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Master of Education (MEd) by Coursework and

Research Report

Title:

Exploring the Use of ICTs in Education:
Evidences from South African Secondary School Managers

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05 August 2020

ABSTRACT

Exploring the Use of ICTs in Education:
Evidences from South African Secondary School Managers

The rapid technological advancements, especially in the field of Information and Communications Technologies (ICTs), have brought with them new and expanded opportunities to create, share, store and communication information like never before. As various ICT tools and devices are being integrated into education it could assist especially school managers with managing teaching and learning, a core function of school Heads of Departments (HoDs). This study aimed at exploring the use of ICTs amongst secondary school managers, specifically mathematics and sciences HoDs in six Gauteng secondary schools. A qualitative approach was adopted to conduct research using semi-structured interviews with each of ten HoDs in these schools.

The key findings of this study revealed that the majority of HoDs do not use ICT tools and devices for higher order management activities, but are using these for purely administrative and clerical purposes. This is even whilst HoDs in the study have an understanding of how ICTs could benefit the teaching and learning process, including assisting with the management of this process. However, the findings of the study also reveal some of the enabling and constraining aspects to consider when integrating ICTs into education. It is these constraining factors which in most cases have prevented HoDs from realising the full potential of using ICTs in assisting with one of their core functions, managing teaching and learning.

KEYWORDS

Information and Communications Technologies

Management and Information Systems

Department of Basic Education

School Management

Heads of Departments (HoDs)

Managing Teaching and Learning

Curriculum

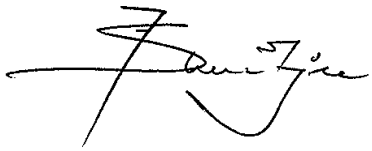
Assessment

DECLARATION OF ORIGINALITY

This serves to confirm that I, Fazel Shaikjee declare that this research study and report has been written up by me and is my own original work. I understand what plagiarism is and am aware of the University's policy in this regard.

I further declare that this work has not been previously submitted to any institution for a degree nor has it been submitted as part requirement(s) for a degree.

I have not used work(s) previously developed by others to hand in as my own work. Any assistance that I have received in conducting the study and in the drafting this research report, has been acknowledged.



Fazel Shaikjee 05 August 2020

DEDICATION

In loving memory of our beloved brother, friend and companion, Naveen Naidoo.
May he always remain an inspiration to others.

This research study and report is dedicated to my wife, Mani
and our two daughters Nadine and Shezaan.
You are the light and joy of my life.

And to my mom, Yvonne Virginia
for her unconditional love and support.

ACKNOWLEDGEMENTS

This report is the culmination of my journey in the academic world that has provided me an invaluable source of information, knowledge and set of skills towards my own personal and professional development. However, this journey and report would not have been possible without the support of various institutions and people to whom I am grateful.

I hereby express my gratitude to the University's Ethics Committee, the Gauteng Department of Basic Education and the Ekurhuleni South District for granting me the necessary permission to undertake this study in the six schools identified. I sincerely thank the principals for allowing me access to their schools and the ten teachers of these schools for their willingness to partake in the study and to share with me their experiences, without which this study would not have been possible.

I must also express my sincere gratitude and acknowledgement to my supervisor Doctor Emmanuel Ojo, for his valuable contribution to this study and report. His advice, guidance and unrelenting support throughout the process, is immensely appreciated.

I would also like to thank Gill Hannant for the splendid work of proofreading this research report.

A special thanks to my loving wife and our loving daughters, who believe in me the way they do and always remain by my side in the best and sometimes difficult times. I will always remain indebted to them for their unconditional love, encouragement and support which has helped me fulfil this journey.

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ABBREVIATIONS AND ACRONYMS

ATPs:	Annual Teaching Plans
CAPS:	Curriculum and Assessment Policy Statements
CMM:	Curriculum Monitoring and Management
DBE:	Department of Basic Education
EGD:	Engineering Graphics and Design
FET:	Further Education and Training
GDE:	Gauteng Department of Education
GET:	General Education and Training
HoD:	Head of Department
ICTs:	Information and Communications Technologies
IQMS:	Integrated Quality Management System
LS:	Life Sciences
LTSM:	Learner Teacher Support Materials
MDGs:	Millennium Development Goals
ML:	Mathematical Literacy
MS:	Mathematics
NECT:	National Education Collaboration Trust
NQF:	National Qualifications Framework
NS&T:	Natural Sciences (NS) and Technology (T)
PS:	Physical Sciences
REQV:	Relative Education Qualification Value
SA:	South African
SAMIS:	School Administration and Management Information Systems
SA-SAMS:	South African School Administration and Management System
SBA:	School Based Assessment
SDGs:	Sustainable Development Goals
SMT:	School Management Team
STEM:	Science, Technology, Engineering and Mathematics
UK:	United Kingdom
UN:	United Nations
UNESCO:	United Nations Educational, Scientific and Cultural Organization
USA:	United States of America

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CHAPTER ONE

Orientation to the study

1.1. Introduction

This research study sought to examine the role of Information and Communications Technologies (ICTs) amongst secondary school managers, specifically Head of Departments (HoDs), in managing teaching and learning. Chapter One provides an orientation and explores the study's background and research problem. The rationale for the study, its aims and research questions are further outlined, followed by a brief clarification of concepts and terms used. The scope, limitations and ethical considerations of the study are pointed out and the chapter concludes with a summary and an overview of subsequent chapters.

1.2. Background

Over the last thirty years, human development has been characterised by rapid technological innovations, developments and changes. The world itself has been transformed into a global society which has been described as one that is powered by technology, fuelled by information and driven by knowledge (Tinio, 2003, p.3). These technological advancements have become so important and valued that it is appropriate that Castells (1999) argued that technology is the force that drives society and without new ICTs none of what is changing people's lives would be possible.

Central to the space that technology encompasses, ICTs is an increasingly important area to consider. This is partly due to recent developments in technology and also to the progress made in the field of ICTs. Our entire planet is organised around telecommunicated networks of computers which sit at the heart of information systems and communication processes, all accelerating its pace almost monthly (Castells, 1999). The advancements and developments, particularly in ICTs have seen the creation of various tools, devices, gadgets and resources that have made it easier than before to communicate, share, store and manage information (Tinio, 2003). These new and improved technologies, in most cases change the way we do things in our daily lives. Advocates of technology have described a range of potential impacts that ICTs have when applied to education (Kozma, 2005).

The use of ICTs in education, specifically in developing countries has therefore been seen by many politicians and educators as an available and ready means of expanding participation in formal education to those social classes who have traditionally been excluded (Selwyn, 2004). ICTs including computers, smart-phones, the Internet and other related technologies, devices and gadgets have become an educational, political and social issue. In schools more especially, this technological advancement in the 21st century requires change and an improvement towards quality education in most schools all over the world (Davies, 2010).

There is a growing body of literature that recognises the use of ICT tools and devices in education and in schools specifically. It has become important in the recent past to investigate and understand how ICTs are applied and used in education, more especially in the teaching and learning process. This growing research theme has been taken up nationally by authors like Wilson-Strydom and Thomson (2005); Hodgkinson-Williams, Siebörger and Terzoli (2007); Blignaut and Howie (2009) and Meyer and Gent (2016) and globally by authors including Yuen, Law and Wong (2003); Bingimlas (2009) and Adu and Olatundun (2013).

Hence, ICTs are relevant within education by providing a means of supporting a process of teaching and learning (Meyer & Gent, 2016). However, a fundamental requirement for developing teaching and learning is establishing sound and proactive leadership and management of learning (Bush, Joubert, Kiggundu, & Van Rooyen, 2009). The importance of school management in ICT is alluded to under phase two in the SA White Paper on e-education, the policy which entails the integration of ICTs by teachers and school management. Relative to those who manage in educational settings this means that there are implications for those who are involved in all types of school management, including managing teaching and learning. School leaders and managers must find ways of implementing and sustaining the impact of technological innovations as technology flows faster into schools (Adu & Olatundun, 2013).

While many empirical studies have paid attention to principals or head teachers as formal school leaders, the available evidence suggests that middle leaders, as a tier of management, have a direct and positive effect on the quality of teaching and learning (Sammons, Thomas, & Mortimore 1997). These studies reinforce the view that middle leaders in school can positively influence teaching and learning processes by building strong professional learning communities where teachers can enquire and develop

together (Harris, Jones, Ismail, & Nguyen, 2019). Overall, the research literature indicates that middle leaders play an essential role in securing better learning outcomes for learners, as a result of their direct and positive influence on teachers' classroom practice (Harris et al., 2019).

Furthermore, other than at the classroom and teacher level, most differences in school performance occurs at the key-stage, or subject and department level (Sammons et al., 1997). In short, a considerable part of the within-school variation can be found at the middle tier implying that this is a significant layer for support and development. As middle managers, Heads of Departments (HoDs) are therefore seen as an important component in attempting to manage the successful implementation of the curriculum.

Bush, et al., (2009) also noted that generally, the management of teaching and learning at a school is one of the most important activities for principals and other school leaders. Heads of Departments (HoDs) who spearhead the department, subject(s) or phase(s) for curriculum implementation make up part of these school leaders and managers, in South African (SA) schools. Given, that managing teaching and learning is one of the core functions of HoDs, the role ICTs play in assisting to manage this function, is therefore an important issue. Whilst most studies in this area have focused on the use of ICTs in the teaching and learning process, this study focuses on how ICTs are used to support the management of this process by secondary school managers, like HoDs within the South African context.

1.3. Problem Statement

ICTs can be seen as a way of connecting individuals and providing them with electronic tools, devices, gadgets and resources to stay in touch and to also create, share, communicate and store information with and amongst each other. Current ICTs are able to provide school managers like HoDs, whose main functions include curriculum management with tools and devices to assist in managing the teaching and learning process. If we aim at providing a quality education, we also need to ensure that the curriculum, which lies at the heart of managing teaching and learning, is implemented and managed effectively. As alluded to, this management of teaching and learning is recognised as a core function of HoDs.

HoDs need to amongst other, continuously communicate curriculum issues and developments to their teachers. For example, to what extent are current ICT

communication platforms like Whats App and emails being used by HoDs to assist with some of these tasks? In addition, HoDs also need to : track, monitor and advise on curriculum implementation; set targets and track learner progress and achievement; evaluate the quality of teaching and learning offered by the various subjects; and also provide the necessary support to the teachers in their departments. ICT tools and devices including computers and smart-phones with their associated programs and applications can provide opportunities for school managers like HoDs to track, monitor and support the effective and efficient delivery of the curriculum. Besides using ICTs to ensure that administrative tasks and activities related to these functions are completed in a more effective and efficient manner, ICTs can also be used by HoDs to assist with the better management of their departments.

However, Blignaut and Howie (2009) contend that whilst ICTs in education have been studied over the years, South Africa is a newcomer to both the study and implementation of ICTs in this area. In their research of ICT integration in grade 8 mathematics and sciences classrooms, these authors observed that the largest impact of ICT use by teachers was on their administrative efficiency and this was then followed by better monitoring of learner feedback by the teachers. Also, only 18% of mathematics and 16% of science teachers reportedly used ICTs in their teaching and for providing learning activities (Blignaut & Howie, 2009). Furthermore, Hoque and colleagues (2012) who studied the use of ICTs by school management in Malaysian (Hoque, Razak, & Zohora, 2012a) and Maldivian (Hoque, Samad, Siraj, & Ziyadh, 2012b) schools, concluded that even whilst ICT facilities and equipment were available in these schools, it was not being used for management purposes but was being used for the daily administrative functions of the school. The authors further suggested that schools do not have the required competencies nor the capacity for effectively using ICTs to manage education.

Clearly, from the above it appears that ICT tools and devices could be used to assist school managers like HoDs in the management of teaching and learning. However, it is also apparent that previous research indicates that the opportunities presented in using ICTs in education, specifically in the management of teaching and learning, identified as a core function of HoDs, is not being fully utilised by this group of school managers.

Therefore, in light of the above this research study seeks to examine a pertinent issue, which is to what extent are ICTs being used by school managers, like HoDs to assist with managing teaching and learning?

1.4. Rationale for the study

This study explored how school managers, specifically mathematics and sciences HoDs use ICTs in managing teaching and learning at their schools. The importance of the science, technology, engineering, and mathematics (STEM) subjects and education in the international and local literature is acknowledged. The current literature I have reviewed showed that while there is so much written and published in peer-reviewed sources on the use of ICT in teaching, there is a dearth of literature on how ICTs are used in school management making the connections with teaching and learning. Specifically in South Africa, there is a dire need for research in the field of ICTs and school management.

Passey (2002) noted at the time that within the educational literature, whilst the importance of ICTs to society and the future is clear, very little research work and studies were being undertaken which considered aspects of ICT and school management. The author continued by suggesting that priority areas for future research could examine what roles leaders, including both the principal and middle managers play as regards the implementation of ICTs in schools. This research could include how management information systems could affect other school management (Passey, 2002). Likewise, Yuen, Law and Wong (2003), recommended that future studies of ICTs and education could examine the role of the leaders, including both the principals and middle managers. The recommendations by these authors are even more applicable relative to the importance of STEM subjects.

Whilst it has been noted that managing teaching and learning effectively and efficiently is an important contributor to improving the quality of education, the significance of establishing the role of ICTs in assisting HODs to manage STEM subjects cannot be underestimated.

1.5. Aim of the study and research questions

This research study aimed at exploring the use of ICTs amongst secondary school managers, specifically mathematics and sciences HODs in six Gauteng secondary schools.

The following research objectives facilitated the achievement of this aim :

- Investigating the sample group of mathematics and sciences HoDs understanding of the use of ICTs in teaching and learning.
- Analysing whether these mathematics and sciences HODs use ICTs for various school administrative and/or management functions.
- Examining the challenges these HoDs encounter in using ICTs to assist with managing teaching and learning.

Hence, in order to achieve the aim of the study, the following critical questions were considered:

1. What are mathematics and sciences HoDs' understanding of the use of ICTs in teaching and learning and the benefits of this in these schools?
2. How do the selected group of HoDs use ICTs as a tool to manage the teaching and learning process?
3. What challenge(s), if any, do they encounter in using ICTs in teaching and learning and the management of this in their schools?

1.6. Definition of key concepts/terms

The following is a list of concepts and terms to which I have provided corresponding definitions, in the context of my research study. Clearly, these concepts and terms are not neutral in origin, definition and use. However, they are used and described below in order to provide some sort of clarity and understanding of how the terms are conceptualised and interpreted in this study.

Information and Communications Technology (ICTs) : This is inclusive of the hardware, software, networks and media for the collection, storage, processing, transmission and presentation of information (voice, data, text, images), as well as related services (Evoh, 2007, p:1).

Hardware : This generally refers to the physical components of a computer or other electronic system and is sometimes referred to as the machinery or equipment.

Software : This generally refers to the operating system, program or applications of a computer or other electronic system or device.

ICT tools and devices : These include but are not limited to computers, smart-phones, smart and inter-active classroom boards, tablets, the Internet, video, film, TV and other used to communicate, create, disseminate, share and store information.

Head of Departments (HoDs) : As used in the South African context this term refers to school subject(s) or phase(s) leaders who are part of and operate in the broader school management team as middle managers. Their main responsibility is to oversee the teaching and learning associated with a particular subject(s) or phase(s). As suggested by Busher and Harris (1999), these school managers are operationally responsible for overseeing and developing the work of their colleagues.

Managing teaching and learning : This term is used in this study to refer to curriculum leadership and management. It attempts to encompass goal setting, planning, developing the educational program of the school and staff, culture building and allocating resources (Lee & Dimmock, 1999, p:457). As part of this, there should be a process which involves assessment for learning and also includes tracking, monitoring, reviewing and evaluation of the curriculum and assessment.

1.7. Significance of the study

The study is of value specifically in secondary education in that it explored how ICTs are used amongst school managers like HoDs to manage a very important process of schooling, teaching and learning. Hence, I hope this research study will make a meaningful contribution to the empirical data available on ICTs in education and more specifically to the role that ICTs play amongst secondary school mathematics and sciences HODs in assisting to manage teaching and learning. In addition, I envisage that the findings from this study may be helpful to the schools who share similar backgrounds and who are attempting to utilise ICTs in supporting the management of teaching and learning.

1.8. Scope and Limitations

This study focused on exploring how ICTs are used in managing teaching and learning by secondary school managers, especially mathematics and sciences HoDs. The participants were chosen in order to obtain an understanding of the role of ICT practices in schools amongst school managers. The study was conducted from a South African perspective and was limited to six public secondary schools in the Alberton, Tokoza and Vosloorus areas of the Gauteng province, South Africa. Primary, independent and private schools, as well as schools in other districts and provinces in the country were excluded.

A qualitative case study approach was used to gather information about HoDs understanding, usage and challenges in using ICTs to assist with managing teaching and learning in their schools, in a specific district and province. Each of the HoDs in the sampled group conveyed their meanings and understanding of ICTs in education and school management specifically, in semi-structured interviews. The convenience sampling method was utilised to select six socio-culturally different secondary schools for the study. This study did not attempt to generalise the findings, these of which could contribute to identifying possible trends applying to research studies with similar situations and which could be used for further research.

1.9. Ethical Considerations

Ethical considerations involve the conscious decision for carrying out events, all within a specific set of morals and values (Resnik, 2015). A general summary of some ethical principles to be mindful of when conducting research studies, according to Resnik (2015), include honesty, objectivity, integrity, carefulness, openness, respect for intellectual property, confidentiality and responsible publishing. I have endeavoured to uphold all these principles and to comply with various requirements in considering ethics in this study.

Prior to conducting the research, I had requested and received permission from the university's ethics committee, to undertake the research. I then requested permission from the Gauteng Department of Basic Education (GDE) to conduct the research in selected schools. After receiving approval from the GDE, I contacted the selected schools, then provided the principals with a letter informing them of the purpose of the study and how it would be conducted. I further requested their consent and permission

to interview selected HoDs, the research participants. On receiving the school principal's consent, I then provided the HoDs with a similar letter that I had given to the principals, where their participation in the study was explained and confirmed.

Given that this study was people-centred, efforts were made by me to establish and maintain a good rapport with the HoDs at all times. To ensure that HoDs acknowledged voluntary participation and understood their rights, among them being the ability to withdraw from the study at any time, they were requested to complete a certificate of consent. In further ensuring that I maintained confidentiality, schools and participants' names have been changed in the reporting of the findings. These ethical procedures adopted for the study are clarified and elaborated on in Chapter Three.

1.10. Outline of chapters

The following is an outline of the content of the chapters of the research.

Chapter One presents the orientation to the study by outlining the background context, problem statement and rationale for conducting the study. This is followed by the research questions and a brief definition of key concepts and terms used in the study. The limitations and scope of the study, as well as the study's ethical considerations are briefly discussed. The chapter concludes with an overview of subsequent chapters and a summary.

Chapter Two presents a review of existing literature to gain an understanding and a more informed perspective about ICT implementation and practices in schools. The relevance of the surveyed and reviewed literature to my study is also indicated.

Chapter Three explains in detail the research design and methodology. Here the process involved in the selection of participants, the data collection methods and research instruments that were applied to capturing, analysing and interpretation of the data is discussed. The chapter concludes by providing a brief description of the ethical issues and limitations of the study.

Chapter Four deals with the analysis of the data or evidence collected. The data is analysed and the findings interpreted according to categories, with themes and sub-themes, using direct quotes from the participants in the study.

Chapter Five provides a discussion of the findings and conclusion of the study. This is achieved by attempting to answer the research questions based on the data collected

and analysed for the study and the available literature in this area. The chapter concludes with some implications for practice and suggests recommendations for future research.

1.11. Summary

This chapter provided a very brief background on technology and ICTs in education and the potential impact of using ICTs in teaching and learning. The chapter then examined the problem statement and the rationale for undertaking the research. The aim of the study was presented, followed by research questions derived from the study objectives. Definitions of key concepts and terms used in the study that pertain to ICTs were provided in this chapter to clarify any possible misconceptions in the context of this study. The chapter concluded by indicating the significance of the study in education and then gave an outline of other chapters of the study.

Chapter Two which follows explores the existing literature about ICT practices and school management in relation to this study.

CHAPTER TWO

Literature Review

2.1. Introduction

This chapter seeks to explore some of the existing literature about ICT practices, ICTs in teaching and learning, and ICTs in assisting to manage this process. The literature review begins with a broad overview of ICTs and then proceeds to examine their role in education. The review continues by identifying policies guiding the use of ICTs in education and in schools. A brief discussion of the role of ICTs in leading, managing and administering various functions of schooling is explored. The chapter continues by identify existing frameworks about the use of ICTs in school administration and management. In the process of investigating each of these areas, there is always an attempt to draw from both the international and local South African literature. The final part of the chapter elaborates on the theoretical framework used in this study.

2.2. An overview of ICTs and their role in education

Blurton (1999), in a UNESCO World Communication and Information Report defined ICTs as a term covering various sets of technological tools and resources which are generally used to communicate, create, disseminate, store, and manage information. In her definition of ICTs, Tinio (2003) has included the Internet, broad-casting technologies (audio and television) and telephony as part of these technological tools. Hoque et al., (2012b) expanded on these definitions of ICTs by including all forms of computer and communications equipment and software used to create, store, transmit, interpret and manipulate information in its different forms.

In this study, I have opted to utilise all the above definitions of ICTs, as well as Evoh's (2007) definition as noted in Chapter One. Hence, ICTs as used in this study consists of electronic tools and devices for the storage and communication of information and includes computer hardware and software, digital broadcast technologies, mobile phones, telecommunications, electronic information resources like CD-ROMs as well as the Internet and smart interactive boards used for teaching and learning.

2.2.1. Benefits of ICTs in education

In providing an overview of ICTs it is important to examine why and how they are used in education and schools in particular. It has been argued that the innovative use of

ICTs in education has the potential benefit of removing barriers that are causing the low rate of education in any country (Adu & Olatundun, 2013). With ICTs, it is likely that access to education can be increased and when used appropriately ICTs are potentially powerful tools that can extend the educational opportunities (Tinio, 2003), both formal and informal to other historically disadvantaged schools and learners. ICTs have become one of the basic building blocks of modern society, where many countries regard ICTs and mastering the basic skills of ICTs as part of the core of education, like reading, writing and numeracy (Adu & Olatundun, 2013).

Furthermore, it would appear that utilising ICTs in the teaching and learning process has many benefits. Brush, Glazewski and Hew (2008) have noted that learners use ICTs as tools for discovering learning topics, solving problems and these tools assist learners with finding solutions to the problems in the learning process. In using ICTs the acquisition of knowledge is made more accessible and subject concepts are understood while engaging learners in applying these ICT tools (Fu, 2013). When operating ICT tools and devices like computers, learners are being provided with a way of engaging in the meaningful use of computers in that they are able to construct new knowledge by accessing, selecting, interpreting and storing information (Castro Sánchez and Alemán, 2011).

