, Science and Technology*, 8(9), 197–206.

- Swanepoel, G. P., & Bruwer, A. (2020). Educating the always-on generation in an instant(gram) #blended learning. *Perspectives in Education*, 38(1), 16–29. doi:10.18820/2519593X/pie.v38i1.2.
- Taghizadeh, M., Hasani, R., & Yourdshahi, Z. (2020). Integrating technology into young learners' classes: language teachers' perceptions. *Computer Assisted Language Learning*, 33(8), 982-1006. <https://doi.org/10.1080/09588221.2019.1618876>
- Tarling, I., & Ng'ambi, D. (2016). Teachers pedagogical change framework: a diagnostic tool for changing teachers' uses of emerging technologies. *British Journal of Educational Technology*, 47(3), 554-572.
- Kini, T., & Podolsky, A. (2016). Does Teaching Experience Increase Teacher Effectiveness? A Review of the Research. *Learning Policy Institute*.
- Tefo, R. M., & Goosen, L. (2024). Fostering Pedagogical Innovation Through the Effective Smartboard Instruction of Physical Sciences: Technologies in Gauteng Schools, South Africa. In *Fostering Pedagogical Innovation Through Effective Instructional Design* (pp. 287-307). IGI Global.
- Tiba, C., & Condy, J. L. (2021). Identifying Factors Influencing Pre-Service Teacher Readiness to Use Technology During Professional Practice. *International Journal of Information and Communication Technology Education*, 17(2), 149-161.
- Tomczyk, L. (2020). Attitude to ICT and Self-Evaluation of Fluency in Using New Digital Devices, Websites and Software among Pre-Service Teachers. *International Journal of Emerging Technologies in Learning*, 15(19), 200–212.
- Tondeur, J., van Braak, J., Ertmer, P. A., & Ottenbreit-Leftwich, A. (2017). Understanding the relationship between teachers' pedagogical beliefs and technology use in education: a systematic review of qualitative evidence. *Educational Technology Research and Development*, 65(3), 555-575.
- Trede, F., & Higgs, J. (2009). Framing research questions and writing philosophically: The role of framing research questions. In J. Higgs, D. Horsfall, & S. Grace (Ed.). *Writing qualitative research question on practice* (pp. 13-25). Brill.

- Trucano, M. (2014). *In search of the ideal educational technology device for developing countries*. <http://blogs.worldbank.org/edutech/ideal-educational-technologydevice>.
- Umugiraneza, O., Bansilal, S., & North, D. (2018). Exploring teachers' use of technology in teaching and learning mathematics in KwaZulu-Natal schools. *Pythagoras*, 39(1).
- Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27(3), 425-478.
- Venkatesh, V., Thong, J. Y. L., & Xu, X. (2012). Consumer acceptance and use of information technology: Extending the Unified Theory of Acceptance and Use of Technology. *MIS Quarterly*, 36(1), 157-178.
- Victoria, C., & Virginia B. (2017). Thematic analysis1. *The Journal of Positive Psychology*, 2(3), 297-298.
- Watkins, D. C. (2012). Qualitative Research: The Importance of Conducting Research That Doesn't "Count." *Health Promotion Practice*, 13(2), 153-158.
- Webb, A. S., & Welsh, A. J. (2019). Phenomenology as a methodology for scholarship of teaching and learning research. *Teaching & Learning Inquiry*, 7(1), 168-181.
- Willig, C. (2014b). Interpretation and Analysis. In U. Flick, W. Scott, and K. Metzler (Eds.), *SAGE Handbook of Qualitative Data Analysis* (pp. 136–149). London: SAGE.
- Williams, P. J. (2017). "Critique as a Disposition." In *Critique in Design and Technology Education*, edited by P. Williams and K. Stables, 135–152. Singapore: Springer.
- Wirch, J.B.P. (2021). *Lived experiences of teacher professional development: A call for the intellectualization of PD a hermeneuticphenomenological study using Cultural Historical Activity Theory*. PhD thesis. Boston, MA: NorthEastern University. Available at <https://www.proquest.com/docview/2633264305?pqrorigsite=gscholar&fromopenview=true&sourceType=Dissertations%20&%20Theses>.