From this, it could be implied that the acquisition of knowledge is made more accessible and learners understand subject concepts better while using ICTs. Also, ICTs develop learners understanding of information and knowledge (Chai, Koh & Tsai, 2010) and it tends to provide more creative solutions to various types of learning pursuits (Fu, 2013). Moreover, ICTs enables learners to work at anytime and not be confined to the school day and times. Koc (2005) noted that ICTs enables learners to communicate, share and work collaboratively, without any time limitations and boundaries. The author cites an example of a teleconferencing session that is composed of learners from various places around the world, learning, sharing and developing information collaboratively without the learners being together in a physical sense in a classroom. These teleconferencing classrooms provide both learners and teachers opportunities to interact with ease and convenience (Fu, 2013). However, the success of this type of learning process will also depend on various factors which could either constrain or enable the process of integrating ICTs in schools.

Other studies like Kulik's (1994) which examined 75 studies across United States showed that learners using computer learning programs in mathematics, natural science, and social science scored higher on tests in these subjects. The findings from this study further indicated a similar trend for learners who used simulation software in science and for primary school learners who used learning programs software in reading with learners scoring higher on reading values. Younger learners who used computers to write their own stories scored higher on measures of reading skill. In addition, it was found that learners who used word processors or who used the computer for writing, scored higher on writing skill measures.

Fu (2013) contended that by using ICTs, teaching and learning is no longer dependent on printed materials only. A variety of resources are now available on the Internet, where knowledge can be acquired through for example visual presentations and video and audio clips. It is important to consider multimedia in attempting to provide learners with quality education as it has been suggested from research in the field. Salomon (1979) suggested that people learn abstract, new and novel concepts more easily when these are presented in both a verbal and a visual form. Furthermore when a constructive learning approach underlies the use of ICTs in education, it assists learners to focus on higher-level concepts rather than less meaningful tasks (Levin and Wadmany, 2006). Also, when learners have more and longer exposure in using ICTs this can promote learners' higher order and critical thinking skills. From the above it would appear that ICTs play a significant role in attempting to equalize the reality of the digital divide.

This digital divide has been described in a simple sense as the gap that exists between those who have access to and control of technology and those who do not - technology "haves" and "have nots" (Bertot, 2003). The digital divide, as Fuchs and Horak (2008) contend, is concerned with the unequal access to and usage of new technologies. In addition, Hodgkinson-Williams et al., (2007) argued that the use of ICTs in education is being seen as a means of expanding access to education, particularly in developing countries. It would appear that the large investments being made in the use of ICTs in education may be seen as an attempt to address the so-called 'digital divide' (Selwyn, 2004).

Blignaut and Howie (2009) noted that another factor to consider in the digital divide is the knowledge divide, which is about the information and knowledge that nations and

peoples have access to, or not. The authors contend that the knowledge divide in South Africa is more widespread compared to countries with more equitable societies. Hence, the introduction and integration of ICTs in education, especially with the reality of the digital divide, is not an easy one (Tinio, 2003). If we do not meet the many challenges of integrating ICTs into education, it could instead result in the further widening of existing economic and social inequalities, more especially among the developed and developing nations (Mikre, 2011). This, in turn could lead to the further widening of the digital divide.

In addition, Carrim and Taruvinga (2015) have noted that, whilst the acquisition of ICTs and skills is important for the further development of African countries it would be a mistake to believe that ICTs are able to solve all African countries' challenges. The authors also caution that ICTs, like other forms of technology are tools that are used to for example enhance teaching and learning. Therefore, according to these authors it cannot be assumed that the use of ICTs will necessarily result in an improvement in learning and learner achievements, nor can it be assumed that ICTs will resolve the many societal challenges, in Africa or elsewhere. Furthermore, Hodgkinson-Williams et al., (2007), noted that there was little research which aimed to provide guidance on what was most likely to enable, undermine or constrain the successful implementation of ICTs in South African schools.

Hence, it is important that we have a broader understanding of what it is that ICTs and the use of ICTs can and cannot do, and the need to have more research on whether ICTs and their use does lead to improved learning and cognitive development (Carrim and Taruvinga, 2015).

2.2.2. Barriers and challenges of ICTs in education

Integrating ICTs in schools is a complex process and as noted there are limitations related to how it is implemented and used. Therefore it is important to identify and note some of these barriers, constraints and challenges encountered in the use of ICTs in education and schools in particular. This will be an important step in seeking to improve the quality of teaching and learning (Bingimlas, 2009). Whilst various barriers and constraints have been identified by researchers and teachers in the integration of ICTs in education, for the purposes of this study I have used the categories as suggested by Mikre (2011). These are technology related, learner related and teacher related, all of

which can limit the benefits of the use of ICTs in education (Mikre, 2011). I have also adapted this to include a fourth category termed 'other barriers' (see Figure 2.1).

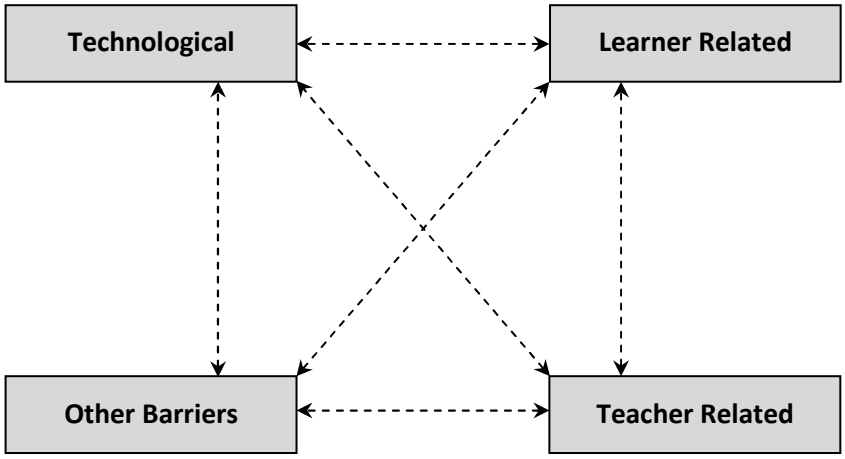

Figure 2.1. : Barriers and Challenges to ICT integration in schools
Adapted from Mikre (2011)

From Figure 2.1, it is apparent that the four categories of barriers and challenges identified are not mutually exclusive. Each barrier is related to another, in some way. For example, it would be short-sighted to assume that the integration of ICTs in schools will be successful, if there are no technological barriers but other barriers persist. Hence, further studies could consider exploring the relationship between these categories of barriers and challenges.

2.2.2.1. Technological barriers

When referring to technological related issues, both hardware and software could be constraining factors when integrating ICTs in education. For example, some research studies identify the lack of the basic access to technology as a limitation. Pelgrum (2001) noted that a key constraining factor to ICT integration in education was a lack of available hardware. Within the South African context, Hodgkinson-Williams et al., (2007) studies of Eastern Cape secondary schools found that the most commonly mentioned hardware constraint amongst these schools was insufficient computers. In addition, Wilson-Strydom, Thomson, & Hodgkinson-Williams (2005), found that the reason most commonly noted for teachers not integrating technology into their lessons was the non-availability of computers.

Location of the technology is also an important aspect to consider related to access to technology. Blignaut and Howie (2009) noted that in most schools in developing countries teachers do not use ICTs in their classrooms as widely as their peers in the

more industrialised countries. This, the authors suggested implies that location is therefore an important aspect related to access to technology for teaching. This is important to note in that if this unequal reality continues it will lead to furthering the digital divide. Further studies related to hardware issues and noted by Hodgkinson-Williams et al., (2007), include the functioning condition of the hardware, the age of computers, the kinds of computers, the reliability of computers, the place where equipment is kept, the scheduling of access to the use of equipment and a plan and program for updating and restoring both hardware and software.

Also, as Bingimlas (2009) noted the lack of access to new technologies differs between countries. Pelgrum (2001) found from a study of 26 countries across the world that according to teachers, four of the top ten barriers in implementing ICTs in schools were related to accessibility of ICTs. The barriers included the insufficient number of computers, inadequate devices, not enough copies of software and a lack of simultaneous Internet access. Padayachee (2017) indicated in a snapshot survey of secondary schools in Gauteng, that some teachers used their own laptops and data projectors for integrating ICTs into their classrooms.

Along with hardware, studies also explore software or the various applications and programs available for integrating ICTs in schools. Hodgkinson-Williams et al., (2007) noted that the availability and the appropriateness of software, whilst enabling is often reported as constraining. For example, local software companies producing software for learning English should work together with teachers to develop local software programs appropriate to teacher and learner needs. The authors noted that software designers and teachers should be working with each other by critically observing various teachers teaching and how suitable forms of software supporting the development of a range of skills and ways of teaching and learning can be better developed for teachers to use in the teaching of their subjects.

Another issue related to technology includes infrastructure, be it on a national level or even in the local school context. Mikre (2011) has suggested that infrastructural challenges of integrating ICTs in education could be related at times to the appropriateness of buildings and rooms to accommodate the technology, shortages of power for example, electricity supplies and telephones lines, and the lack of the different types of ICT tools and devices. In examining some of the barriers associated with ICT integration in Bangladesh schools, Khan, Hasan and Clement (2012) noted

that the country lacked the resources and the appropriate infrastructure for integrating ICTs in education.

This lack, at times of financial resources is also seen as a significant barrier for ICT implementation in many countries around the world. Albugami and Ahmed (2015) refer to several studies, which have confirmed the shortage in ICT infrastructure as one of the main obstacles in Saudi schools. However, as Mikre (2011) has pointed out, placing more technological resources and making massive ICT investments in the classroom do not always translate to improved learner achievements.

In addition, sufficient and affordable connectivity as suggested by Hodgkinson-Williams et al., (2007) is also a practical factor that contributes to integrating ICTs in schools. The authors noted that closely related to the cost of internet connectivity is the problem of inadequate bandwidth, which measures how much data can be sent over a specific connection in a given amount of time. This also includes the issue of the speed at which data is downloaded. The study by Hodgkinson-Williams et al., (2007) of secondary schools in the Eastern Cape, showed that even when schools were able to afford connectivity, they were unable to afford large amounts of bandwidth. Padayachee (2017) noted that some teachers had to absorb the cost of using technology in their teaching by downloading learning material for their lessons. Unless the costs of access to the Internet are lowered in South Africa either through increased competition in the local market or through government subsidies, schools will continue to be constrained by the high prices of data which in turn will increase rather than decrease the digital divide (Hodgkinson-Williams et al., 2007).

Furthermore, Mikre (2011) identified the high cost of the technology and maintenance of the equipment and facilities, the high cost of available and spare parts, viruses of software and computer programs, interruptions of connections to the internet and poor supply of electric power as limitations related to technology when integrating ICTs in education. Added to this are issues of storage and school safety and security of the ICT equipment, tools, devices and gadgets. Padayachee (2017) noted that teachers were also concerned about the physical security and safety of ICT equipment in the school.

Apparent therefore are the various and many technological barriers and challenges to contend with in the integration of ICTs in schools, especially those related to learners or teachers or other areas as covered in existing literature.

2.2.2.2. Learner related barriers

In examining the limitations ICTs place on learners, issues related to technology, be it access, type, hardware, software and the like need all to be considered. In addition to these, the digital literacy skills of learners must also be taken into account. For example, in an evaluation of South Africa's readiness to integrate ICT into the classrooms of two core STEM subjects, mathematics and sciences, Blignaut and Howie (2009) noted that teachers in the country reported learner related issues as one of their biggest obstacles. Teachers generally reported that learners do not possess the required ICT skills and that learners do not have access to ICT related skills outside of the school grounds (Blignaut and Howie, 2009). The authors further added that more than 70% of the country's teachers, like teachers in the Russian Federation and Thailand indicated learner related obstacles were most significant when integrating ICTs into their classrooms.

In addition, Padaychee (2017) pointed out that teachers often indicated that learners were not always digitally literate and that these learners did not have access to devices such as tablets and smart phones. It is important then that even when learners have access to ICTs for learning, they must acquire relevant and appropriate skills and knowledge to get the best out of using ICTs in pursuit of education. Learners must be encouraged to acquire specific technical skills to make it easier for them to engage in learning in ICT environments (Castro Sánchez & Alemán, 2011). However, this does not guarantee an improvement in learner attainments. As Cox, Webb, Abbott, Blakeley, Beauchamp and Rhodes (2004) noted that the impact of using ICTs to present and discuss learners' work was less researched, and the effects on learner achievement were not so clear.

On the other hand, ICTs could at times serve as a distraction to learners when integrated into education. There is a tendency amongst learners to misuse the technology for leisure time activities and therefore learners have less time to engage in formal learning and study (Mikre, 2011). Given, the multiplicity of social media platforms nowadays, learners could easily be on these instead of interacting with subject related content. Some studies have described chat rooms, online gaming platforms, the use of face book and other communication channels as observed downsides of ICT use in formal education, precisely because learners can easily change over or visit other sites at the expense of their studies (Mikre, 2011).

In addition Czerniewicz and Hodgkinson-Williams (2005) suggested that we should be aware that learners nowadays grow up in a digital culture and the new ways learners communicate, play, read and generally engage with content is changing the way they learn. It is important therefore for teachers to understand the various types of learning practices these learners bring into the formal educational settings. The authors further suggested that we are better informed and positioned to design appropriate educational interventions when we recognise the digital identities of local youth and understand what kinds of new practices learners bring to the fore. Other limitations of ICT use in education are that learners engaging in computer-based learning may have less opportunities to use oral skills and hand writing; the repeated use and exposure to digital screens could have negative physical side-effects relating to vision and body posture; and ICT usage for learners who have challenges in working independently may be difficult as these learners may need more support from the teacher (Mikre, 2011).

2.2.2.3. Teacher related barriers

Similarly, for teacher related limitations in using ICTs in education, these should not be seen exclusively from technological and/or learner related issues. For example, Hodgkinson-Williams et al., (2007) suggested that a major barrier in implementing computer-related classroom practices by teachers is the lack of or insufficient technical support provided to teachers in using hardware and software. In addition Tearle (2003) noted that the provision of support is associated with the provision of training which in turn, is related to teachers having adequate time to prepare for lessons in which they integrate ICTs. What becomes apparent is, just as for learners, ICT training and literacies should be included in any technical support program to be rendered to teachers.

It is also important to consider the attitudes, beliefs and perceptions of teachers in integrating ICTs in schools. Bingimlas (2009) noted that much research into this area has observed that teacher attitudes and a general resistance to change were found to be a significant barrier to the successful integration of ICTs in schools. In addition, Botha (2013) who studied ICTs and school management revealed that the perceived beliefs, attitudes and vision of school management team (SMT) members could have an impact on the climate for integrating ICTs in schools.

Mikre (2011) also observed that teachers' attitudes play an important part in a teaching learning process utilising ICTs like computers and internet connections. The author also

suggested that although the teachers' attitude towards the use of these technologies is a key consideration, observations reveal that teachers are not always clear about the benefits of the technology for facilitating and enhancing learning. Even so, some teachers may have positive attitudes to the technology, but may abstain from using these during teaching due to low self-efficacy, which is generally the tendency for teachers to not feel qualified to teach using technology (Mikre, 2011). Also, in schools where sufficient infrastructure is in place, teacher participation could remain a key barrier and constraint to successfully integrating ICTs for teaching and learning (Hodgkinson-Williams et al., 2007).

Furthermore, Cubukcuoglu (2013) noted when studying Turkish teachers' feelings and thoughts about integrating ICTs in schools that where teachers have negative attitudes towards its use, these teachers cannot be expected to use technology more often in their teaching. This confirms the results of the study by others that one of the most important predictors of future ICT use is teachers' attitudes toward it (Fu, 2013). Other observations seem to suggest that some teachers who had resisted integrating ICTs into their classrooms felt they were too old to learn new tricks (Padayachee, 2017).

Teacher attitudes also have an influence on the integration of ICTs into schools (Fu, 2013). The author noted that where teachers were influenced more by constructivist beliefs about teaching, these teachers held stronger intentions of integrating technology into their future practices. This implies that whilst teacher attitudes towards ICT are one of the main predictors of it being integrated into schools, the impact of the teachers beliefs and confidence in using ICT should not be ignored (Fu, 2013). If teachers lack ICT skills and competencies they may not feel as confident to integrate technology into their teaching. Moreover, as Cubukcuoglu (2013) had observed, teachers believed that if someone knows how to use technology in their personal life, it could lead to them using it in their teaching practises. The author noted that where pre-service teachers were more confident using technology, they were also more capable and interested in using computers in their classrooms.

Chigona (2011) suggested that the cause of some teachers' negative perceptions to integrating ICTs into their classrooms is as a result of the training they had with technology. ICT training, as noted by the author was inadequate to equip teachers with pedagogical skills and understanding on how to effectively incorporate ICTs into their classrooms. This adds to the observation made by Dlamini and Mbatha (2018), that the

ICT professional development needs of teachers were not being addressed in a meaningful and systematic way even though there was a demand for teachers to develop their ICT skills and competencies. In addition, Padaychee (2017) observed that there was little or no support being provided to teachers to integrate ICTs into their teaching with teachers indicating that that there was often not enough time for them to engage with and learn how to use new technologies. This lack and mismatch of teacher ICT training and development could continue being a barrier to the integration of ICTs into schools if not addressed adequately.

Albugami and Ahmed (2015) in their study of Saudi schools noted that the resistance to change or the reluctance from teachers to integrate ICTs into teaching are other barriers to using ICTs in schools. These authors suggested that these barriers can be due to a multiplicity of issues including teacher ICT skills and competencies, the digital infrastructure of the school, technophobia and access to ICT tools.

2.2.2.4. Other barriers

Categorising barriers to ICT integration in schools using the three areas as suggested by Mikre (2011) omits those issues which may be barriers or act as constraints and which may not fit neatly into either of these categories. Hence, it is important to identify and briefly discuss some of these as failure to do so could impede negatively on integrating ICTs in schools. Whilst I have attempted to identify the many barriers to the integration of ICTs in education and schools, it must be pointed out that this list of barriers is not exhausted in the discussion.

Other issues that could become barriers relate to the school's culture and the type of leadership and vision the school has for integrating ICTs into education. When examining the importance of school culture in ICT integration, it is important to recognise that effective ICT integration depends more on the perceptions and vision of school leaders than on the ICT skills and competencies of teachers (Fu, 2013). From their studies of Hong Kong schools, Yuen et al., (2003) reported that using ICTs in schools was strongly dependent on the school's general vision and mission as well as the background, culture and history of the school. The authors suggested that in addition to this, the school leader's vision and understanding of the role and impact of ICT in the curriculum and their goals and objectives for ICT integration, were equally important.

In addition, Fullan (1993) provided a framework that attempts to examine the role and processes of the implementation of ICTs in schools. The author takes into account the complexity of the change process in schools, within the context of change involving curriculum and pedagogy. Consequently, the author argued that the most critical step in the implementation process is the formulation of a common vision. Fullan's (1993) framework can also be used as a conceptualisation in examining and understanding the nature and some of the barriers and challenges beset by change as regards ICT implementation in schools.

The ability to develop and communicate a vision of how ICTs could produce changes is a critical element in ICT leadership (Kearsley & Lynch, 1992). How school leaders view ICTs is important because if they do not have a relevant and appropriate vision, it may impede the successful integration of ICTs in their schools. Hodgkinson-Williams et al., (2007) observed that in some South African schools the use of ICTs was more successful where principals supported ICT integration in their schools. They further observed that at a school where the principal displayed little interest in ICTs, it resulted in the teaching staff making little effort to use ICTs in school. In addition, Manduku, Kosgey and Sang (2012) in their study of Kenyan schools found that in cases where the school manager had ICT skills and a keen interest in this area, a trickledown effect was observed in the school.

Sangrà and González-Sanmamed, (2010) contended that the contribution ICTs play in improving teaching and learning processes is greater in schools that have integrated ICT as an innovation factor. The authors argued that to achieve this higher level it implies that a school has to attend to modernising the technological tools and changing the teaching models. The latter, according to the authors include the role that teachers have, classroom organisation, the teaching and learning processes and interaction. If these are not attended to adequately, it could serve as barriers and constraints in integrating ICTs into schools. Furthermore, Albugami and Ahmed (2015) noted that amongst other barriers, a lack of clear ICT policies and understandings was a barrier that impacted on the integration of ICTs in education.

However, in identifying how other barriers including those related to policy impact on the integration of ICTs in education, it is important to understand that the main purpose of noting these is to turn these very same barriers into positive factors that could assist in the successful integration of ICTs in education. Albugami and Ahmed (2015)

suggested that this implies removing any possible barriers that may hinder the use of ICTs in schools and then identifying the factors which enable and promote their use. These enabling factors could assist teachers in being more motivated and enthusiastic about using ICTs in their teaching (Cubukcuoglu, 2013).

2.3. Global and National policies guiding the use of ICTs in schools

The use of ICTs in education is promoted by the United Nations (UN) in its 2030 Agenda for Sustainable Development. This type of sustainable development, in a very broad sense, aims at improving the state of nations and the world itself. The Sustainable Development Goals (SDGs) are viewed as a type of blueprint to achieving a better and more sustainable future for all, by addressing the global challenges humanity currently faces. The UN SDGs, also referred to as the Global Goals builds on the UNs Millennium Development Goals (MDGs). The terms of the MDGs expired in 2015 and the UN 2030 Agenda now sets out 17 SDGs designed to eradicate poverty, reduce inequality, and tackle environmental concerns on a global scale. Surely, if development is to be sustainable then part of this development should not only be concerned with access to education for all, but also access to quality education, especially with globalisation and the advent of the information age.

The MDGs had in the past placed more emphasis on quantitative targets including increasing education enrolment rates only to see the quality of education decline. Hence, in the recent past there has been a shift where the SDGs now place more emphasis on quality issues. SDG4 dealing with education has as an aim to “develop education systems that foster quality inclusive education and promotes lifelong learning opportunities for all” (UNESCO, 2017). This SDG4 encourages the use of ICTs to support the principles of improving access to inclusive and equitable education as well as to provide a good quality of education for all. The type of education as expounded in SDG4 must seek to match the needs of learners and the relevant skills and knowledge required for the 21st century.

The Department of Basic Education (DBE) in South Africa has developed its own national policy document to transform teaching and learning through ICTs in education, known as the e-Education White Paper. The policy, which was legislated on 26 August 2004, identifies six strategic objectives for action. As part of the core strategies for developing teachers and learners to acquire relevant skills matching the needs of our

ever changing society and world, the policy document includes reference to the integration of ICTs in teaching and learning. This e-Education policy is a first from a South African government department to integrate ICTs in the teaching and learning process (Blignaut and Howie, 2009). The policy in the view of these authors represents a framework for implementing various aspects of the e-Education policy in South Africa. These include the strategic, political, pedagogical and developmental aspects. It is important to note that the strategic objective of this e-Education policy emphatically states that : “Every South African learner in the general and further education and training bands will be ICT capable (that is, use ICTs confidently and creatively to help develop the skills and knowledge they need to achieve personal goals and to fully participate in the global community) by 2013” (Department of Education, 2004b. p.17).

In defining e-Education in Chapter Two of the policy, it is made clear that e-Education is central to fast tracking the implementation of national education goals. The policy notes that by connecting learners and teachers to better ideas and information, it intends to support educational reforms in this process. In Chapter Three of the e-Education policy, the aim is to focus on teaching and learning for a new generation of youngsters growing up in a digital world and who are generally comfortable with using the current digital technologies. Furthermore, the importance of school management in ICT is referred to under phase two of the policy, which entails the integration of ICTs by teachers and management. Given that the HoD is central to managing teaching and learning, ICTs and school management are therefore important issues.

In addition, in early 2012 the DBE made public its ‘Action Plan to 2014’, with a total of 27 goals (Department of Education, 2016). Goals 16, 20 and 27 had particular reference as regards the use of ICTs in education. In 2015, an updated version of the DBEs ‘Action Plan to 2014’ was released, known as ‘Action Plan to 2019’. These plans have the same 27 goals but in addition include the priorities, targets and programs of the country’s National Development Plan, known as ‘Vision for 2030’ (Department of Education, 2016). Goals 16 and 27 continue to remain priority goals, in relation to ICTs in education. In its revised five-year strategic plan the DBE continues to identify the strengthening of school management and information as part of its medium-term strategic framework, numbered output five (Department of Education, 2016). The document also includes reference to the integration of ICTs in teaching and learning as part of the core strategies for developing learners and teachers.

However, Czerniewicz and Hodgkinson-Williams (2005) have indicated that unlike the United Kingdom and Australia, the integration of ICTs in education in South Africa is not being driven mainly by top-down policies and funding incentives. Like others (Isaacs, 2007), the authors noted that the e-Education White Paper was primarily focussed on schools and that at the time there was no policy for ICTs in higher education locally. In addition, Isaacs (2007) reported that the lack of national co-ordination amongst various organs of government, civil society and the private sector, which seemed to be operating in isolation from each other, was a major constraining factor when integrating ICTs in education locally.

Vandeyar (2015) observed that in analysing how DBE district officials understand and implement ICTs in schools, the capacity and lack of ICT competencies amongst officials negatively impacted their ability to implement policies and provide the necessary support to schools. In addition, Albugami and Ahmed (2015) made reference to studies conducted which showed that 39.8% of teachers noted a lack of explanation of ICT in Saudi educational policy. Furthermore, in their study of Malaysian schools, Hoque, et al., (2012a) observed that although national ICT policies exist, 84% of the teachers were not aware of them. Their finding also showed that most of the schools (80%) surveyed did not have ICT policies at the school level even whilst the facilities and equipment of ICT were available in most Malaysian schools. So, whilst there may be resources and funding available which is being invested for integrating ICTs in education, it may very well be that there is no clear strategy for its implementation. Therefore it is important to examine ICT policies to gain a better understanding of why and how best it could be implemented in education and schools in particular.

Policies of individual institutions would seem to play a major role in promoting the integration of ICT into the curriculum despite at times the lack of provincial policies (Czerniewicz and Hodgkinson-Williams, 2005). Hence, there is a need to develop and implement effective ICT policies in schools, driven by school leaders and managers with a vision and mission that understand the benefits and recognises the barriers and constraints of integrating ICTs in schools. Also, Czerniewicz and Hodgkinson-Williams (2005) noted that the policy climate in the country generally favoured the use of ICTs as a necessary educational benefit. The authors suggested that various references to the potential benefits of ICT appear in a range of national education documents, human resources planning and the sciences and technology sectors.

What becomes clear is that globally countries have designed various policies and initiated many programs for implementing ICTs in education. These policies and programs are important in realising the benefits ICTs can bring to education (Kozma, 2008). However, in our quest to improve education, certain challenges and decisions cannot always be captured in policy terms (Christie, 2010).

2.4. The use of ICTs in school leadership, management and administration

School leadership, management and administration are all integral parts of the daily running and success of schools. However, this landscape entailing leadership, management and administration is methodologically diverse and its central concepts are not settled (Christie, 2010). This situation could be further exacerbated with the integration of ICTs in schools. In mapping the changes to school leadership in South African schools, Christie (2010) argued that a traceable theme across the landscape of work in school leadership in the United States of America (USA), the United Kingdom (UK) and Australian literature is a move and interest from 'administration' to 'management' to 'leadership'.

She further noted that partly due to geographical differences, 'administration' was the preferred term in the USA from the 1950s onwards and was also the term used in pre-democratic South Africa, whereas 'management' was favoured in the UK until the 1970s. In moving to school-based management in the 1990s the term 'leadership', as imported from business literature, became more fashionable and in a way consumed management as the prominent concept (Christie, 2010). In recognising and acknowledging the historical development and evolutionary nature of these three concepts, it is also important to provide some type of working definition and distinction between them as my research study explored how school leaders like HoDs use ICTs to assist with managing the teaching and learning process.

Whilst the concepts school leadership and school management are at times used synonymously and often perceived to be the same, there are notable differences between them. The same applies to the concepts school management and school administration. For example, Cuban (1988) provides a type of distinction between school leadership and management by suggesting that school leadership is associated with change while management is seen as a maintenance activity. The author contends that leadership is about influencing others' actions to achieve desirable ends and leaders are those who shape the goals, motivations and action of others. School

leadership is the act of influencing others in a school setting to achieve the desired goals and necessitate some kind of action (Connolly, James & Fertig, 2017).

Furthermore, Christie (2010) suggested that whilst leadership is often associated with vision and values, it is often framed in terms of the qualities an individual possesses. However, the author also noted that leadership may be more usefully framed in terms of the social relationship of power where some individuals are able to influence others. Leadership can be exercised at most levels in organisations and in most activities implying that leadership in schools is not limited to positions and can be found and built throughout the school (Christie, 2010).

Management, on the other hand is according to Cuban (1988) more about maintaining efficient and effective current organisational arrangements. This implies that whilst management will include leadership skills, its general function however, is more towards maintenance than change. In addition, management which is more likely to be associated with formal positions than persons relates more to structures and processes where institutions like schools attempt to meet their goals and central purposes (Christie, 2010). Also, management is generally seen as a more encompassing term and more comprehensive activity than administration.

Administration is generally viewed and concerned with for example, lower order duties, like completing certain forms, learner attendance numbers and returns in educational contexts (Connolly, et al., 2017). It is important to note that not completing daily administrative functions linked to learner and staff attendances, curriculum tracking like monitoring of teacher and learner records, uploading of learner scores on assessments, providing information and feedback to learners and staff, could negatively impact on the effective and efficient operations of the school.

In attempting to distinguish between the concepts school leadership, management and administration, I also recognise that they work together in schools and are not mutually exclusive. However, each of these as a function of schooling needs to operate in an effective and efficient manner if we aim that our schools provide the best quality education. As Bush (2007) noted, each of the concepts leadership and management need to be given equal priority if schools are to operate effectively and achieve their goals. In addition, Christie (2010) noted that ideally, there should be an abundance of good leadership at all school levels and the type of conditions should allow school leaders to manage in unobtrusive ways. She suggested that school principals, for

example should integrate and possess skills in both leadership and management functions. As researcher, I also recognise the inclusion of the concept and processes related to administration in completing these school leadership and management functions.

Bush et al., (2009) noted that in many countries effective school leadership is identified as one of the main contributors to successful schools. Amongst seven claims identified by Leithwood, Harris and Hopkins (2008), for successful schools, school leadership rates as only second to classroom teaching as an influence on learning. This implies that in the integration of ICTs in schools, we need to be aware of the importance of school leadership and management. At the same time, we need to give attention to these areas as being constraining or enabling factors in augmenting teaching and learning with the intention of improving the quality of education through the use of ICTs.

The available international and local literature on the subject of the leadership role of middle managers, HoDs in the case of this research study, suggests that it is an important element in contributing to school effectiveness (Bush et al., 2009; Ali & Botha 2009; Leithwood, 2016; Mampane, 2017). This is important to note as Spillane (2005) suggested that both researchers and practitioners tend to link leadership to the head or principal leadership and this in a sense ignores how leadership is distributed and actualised amongst other school leaders.

Cranston (2013) in critically examining the role of school leadership and school success argued that school leaders and those aspiring to be in these positions view accountability as a major factor in how their roles as school leaders are defined and actualized. The author identified management and administration as associated demands of this type of leadership. Clarke (2007) suggested that the functions and duties of school managers broadly range from implementing policy to organising and staffing, planning and budgeting, problem solving, monitoring and evaluating plans, controlling discipline and motivating staff. More importantly, Botha (2013) alluded to school managers being expected to take on important roles of influencing, facilitating and improving the teaching and learning culture of the school.

Ali and Botha (2009), who studied the role of HoDs in Gauteng secondary schools, noted that the main responsibility of HoDs was curriculum delivery. Relative to curriculum leadership and management, Lee and Dimmock (1999) suggested that this would seek to encompass things like goal setting, planning, monitoring, reviewing and

developing the educational program of the school and staff, building a culture and allocating resources. If teaching and learning is to improve, it is expected that HoDs would spend more time in supervising the daily teaching and learning activities in their subjects (Ali and Botha, 2009).

Although most of the HoDs in the study by Ali and Botha (2009) indicated that monitoring the teaching and learning process was an important element in contributing to school improvement, the researchers question whether HoDs actually carry out this task effectively and efficiently. Similarly, Bush, et al., (2009) noted that whilst most middle school leaders acknowledge their responsibility to monitor teaching and learning, many may not be doing so in reality. In addition, Christie (2010) noted that other local research concurs with the analysis that good leadership and management is essential for the functioning of schools. It has been further suggested that this local research confirms the view that if schools are not managed well, the primary task and central purpose of the school, which is teaching and learning, is likely to suffer (Christie, 2010).

Furthermore the research conducted by Mampane (2017) in former disadvantaged public schools in South Africa found that acquiring leadership and management skills for effective teaching and learning by HoDs was positively related to improving learner performance and the commitment of teachers. The author suggested that this finding implies that improved leadership behaviours may result in improvement of other areas like teaching and learning, teacher motivation and personal commitment. It would appear that where HoDs are more empowered in leadership and management skills, the better the performance of the schools in which they teach (Mampane, 2017).

Whilst it is beyond the scope of this study to explore the various models around school leadership, management and administration, it is important to note that many schools across the globe are using ICTs to support a variety of these management and administrative tasks and activities. This, as noted, is partly linked to the efficiency and effectiveness of using ICTs in completing these management and administrative functions and demands. Prokopiadou (2011) has suggested that ICTs have been increasingly integrated into school administration to facilitate administrative tasks and activities and to improve how the organisation handles official school data.

The South African e-Education policy also recognises that schools, like other organisations are using ICT-linked management systems for planning, monitoring, improvement and accountability purposes. The policy notes that ICTs have the ability to automate processes thereby saving school managers time that can be used for focussing on instructional leadership issues, which broadly relates to providing leadership with teaching and learning as a focal point. In the e-Education policy it is clearly stipulated that “Every teacher, manager and administrator in General and Further Education and Training must have the knowledge, skills and support they need to integrate ICTs in teaching and learning” (Department of Education, 2004b. p. 25).

However, the policy further recognises that educational leaders are not yet fully appreciative of the benefits that e-Learning and e-Administration could bring to schools. Hence, as the policy indicates it remains imperative that educational leaders, including HoDs are given the necessary and enabling support to manage the introduction and integration of ICTs in schools. For example the DBE has in the e-Education policy undertaken to develop standardised templates for schools on management, statistical analysis, record keeping and reporting.

Shah (2014) argued that ICTs provide opportunities for assisting school managers to determine the aims of the school, to formulate policies and plans, to distribute resources accordingly and to evaluate things like staff performances and the success of the organisation. The author observed that school managers, who spend a lot of time completing various tasks like solving intricate staff allocation, resource allocation and timetabling issues, but who also have to monitor the school operations, currently have broader options available to them for completing these tasks with the enhanced technologies in schools. In addition, Passey (2002) asserted that the topic of ICTs and school management are important issues, as it is well recognised that senior managers in schools have a major impact upon classroom and curriculum practices. However, as the author suggested linking effective school management with higher learner achievements when using ICTs is completely contextual.

Makewa, Meremo, Role and Role (2013) who studied teachers’ and administrators’ perceptions on the importance of ICTs in secondary school administration and evaluated the extent to which it was used by administrators, asserted that school management is regarded as one of the main factors contributing to a school’s effective functioning. These authors observed that both teachers and administrators indicated

ICTs to be of importance in usage by Kenyan schools. In their study, administrators are those involved in the daily operations of secondary school duties like HoDs, deputy principals and principals. The study found that teachers and administrators viewed the use of ICTs in learner administration as equally important while administrators rated the importance of using ICTs in the supervision of instruction and in learner administration higher. Administrators, it was noted used ICTs in preparation, administering, compiling and analysing learners' test marks. However, it was also observed that both groups agreed that administrators rarely use ICTs in other areas of schooling, including financial, personnel and supervision of instruction (Makewa, et al., 2013).

Maki (2008) observed that ICTs play an important role in supporting dominant, efficient management and administration systems in the education sector. The author suggested that in education institutions, in this case schools, technology can be used from learner administration, like learner records to different resource administration. Under the types of administrative subsystems, Maki (2008) includes amongst other personnel, learner, resource, financial and general administration.

Also, these information technologies make it easier to decentralize work tasks and to coordinate these tasks in an interactive network of communication in real time (Castells 1999). Furthermore schools are places where knowledge and information in their various forms are central issues of schooling. This presents various opportunities in establishing ICTs as fundamental information management tools at all levels of an educational system, from classroom to ministries (Mikre, 2011).

The overall review of some of the literature indicates a very positive impact of integrating ICTs in the area of educational management (Shah, 2014). Therefore, it could be argued that ICTs could be used to support school leaders in completing the management and administrative functions that they are faced with on a daily basis. However, despite the benefits of using ICTs in school management and administration, the research by Manduku, et al., (2012) in schools in Kenya indicated school management had not fully realised the potential of adopting and embracing the use of ICTs to perform various management tasks due to several constraints. The authors suggested that these constraints included the lack of skills, finance, technical support, facilities, ICT related software and hardware to perform the management functions and limited knowledge on how to integrate ICTs into management functions. These, the authors contended have resulted in most schools adhering to traditional conventional

ways of performing management tasks even though improved technological innovations were available. Hence, school managers should be trained to ensure that they have appropriate ICT skills and knowledge to perform school management functions using ICTs (Manduku, et al., 2012).

In addition, Maki (2008) observed that although important steps had been taken by the Cypriot government regarding the integration of ICTs in schools, the utilization of these technologies and information systems remained at an early stage in educational management and administration. Also, research studies done by Hoque, et al., (2012a) in Maldivian and Malaysian schools (Hoque, et al., 2012b), found that ICTs were being used more for administrative rather than for management functions of the school. Similarly, New (2016) noted that many schools in the USA were using ICTs to maintain and sustain day-to-day school operations, instead of leveraging data linked to ICTs to transform and augment these operations. Consequently, the author argued that these schools and their teachers were not using data to make timely decisions for learners and to transform the education system.

2.5. School administration and management information systems (SAMIS)

The development of school administrative computer applications and systems started in the late 1970s, during which time the use of ICTs in schools, like software applications were used mainly to improve the efficiency of schools in for example storing learner and staff data (Forrester, 2019). Also, Visscher (1996) suggested that in the early 1980s, a few non-integrated clerical and administrative software applications were developed, but these applications limited the possibilities for management support by for example not being able to analyse the relationships between various data. The author suggests that it was during the ICT integration stage that the value of management and not only administrative information systems was also recognised.

Hence, whilst these systems and applications had made significant progress in the area of school electronic data systems at the time, it lacked the kinds and type of data schools, teachers and society in general find useful. Forrester (2019) suggested that the use of school management and information systems was one form of information technology adopted to fill this void. This, as the author noted, was due to the ability of these school management and information systems to generate data and also its efficiency and effectiveness to save time and develop solutions for complex problems.

Telem (1996) adapted business-type organisational management information systems to develop a framework for a school management information system.

The author suggested that a school management system is a system designed to, in a way, match the structure of the school, its various management tasks, instructional processes and special needs. The school management and information system is also referred to as an education information system, academic or learner administration system, learner information or learner management system (Forrester, 2019). In my study, I have opted to use the concept school administration and management information systems (SAMIS) as an all-encompassing term for specifically these ICT related systems.

Furthermore, Telem (1996) suggested that information systems are able to provide tools that contribute to the better and quicker execution of administrative tasks and work. The author further noted that school information systems are able to provide for data integration from several sources as well as for the management of: (i) school information (planning and development, security, legal issues and public relations); (ii) learner information (for example, registrations, attendance, grades, curriculum); (iii) teaching information (for example, workloads, training seminars, administrative task allocation); (iv) information on general issues (for example, learner excursions, catering services, social events); (v) information on additional school functions (seminars, school library); and (vi) general administration information (for example, teacher salary payments, transfers and budget and infrastructure management).

Various SAMIS have been developed and have evolved over the years. Shah (2014) concurred that these educational management systems are being used by schools to support a wide range of administrative activities including the monitoring of attendance, compiling and updating learner assessment records, reporting, financial management and resource and staff allocation. The author also noted that these systems have the ability to provide users with the processed information, models of analyses, updates in real-time and hypothetical scenarios to assist them in a decision-making process. However, education management information systems are distinct from the other information systems in that they are designed to analyse and facilitate strategic and operational activities in an organisation like the school (Shah, 2014).

Visscher (1996) is of the view that educational management information systems are able to provide administrators and teachers with the type of information that is required

for informed planning, policy-making, and evaluation. These management information systems have certainly changed school management in various areas of leadership, workload, responsibility, decision making, communication, planning and human resource management (Shah, 2014). Management information systems of this nature can assist school managers when formulating the aims of the school, developing strategic plans, distributing resources as well as evaluating the performance of staff and organizational success (Telem, 1996).

Furthermore, Blau and Presser (2013) suggested that these school management information systems provide extensive support for school leaders like principals to manage the organisation and delegate responsibility which in turn increases the pedagogical effectiveness of the school. The interest in educational management information systems is generally rooted in the belief that such information systems allow for better school and district management and increases a school or district's accountability to the community it serves (Shah, 2014). Also, efficient and quick decisions can be made possible when school managers get accurate and up-to-date information when using an educational management information system (Shah, 2014).

As regards HoDs, Blau and Presser (2013) also noted that a school management system improves school effectiveness by enhancing the e-leadership of middle-level school staff. The authors suggested that management information systems assist HoDs in planning and monitoring curriculum implementation in various subjects as well as enhancing learning. For example, teachers enter into the system the topics of their lessons, homework and learner information and they are then able to focus and respond to questions from learners and prepare them for assessments (Blau and Presser, 2013).

In the South African context, the topic of SAMIS is promoted under the National Education Policy Act No. 27 of 1996 which has informed the National Education Information Policy, published in August 2004 (Department of Education, 2004a). This national education information policy acknowledges that in the education system, effective gathering, dissemination and analysis of information is important. The policy also recognises that the South African education system has a multitude of information systems, both computerised and paper-based. These systems are being employed amongst other uses, to admit learners, register learner attendance and achievements, communicate with parents and appraise educators. It is important to note that this

national education information policy aims to develop education information systems in the country which firstly, enhance the daily operations of schools and thereby promote accountability and secondly, that these systems produce valuable data and statistics for planning and monitoring purposes (Department of Education, 2004a. p.6).

Hence, the national education information policy recognises that schools will benefit from a school management information system that facilitates administration, management and planning in every school. The policy stipulates that historically disadvantaged schools will receive the necessary support to establish these information systems. This support is currently rendered in selected schools by the DBE in the form of the South African Schools Administration and Management System (SA-SAMS), which aims at supporting the daily operations, administration and reporting by schools. Whilst the primary purpose of this system is school administration, data that is captured is used in reporting, planning, monitoring, learner and teacher management, curriculum management as well as registration for the National Senior Certificate examinations in the country (NECT document, 2019).

Although the SA-SAMS is at times rich in functionality, the DBE has identified areas where this administration and management system can be improved. This has been referred to as the modernisation of the SA-SAMS system and processes. At the time of this research study the DBE, through the National Education Collaboration Trust (NECT), was seeking to introduce a more innovative approach towards the national and provincial implementation of SAMIS to replace the existing SA-SAMS solution and meet the future needs for administration and management of information in educational institutions like schools. This modernisation and re-engineering process is to supply, implement, maintain and support a cost-effective commercial off-the-shelf software solution that was intended to replace the current SA-SAMS, initially in the provincial DBE departments of the North West and Free State provinces in South Africa (NECT document, 2019). It will be very interesting to explore how this process unfolds and the impact it has on existing SAMIS in schools in the targeted provinces and schools in general.

In addition, the multitude of components that exists in Telem's (1996) framework, for educational management information systems noted earlier, confirm the view that the integration of ICTs in schools is a complex process. It would appear then that this integration requires special attention even when the change does not involve teaching

and learning directly, but is related to management issues. Also, whilst most secondary schools use some type of SAMIS, these management information systems tend to be used primarily for clerical purposes and not to support higher order managerial activities (Bosker, Branderhorst and Visscher, 2007).

With the amount of support and assistance these SAMIS offer, this finding by Bosker et al., (2007) is somewhat discouraging. The authors further argued that whilst this type of assistance with pure clerical work is very important and could also result in valuable improvements in schools, information systems are not being applied generally to optimise the support of higher order managerial work in schools. In addition, previous studies on using management information systems in schools stress the importance of teacher training and development (Bosker et al., 2007).

2.6. Theoretical framework

Given that ICTs and their associated technologies are related to human activity, this research study was located within a theory of social action. The social action theory used in this study stresses the importance of communication and promotes the idea that the communicative mind and communication amongst social beings form the basis of communities and organisations (Mitrovic, 1999). Communication seeps into all aspects of human experience and it is important in providing some understanding of human behaviour. In addition, communication is the social production of meaning in society and is about the social process of shared and joint meaning-making with the assistance of symbol production and interaction (Fuchs, 2016).

Also authors like Janson, Woo, and Smith (1993) noted that the need for effective communication seems to be a recurring theme in literature around electronic management and information systems. The authors further noted that applying communicative action theory to the development of information systems enables one to formulate appropriate strategies as one examines the cause of peoples' problems. Communicative action theory contributes significantly to the development of information systems as the problems people experience when using these systems are often the cause of systems failures (Janson et al., 1993). This also implies that people are able to develop solutions to these challenges in the way we communicate with each other.

Furthermore, information systems have the potential to support pure communicative interaction between actors in an organisation in a manner that inspires criticism,

facilitates learning and generally raises the overall competence of the organisation (Lyytinen & Hirschheim, 1988). How language is used in a social context to generate meaning and understanding amongst humans is the essence of Jürgen Habermas's (1981) communicative action theory as referred to by Janson et al., (1993). Hence, in this study I too have opted to utilise this theory of social action, more especially in applying it to information and communications technologies and systems.