- Wong, K. T., Teo, T., & Russo, S. (2013). Interactive whiteboard acceptance: Applicability of the UTAUT model to student teachers. *Asia Pacific Educational Resources*, 22(1), 1-10. <http://dx.doi.org/10.1007/s40299-012-0001-9>
- World Bank, 2016. Education and Technology. <http://www.worldbank.org/en/topic/edutech/overview#1>.
- Wu, X., & Ding, B (2020). Technology Teachers' Conceptions of Technology Teaching in Secondary Schools in Beijing: A Phenomenographic Analysis. *International Journal of Technology and Design Education*, 1–25. doi:10.1007/s10798-020-09629-3.
- Wu, Y.L., Tao, Y.H., & Yang, P.C. (2007). *Using UTAUT to explore the behaviour of 3G mobile communication users*. IEEE International Conference on Industrial Engineering and Engineering Management. Singapore.
- Xu, W., & Zammit, K. (2020). Applying thematic analysis to education: A hybrid approach to interpreting data in practitioner research. *International Journal of Qualitative Methods*, 19, 1609406920918810.
- Yaw Sekyi, A.B. (2012). Status of implementation of the ICT Curriculum in Ghanaian Basic Schools. *Journal of Arts and Humanities (JAH)*, 8(3), 27-37.
- Yin, R. K. (2009). *Case Study Research Design and Methods* (4th ed.). SAGE.
- Zeichner, O. (2021). Teachers' views and perceptions of ICT – Differences between veteran schools and newer schools. *International Journal on E-Learning*, 20(1), 83-108.
- Zhang, Y. (2019). Investigating K-12 teachers' use of electronic board in the classroom in the Central South of United States. *Education and Information Technologies*, 24, 825–841 <https://doi.org/10.1007/s10639-018-9800-9>
- Zincume, X., & Marimuthu, M. (2022). Structural Equation Modelling of Factors Influencing Users 'Adoption of Smart Board: A South African University Perspective. *International Journal of information and education technology*, 12(3).

Annexure A: Research Approval Letter



GAUTENG PROVINCE

Department: Education
REPUBLIC OF SOUTH AFRICA

8/4/1/2

GDE RESEARCH APPROVAL LETTER

Date:	02 April 2024
Validity of Research Approval:	08 February 2024– 30 September 2024 2024/07
Name of Researcher:	Bosman R
Address of Researcher:	28 Laverda Avenue Eden park/ Alberton
Telephone Number:	066 500 1557
Email address:	rochleybosman@gmail.com
Research Topic:	Senior Phase Technology teachers' experiences on the utilisation of smartboards in township schools
Name of University:	UP
Type of qualification	Masters
Number and type of schools:	3 Primary schools and 2 Secondary Schools
Districts/HO	Ekurhuleni 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:

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: Faith.Tshabalala@gauteng.gov.za

Website: www.education.gpj.gov.za

Annexure B: Consent letter to the school principal

Dear Principal,

REQUEST FOR YOUR SCHOOL'S TEACHERS TO PARTICIPATE IN AN INTERVIEW FOR A RESEARCH PROJECT:

Title: Senior Phase Technology teachers' experiences on the utilisation of smartboards in rural schools

I am Rochley Maurees Bosman, a master's degree student at the University of Pretoria under the supervision of Dr. Maryke Mihai. The title of my approved research study is: "Senior Phase Technology teachers' experiences on the utilisation of smartboards in rural schools."

The purpose of this study is to explore the experiences of Senior Phase Technology teachers on the utilisation of smartboards in Ekurhuleni District rural schools. This research will offer insights into potential benefits, challenges, and strategies for optimised smartboard utilisation, informing teachers, curriculum developers, and policymakers seeking to enhance technology education in an increasingly technology-driven landscape. The effective use of smartboards can challenge current pedagogical practices, as they facilitate efficient and reliable communication between teachers (Tirosh et al., 2003). According to the White Paper on e-Education (South Africa, 2004b), ICTs are obligatory to the changes taking place throughout the world.

I would like to involve you in this research in the sharing of your own experiences linked to educational technology through the completion semi-structured interviews. The data collection for this study will require semi-structured interviews with two of your technology teachers on how they utilise the smartboard in the Senior Phase Technology Learning Area (TLA). The interview will take approximately 40-60 minutes or longer depending on the teachers' responses. I have included here for your information a schedule of interview questions. I hereby request you to participate in the interview. I hereby request your permission to allow Senior Phase Technology teachers in your school to participate in the interviews.