However, as with most theories issues of complexity are abound. Therefore, in espousing a social action theory, information systems in this study are viewed as a manifestation of social action which is socially determined and conditioned (Lyytinen and Hirschheim, 1988). This way of studying information systems provides a broader perspective as compared to the traditional technical ways of examining ICTs. Lyytinen and Hirschheim (1988) suggested that by adopting this type of approach, implementation can now be considered in terms of the way actors make sense of their environment and the role that information systems play within those environments.

Given that this research study examined the role of school managers particularly HoDs, who also lead their departments, in integrating ICTs in schools, it is important to provide a framework for school leadership within the context of the study. Hence, this study is further located in the distributed leadership framework, which as noted by Seong and Ho, (2012) includes the notions of instructional and transformational leadership, when integrating ICTs. Whilst the literature on school leadership has predominantly focused on the role of the head or principal, there are important tasks and activities performed by other tiers of school leadership that contribute to providing a quality education. This neglect in how leadership tasks and activities in a school are distributed and performed by others besides the head or principal locates this study within a distributed leadership framework.

Hence, for the purposes of this study, distributed leadership is defined as the deliberate dispersion and distribution of school leadership functions where it is seen as not being confined to the principal, but also to others like middle management, including deputy principals and HoDs. Also, a distributed leadership style for ICT integration and implementation in schools requires both aspects of transformational leadership and instructional leadership to aim at developing the teacher's capacity to enhance their instruction with ICTs (Seong and Ho, 2012).

Bush and Glover (2016) contend that instructional leadership, which generally deals with the school's central activities, namely teaching and learning, is one of the most important activities school leaders engage in. The authors further noted that other terms used to describe this relationship, include pedagogic leadership and curriculum leadership and that instructional leadership as a concept links leadership and learning. In addition, Leithwood and Riehl (2003) asserted that views on the principal as primary or most important instructional leader requires rethinking. Within this study, it is argued that if school leaders are to effectively and efficiently manage their teachers in various areas required by the teaching and learning process, then HoDs as part of this leadership need to be provided with relevant and appropriate skills, knowledge and values embedded in instructional leadership. These include skills and knowledge related to the management of the curriculum, learner assessments, performances and achievements; planning, co-ordination, tracking, monitoring and evaluation; teaching and learning tasks and activities; and teacher professional development.

However, as with other models of school leadership, instructional leadership has also been associated with the head or principal being the centre of expertise, in this case leading and managing the core function of the school, teaching and learning. Consequently, as Bush and Glover (2016) noted this notion of leadership tends to overlook or even underplay the role of other school leaders including deputy principals, middle managers or HoDs (in this study), leadership teams and classroom teachers. Leithwood and Poplin (1992) observed that transformational leaders in schools are generally in pursuit of three main goals being (i) assisting staff to develop and maintain a collaborative, professional school culture, (ii) fostering teacher development and (iii) assisting with collective problem solving. This implies that in seeking to provide a good quality education, it is important that school leaders like principals provide appropriate opportunities for their teachers to reconsider and rethink assumptions about their work (Leithwood and Poplin, 1992). Hence, it becomes imperative that school leaders including HoDs develop and practise transformational leadership to successfully integrate ICTs in their schools.

This type of theoretical framework, I argue allows me as researcher to accomplish two pertinent issues within my research study. I am firmly of the view that as humans we are primarily social beings and our behaviours, actions and how we construct and make meaning of our experiences are largely a result of our interactions with and amongst each other and our environments. Hence, with the type of approach adopted, I was

firstly able to locate the main focus of the study, which is ICTs in a social action theory of communications and information systems, namely the communicative action theory.

Secondly, my study also focused on school leadership and management, in that I attempted to explore how school managers, like HoDs being social agents utilise ICTs to manage a social process, that is teaching and learning. Hence, the approach adopted further assisted me with locating the study within a theory of school leadership and management, namely distributed leadership with aspects of instructional and transformational leadership making up part of this leadership framework.

2.7. Summary

From the review on the available literature in this area, it would appear that ICTs have brought new opportunities for schools, including school leaders, teachers and learners. However, the successful integration of ICTs in schools is complex and dependent on a number of factors. These, if not dealt with appropriately could become barriers, constraints and challenges to the successful integration of ICTs in schools.

However, these very same barriers and challenges, categorised in this study as technological, learner, teacher and other could serve as enabling in integrating ICTs in schools, when dealt with appropriately. ICT integration is also dependent on a number of factors including the type of leadership and management styles of school leaders. Subsequently, it is also important to consider how school administration and management information systems assist school leaders with the integration of ICTs in schools.

In reviewing the available literature on ICTs, this chapter has attempted to provide a synopsis of this. The following chapter provides a more in-depth account of the research design and methodology used for the purposes of this study.

CHAPTER THREE

Research Design and Methodology

3.1. Introduction

This chapter examines the research paradigm and methodology used in this study. A brief discussion of the research strategy and design adopted is provided, with a description of the data gathering methods and research instruments used in the study. Hereafter, the method of data analysis is outlined and the chapter concludes with a brief description of the ethical issues and limitations of the study.

3.2. Research paradigm and methodological perspective

Mackenzie and Knipe (2006) note that in educational research the term paradigm is used to describe the 'worldview' of the researcher. Kivunja and Kuyini (2017) continued by suggesting that this worldview is the thinking, or perspective, or school of thought, or set of shared beliefs, that informs the interpretation or meaning of the research data. The researcher's 'worldview' constitutes the abstract beliefs and principles that show how the researcher sees and views the world, and how they interpret and act within that world; it is the lens through which the researcher looks at the world (Kivunja and Kuyini, 2017).

Some of the more common research paradigms referred to in the literature include the positivist paradigm, the interpretive/constructivist paradigm, the transformative paradigm, the pragmatic paradigm and the subjective paradigm. In this study, I chose to work within an interpretive/constructivist paradigm, as my intention was to understand the world of human experience. In my worldview, the interpretations, understanding and meaning we bring to these experiences is a socially constructed process. Hence, my choice of a research paradigm provided me a framework to interpret my findings in a way where I was able to construct meaning to these experiences. Also, Lim (2002) is of the opinion that the study of ICTs in schools should consider the social processes that ICTs support during their use and how experiencing and using ICTs is integrated into notions of learning to develop higher order skills. Hence, it is clear that the choice of research methods will to a large extent depend on the researcher's own theoretical grounding in the field.

Generally, in using an interpretive/constructivist paradigm it aligns with the type of research methods and procedures that will gather and analyse qualitative data. This study, which explored how HoDs use ICTs to manage teaching and learning, attempted to access the views, values, beliefs and assumptions of these HoDs as agents of society using ICTs, hence the choice of an interpretive/constructivist paradigm.

In using a qualitative approach, with an underlying interpretive/constructivist paradigm the more appropriate research methods are interviews, discourses, reflective sessions and text messages with the researcher acting as a participant observer (Kivunja & Kuyini, 2017). In aligning my study with this paradigm, I chose and conducted face-to-face interviews with my participants using a semi-structured questionnaire.

3.3 Research strategy

A case study could be a specific instance or event that is frequently designed to illustrate a more general principle (Cohen, Manion & Morrison, 2007). This approach enables the reader to understand ideas more clearly than by representing them in abstract theories or principles, in that the case study provides a distinct example of people in real-life situations (Cohen et al., 2007). In addition Crowe, Cresswell, Roberston, Huby, Avery and Sheikh (2011) noted that the case study approach is an established research design strategy and it is used extensively in various disciplines, more especially in the social sciences. The authors contended that this type of approach is very useful particularly when there is a need by the researcher to obtain a detailed account of an issue, event or phenomenon in its natural real-life context. Hence, a case study approach to research is used to generate an in-depth understanding of a complex issue in its real-life context (Crowe et al., 2011).

In drawing my data from a real-life, natural setting I employed a multiple case study approach to my study as the focus of my investigation was on interpreting how HoDs in six schools use ICTs to manage teaching and learning. Each of the schools in the study was a case that could be studied separately, or in my case a study exploring ICTs in a number of secondary schools.

3.4 Research design

3.4.1. Selection of research sites

The research sites or schools in my study were selected to provide a local perspective of how ICTs are used by HoDs in public schools in the Alberton area, of the Ekurhuleni South district of the GDE. The research sample consisted of secondary schools only as my assumption was that ICT implementation and practise was more prominent in these schools as compared to primary schools. This assumption was influenced by the huge ICT investments being made by the GDE in secondary schools in the Gauteng province. Furthermore, the sample schools were chosen from a list of approximately 447 secondary schools in the Gauteng province that the GDE has classified as ICT schools.

I also used convenience type sampling (Cohen, et al., 2007) as I conducted my research in one education district in Gauteng, in secondary schools all in close proximity to each other, but located in communities with varying socio-economic status. The underlying proposition I used here was that due to disparities in the socio-economic status of schools, differences may occur in the way HoDs use ICTs to assist in managing teaching and learning in the various schools. Furthermore, in order to achieve the sample of six secondary schools, a maximum variation sampling technique was used. Cohen et al., (2007) suggest that this technique is useful to researchers as it aims at investigating distinct changes, variations or patterns that may emerge as a result of participants responding to a phenomena or event. In my study, I made an attempt at exploring how ICTs, as the phenomena or event, when used by HoDs to manage teaching and learning, makes any difference.

Therefore, the participants were purposively selected through maximum variation sampling so that fee-paying and non-fee-paying schools as well as schools classified by the DBE according to quintiles were represented (see Table 3.1). In SA schools, the quintile ranking or the national poverty ranking is used to classify schools along socio-economic variations. My rationale for choosing schools in different socio-economic settings was based on my observations and experiences as an educator in a secondary school and a former employee of the DBE, who continues to work with schools in my private capacity. My observations and experiences suggest that conditions for teaching and learning differ, at times widely between SA schools located in communities that are poorer as compared to more affluent communities.

For example, a quintile 1 school, classified in socio-economic terms as the poorest of SA schools is associated with a lack of, amongst other, adequate school infrastructure and resources as compared to a more affluent and well resourced quintile 5 school.

Table 3.1.: Socio-economic status of research sites/schools

Site/School	A	B	C	D	E	F
Ex Department	HOA	DET	Built after 1994	Built after 1994	HOR	HOD
Location	Former White suburb	Former African township	Former Indian township	Former African township	Former Coloured township	Former Indian township
Quintile	5	3	5	2	3	3
Fee Paying	Fee Paying	Non Fee Paying	Non Fee Paying	Non Fee Paying	Non Fee Paying	Non Fee Paying
Buildings	Brick & Mortar	Brick & Mortar	Prefab classrooms	Prefab classrooms	Brick & Mortar	Brick & Mortar

Key : HOA – House of Assembly (for Whites)
HOD – House of Delegates (for Indians)
HOR – House of Representatives (for Coloureds)
DET – Department of Education and Training (for Africans)

NB : The above key is used to show how schools were classified before1994

(The key shows the schools in hierarchical positions with the top HOA schools receiving larger budgets and the bottom DET schools receiving the least spending from government before 1994)

Table 3.1 shows the socio-economic status of the study sites/schools according to quintile ranking, fee-paying and the previous departments of education the schools were under before the new dispensation in the country in 1994. In selecting schools to also represent these previous education departments, I argue that due to differences in the locality of schools, that is, located in areas and suburbs previously classified according to race in the country, differences may also occur in the way HoDs use ICTs to assist with managing teaching and learning in the various schools.

As an example, it could be argued that HoDs working in schools located in former White suburbs will be more knowledgeable and skilled in using ICTs to manage the teaching and learning process as compared to their counterparts in the former townships. In presenting this view, I firmly believe that the different spend by the government of the

time before 1994 on these schools, largely contributed to these differences. Schools in former White suburbs in South Africa were provided with among other, better resources, physical and human, before 1994. Therefore, my choice of schools according to quintiles and ex-departments was to ascertain during the study if there were differences between how mathematics and sciences HoDs use ICTs to manage teaching and learning given their location and context in relation to the communities these schools serve.

Of the five schools, it is only School A which is a fee paying school. Both schools C and D have been built after 1994 as temporary structures. However, their quintile rankings differ because they are located in suburbs with different socio-economic conditions. Whilst school C is ranked as a quintile 5 and school D as a quintile 2 school, both are non fee paying schools as the majority of learners attending both these schools are from poorer socio-economic backgrounds.

Before conducting the research study, I wrote to the university's ethics committee and completed an application form seeking approval to conduct this type of research, of which I subsequently received (Appendix A). Also, prior to embarking on the actual data collection, a letter and application form was sent to the GDE requesting permission to conduct research in two of their secondary schools, of which I received (Appendix B1). However, it was recommended by the university's ethics committee that I broaden the scope of the study to include more HoDs. Given that my target group was mathematics and sciences HoDs, this meant increasing the number of schools for my study as generally public secondary schools would not have more than two HoDs employed in these positions. Hence, I again wrote to the GDE to request a broadening of scope and allow me to visit six instead of only two of their schools, which they agreed to.

On receiving approval from the GDE (Appendix B2), I contacted the principals of the six secondary schools, to set-up an initial meeting where I shared with them the aim of my research study and my needs relative to the data collection process. I also provided the principals with a formal letter informing them of the purpose and conduct of the study (Appendix C) as well as requesting their consent and permission to interview selected HoDs (Appendix D). After receiving the school principal's consent, I then provided the selected HoDs with a similar information letter that I had given to the principals (Appendix E) and gained their consent (Appendix F). At these initial meetings, I emphasised to the school principals and the selected HoDs that their participation in my

study was voluntary and there would be no foreseeable risks in participating in this study, nor any financial or other imbursements to either the school or the individuals volunteering their time to be interviewed. On receiving consent from the school through the principal and the selected HoD, I contacted each HoD personally via phone to arrange for a suitable time for both the participant and me as the researcher to conduct the interview. On receiving the necessary approvals and permission, the fieldwork of my study was conducted between August 2019 and February 2020.

3.4.2. Selection of participants

The main purpose of my research study was to explore how school managers like HoDs in secondary schools use ICTs to assist with the management of teaching and learning. This entailed exploring selected HoDs understanding of ICTs specifically in the teaching and learning process, their utilisation of ICTs to manage this process and some of the challenges they face when using ICTs to carry out this function. I adopted a purposeful sampling approach in each of the six schools by purposefully selecting only the mathematics and sciences HoDs in secondary schools. According to De Vos (2002), this type of sampling allows the researcher to focus on a particular feature or process that the study is interested in, in my case the mathematics and sciences HoDs.

An information form (Appendix H) was used to capture the data of the sample group according to race, gender, age, qualifications and teaching experience. A summary of this appears in Tables 4.1 and 4.2 in Chapter Four dealing with the analysis of the data.

3.4.3. Pilot Study

Generally, engaging in a pilot study before the actual larger research study allows one to identify obstacles and challenges that could be avoided in a larger study. This further allows for opportunities to improve the research process thus ensuring a successful study. Also, pilot studies are a trial run or small-scale study of the research to be conducted as well as a testing of the research process and data collecting tools (De Vos, 2002). Hence, pilot studies can make a significant contribution to provide information and in my case assisted with the actual research study I conducted.

Therefore, prior to embarking on the data collection for this research study, I conducted a pilot study between May 2019 and June 2019, with four HoDs at two secondary schools in the Johannesburg East district of the GDE. The pilot study provided me with various opportunities for acquiring relevant experience to conduct semi-structured

interviews in my actual research study. Through this type of a trial-run, I was able to improve on various processes and procedures before I embarked on collecting the data for this research study. For example, I ensured, among other that proper protocols were followed to gain the voluntary participation of HoDs. During the pilot study, I was also able to acquire more knowledge on the audio recording application I used to capture the responses of participants. This new knowledge I used when I recorded the interviews with the participants for my research study.

3.5 Data generation methods

The data collection methods used to collect the required data for this study included information forms, interviews, interview notes and reference to DBE documents. Scott and Morrison (2005) have noted that by using various methods to investigate phenomena or facets of it, it allows a researcher to provide a more holistic and rich account of the phenomena in question. By integrating and combining a multitude of data methods, I was able to triangulate the data by ensuring that the research question was answered from different angles. This process of triangulation allows the findings from the data to be corroborated by providing avenues for comparing the data collected by different methods (Scott & Morrison, 2005).

3.5.1. Information forms

At the beginning of each interview I requested the HoD or interviewee, to complete an interviewee details or information form (Appendix H) designed by me, to purposefully capture their demographic and basic teaching details. The form contained pre-captured information I had populated which related to the name of the school, the name of the province (Gauteng) and district in which the school was located. Also included was the address and contact numbers of the school, and the name(s) of the principal and/or either their deputies and their contacts. This information I had acquired from the DBE's schools master list of March 2019. This list of public schools in the country was available on the DBE's website. The list also provided me with information around the socio-economic ranking of the school and whether the school was a school built before 1994 and if so, under which previous administration of education, like the Department of Education and Training or House of Assembly, Delegates or Representatives or whether it was built after 1994, by the GDE.

The information form I designed also consisted of gathering basic information on the HoD, like the number of years they had been teaching as well as the total number of years experience they had as an HoD. The form did not request any information on quantitative issues regarding ICTs, like the amounts and types of ICTs available in the school as the focus of the study was on gathering and analysing qualitative data. The information gathered from these forms are summarised in Tables 3.1, 4.1 and 4.2.

3.5.2. Interviews

By using interviews as a data collection method in research, it is a move away from seeing human subjects as something that can be manipulated, where data itself is external to these subjects towards accepting knowledge that is generated between humans, often through conversations (Cohen et al., 2007). Interviews emphasise a socially constructed process and in aligning with my own worldview this method was also my choice of generating data.

However, as I aimed at keeping the interview process as natural as possible, I did not opt for an interview situation which was inflexible and which did not allow me to make changes to the sequencing of questions or their content. Hence, in allowing me to make any modifications, with a set of predetermined questions to how the questions were sequenced and still allow for a natural process, I conducted semi-structured interviews (Appendix G) with each of the participants. The questions I posed in these interviews mainly addressed the research objectives of the study. These questions were open-ended as the advantages of using these types of questions allowed me to probe further during the interview in order to gain a more in-depth understanding and in the process clear up any misunderstandings (Cohen et al., 2007).

I recorded the semi-structured interviews with an audio application, available on my smart phone. However, for ethical reasons (discussed in more detail below), I needed to firstly obtain the permission of my participants before recording any interviews with them. All the selected HoDs allowed me to record the interviews. Each of the semi-structured interviews were conducted individually with the selected HODs of each school, in order that each study participant felt comfortable and did not feel influenced or coerced into responding in a way that is inconsistent with their own values, beliefs, opinions and experiences, which could have happened in a group.

The voice or audio recording of each interview was downloaded onto a computer for safe keeping and to assist with the transcribing process. The transcripts of the interviews allowed me to transcribe my participants' responses. Transcribing my participants' responses from the interview was a time consuming process. I intended overcoming this by following the recommendation of Thomas (2006) which was to acquire a computer based application that would be able to transcribe the voice notes into text, like a word format. However, I was unable to find and utilise a relevant and appropriate application for the transcribing process and resorted to manually transcribing the interviews into a Microsoft Word format. The limitations in using the applications were that they were at most times unable to identify with the local accent of my study participants. This meant that I would need to listen to the recording again and fix the transcription, so I decided on transcribing the interviews myself.

3.5.3. Interview notes

During each of the interviews, I made some interview notes in relation to the participant's responses on the semi-structured interview questions. I utilised these notes to verify participants' responses and to reflect on my understanding and interpretation of what transpired during the interviews. These notes also assisted me to identify and record themes that emerged during the interview process.

Some may argue that whilst it is possible to make notes to capture participants' responses, it is difficult to focus on conducting an interview as well as jotting down notes during the interview. This could result in sub standard notes being taken by the researcher and could also detract from a good rapport being developed between interviewer and interviewee (Cohen et al., 2007). However, despite taking notes during the interviews I ensured that I built and maintained a good relationship with each of my study participants.

3.5.4. DBE documents

Bowen (2009) noted that documents are able to provide background information as well as historical insight into the phenomena under study. This type of information and insight, according to the author, can assist researchers in understanding the historical roots of specific issues and can indicate the conditions that impose upon the phenomena being studied. The researcher is able to use data drawn from a variety of

documents to contextualise data especially that collected during interviews (Bowen, 2009).

In my study I chose to analyse various DBE policy documents that relate to ICTs in education and to managing teaching and learning. These documents were mainly in the form of national and provincial DBE policies that regulate and provide guidance on the implementation of ICTs in education. These documents are available in printed or electronic formats. I did not request or analyse documents from my study participants.

3.6 Data Analysis

According to Scott and Morrison (2005), in analysing qualitative data researchers are primarily concerned with ensuring that the findings of the research is grounded in the information collected in the field. Such data, as the authors suggest is mainly concerned with making meaning rather than dealing with numbers. The focus is on unearthing patterns in social life that individuals may or may not be aware of (Engward, 2013). Hence, I also used the grounded theory approach in assisting with the data analysis process for my study. This method of data analysis has its foundations in analytical induction methods based on Glaser and Strauss's (1967, cited in Scott & Morrison, 2005), *The Discovery of Grounded Theory*.

Engward (2013) contended that grounded theory as used in research is an inductive approach where hypotheses and theories are generated from the collection of data. It is, as the author notes, a systematic means of collecting and analysing the data to develop theories about patterns of human behaviour in various social contexts. The qualitative methodology that the author refers to here can be used to expand on our understanding of social phenomena (Engward, 2013).

Hence, as researcher I subjected the primary data I had collected through semi-structured interviews to an inductive analysis. One of the main differences between an inductive and deductive approach to research is that a deductive approach is aimed at testing theory, whereas an inductive approach is concerned with the generation of new theory emerging from the data. This was very appropriate for my research study as I intended eliciting my participants' responses through semi-structured interviews to ascertain their values, beliefs and opinions on the role of ICTs in school management, specifically teaching and learning

Another purpose for using an inductive approach as suggested by Thomas (2006) is to condense raw textual data into a brief, summary format. This I achieved by transcribing my participants' responses from the interviews. Through inductive analysis the researcher is able to establish clear links between the evaluation or research objectives and the summary findings derived from the raw data (Thomas, 2006). This approach allowed me to further explore the role of ICTs in school management from the raw data I collected from my participants.

In developing a framework of the underlying structure of experiences or processes that are evident in the raw data, the inductive approach as suggested by Thomas (2006) provided a good basis for this. Also, the author contends that the inductive approach provides a user-friendly and systematic set of procedures for analysing qualitative data that can produce findings that are reliable and valid. Although the general inductive approach may not be as strong as other analytic strategies for theory or model development, it provided me as the researcher with a simple, straightforward approach for deriving findings in the context of the semi-structured questions in my interviews.

After examining all the raw data, I developed a list of topics based on the responses of the participants in my study and clustered similar topics together, according to how they related to each other. I adopted this approach in attempting to align my analysis of the data to what authors like Scott and Morrison (2005) suggest where qualitative researchers often take the information that becomes data to categorise it and build connections between categories. I then used the various codes to create categories which were named by me, in relation to the research question and common themes that emerged from the data. Codes develop from being descriptive and/or from various literal data to interpretative, and then move on to explanatory and then abstract data, which move towards a type of conceptual analysis which owes much to a discovery or grounded approach to research (Scott & Morrison, 2005). The process of coding as noted by De Vos (2002) involves breaking down the data, conceptualising it and then putting it back together in new ways, which enables a more systematic analysis of the data. In working with the data in this way, I also looked for any patterns, trends or even contradictions in the various themes identified.