All participation is voluntary, therefore, please note that no participants will receive any monetary awards or awards in any kind. No harm or injury will come to the teachers during the interview. Please note that the decision for teachers to participate is completely voluntary and this will not affect their livelihood. None of the results obtained during the interview will be used for assessment purposes. The teachers may request to leave the interview at any time without any explanation or consequences.

All information obtained during the research study will be treated confidentially. My supervisor and I will have access to the data. The names of teachers, principal or school will not be mentioned during any phase of the study. Furthermore, pseudonyms will be used to avoid identification of the teachers and school.

At the end of the study, I will provide the school with a copy of the study containing both the findings of the study and recommendations. In addition, I would like to request your permission to use all data, confidentially and anonymously, for further research purposes, as the data sets will become the intellectual property of the University of Pretoria. Further research may include secondary data analysis and the use of the data for teaching purposes. The confidentiality and privacy applicable to this study will be binding on future research studies.

All the information obtained during the research study will be treated confidentially, with not even the University of Pretoria or 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 study.

Should you agree to participate, please read the following:

I consent that data from this study can be used for research purposes in the CIE master's project as well as for dissemination in research output as indicated in this letter.

I acknowledge that:

I have been informed that participation is voluntary, and I am free to withdraw from the project at any time without explanation or prejudice and to withdraw any unprocessed data previously supplied.

I have been informed that the confidentiality of the information collected will be safeguarded.

My educational environment as well as I will be referred to by pseudonym or code name in the study and any publications arising from the research.

I look forward to learning with you!

Your Faithfully

Rochley Maurees Bosman

Mr. RM. Bosman

Master's Student Researcher

University of Pretoria

rochleybosman@gmail.com

066 500 1557



Dr. M. Mihai

Supervisor

University of Pretoria

maryke.mihai@up.ac.za

0824302928

LETTER of CONSENT

SCHOOL PARTICIPATION

VOLUNTARY PARTICIPATION IN THE RESEARCH PROJECT ENTITLED

Senior Phase Technology teachers' experiences on the utilisation of smartboards in rural schools

I, _____, (Full name) the principal of _____

Please tick the appropriate block

Give consent

Do not give consent

to allow my school to participate in the above-mentioned study introduced and explained to me by Mr. Rochley Maures Bosman, an enrolled master's student at the University of Pretoria. I further declare that I understand, as explained to me by the researcher, the aim, scope, and purpose of collecting information proposed by the researcher, as well as how the researcher will attempt to ensure the confidentiality and integrity of the information he collects.

Full name

Signature

Date

School stamp

Annexure C: Consent letter to the participants

Dear Sir/Madam,

REQUEST TO PARTICIPATE IN AN INTERVIEW FOR A RESEARCH PROJECT:

Title: Senior Phase Technology teachers' experiences on the utilisation of smartboards in rural schools

I am Rochley Maurees Bosman, a master's degree student at the University of Pretoria under the supervision of Dr. Maryke Mihai. The title of my approved research study is: "Senior Phase Technology teachers' experiences on the utilisation of smartboards in rural schools."

The purpose of this study is to explore the experiences of Senior Phase Technology teachers on the utilisation of smartboards in Ekurhuleni District rural schools. This research will offer insights into potential benefits, challenges, and strategies for optimised smartboard utilisation, informing teachers, curriculum developers, and policymakers seeking to enhance technology education in an increasingly technology-driven landscape. The effective use of smartboards can challenge current pedagogical practices, as they facilitate efficient and reliable communication between teachers (Tirosch et al., 2003). According to the White Paper on e-Education (South Africa, 2004b), ICTs are obligatory to the changes taking place throughout the world.

I would like to involve you in this research in the sharing of your own experiences linked to educational technology through the completion semi-structured interviews. The data collection for this study will require semi-structured interviews with two of your technology teachers on how they utilise the smartboard in the Senior Phase Technology Learning Area. The interview will take approximately 40-60 minutes or longer depending on the teachers' responses. I have included here for your information a schedule of interview questions. I hereby request you to participate in the interview. I hereby request your permission to allow Senior Phase Technology teachers in your school to participate in the interviews.

All participation is voluntary, therefore, please note that no participants will receive any monetary awards or awards in any kind. No harm or injury will come to the teachers during the interview. Please note that the decision for teachers to participate is completely voluntary and this will not affect their livelihood. None of the results obtained during the interview will be used for assessment purposes. The teachers may request to leave the interview at any time without any explanation or consequences.

All information obtained during the research study will be treated confidentially. My supervisor and I will have access to the data. The names of teachers, principal or school will not be mentioned during any phase of the study. Furthermore, pseudonyms will be used to avoid identification of the teachers and school.

At the end of the study, I will provide the school with a copy of the study containing both the findings of the study and recommendations. In addition, I would like to request your permission to use all data, confidentially and anonymously, for further research purposes, as the data sets will become the intellectual property of the University of Pretoria. Further research may include secondary data analysis and the use of the data for teaching purposes. The confidentiality and privacy applicable to this study will be binding on future research studies.

All the information obtained during the research study will be treated confidentially, with not even the University of Pretoria or 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 study.

Should you agree to participate, please read the following:

I consent that data from this study can be used for research purposes in the CIE master's project as well as for dissemination in research output as indicated in this letter.

I acknowledge that:

I have been informed that participation is voluntary, and I am free to withdraw from the project at any time without explanation or prejudice and to withdraw any unprocessed data previously supplied.

I have been informed that the confidentiality of the information collected will be safeguarded.

My educational environment as well as I will be referred to by pseudonym or code name in the study and any publications arising from the research.

I look forward to learning with you!

Yours Faithfully

Rochley Maurees Bosman

Mr. RM. Bosman

Master's Student Researcher

University of Pretoria

rochleybosman@gmail.com

066 500 1557



Dr. M. Mihai

Supervisor

University of Pretoria

maryke.mihai@up.ac.za

0824302928

LETTER of CONSENT

INDIVIDUAL/ PRINCIPAL CONSENT

VOLUNTARY PARTICIPATION IN THE RESEARCH PROJECT ENTITLED

Senior Phase Technology teachers' experiences on the utilisation of smartboards in rural schools

I, _____, (Full name)

Please tick the appropriate block

Give consent

Do not give consent

to participate as an individual / school in the above-mentioned study introduced and explained to me. I further declare that I understand, as explained to me by the researcher, the aim, scope, and purpose of collecting information proposed by the researcher, as well as how the researcher will attempt to ensure the confidentiality and integrity of the information he collects.

Full name

Signature

Date

School stamp

Annexure D: Interview questions

Biographic data

Please specify your gender.

In which age group do you fall, (20-30), (30-40), (40-50), (50-60+)?

How long have you been teaching with the smartboard?

Sub-research question 1: How do Senior Phase Technology teachers in Ekurhuleni District rural schools perceive the utilisation of smartboards to enhance the teaching and learning process?

- a) What are your experiences in the use of the smartboard? Explain both the positives and negatives.
- b) How do these factors influence your teaching?
- c) How do you use the smartboard in your teaching of Technology?

Sub-research question 2: How easy is it for Senior Phase Technology teachers to use smartboards in teaching and learning?

- a) How confident do you feel using the smartboard? Why?
- b) Do you find it easy to use the smartboard or not? Why or why not?
- c) Elaborate if using the smartboard enables you to accomplish tasks more quickly.
- d) Do you find it useful to use the smartboard in the teaching of Technology? Why or why not?
- e) Does your age have any effect on how you perceive the use of the smartboard? Explain why or why not.

Sub-research question 3: How do stakeholders in Ekurhuleni District rural schools address the utilisation of smartboards in classrooms?

- a) Did you receive any training in the use of the smartboard? If so, what training? If not, why not?
- b) What changes are still needed at your school for maximal use of the smartboard in teaching and learning?

- c) If you think that the use of the smartboard is important, how would you ensure that your fellow colleagues use it?
- d) Who is providing smartboard support or training to teachers and how much time is spent on these activities?

Sub research question 4: How do available support tools address the imperative of the utilisation of smartboards in Ekurhuleni District rural schools by Senior Phase Technology teachers?

- a) How relevant and available is educational technology and e-resources for your specific subject content?
- b) How do you find and select technology/resources/activities to use in your specific subject area?
- c) What technologies are available to your learners to use? And how do they use it?
- d) How do your learners feel about the use of the smartboard in the technology classroom?