Also, in referring to grounded theory, Engward (2013) suggests that the researcher needs to be open and sensitive during the research process to allow issues of importance to the study participants to be exposed during the data collection and

analysis. This I tried to ensure when during the interview process I allowed study participants to express their views on issues that may not have related directly to the topic for my research study. This was important as I found that in some instances, my study participants referred to various challenges that were not related to ICTs but may impact on how they manage teaching and learning at their schools. These, I discuss further in Chapter Four.

On completing an analysis of the data, I proceeded to interpret the data in order to make meaning of how HoDs used ICTs to manage the teaching and learning process at their schools. The themes I had identified were compared and analysed for each participant in the study as well as across the different cases or schools. Where I needed to illustrate points from the participants I used direct quotes to ensure the authenticity of the information. In the analysis and discussion of the findings, the names of schools and selected HoDs were coded to ensure the anonymity and confidentiality of the study schools and participants. The results of these are provided in Chapter Four.

3.7. Trustworthiness

Generally, trustworthiness is about establishing whether the research study measured what it intended to and whether the findings from these are reliable and valid. The concepts reliability and validity are often associated with quantitative research. However, given the qualitative nature and approach of my research study when accessing the various worldviews, beliefs and opinions of my participants on the role of ICTs in school management, it was appropriate to utilise a set of criteria to ascertain whether the ‘stories’ we each tell in the research process is true or believable.

Loh (2013) argues that ‘narrative research’ where the participant and researcher construct and tell their stories, should have a set of criteria or considerations to refer to in order to evaluate the acceptability of narrative studies. For example, Lincoln and Guba (1985) propose a set of four trustworthiness criteria: (i) credibility, referring to the internal validity of the research study, (ii) transferability, which examines the external validity, (iii) dependability, referring to reliability and (iv) confirmability, which examines the objectivity of the research. The authors have also suggested that these criteria impose checks for the researcher to be certain that the proposed procedures are in fact being followed.

In addressing credibility, I ensured that my study dealt with the focus of the research. To have interviewed the principal of the school on the maintenance of the school grounds, was not going to be a credible piece of empirical evidence when my focus was on ICTs and school management. As for transferability or what is also termed as applicability, I addressed this in my study by ensuring that my study procedures and methods of data collection and analysis can be transferred or will be applicable to other settings or groups.

Dependability refers to a large extent to the ability of the researcher to account for constant changing conditions of the phenomena under study, for the interaction with study participants and for the research process conducted to be an emergent one. In my case, I needed to consider whether I could repeat my findings from my research study in the same context, with the same subjects, which I was able to do. Conformability refers to the extent of the findings of the research study being affected by personal interest and biases. In essence, this criterion refers to the neutrality of the data rather than the neutrality of the researcher. Hence in the data collection process and analysis it was important for me to keep personal field notes which contained my impressions and decisions along the research path. These notes were also used to enhance the aspect of trustworthiness.

Furthermore Silverman and Marvasti (2008) suggest that research is of good quality when it satisfies some main criteria. These are when the research : (i) develops empirically sound, reliable, and valid findings; (ii) uses methods that are demonstrably appropriate to the research problem, and (iii) where possible, it contributes to practice and policy. Whilst the first two of these criteria have been addressed above by using Lincoln and Guba's (1985) criteria, I have in this study alluded to the lack of research studies in the field and more particularly with ICTs and school management. Hence, I hope that this study will contribute to both policy and practice in ensuring that I improve on the integrity and believability of my qualitative inquiry.

3.8. Ethical Considerations

Firstly, I needed to obtain ethics approval and clearance from the university prior to the commencement of my research study, by following and complying with the university's procedures and processes. I achieved this by completing the university's ethical clearance application and submitted it for approval. On receiving university approval

and clearance, I submitted an application to the GDE to compete the research study in initially two of their schools, which I later expanded to six with the GDE's permission.

Hereafter, I obtained the written permission of the six principals in whose schools I conducted the data collection. I also drafted consent forms to be completed and signed by my study participants where they provided me with the necessary consent to be interviewed. These forms also gave me consent to record and transcribe our discussions. Most of all, it provided me with the consent and permission to publicly publish the findings of these interviews in my research study.

The consent forms were given to the school principals and the selected participants. The contents of the forms were discussed in meetings with the school principals and selected HoDs at each of the six schools. Each principal or their deputies and each of the selected HoDs volunteered their participation in the study by agreeing and signing consent forms. Values like transparency, safety, confidentiality, trust and privacy needed to be guaranteed for my participants and were therefore explicitly stated in these consent forms. Given that participants volunteered their participation in the study, the consent form also specified that they were at will to withdraw from the study at any time, without any punitive consequences.

3.9. Limitations of the study

The research study was conducted in Gauteng public secondary schools only, which is primarily an urban area. Other limitations of this study include the focus, which was the role of ICTs in school management, specifically with HODs. Also, the target of my study was only six schools which is small-scale. Therefore in terms of this study demarcation, the study and its findings are limited to these participating schools.

3.10. Summary

This chapter provided a very brief discussion of the research paradigm and methodology used in this study. The chapter then examined the research strategy and research design adopted for the study. This was followed by a description of the data gathering methods and research instruments used in the study, where after a brief description of the method of data analysis was outlined. The chapter concluded with some ethical issues and limitations of the study. In the following chapter a presentation, analysis and interpretation of the data is provided.

Table 3.2. : A summary of my research design and processes

Research design and process	Researcher's choice	
Research paradigm	• Interpretive/Constructivist	
Methodological perspective	• Qualitative	
Research strategy	• Multiple case-study	
Research methods and instruments	• Pilot Study	• Interview protocol
	• Semi-structured interviews	• Interview protocol
	• Information form and interview notes	
Study population	• Heads of Departments (HoDs) for mathematics and sciences in secondary schools (*n*=10)	
Sampling methods	• Purposeful sampling • Maximum variation sampling • Convenience type sampling	
Data	• Information forms • Audio recordings of interviews • Interview transcripts • Interview notes • DBE policy documents	
Data analysis	• Grounded theory approach • Manual coding • Categorising and identifying themes	

(Adapted from Botha, 2013)

CHAPTER FOUR :

Data presentation, analysis and interpretation

4.1. Introduction

This chapter provides a presentation, analysis and interpretation of the data collected from ten HoDs from six selected schools in the study. The data has been primarily derived from semi-structured interviews designed to seek HoDs understanding of ICTs in education and specifically school management. The aim of the study was to explore how HoDs use ICTs to manage teaching and learning in their schools. Information forms (Appendix H) provided to each HoD before the interview commenced, have been summarised and an analysis is provided in Tables 4.1 and 4.2. Hereafter, an in-depth analysis of the semi-structured interviews with the ten HoDs follows.

Table 4.1 provides a summary of the demographics of the ten HoDs showing the average age for the sample group at 49.1 years. The average number of years teaching experience for the ten HoDs is 24.2 years, whilst the average number of years experience as an HoD for the sample group is 6.5 years. The minimum qualification obtained by each HoD is a four year degree or a three year diploma plus a post graduate diploma in education. On the DBEs relative education qualification value (REQV) system, this equates to an REQV value of 14, which is also the minimum requirement by the DBE for new teachers entering the public schooling system. In relation to the National Qualifications Framework (NQF) in South Africa where all qualifications are graded from level 1 to 10, with the lowest grading at level 1 equating to a grade 9 secondary schooling and the highest grading being a doctorate or post doctoral research degree at NQF level 10, this REQV value equates to an NQF level 7.

Although purposeful sampling was used to select mathematics and sciences HoDs only, Table 4.1 shows that there are more female mathematics and sciences HoDs (60%) as a study group as compared to male HoDs (40%). Of the study participants only one of the male HoDs, HoD 7 has obtained a qualification higher than an NQF level 7, this being an Honours degree, graded as NQF level 8. The highest qualification obtained by the study participants is a Masters in Education, graded at NQF level 9 which has been achieved by two female participants, namely HoD 1 and HoD 5.

Table 4.1. : Demographics of study participants/HoDs

School	Race	Gender	Age	Highest Academic qualifications	Teaching experience	Experience as an HoD
School A: HoD 1	African	Female	42	Masters in Education	16 years	13 years
School B: HoD 2	African	Female	45	Bachelor of Science - Education	16 years	4 years
School B: HoD 3	African	Male	52	Bachelor of Science – Education	30 years	10 years
School C: HoD 4	African	Male	46	Bachelor of Arts - Education	18 years	6 years
School C: HoD 5	African	Female	54	Masters in Education (Mathematics)	30 years	4 years
School D: HoD 6	African	Male	59	Advanced Certificate in Education (ACE) – Mathematics Literacy	37 years	3 years
School D: HoD 7	African	Male	46	Bachelor of Education (Honours)	20 years	1 year
School E: HoD 8	Coloured	Female	49	Further Diploma in Education	26 years	2 years
School E: HoD 9	Coloured	Female	51	Advanced Certificate in Education (ACE) - Mathematics	25 years	13 years
School F: HoD 10	African	Female	47	Bachelor of Education (Honours)	24 years	9 years
Averages	8 African and 2 Coloured =10 HoDs	6 Females and 4 Males	49.1		24.2 years	6.5 years

Table 4.2 provides a breakdown of the various subjects headed and managed by the HoD in their departments, the number of teachers the HoD manages at their school and the subjects and grades taught by the HoD at the time of collecting the data. The

workload distribution of teachers according to subject(s) and grade(s) will generally change in the following school year.

Table 4.2. : Subjects heading, number of teachers managing and grades teaching by HoDs

Participant	Position occupied	Subjects headed by HoD	Number of teachers managed by HoD	Subjects and grades currently taught by HoD
School A-HoD 1	Appointed HoD	• MS (Gr. 8-12), • ML (Gr. 10-12), • PS (Gr. 10-12), • LS (Gr. 10-12) and • NS&T (Gr. 8 & 9)	9 teachers	• PS (Gr. 10 & 12) • ML (Gr.11 & 12)
School B-HoD 2	Appointed HoD	• MS (Gr.8-12)	6 teachers	• MS (Gr.10 & 11)
School B-HoD 3	Acting as HoD	• ML (Gr.10-12), • PS (Gr. 10-12) and • NS&T (Gr. 8 & 9)	5 teachers	• MS (Gr. 12) • ML (Gr.10)
School C-HoD 4	Appointed HoD	• PS (Gr. 10-12), • LS (Gr.10-12) and • NS&T (Gr. 8 & 9)	8 teachers	• LS (Gr.11 & 12) • NS&T (Gr. 9)
School C-HoD 5	Appointed HoD	• MS (Gr.8-12) and • ML (Gr.10-12)	10 teachers	• MS (Gr. 10-12) • ML (Gr.10)
School D-HoD 6	Appointed HoD	• PS (Gr. 10-12), • LS (Gr.10-12) • NS&T (Gr. 8 & 9) and • EGD (Gr. 10-12)	4 teachers	• PS (Gr. 11 & 12) • EGD (Gr. 10, 11 & 12)
School D-HoD 7	Appointed HoD	• MS (Gr. 8-12) and • ML (Gr. 10-12)	9 teachers	• ML (Gr.12)
School E-HoD 8	Appointed HoD	• PS (Gr. 10-12), • LS (Gr.10-12) and • NS&T (Gr. 8 & 9)	5 teachers	• PS (Gr. 11 & 12) • ML (Gr.10 & 12)
School E-HoD 9	Appointed HoD	• MS (Gr. 8-12) and • ML (Gr. 10-12)	8 teachers	• ML (Gr.11 & 12)
School F-HoD 10	Appointed HoD	• PS (Gr. 10- 12), • LS (Gr.10-12) and • NS&T (Gr. 8 & 9)	4 teachers	• PS (Gr. 11 & 12) • LS (Gr. 10) • NS&T (Gr. 8 & 9)

Key : PS – Physical Sciences MS – Mathematics
LS – Life Sciences ML – Mathematical Literacy
NS&T – Natural Sciences (NS) and Technology (T)
EGD – Engineering Graphics and Design

As Table 4.2 indicates, only HoD 3 has not been officially appointed in this position. His ten years experience as an HoD shown in Table 4.1, is largely made up of his time in a former HoD position in a Zimbabwean school, before arriving to teach in SA. The HoD managing the most number of teachers is HoD 5 and hails from School C. In addition, this school also has the most number of mathematics and sciences teachers. Whilst HoD 1 in School A heads the second highest number of teachers along with HoD 7 in School D, the HoD in School A heads both the mathematics and sciences department. The HoD for mathematics in School F indicated a willingness to partake in the study. However, due to workload priorities and time constraints did not partake in the study. Hence, of the 6 schools selected, ten HoDs in total were interviewed for this study.

The average number of subjects grouped as either mathematics or sciences and headed by each HoD in the sample group is 2.8. These subjects include mathematics and mathematical literacy (grouped as mathematics) and natural sciences, physical sciences, life sciences and technology and engineering, graphics and design (grouped as sciences). All HoDs offer one or more subjects in either the mathematics and sciences groups of subjects, for any of grades 10, 11 and 12 which is classified as the Further Education and Training (FET) band of the South African school curriculum. However, only two HoDs, HoD 4 and HoD 10, from schools C and F respectively also offer subjects at the General Education and Training (GET) band, this being for the subject natural sciences and technology at grade 8 and/or 9.

The primary data for the study, the semi-structured interviews for the ten HoDs were transcribed. These transcriptions were used to organise the data into various categories, themes and sub-themes emerging from *a priori* coding of the data. An analysis of the data is presented here according to five sections, namely :

1. HoDs' definition and understanding of ICTs
2. The benefits expressed by HoDs of using ICTs in teaching and learning
3. The various functions as perceived by HoDs in managing teaching and learning
4. HoDs utilising ICTs to manage teaching and learning
5. The challenges expressed by HoDs in using ICTs in teaching and learning and in the management of this

These sections are classified as categories in Table 4.3. to give meaning to the data analysis and align with the research questions identified in Chapter One.

Table 4.3. : Development of categories, themes and sub-themes

Category 1 : Understanding of ICTs	
Theme	Definition and understanding of ICTs in education
Sub-themes	• Technological changes
	• Teaching with technology using ICT tools and devices
	• Teaching and learning experience using ICTs
Category 2 : Benefits of using ICTs in education	
Theme	Benefits of using ICTs in teaching and learning
Sub-themes	• Teacher related – Lesson development and delivery; Management functions and time; and Paper and chalk
	• Learner related - Learner interest; Knowledge and information; and Past question papers
	• Other - Using web applications; and ICTs, user-friendliness and communication
Category 3 : Managing teaching and learning as an HoD	
Theme	HoDs functions when managing teaching and learning
Sub-themes	• Curriculum Coverage – Annual Teaching Plans (ATPs); Learner books; Class visits
	• Assessment management – Managing assessment and curriculum coverage; Assessment quality controls; and Assessment pans
	• Policy implementation and planning – Adherence to policy; and Management plans
	• Learner Teacher Support Materials (LTSM)
	• Discipline and attendance
Category 4 : Using ICTs to manage teaching and learning as an HoD	
Theme	Using ICTs to manage teaching and learning
Sub-themes	• ICTs and Communication - ICT communication channels; DBE officials and communication using ICTs; SMTs, HoDs and teachers communicating with ICTs
	• Managing teaching and learning functions – Curriculum coverage; Assessment management; Policy implementation and planning; LTSM; and Discipline & attendance
	• School Administration and Management Information Systems (SAMIS) – SASAMS; DBE forms and self-developed SAMIS
Category 5 : Challenges HoDs face in using ICTs in education	
Theme	Challenges of HoDs in using ICTs for teaching and learning as well as management
Sub-themes	• Technological – Hardware and software; Connectivity, Data and Power
	• Teacher related –Training and development; Access and age; and Misuse of ICT tools and devices
	• Learner related – Access, Misuse of ICT tools and devices
	• Other - Safety and security; Staggered implementation; Buildings and Infrastructure; Government; Workloads and Time; Discipline; Literacy and Numeracy

4.2. HoDs definition and understanding of ICTs in education

The first category focuses on identifying common themes in the study participants understanding and their definitions of ICTs in education. As Figure 4.1 shows, this category is discussed in relation to its main theme relating to the understanding and

definitions of ICTs by HoDs and three sub-themes dealing with (i) technological changes, (ii) the ICT tools and devices in teaching with technology and (iii) the teaching and learning experience as a result of using these technologies.

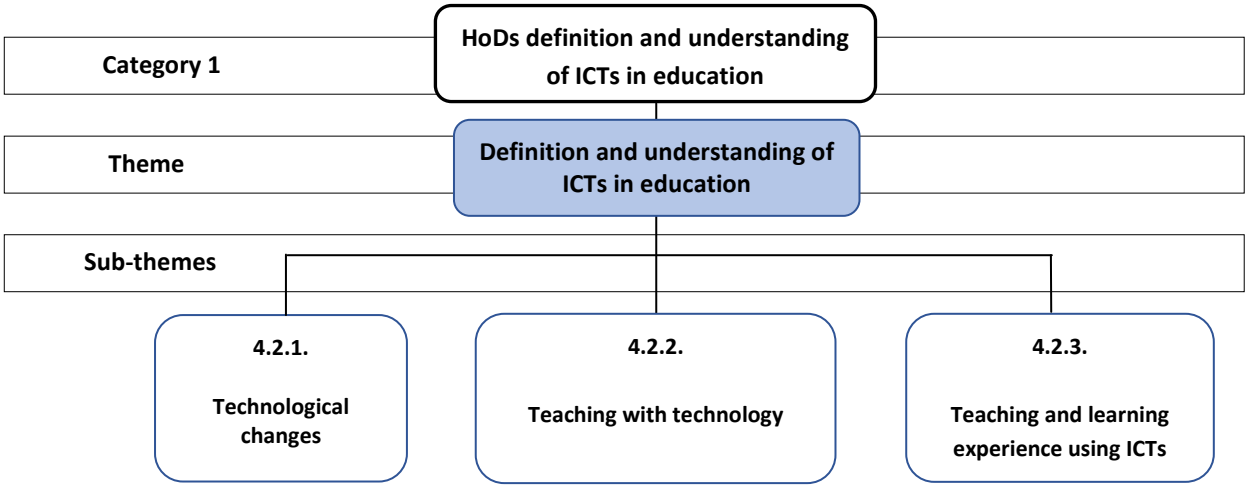

Figure 4.1. Categories and themes relating to the sampled HoDs definition and understanding of ICTs in education

4.2.1. Technological changes

From the study participants, HoD 3 and HoD 7 both expressed their understanding of ICTs by aligning them with the technological changes we are currently experiencing and acknowledged in the literature, at times referred to as the force which drives humanity. In this respect HoD 3 indicated that:

> *The whole world is moving, they call it what a technological revolution.*
>
> *We are living in a modern world today, where we are doing away with old systems of maybe conveying information, planning, preparing.*

In a similar light, HoD 7 remarked that:

> *Remember, we are moving on to maybe you may call it the fourth industrial revolution.*

In expressing their understanding of the technological changes, three HoDs also linked it to integrating ICTs in education, specifically teaching when they stated:

HoD 4 : *What I understand about the ICTs is that now we have to use technology in classes.*

HoD 9 : *ICTs I would understand is using new technology in teaching.*

HoD 10 *: I understand ICTs as the technological way of teaching learners via smart boards and it's helping the learners to get interested.*

The idea of teaching with technology as expressed by these three HoDs, makes reference directly or indirectly to ICT tools and devices. These have been identified as a second sub-theme in this category where the HoDs definition and understanding of ICTs and ICTs in education was sought through the semi-structured interviews.

4.2.2. Teaching with technology using ICT tools and devices

None of the HoDs identified any ICT tools or devices which were different or not captured in the definition of ICT tools and devices in this research study. All HoDs in the sampled group indicated that they use a computer, laptop or desktop to assist with completing various administrative tasks. In sharing her understanding of ICTs in education and how she uses a computer as an ICT device, HoD 9 remarked:

> *I love it ICTs. I love computers. I'm fascinated by the technology and I've always used my laptop, preparing my lessons…*

HoD 1 shared a similar view in relating her experience with an ICT device like the laptop, when she stated:

> *I've always loved working with the laptop. ICT, I've always used ICT before there was ICT being introduced in schools.*

Figure 4.2 shows the various examples of the ICT tools and devices identified by HoDs in this study. This information has been extracted solely from the interviews of each of the HoDs. In other words, the bar graph is based on the ICT tools and devices they made mention of in the course of the interviews. In Chapter One, a working definition of ICT tools and devices was made. In assisting with the data for this sub-theme only, these are divided as ICT tools (Wi-Fi, Whats App and emails) and ICT devices (desktops and laptops, tablets, interactive and smart boards, projectors, cell phones, photo copiers and connection cables).

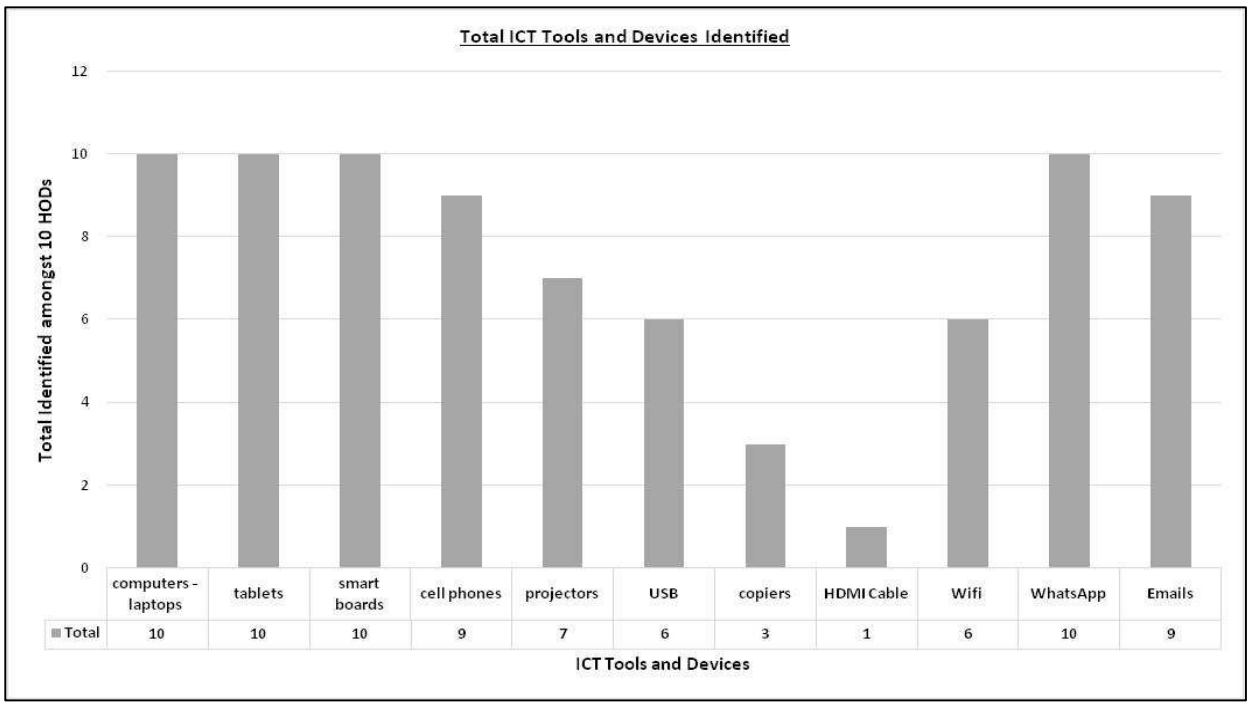

Figure 4.2. : ICT tools and devices identified by the sampled group

From the above Figure 4.2 it is clear that the total number of ICTs tools and devices mentioned by the sampled group is 11. An ICT tool like Whats App and ICT devices like laptops, tablets and interactive smart boards were mentioned by all HoDs in the sampled group. The use of emails was the second most ICT tool identified by the group along with cell phones, classified as a device here. Another ICT device, the HDMI cable was mentioned by only one HoD.

Figure 4.3 below shows the number as a proportion of all eleven ICT tools and devices identified by each of the HoDs in the sample.

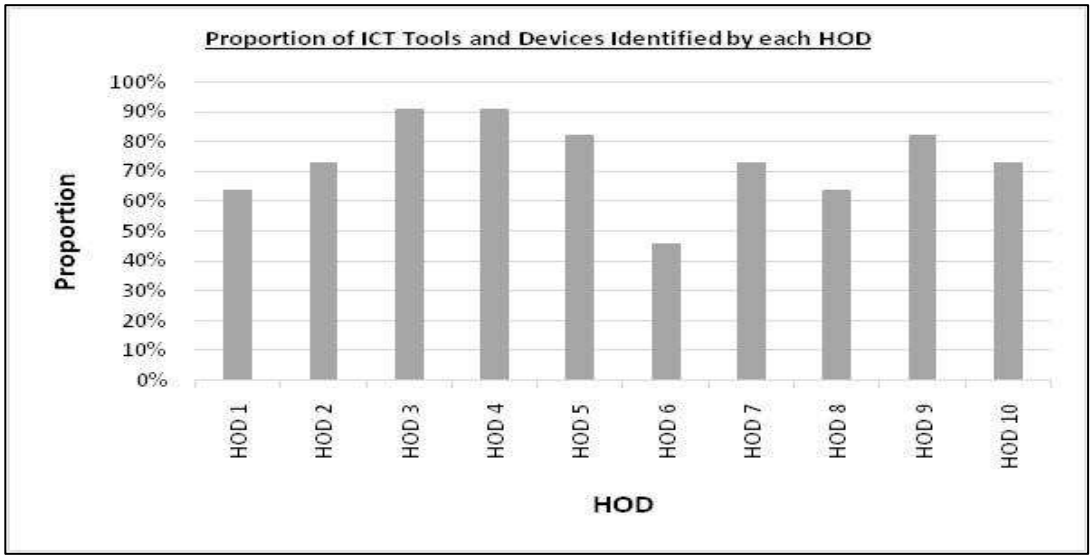

Figure 4.3. : Proportion of ICT tools and devices identified by each HoD

It is evident from Figure 4.3. that HoD 3 and HoD 4 have both mentioned the most number of ICT tools and devices from the total number as mentioned by the sampled group. During the interviews, HoD 6 mentioned 4.95 items, the lowest number of ICT tools and devices from the total of eleven items mentioned by the sample group. This makes up a 45% proportion of all items mentioned as shown in Figure 4.3.

4.2.3. Teaching and learning experience using ICTs

In providing their understanding of ICTs in education, three HoDs made reference during the interviews to how when using ICTs it impacted on the teaching and learning experience, when they stated :

> HoD 1 : *When you teaching learners through media with, if I sum it up, where you could either use videos, you could get some adverts and then you project that or you play it on the smart board.*
>
> HoD 3 : *Technology is very, very essential and very important because it helps us in actually teaching in itself… we can keep even videos and then use them to teach learners.*
>
> HoD 9 : *What I like is like the Gauteng Department of Education introduced the smart boards and that was really fascinated for me because I'm fascinated by ICTs.*

Of these three, HoD 3 also related his understanding to the technological changes identified in the first sub-theme of this category.

4.3. The benefits expressed by HoDs in using ICTs in teaching and learning

Relative to the main theme identified in this category, the ten HoDs interviewed expressed various benefits in relation to integrating ICTs in education, specifically in teaching and learning. In the literature review of this research study, various barriers and constraints to ICT integration in education were grouped into technological, teacher related, learner related and other. Reference was also made here to the notion of turning these barriers and constraints into positive factors that could assist in the successful integration of ICTs in education. Therefore, in discussing what HoDs in the study perceive to be the benefits of integrating ICTs into teaching and learning, three of these groupings have been used here to assist with identifying sub-themes related to this category, as shown in Figure 4.4. These benefits have been grouped as (i) teacher related, (ii) learner related and (iii) other.

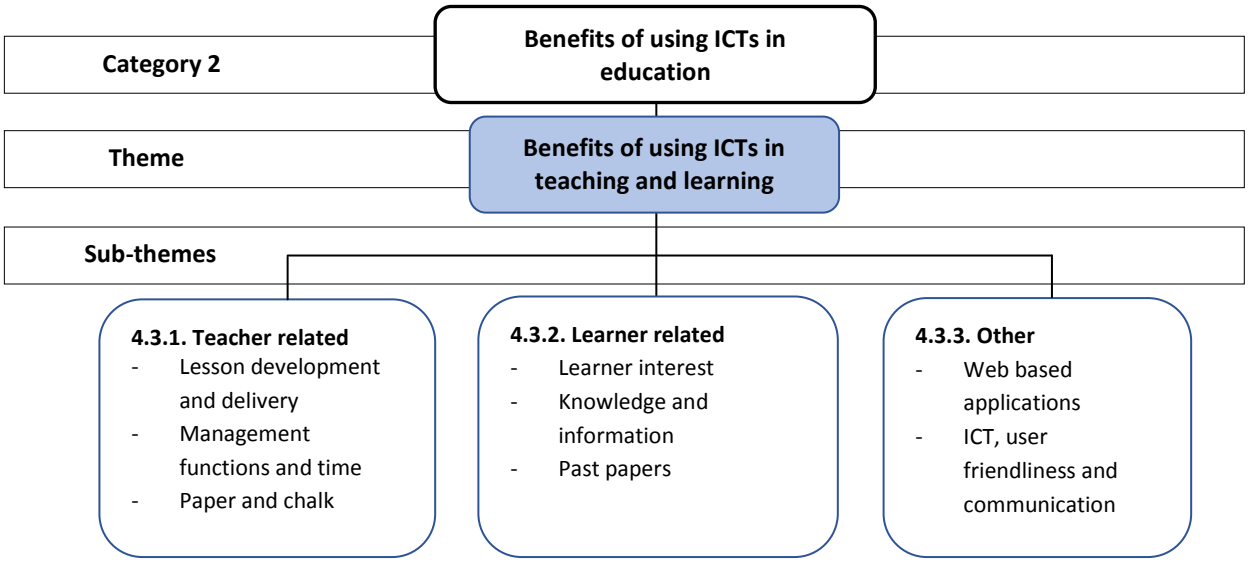

Figure 4.4. : Categories and themes relating to the benefits of ICTs as expressed by the sampled group of HoDs

4.3.1. Teacher related

All ten HoDs in the sample group indicated that when used in education, ICTs brought many benefits to teachers and learners. The teacher related benefits have been further grouped into three sub-themes, the first dealing with how HoDs use ICT tools and devices like computers and smart boards to develop lesson plans in attempting to enhance their delivery of lessons.

4.3.1.1. Lesson development and delivery

Three HoDs explained how the various ICT tools and devices assisted in the development and delivery of lesson plans. These were:

HoD 4 : *With the smart board everything is in colour, but when you do it from the photocopying machine, it's black and white. Sometimes with electricity, when you are working with resistance, to calculate those the value of the resistor, you need to see that the band its violet, it's value, this is one is red.*

HoD 7 : *That's lesson preparation, I'm preparing, for a certain topic, I also have to use the internet to get extra information. It could be, I want to use maybe pictures. I want to use maybe the latest information, maybe on the taxation, I have to go into the internet to get the relevant information, the pictures all that. Put it into my planning, then after that I go into my class.*

HoD 8 : *With your preparation and everything, you don't have to write everything down, you just use your laptop. As you present your lesson, there's things that you can write or add to it.*

The second sub-theme identified here, deals with how ICTs make management functions easier and saves time, as expressed by HoDs in the research study.

4.3.1.2. Management functions and time

This, as a second sub-theme identified under teacher related benefits, showed that six of the ten HoDs in the sample population, namely HoDs 1, 2, 3, 7, 8 and 10, indicated that by using ICTs it makes it easier to deal with various management functions.

In this regard, HoD 7 indicated that:

> *Like in the administration, let's talk of let's say capturing of marks, issuing of reports,…all other administrative issues, it is done well.*

HoD 2, 8 and 10 remarked that by using ICTs in school management it made it easy, when they stated:

HoD 2 : *…it makes my life to be easy.*

HoD 8 : *It makes it very easy for everybody. It really makes things easy.*

HoD 10 : *…it was making maybe we'll say our job easier.*

In addition, seven of the ten HoDs in the sample population, namely HoDs 1, 4, 5, 6, 7, 8 and 10 indicated that by using ICTs it makes it faster and quicker and saves time. For example, in relation to this, HoD 4, 5 and 7 stated:

HoD 4 : *It does save time, you can cover a lot of work by using ICT.*

HoD 5 : *…it saves you time.*

HoD 7 : *Faster, easier, ja. Smarter, does not take time.*

4.3.1.3. Paper and chalk

This is the third sub-theme identified in this category. From the ten HoDs interviewed for the study, six of the HoDs namely HoD 1, 2, 3, 4, 8 and 9, indicated that when they used ICTs, they tended to use less or no chalk at all. Some of these HoDs described this situation as a 'cleaner experience' as compared to when they used chalk in the classroom for teaching.

In support of this, HoD 8 remarked:

> *I don't have to use chalk and everything anymore.*

And HoD 3 indicated:

> *No more dust in the classroom; you can put on your best suit and still enjoy your teaching.*

Whilst HoD 9 noted:

> *… I think it's a clean way of teaching.*

In relation to the saving of other resources used in the classroom for teaching and learning, four of the HoDs from the sample population, namely HoDs 1, 7, 9 and 10 indicated that when using ICTs it reduces paper work and saves paper. In light of this, HoD 7 and HoD 9 remarked that:

HoD 7 : *It has reduced all this paper work and all this space where to store.*

HoD 9 : *We could've reduced paper wastage also along the way.*

Therefore it would appear from the sample group that when using ICTs in teaching and learning, there is less reliance on traditional teaching resources, like paper and chalk.

4.3.2. Learner related

Responses grouped in this sub-theme relate to what HoDs in the sample group perceive to be the benefits for learners when integrating ICTs in education. These have been further categorised into three sub-themes, namely (i) higher learner interest, (ii) access to knowledge and information and (iii) access to past question papers.

4.3.2.1. Learner interest

Of the ten HoDs interviewed, five of them representing fifty percent of the sampled group, indicated during the interview that when using ICTs in teaching and learning, it presents opportunities for the teacher to provide learners with videos and animations which attempt to enhance the subject content and get learners more interested in the lesson. In support of this, these HoDs expressed the following:

HoD 1 : *We do show them videos, we do use Power Points, we do have smart boards where we can just show some of the animation.*

HoD 4 : *In physics we don't have a lab, but with the smart board it's like we are having one.*

In addition, HoDs 9 and 10 expressed their view on this by stating:

> HoD 9 : *As I said I really enjoy ICTs and I see the impact that it has on our learners and especially teaching sciences, making the abstract less. There's nice videos you can introduce. If you introduce ICTs, a new voice, a new teacher into the classroom, it's always exciting.*

> HoD 10 : *I use it when I want maybe to show the learners some videos. Sometimes you have to conduct an experiment and you don't have the apparatus to conduct the experiment. Then you download and then you let them watch the video…*

While the above responses reflect how these HoDs describe some benefits of using ICTs in teaching and learning, it is important to note the remarks of HoD 4 and 10 in relation to the lack of science equipment and how they try to use videos to make up for this inadequacy. These remarks and other findings are further explored in Chapter Five.

In addition to these HoDs, HoD 3 also indicated that at times they show learners motivational videos:

> HoD 3 : *We use also video, some videos that we loaded in the smart boards, motivational videos.*

Therefore, amongst the sampled group the sharing of videos with learners is not limited to subject content only. It also contains material that attempts to motivate learners.

4.3.2.2. Knowledge and information

HoD 1 indicated that when integrating ICTs in education, it provided the learners opportunities to access knowledge and information. However, she also states that this access and sharing of knowledge and information is a two way process between the teacher and learner:

> HoD 1 : *It's about that freedom, that knowledge, it's not only in the teacher only and teaching is an interactive thing.*

She went on further to suggest that in using ICTs in education, the teacher is not the only one with access to subject knowledge. For example, she stated:

> HoD 1 : *ICT is trying to move away from the teacher being the one who is the knowledge bearer.*

This HoD's comments on teaching and the transmission of knowledge being a two way process is important. This is because as she notes that the teaching and learning process now becomes more interactive, with both learner and teacher playing this active role.

4.3.2.3. Past question papers

This, as a third sub-theme dealing with learner related benefits in integrating ICTs in education, is used here to purposefully differentiate from the previous and second sub-theme of this category which deals with access to knowledge and information. This is because in my opinion accessing past question papers may not involve the same processes as accessing knowledge and information that the learner can use, create, share and store. Hence, there was a need to identify this as a separate sub-theme.

Also, two HoDs, HoD 6 and 8 indicated that mainly grade 12 learners benefited from being able to access and download previous question papers. These question papers serve as a revision for learners in assisting with preparing them for their final examination. However, both HoDs expressed a concern that when grade 12 learners were given tablets by the GDE, this according to their observation was the major benefit of attempting to integrate ICTs into education. This is clear when they stated that:

> HoD 6 : *We upload the previous question papers, maybe there are preliminary question papers there, together with the memorandum. It's about that, those previous question papers, mostly.*

> HoD 8 : *It only helped in the case where we used question papers.*

These comments about ICTs being used mainly for accessing and downloading past question papers are important to note and are further explored in Chapter Five.

4.3.3. Other

Other benefits expressed by some of the HoDs in the research study include being able to (i) use web based applications in teaching and learning and that (ii) ICTs were user-friendly and made communication easier. Each of these has been identified as a sub-theme for this category and a brief analysis of data collected in the study and linked to these sub-themes is outlined below.

4.3.3.1. Using web-based applications

Two HoDs, namely HoD 3 and 5 indicated that another benefit for them in integrating ICTs in teaching and learning was that they were able to use web based applications to draw geometric shapes and trigonometric graphs for their lessons. This was something that that previously proved difficult to do.

It is not surprising as shown in Table 4.2, both are mathematics HoDs. This they elaborated on when they stated:

HoD 3 : *It's easy with diagrams even graphs you just go there, you go, the right tile and then you can draw your diagrams.*

HoD 5 : *We use Geo-graph for the maths, you use the equation what, smart equations and then you develop your own things that you can present to learners.*

It would appear from these comments that maths HoDs use web based applications to assist them in creating and developing subject material for teaching and learning. This requires the displaying of geometric shapes and trigonometric graphs. As for the sciences, none of the HoDs in the sample group made reference to utilising any web based applications and programs for their subjects.

4.3.3.2. ICTs, user-friendliness and communication

One of the HoDs, HoD 7 whilst having indicated that ICTs saves time also indicated that they are user friendly when he stated :

It has made the work to be easier, quicker and even user-friendly.

His comment on the user friendliness of ICTs should also be considered in relation to the various barriers and challenges of integrating ICTs in teaching and learning. In line with the literature suggesting that ICTs have made it easier than before to communicate, share, store and manage information, two of the HoDs in the sampled group expressed the notion that they had found communication easier. These comments related to communicating with parents, which at times could prove challenging. In support of this, the HoDs stated:

HoD 1 : *ICT makes even communication to parents easy.*

HoD 7 : *…communication with parents …, it is done well.*

However, the HoDs in the sampled group also expressed how they are able to communicate and share information with and amongst each other by using applications and tools, like Whats App and emails which is discussed further on.

4.4. The various functions as perceived by HoDs in managing teaching and learning

Whilst national and provincial policies and available literature expounds on the duties and job functions of school managers, this category discusses what HoDs in the sample group have identified as these. Hence, this category deals with the main job functions of HoDs when managing teaching and learning and the central theme is to examine what HoDs track, monitor and report on whilst fulfilling the functions they identify. As shown in Figure 4.5, five sub-themes have been identified here namely, (i) curriculum coverage, (ii) assessment management, (iii) policy implementation and planning, (iv) learner teacher support materials (LTSM) and (v) learner discipline and teacher and learner attendance. These have been grouped in this way to also reflect some of the job functions school managers, in this case HoDs in the sampled group engage in.

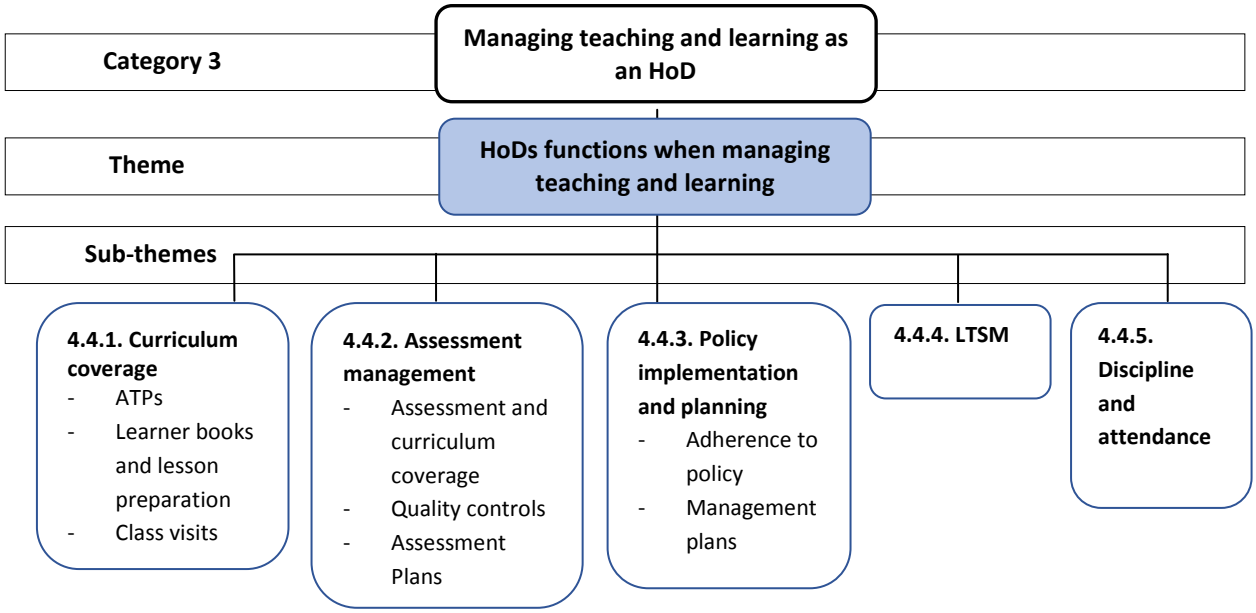

Figure 4.5 : What the sampled group perceived to be the main functions in managing teaching and learning

4.4.1. Curriculum coverage

All the HoDs interviewed indicated that one of their job functions was to track and monitor the curriculum coverage by their teachers for the relevant subject or phase that they are heading. HoD 8 affirms this when she stated:

> *…manage the curriculum, I think that would take preference.*

In sharing her understanding of curriculum, HoD 9 commented:

> *…the curriculum is what we need to carry from point A to point B, the teaching becomes now the vehicle.*

In linking the curriculum with teaching and learning, HoD 3 appropriately mentioned:

> *There is no way we can separate curriculum issues from teaching and learning…when we are teaching, we are implementing the curriculum.*

In relation to the curriculum, HoD 9 then indicates that learners may not understand the content as curriculum and one needs to find a way of making it interesting to the learners:

> *How do I make this come alive for the learners? How do I make them understand this? They don't know it's curriculum for them, for us it's curriculum.*

From the research study, HoDs tracked and monitored curriculum coverage by checking on mainly three areas, which have been used as sub-themes here. These are (i) how far the teacher was at various stages in the year in mediating the DBE's annual teaching plans (ATPs) to the learners, (ii) work covered in learner books and (iii) conducting class visits.

4.4.1.1. Annual Teaching Plans (ATPs)

Seven of the ten HoDs in the sample group made reference to checking, tracking, monitoring and reporting on curriculum coverage by their teachers, by referring to the ATPs that the teacher used in ensuring curriculum coverage for the subject or phase. These were HoDs 1, 3, 4, 5, 8, 9 and 10. In relation to this, some of these HoDs stated:

HoD 1 : *…about 90% of an HoD is to manage curriculum delivery. Where you check if the ATP is, whatever content there is or has to be taught is covered.*

HoD 3 : *Like you have ATPs, annual teaching plans so from time to time you have to check and find out if it is followed. And then the pacing, are the teachers on par with the ATP, are they behind.*

HoD 9 : *…you need to understand your ATP or work schedule, whatever they may call it or your pace setter. From your teaching have you covered the curriculum according to your ATP or pace setter…*

HoD 10 : *I check the lesson preparations against the ATP. And then even the activities that are related to the lesson preparation.*

Clearly from the remarks of HoD 10, it is also evident that the teachers and HoDs do not work with the ATPs and lesson plans in isolation to each other. This should be the case, as teachers would plan their lessons according to the demands as set out in these ATPs and the DBE's Curriculum and Assessment Policy Statements (CAPS) for the subject or phase.

As HoD 7 remarked:

> *Is the teacher following all what the CAPS documents requires in that subject, on that topic?*

4.4.1.2. Learner books and lesson preparation

Nine of the ten HoDs, making up 90% of the sampled population interviewed in this study made reference to checking the learner books of their teachers in tracking, monitoring and reporting on curriculum coverage. These HoDs check and control learner books to see if the work indicated by the teacher in the ATPs has been covered in the learner books. For example, HoDs in the study remarked:

> HoD 3 : *Then take books to say what is it the teacher said he has done and then I've taken the books and I will confirm that the percentage is covered, 72% of the syllabus and then I check on the books.*

> HoD 4 : *Where I will be dong monitoring, where I'll just take learners books, for assessing the ATP to check where if the teacher he has covered everything.*

> HoD 6 : *Check the ATP, the work program here against the work in the book.*

> HoD 8 : *I check in the learners' books, is it measurement and is it in correlation with the ATP.*

Furthermore, whilst HoD 7 and 10, made reference to checking learner books, they also linked these to the teacher's lesson preparation when they stated:

> HoD 7 : *I go through learners books. I go through your lesson plans.*

> HoD 10 : *When I check the ATP against the learner book, with the teacher's prep then I can see exactly where they are.*

However as HoD 10 alluded to, there should be a link and connection with the ATPs, the teacher's lesson preparation and the work covered in the learners' books in order for the HoD to track and monitor that the curriculum is being covered according to a set pace. This set pace, as provided in the ATPs is to ensure that teachers do complete the curriculum in the time allocated.

Furthermore in ensuring good practice, this link from ATPs to lesson preparations and work in learner books should also indicate how assessment of learners will be covered. HoD 9 made this observation when she stated:

> HoD 9 : *We compare the books to the ATP and then we look at syllabus coverage and we look at school based assessment coverage.*

4.4.1.3. Class visits

Class visits are often conducted by HoDs to see how the teacher is implementing the curriculum through the delivery of their lessons. Whilst this provides opportunities for the HoD to coach and mentor the teacher in pedagogic areas, it is also used to track and monitor curriculum coverage where the HoD is able to get a firsthand experience of how the teacher is implementing the curriculum and how far they are with the various topics.

Three of the HoDs in the sample group referred to class visits when tracking and monitoring curriculum coverage as part of managing teaching and learning when they remarked:

HoD 1 : *I do class visits once a term.*

HoD 3 : *We do class visits and look at how the teachers are prepared for a particular lesson and then go and observe how the teacher teaches in class, classroom management.*

HoD 6 : *When you come to monitoring teaching, that work is in the paper work, but teaching must visit them in classes, where you will see that what reflects in their books has been taught, because something can be in the books while the learners were not just taught as it supposed to be.*

It is the comment from HoD 6 which suggests that in order for HoDs to really evaluate how their teachers are teaching and fairing in relation to a set pace for curriculum coverage, as set out in the ATPs, HoDs are almost compelled to do class visits.

4.4.2. Assessment management

As noted, HoD 9 made reference to managing the school based assessment tasks when she checks curriculum coverage. HoD 5 also suggested that managing curriculum and managing assessment are related when she stated:

…curriculum management also involves curriculum assessment.

Again, this should be the case as HoDs in the group sampled have to be aware of how these assessment tasks and activities are stipulated in the CAPS for the subject or phase. Hence, the management of curriculum and assessment seems to go hand-in-hand. Managing assessment, in being identified as one of the HoDs functions is referred to by eight of the ten sampled HoDs. It is only HoDs 6 and 8 that did not refer to managing assessment as a function of teaching and learning.

Three sub-themes have been identified for this category, the first of which has been noted and is elaborated on below, namely managing assessment and curriculum coverage, the second examines assessment quality controls and the third deals with assessment plans.

4.4.2.1. Managing assessment and curriculum coverage

It would seem from the data analysed here that in managing the curriculum coverage, HoDs also need to manage the assessment linked to this and stipulated by the CAPS in the various School Based Assessment (SBA) tasks. The remarks by some HoDs confirmed this. For example:

In relating the management of assessment to curriculum coverage, HoD 1 explained:

> *Then they have to go to their ATP and say where are they if they were doing patterns and exponents where are they in terms of the ATP. And then in terms of their SBAs to say they have already administered the formal assessment.*

HoD 3 remarked about this when she stated:

> *The SBA, like the written work, the official, what you call that, like tests how many tests have been given up to a certain period and then it means the teacher will actually, he writes himself for this period this is what I've done.*

And HoD 7 and 9 indicated that in monitoring assessment coverage, they ask of their teachers:

HoD 7 : *Week one, week two we agreed on giving a learner test on this topic. Have you done so? That's how I check on them.*

HoD 9 : *Is it just content or have you prepared the learners for informal assessment? Is the, are the children prepared for a formal assessment with regards to the content that's being covered?*

Apparent from the above is that in managing curriculum, the majority of the sampled HoDs also need to manage assessment for the subjects and phases they head.

4.4.2.2. Assessment quality controls

This deals mainly with quality control measures like pre and post moderation. Pre moderation involves the quality controlling of assessment tasks set by teachers for their learners, where the HoD will check various items of the assessment, including but not limited to the type and level of questions, mark allocations, weightings and lay-out, before the assessment is given to learners. The HoD will then recommend changes to the teacher and when both are satisfied, the assessment is given to the learners. In

post moderation, which happens after the assessment is handed in by the learner and marking has been done, the HoD will amongst other check the tallying of marks and in general how marking was done by the teacher. Hence, both pre and post moderation are assessment quality control measures in adhering to specific standards.

Only HoD 3 in the sampled group did not indicate that they engaged in completing and ensuring that moderation is done and managed accordingly as part of managing assessment.

As regards pre moderation, HoD 2, 4, 7, 8 and 10 stated:

HoD 2 : *I will go through the question paper to check it, whether is of a good standard. I'm looking at the different levels, I'm looking at the mark allocations.*

HoD 4 : *…teachers set exams, I do pre-moderate it. We check things like cover page, is it every information there, like the name of the subject, the grade, the subject, the marks, what's the duration of the tasks; are all the cognitive levels covered.*

HoD 7 : *A learner cannot write a test without me looking at the test and check if it is up to standard. I have to moderate it. There is a moderating tool that we use to check.*

HoD 8 : *We must pre-moderate first. So, there's a form that we have and we do pre-moderation.*

HoD 10 : *The teacher concerned will draft the assessment and send it to me. I moderate the assessment and after moderating the assessment, I give it back to the teacher.*

From these remarks, the majority of HoDs in the sampled group have as one of their functions in managing assessment, ensuring quality controls like moderation.

4.4.2.3. Assessment plans

CAPS provides a guide of what and when various assessment tasks related to the topics in the curriculum will be covered. Schools need to implement this by ensuring that they adhere to these guidelines and also by drafting specific dates for conducting the formal assessments. These are formalised in the subject and phase assessment plans which feeds into the larger school assessment plan. Hence, it is incumbent upon school managers like HoDs to ensure the development, implementation, tracking and monitoring of these assessment plans.

From the sampled population, three HoDs (2, 5 and 10) mentioned managing assessment by referring to their department assessment plans:

HoD 2 : *Even the assessment tasks and again, we are having the assessment plan.*

HoD 5 : *Based on the ATP then we would have a meeting together as a department and then we would develop assessment plans.*

HoD 10 : *We have the assessment plan so the assessment plan will show us which tasks must be done when.*

Therefore, it would appear that managing assessment, like managing curriculum coverage is a key function of managing the teaching and learning process as identified by the sampled group of HoDs.

4.4.3. Policy implementation and planning

Compliance to the implementation of policies and the development of various plans are also identified herein as a category related to the functions of HoDs, when managing teaching and learning. Again, the various categories and themes have been clustered in relation to the responses of HoDs interviewed in the sampled population. Two sub-themes are further identified in this category, namely (i) adherence to policy and (ii) management plans.

4.4.3.1. Adherence to policy

Relative to the teaching and learning process, HoD 2 made reference to policy when she mentioned the subject policy:

HoD 2 : *Each subject is having its policy and the subject policy to check whether the teacher is going along with the subject policy and the ATP.*

HoD 3 and 4 related how class visits by HoDs was in compliance with policy when they both referred to the DBE's integrated quality management system (IQMS) for teacher appraisal:

HoD 3 : *IQMS demands that an HoD visits, do some class visits. It's a, in fact it's a requirement.*

HoD 4 : *Also IQMS because with IQMS that's where you, we are able to see that this teachers is struggling on this aspect and then try to develop the teacher.*

The remarks made by HoD 4, whilst being contextualised by the HoD within policy, like the IQMS also refers to teacher development which is discussed further herein and in Chapter Five.

4.4.3.2. Management plans

Of the sample population, six HoDs, namely HoD 1, 2, 4, 5, 7 and 10, made reference to having management plans for the department as part of managing the teaching and learning process. As examples, HoDs in the study made the following remarks:

HoD 2 : *If there is no management plan, it means there is no direction.*

HoD 4 : *At the beginning of the year, it's just to make sure that I have a management plan. That management plan is given to each and every teacher.*

HoD 5 : *We also have the management plans for the term.*

HoD 7 suggested that within his school, the SMT and the principal uses school management plans, when he stated that:

> *For us maybe, the HoDs, the school management team and the principal, we are also using in terms of planning.*

These comments suggest that HoDs in the sampled group devise and develop management plans for their subject or phase and are involved in this process for the broader school management team. This further implies that the development and implementation of these plans is a function of some of the HoDs in the sampled population, when managing teaching and learning.

4.4.4. Learner teacher support materials (LTSM)

LTSM is generally regarded as an important area as it links directly with teaching and learning. From the sampled group it appears that only two of the HoDs interviewed, namely HoD 1 and HoD 10 made reference to this in their interviews.

In relating the importance of LTSM and the management of this, HoD 1 stated that:

> *It's a Science department I have to make sure that I keep track, stock, order for them chemicals, when there is a shortage.*

Her remarks indicate that she is aware that her teachers, who would use chemicals in their teaching of chemistry, need to have these available when mediating sections that

require their use. She is ensuring that in managing teaching and learning, she manages the LTSM needs and requirements of the subject and phase.

HoD 10 also recognises the importance of LTSM, more especially at the beginning of the year when learners are being equipped with the necessary LTSM, by stating:

> *…the school is a section 21, so the learners are supposed to get the books from the school. So, we give the learners the textbooks and then the writing and then they start teaching.*

Hence, whilst two HoDs made reference to managing LTSM, it would appear that this is also an important function of what HoDs in the sampled group manage as part of the teaching and learning process.

4.4.5. Discipline and attendance

Maintaining discipline and monitoring attendance in schools appears to be a function of HoDs interviewed in the sample group and has been identified as a theme in managing teaching and learning. No sub-themes have been categorised for this theme.

The following remarks of some HoDs refer to maintaining discipline in their schools:

HoD 3 : *We have to manage the learners themselves like when they go out for break, when they are outside.*

HoD 4 : *Make sure that learners are in class, teachers are attending. Those period registers all of them, grade 11s, they are brought back to me on Friday. Then I will sit with them, then I will track those learners who frequently not in class. The same applies with teachers.*

The comments by HoD 4 go beyond only learner attendance. HoD 4 says it also applies to teacher attendance. This is important as more often the topic of discipline in schools refers to learners only. In addition, amongst the ten HoDs interviewed for this study, HoD 3 and HoD 7, like HoD 4 who remarked about learner and teacher attendances, also mention teacher attendance as part of maintaining discipline at school:

HoD 3 : *I have to find out if the teachers go to class.*

HoD 7 : *Attendance register, have you been to class, the teacher? Are you attending your classes?*

HoD 2 also referred to teacher attendance by also explaining how she has to ensure that she manages this when a teacher is absent:

> *Again, absenteeism of teachers. As a head, I must know whose not in, whose in so that if the teacher is not there I must check the one who is not, who is free to stand in for that teacher.*

Maintaining learner discipline, and tracking learner and teacher attendance is a function of some of the HoDs in the sampled population.

4.5. Utilising ICTs to manage teaching and learning

In addressing the main aim of this study it was important to ask school managers like the HoDs selected for the study, questions around how they use ICTs to manage the teaching and learning process. This would imply also examining the management functions associated with teaching and learning as identified by HoDs in the sampled group and discussed in the preceding category and to explore how HoDs use ICTs to manage these functions. In attempting to achieve this, it is appropriate that a category like this one, which has as its main theme exploring how HoDs use ICTs to manage teaching and learning is identified and discussed here. Reference to this theme by the sampled group is presented below and the findings around this are discussed in Chapter Five.

Three sub-themes have been identified in addressing the main theme in this category as shown in Figure 4.6. These are (i) ICTs and communication, (ii) ICTs and managing teaching and learning functions and (iii) school administration and management information systems (SAMIS).

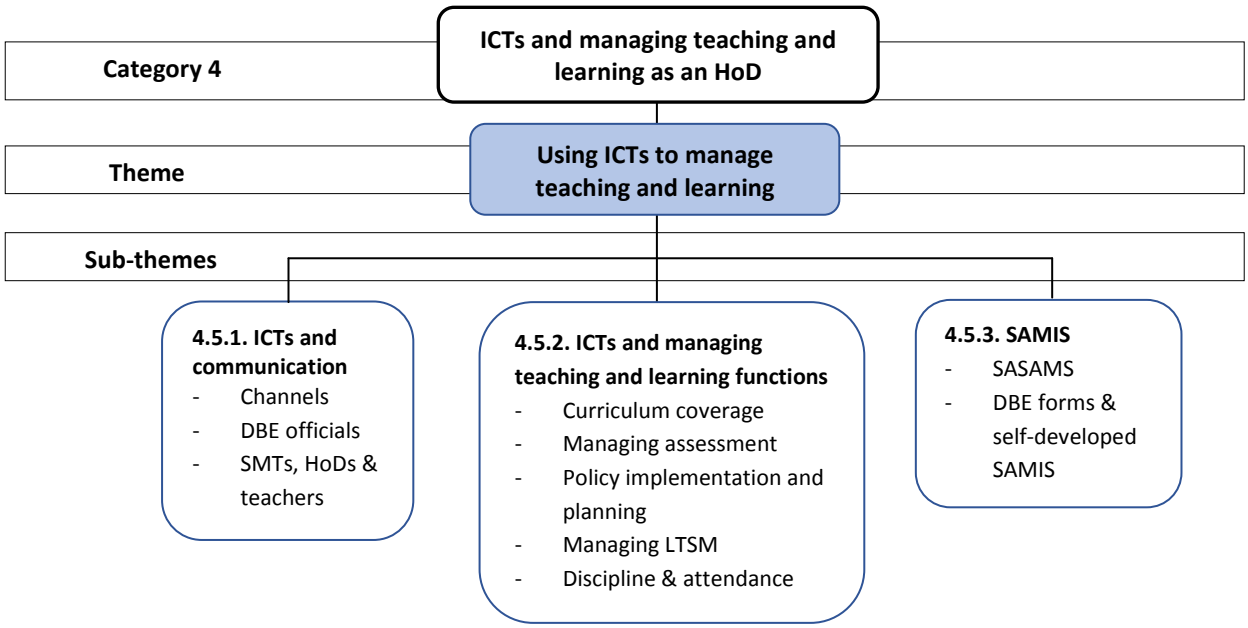

Figure 4.6. : How and for what HoDs in the sampled population use ICTs to manage teaching and learning

4.5.1. ICTs and communication

In analysing the data in category two dealing with some of the benefits identified by the sampled population, there was reference by HoD 1 and HoD 7 that in using ICTs they found it easier to communicate with parents. In this category, I explore how available ICTs in schools impact on communication with regard to the management of teaching and learning. Therefore, three sub-themes have been identified for this category, namely (i) ICTs and communication channels, (ii) DBE officials and communication using ICTs and (iii) SMTs, HoDs and teachers communicating with ICTs. Each of these is briefly discussed below.

4.5.1.1. ICTs and communication channels

As shown in Figure 4.2 in this chapter, it was found that the most common ICT tool that the sampled group of HoDs use to share and communicate information is the Whats App application. All ten HoDs in the sample indicated that they belonged to at least two or more school related Whats App groups. As regards the prominence of Whats App, HoD 9 remarked:

> *You know these days with Whats App, you get everything on Whats App.*

And HoD 2 and HoD 5, both mathematics HoDs, stated:

> HoD 2 : *I do have a Whats App group with the teachers that are under mathematics, all of them. We communicate through Whats App.*

> HoD 5 : *In our maths department all the teachers do have Whats App. We mainly communicate through Whats App, most of the time.*

It would also appear that with Whats App, some HoDs in the sampled group found the application easily at hand to be able to share or request academic information from their teachers, like HoD 10 stated:

> *If I want to send them something via Whats App, or I want to call a meeting, I send the Whats App or I want the marks, I send the Whats App…*

In relation to the sharing of information through Whats App, HoD 4 remarked:

> *Or you find a nice question paper from another province, put it there on the Whats App group.*

And HoD 6 stated:

> *When people struggle with a certain question or they looking for a question paper, then we post it on Whats App.*

Whilst HoD 1, 3, 4 and 7 also use Whats App, they also communicate through email with their teachers. This involves the sharing or requesting of assessment related information, mainly around question papers. For example, some of these HoDs commented:

HoD 1 : *My life science and my physics teacher what they will do if they are setting papers they will email them to me.*

HoD 3 : *Sending memos, even some question papers, I will send through their emails.*

HoD 7 : *if I, we want maybe marks, analysis of results, email the template, fill in and email it back to me.*

This use of e-mail by these HoDs for mainly sharing and requesting of assessment related information, like question papers with their teachers is important. HoD 4 and HoD 6 indicated above how they use Whats App for sharing past question papers. Also, it was HoD 6 and HoD 8 who indicated in category two that according to them, the major benefits for learners when they were given tablets by the GDE was that learners were able to access and download previous question papers. Again, these comments about ICTs being used for mainly accessing, downloading and sharing of question papers is important and further explored in Chapter Five.

Whilst nine out of ten, equating to 90% of HoDs in the group sampled made reference to e-mails as being part of ICTs as shown in Figure 4.2, they also reported that they and their teachers have personal email accounts, not school emails. Also, it would appear from the foregoing that Whats App is more commonly used as an ICT communication tool by the sampled population. As HoD 9 stated:

We don't communicate via emails, only Whats App.

4.5.1.2. DBE officials and communication using ICTs

The prominence of Whats App groups featuring as a channel of communication with ICTs amongst the sampled group is further extended to include the DBE officials like subject advisors and also subject or phase groups consisting of teachers from schools in the same district. Therefore this has been identified as a separate sub-theme here as it invariably also looks at communication channels being used by the DBE to share information with teachers and to organise teachers into different subject and phase groups, with possibly the intention of focussing on issues relevant to the particular subject or phase.

The comments from HoD 7 indicate how Whats App is used to communicate from the district level to schools when she remarked about how the communication moves from the district to the teachers in various clusters and to the schools. She too has her own Whats App group for her teachers and remarked:

HoD 7 : *It is spreading from the district to cluster and to school, individual teachers all those. Even maths, we have a Whats App group.*

In referring to the communication sent by subject advisors through Whats App, HoD 1 commented:

Mostly facilitators, some of the communication they sent it via Whats App.

Later during the interview, HoD 1 stated:

… I also have a department Whats App group where if there's any quick communication that comes, I quickly post it.

Whilst her statement confirms her having her own department Whats App group, it also implies that she is able to quickly share information that comes for the subject or phase through Whats App, with her teachers.

In relation to DBE officials using email to communicate, HoD 4 remarked:

The subject advisors, whatever information lately before the hard copy can arrive at school, already we have. They have already emailed us.

The comments by HoD 4 indicate that email is also still relevant and used by subject advisors to share information with the sampled population. The comment also indicates that at times information regarding school visits is shared through email with the HoDs in the sampled group and by subject advisors prior to advisors visiting the schools.

It would appear that ICT communication tools like Whats App and email also feature high amongst DBE officials communicating with and amongst their subject or phase teachers, as with HoDs and their teachers. Amongst the sampled population, HoD 2 indicated that Whats App messages were easier as it was in real time compared to receiving copies of circulars from the DBE which she had to wait for, when she stated:

I find it easier because I got the message immediately, unlike I have to wait for a circular.

4.5.1.3. SMTs, HoDs and teachers communicating with ICTs

From the sampled population, Whats App as a means of communication extends to the SMT groups and is used to communicate information to school staff. Five of the ten HoDs in the sampled group make reference to their school Whats App groups, during

the interviews. These are HoDs 2, 6, 8, 9 and 10 and their reference to these Whats App groups is evident when HoDs 9 and HoD 10 indicate the various groups they belong to:

HoD 9 : *We have a group for the SMT and we have a group for the staff.*

HoD 10 : *The SMT, the physical science group chat, the life science group chat, the NS group chat.*

This is further evident when HoD 6 remarked:

> *The Whats App group is only, the two that I've got in my cell phone is for the SMT, the school management team and then the staff, not for my teachers.*

What also stands out from HoDs 6 comments is that whilst he belongs to the school SMT and staff Whats App groups, he does not have a Whats App group for his own department. When asked about this he stated that because his department consisted of only four teachers, he felt communication was easy in his department with this number of people and therefore there was no need for a special Whats App group. HoDs in the sampled group also indicated that the Whats App groups that they had created or belonged to were used for academic purposes only.

In this regard, HoD 3 and 4 stated:

HoD 3 : *We have kept it as formal, because once we allow that it will no longer serve the purpose.*

HoD 4 : *We specify that, that the group is only for curriculum related matters.*

Whilst HoD 9 also agreed that the Whats App groups were used for communicating academic information, she also noted that at times motivational messages were shared amongst teachers stating:

> *Most of the time we use it for academics. But, there is sometimes motivational things that they post there ... But, most of the time it's information.*

What is clear is that the sampled HoDs communicate information with their teachers, the school management team, other staff members and the subject advisors responsible for overseeing their subjects or phases, through ICT related platforms like mainly Whats App and email.

However, it is important to keep in mind that there should not be an overload of especially Whats App groups and/or sharing of information on these groups. If it does happen, there could be a risk of individuals not paying detailed attention to curriculum

or other school related information, by scanning through their messages instead of reading it in more detail. This could result in them not getting all the information, something also discussed further in Chapter Five.

Like HoD 5 remarked:

> *We have the district groups, there is so many we have. This stuff makes you crazy.*

4.5.2. Managing teaching and learning functions

The functions in managing teaching and learning for this category have all been derived from the responses of the sampled group of HoDs during their interviews. A detailed explanation of the data around what the sampled HoDs perceived to be functions when managing teaching and learning was provided in category three. The same sub-themes have been used in this category to explore how HoDs use ICTs to manage the identified functions. However, for each of these sub-themes no further themes have been identified as the sub-themes referred to in category three are discussed holistically in this category, given the responses of HoDs in the study.

4.5.2.1. Curriculum coverage

All ten HoDs in the sampled group use computer generated forms to report on curriculum implementation, coverage and monitoring for the subjects or phase they are heading and managing. However, these forms are developed by the district office and all schools in the district, according to the sampled group are requested by the district office to use these curriculum monitoring and management (CMM) forms to report on curriculum coverage for their subjects and phases, at least twice a term.

As HoD 1 stated:

> *We are having a tool, we call it 'curriculum management', CMM, curriculum monitoring.*

And in relation to this form, HoD 9 indicated:

> *They call it CMM. We do it twice a term.*

On checking curriculum coverage for her teachers, HoD 8 remarked:

> *We have that curriculum monitoring tool that we use, to check how far are they.*

HoD 3's remarks tend to elaborate on the CMM form, referred to by some HoDs in the sample group as a tool when he stated:

> HoD 3 *: …we have a tool. That tool I don't keep it, I submit it to the office. Then in turn, the office they submit to the district.*

The CMM form supplied by the district office compels school managers, like HoDs to report on curriculum coverage in their subjects and phases. Schools in the study complete four forms when reporting curriculum coverage to their district office, namely forms A, B, C and D. As HoD 6 explained it:

> *Form A is filled by the teacher, form B by the HoD, form C by the deputy, form D by the principal.*

In completing form A the teacher is requested to supply information around curriculum coverage and other topics like adherence to the requirements of CAPS. This includes information related to subject content coverage on the ATPs. The HoD then completes form B based on the information supplied by the teacher and confirmed by themselves through checks. Form C is then completed by the deputy based on the HoDs reports and their own findings and form D is then completed by the principal which is a summary of forms A, B and C.

As HoD 6 continued during his interview:

> *I'll write form B. That is by the HoD, even the deputy principal then we'll check whether I didn't do favour, or maybe just do it for over-dressing. She must also check that what reflects in the report is true.*

Whilst HoD 6 referred to schools tending to do a 'window dressing' when reporting on curriculum and other issues in completing the relevant district generated forms, he also stated:

> *HoD 6 : It can be changed but who cares because we are just doing it for the sake of paper work of the district and for the sake of formality. Most of the things are window dressing.*

Whilst she complies with the requirement of getting her teachers to complete form A and she completes form B of the district CMM form, HoD 1 is the only HoD who has created and developed her own ICT linked system for this, that is to track, monitor and report on amongst other curriculum coverage.

This is clearly evident from her remarks when she stated:

> *I've designed a tool where weekly they report to me and then that tool I've designed it in Excel.*

She has linked her teachers ATPs to this form which she has created and developed for tracking curriculum coverage. This she affirms when she stated:

> *And within my tool, my Excel tool, what I do I also attach their ATPs.*

During the interview, HoD 1 suggested that with her self-developed ICT management and information system it makes it easy to generate monthly reports on each teacher which is similar to the requirements of the district CMM form. This she indicated when she stated:

> *In this way it makes it easy for me to generate a monthly report which is similar to the same tool.*

Her self-developed ICT system also makes it easy for HoD 1 to report on various curriculum strategies that her school is part of. As an example, she mentioned how she even generates reports for the maths, science and technology (MST) strategy:

> *When it's the day for me to write a report to the facilitator on how the MST is going, Maths Strategy is going then I just come here, I have all the data and then I just provide and then here is where I do the weekly.*

Clearly as she explains from this statement, she has collected and electronically stored the curriculum information or data that she receives from her teachers in form A, as part of the district's CMM forms. This information she not only stores on her computer but she also uses it to track, monitor and report on her teachers in her department, by creating an Excel spreadsheet for each of her teachers where she also links their ATPs.

HoD 9 made reference to how she stores information on curriculum coverage for her teachers on her computer by stating:

> *If they would like to see it, my computer is always available.*

Whilst HoD 9 suggests that her information is available on computer for DBE officials to view when they visit schools and request such information, she has not developed or created her own ICT management system like HoD 1 has. HoD 9 uses the computer to store information related to managing her department, not to create and develop an ICT management and information system for her department.

HoD 7 indicated that he too uses a computer to store information gathered from his teachers and other. However, he uses the computer largely as a storage device for this as he also does not have his own ICT management and information system. He refers to documents stored on his computer and prints these when required, but has not developed or created his own ICT management and information system like HoD 1 has:

> *We use our computers to put all those things down, then print it out, and or keep it in the computer, so that when we want to implement those things, we always refer back to our computers.*

In referring to administrative functions like meeting agendas or minutes and storing of learner results and marks, HoD 6 also made reference to the computer as a tool in his department:

> *We are typing the meetings, invitations and the meeting minutes. And then all those go through the computer and then the agenda of the meetings, in the computer. And then the records about the results of the learners, the marks, mark sheets, all those things are in the computer.*

However, HoD 6 has also not developed or created his own ICT management system. In addition, HoD 2 stated that she has not reached a level of creating or developing an ICT system for managing teaching and learning:

> *I can say I've not reached that level.*

So whilst all HoDs in the sampled group use computer generated forms to report on curriculum coverage, which are the CMM forms or tools developed and supplied by the district office, only HoD 1 uses a computer to generate her own forms and create Excel spreadsheets to track, monitor and report on curriculum coverage. She links these to the district CMM forms and in compliance with the district requirements, reports on teachers in her department using the CMM forms.

Furthermore, HoD 1 feels that if her management and information system were to be used throughout the school, it would also be able to generate forms C and D of the district CMM forms, like it does her form B. Hence she stated:

> *HoD 1 : If this can continue you know as a school if we go with this, then it will automatically here have a form C and a form D for the principal where then it will be a chain.*

It is clear that in using her own ICT management and information system, HoD 1 has linked it to the required forms, like the CMM forms from the district office in generating reports and ensuring that she also supplies information requested in these forms. The other nine HoDs in the sample do not have their own ICT management and information system for managing the curriculum. These nine HoDs complete the district CMM forms with no links to any of their own ICT management and information systems, even though some of the HoDs in the study indicated that they use the computer to complete, store and print the CMM forms.

4.5.2.2. Managing assessment

As was found in category three, HoDs in the sampled group indicated how curriculum coverage and the school based assessment are closely related. This is reiterated by HoD 7, who indicated how he manages his teachers in this regard:

> *HoD 7 : When I'm doing the CMM and I've noticed some discrepancies in your SBA, in your curriculum coverage. I write down those flaws and topics that I see in your learners' books. I write them down and then I send it to you electronically to check these topics, I didn't see them in your books. So, check and give me the feedback or next time I want the books, I want to see those topics, in your books.*

This remark by HoD 7 indicates that whilst he notes any discrepancies with any of his teacher's coverage of curriculum in relation to the SBA tasks, he sends the teacher his notes and feedback on this electronically. His teacher is asked to check that the next time they monitor and report on this, the teacher's coverage of the curriculum and the associated SBA task must correspond. However, HoD 7 is not using an ICT system to keep track and monitor this. He only shares the feedback electronically with his teacher and uses his computer to store this for use the next time he checks on his teacher's curriculum coverage.

On the other hand, HoD 1 links her teacher's SBA tasks to the Excel spreadsheets she creates on her computer. Whilst she did not state this explicitly, she had her computer on hand during the interview and briefly showed me how she uses Excel to create a type of management and information system to use when tracking, monitoring and reporting on what her teachers were doing as regards teaching and learning. Remarks and comments she made to this is effect are analysed in this study.

HoD 1 showed me how she creates a spreadsheet for each teacher on her computer and links curriculum requirements like the teacher's ATPs to these spreadsheets. She indicated that she updates each teacher's spreadsheet including the SBA tasks that have been administered to learners, when she receives the CMM forms from her teachers. In updating her teachers' spreadsheets using information from these forms and other, HoD 1 is able to check whether the SBA tasks by her teachers are aligned to the teacher's ATPs and CAPS. At the end of each term, HoD 1 is able to see summaries of the various types of assessment her teachers have administered to learners and whether these comply with policy.

None of the other HoDs in the sampled group indicated during their interviews how they manage assessment using an ICT management and information system. Only HoD 1 shared how she uses ICTs to manage a range of curriculum issues with her teachers, including assessment.

In addition, none of the HoDs in the sampled group indicated how they used ICTs in assisting with other assessment management functions like moderation. As noted earlier, HoD 3 did not allude to completing moderation during the interview process. Of the nine HoDs that made reference to moderating assessment tasks set by their teachers, all indicated that they used the district developed tools for completing moderation of assessments, in adhering to the district requirements.

4.5.2.3. Policy implementation and planning

With reference to policy implementation and planning, HoD 6 has stated earlier how he uses the computer to record minutes of meetings or other items associated with this like the meeting agenda. However, he does not have an ICT linked system to track and monitor for example implementation of decisions taken at these meetings.

HoD 9 uses a computer to store her plans and uses this information to go back and reflect on the year's accomplishments for her department. This she explained when she stated:

> *And the nice thing with especially if you do your planning, on the laptop, I would go back at the end of the year, then I go, then I say okay this didn't work well.*

So whilst HoD 9 also uses a computer to store information around school and department planning and to reflect on this information when required, she does not have an ICT-linked system to track and monitor these plans.

None of the other HoDs in the sampled group indicated during their interviews how they used ICTs to manage policy implementation and planning.

4.5.2.4. Managing LTSM

In category three which deals with the functions of managing teaching and learning as perceived by the sampled group, it was reported that two HoDs, HoD 1 and HoD 10, referred to LTSM as a function of managing teaching and learning. However, the remark made about LTSM by HoD 10 refers to the management of LTSM in relation to

distributing it to learners. Also, there is no reference in her statement as to how she uses ICTs to assist with managing LTSM, as a perceived management function of teaching and learning.

On the other hand, the remarks of HoD 1 concerning LTSM in category three, suggest that she tracks LTSM when she checks the stock of chemicals needed in the teaching and learning process by her teachers. This she does by also using an Excel spreadsheet to record and track stock.

None of the other HoDs in the sampled group made reference to managing LTSM using a computer or any ICT device.

4.5.2.5. Learner discipline and learner and teacher attendance

As a function of managing teaching and learning, as perceived by the sampled group, none of the HoDs in the sampled group made reference to how they use ICTs to monitor learner discipline and teacher and learner attendance.

4.5.3. School administration and management information systems (SAMIS)

4.5.3.1. The South African school administration and management system (SA-SAMS)

As indicated in the literature review the DBE's SA-SAMS was introduced into schools with the aim of supporting the daily operations, administration and reporting by schools. Schools using SA-SAMS are generally those with inadequate and outdated ICT linked management and information systems. Whilst the main purpose of the SA-SAMS is to assist with school administration, data can be captured into this system for use in other areas like reporting, planning, monitoring, learner and teacher management as well as curriculum management. Schools do not have to use SA-SAMS, but as per policy need to have some type of ICT linked management and information system which meets the present day requirements. Hence these SAMIS are ICT-linked and based.

From the sampled group it was found that school A, from which HoD 1 hails is not using the SA-SAMS and it seemed that the school did not opt for this system. This was evident when HoD 1 remarked about the SA-SAMS:

No in this school, we're not SAMS. They don't want to, they don't want SAMS.

Furthermore, it was found from the comments of HoD 8, that SA-SAMS is being used for purely administrative purposes in her school. This HoD 8 referred to when she stated that:

> *With SA-SAMS we just use it for them to type, for the reports basically.*

The remark by HoD 8 indicates that SA-SAMS is not being used to assist with managing the teaching and learning process. This is even whilst there is some scope within the SA-SAMS to use the data of teachers in other ways. The SA-SAMS in school 5, where HoD 8 comes from is being used by the school staff for administrative purposes only, including generating learner reports.

Also, from the sampled group, HoD 5 and HoD 8 refer to the inflexibility of the SA-SAMS in terms of local school needs. Their remarks in this regard support this, for example HoD 5 stated:

> *There is limitations with the SAMS. SAMS is not so flexible, at all.*

HoD 5 continues to explain some of the SA-SAMS limitations when she commented on the system:

> *It doesn't do conversions. For instance, if I gave the test out of 60, I have to do the conversion and submit it out of 50 or that mark that they have there.*

By also referring to some of these limitations of the SA-SAMS, HoD 8 stated:

> *Some of the subjects I know, they are struggling with SA-SAMS weightings and their own because sometimes the marks differ.*
>
> *With SA-SAMS there are maybe, let's say for term three, there are three spaces where you can write in your marks. But then, maybe you have four activities, then you need to combine one.*

Also, it would seem that teachers using the SA-SAMS for generating learner report cards have to complete a type of double entry when they submit learner marks to be entered on the SA-SAMS for generating these reports. This was explained by HoD 5 in her comments:

> *The problem is, I have, I punch the marks on the laptop. All of us as teachers, we punch the marks for our classes on the laptops. Now in order to submit to SA-SAMS, we get a hard copy. Now I must rewrite the marks on the hard copy and submit to the office. So, it becomes tedious. They have to do it all over again. That's what's the problem.*
>
> *SAMS is not linked to our computers and is not flexible to working with how we work.*

From these comments it is apparent that the SA-SAMS is not being used by HoDs in the sampled group to assist with managing teaching and learning functions.

The SA-SAMS, where used, is being used for administrative purposes.

4.5.3.2. DBE forms and self-developed SAMIS

As evident from the above, all HoDs in the sample use form B of the district developed CMM forms to report on their tracking and monitoring of curriculum and assessment in their subjects and phases. Only HoD 1 has created and developed her own ICT management and information system with managing teaching and learning functions in her department. She incorporates the requirements of the CMM forms for her teachers in this.

When asked during the interview about whether he uses an ICT-linked management and information system for his department, HoD 4 responded by stating:

> *I'm not, that's what I was thinking of doing that, that I must just create a folder.*

This response from HoD 4 suggests that as a school manager he has been thinking about using ICTs to assist him with managing various functions in his department, but is not there yet. He continues by indicating that one of his teachers in his department had created an Excel tool that was able to track learner progress and achievements. When he saw this form he thought of getting it from the teacher with the intention of modifying it to manage his own teachers. This he stated when he relates what he asked of the teacher:

> *Give me this to me and I'm still now going to sit down with that tool and see how can I modify it so that I can be able to track the teachers using that tool.*

It is clear that whilst HoD 4 does not have his own ICT management and information system he sees it as something that can assist in his department. He thinks that even his own teachers should have an e-file when he stated:

> *Like the ATPs when we have our first meeting, even if they have to have a file, they must have the e-file.*

HoD 3, who has also not developed his own ICT management and information system and uses the district CMM forms, thinks that ICTs can be used to track teachers' progress when he referred to systems that track learner progress:

> *The learner is going up, or we can do it the same with the teachers in the department, measuring their performances.*

It is clear that all HoDs in the sampled group use the district developed CMM forms to report on curriculum and assessment issues. Whilst some HoDs in the group remarked

that they use a computer to store reports and other, nine of the ten HoDs in the study have not created or developed their own ICT management and information system that they can use to assist with managing teaching and learning. Only HoD 1 has developed her own SAMIS using Excel that assists with managing her department and linking the district CMM forms to this which makes it easier for her to provide reports on teachers in her department.

When asked if she shares her SAMIS with other HoDs in the school, HoD 1 remarked:

> *Other HoDs, I've shared with them, we always have that but they are sort of it's a learning curve for them because they are not into ICTs like I am.*

4.6. Challenges of HoDs in using ICTs for teaching and learning as well as for management

In identifying the challenges in the integration of ICTs in teaching and learning and the management of this process, the same sub-themes used in category two indicating benefits of ICTs in education, have been used here to examine what HoDs in the study identify as challenges related to this process, as shown in Figure 4.7.

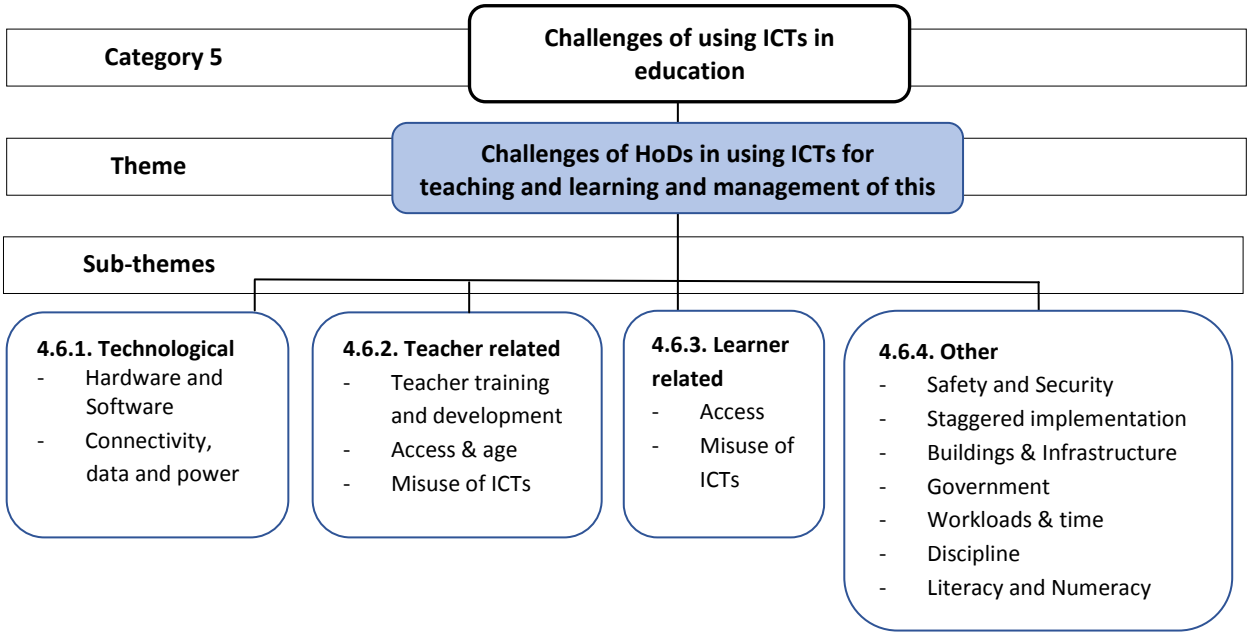

Figure 4.7. : Challenges in using ICTs in teaching and learning and the management of this

Identifying challenges is useful in that it stresses the notion of turning challenges and obstacles in integrating ICTs in education, into benefits. An additional sub-theme has been added to bringing the number of sub-themes in this category to four as shown in

Figure 4.7. These are (i) technological, (ii) teacher related, (iii) learner related and (iv) other, each of which is briefly discussed.

4.6.1. Technological

4.6.1.1. Hardware and Software

As was explained in the literature review, the challenges beset by integrating ICTs into education includes both hardware and software issues. In discussing some of the hardware related challenges that HoDs in the sampled group refer to here, access to ICT tools and devices is discussed further on as a separate sub-theme.

HoD 10 indicated how outdated some of their school laptops were, when she stated:

> *We have laptops from the school long time ago. Those laptops are not working anymore.*

She commented on how they also experience challenges around photocopying:

> *The machines may be breaking or lack of toner or lack of paper.*

In relation to other ICT tools and devices, HoD 3 remarked about how there needs to be continuous maintenance on the hardware like smart boards:

> *From time to time you find the smart boards, at times they don't respond. They are no longer working efficiently as they came, so it may take time of it being fixed, in a day or two so, you may have the whole week. I think the challenge is on maintaining.*

Software challenges were also expressed by some of the HoDs in the sampled group. These relate to the type of videos used for teaching and learning as well as teachers needing to at times pay from their own pocket for software programs and applications. In relation to this HoD 5 commented on the cost of these:

> *The other thing I find is that some of the programs that would make our work easier, you have to subscribe to them so it's quite expensive to use as well, it's not so cheap.*

In relation to the content in for example videos that could be used for teaching and learning, the following remark was made by HoD 8:

> HoD 8 : *In our case where we have Afrikaans, most of the textbooks are in English. They don't load Afrikaans stuff and things like that, so we need to download it our self.*

HoD 8 is based at a dual medium school, offering both English and Afrikaans. HoD 9 who teaches at the same school, commented on the accent in videos that was sometimes a challenge when she stated:

> HoD 9 : *Then sometimes when you play the video, there may still be learners that doesn't understand. Maybe it might be the language, maybe it might be the accent of the person that presents.*

Hence, it is important that software programs and applications used for teaching and learning take the local needs into consideration.

4.6.1.2. Connectivity, data and power

Six of the ten HoDs interviewed in the sample indicated that connectivity to the Internet was a challenge in their schools. It would seem that Wi-Fi connectivity was available near the office or administrative areas only and covered a very small radius. This is evident from HoD 8 who remarked:

> HoD 8 : *We have Wi-Fi, but it's mainly for the office block and not in the class.*

HoD 8 commented on how this had impacted on teaching and learning by remarking that :

> *We really have a problem with Wi-Fi because sometimes you just want to download something on the smart board and then you need, you need to use your phone, or you own Wi-Fi for that matter.*

HoD 5 who teaches at a different school as compared to HoD 8 expressed a similar view in relation to the small radius the school Wi-Fi covered when she stated that:

> *…you can't connect. You need to be, it says you need to be nearer the office.*

There was no Wi-Fi connectivity in School B from which HoD 2 hails, at the time the interview was being conducted for this study. In support of this, HoD 2 also indicated that the network was unreliable and probably down, when she remarked:

> *Sometimes network is a problem, like right now, there is, I don't think of the network is there.*

In relation to the cost of data, five of the ten HoDs in the sampled group indicated that data was expensive. Some comments in this regard were:

> HoD 2 : *Data is so expensive.*
>
> HoD 4 : *So, the fact that this data is expensive, its' a big challenge.*
>
> HoD 8 : *Data's expensive.*

The challenge around power shortages and outages was also expressed by some of the HoDs in the study as they felt that it impacted negatively on teaching and learning:

HoD 7 : *We don't have a reliable source of electricity at the school.*

HoD 4 : *Another challenge with the smart board, you will now, you are comfortable, you are enjoying your lesson, now there is load-shedding.*
You come today, no electricity, you don't have a back-up.

Within the South African context this is an important sub-theme given the challenges around both the cost of data and the power outages experienced in the country during the time of this research study. These issues are further explored in Chapter Five.

4.6.2. Teacher related

4.6.2.1. Teacher training and development

It was found that at least four of the ten HoDs in the sampled group indicated that teachers required more training and development with ICTs, like HoD 4 stated:

> *I think with educators we need to be trained, because some of the educators are long in this profession when there were no computers.*

HoD 4 also suggested that some teachers:

> *… are not familiar with the programs that are being used. Some, they don't even know how to open, how to close the smart board, how to search information, from the smart board.*

In addition, HoD 1 alluded to a similar type of skills set she lacks when operating a smart board and using it for teaching and learning purposes when she remarked:

> *I don't have smart board in my class so I don't use it every day ….you know the skill when you don't practise, you easily forget.*

And HoD 4 also referred to the lack of skills in operating the smart board when he commented:

> *We still have challenges of knowing everything about the smart board.*
> *We're still at elementary, we haven't really learnt much.*

HoD 1 explained how teachers lacked the same skills when operating the interactive or smart board, by mentioning that:

> *They don't have those kind of skills, so as much as they have the interactive board or the smart board but they are not using them effectively because they don't have the skill.*

Even when teacher training was available it would appear that some HoDs still experienced challenges. For example HoD 8 stated that:

> *We have a problem with the training. It's better if there's somebody twenty four hours at the school, until everybody is on that level.*

Her comments are important in that she believes that there should be onsite ICT support available at school, whenever required. On the other hand, HoD 3 believes that much progress has been made in integrating ICTs in education and suggests that it is also up to the individual to ensure they upgrade themselves with the necessary skills:

> HoD 3 : *I hope and really believe that we have made progress, but we still need to do more and then advance even ourselves, improve ourselves, use everything that you know, every feature of the smart boards and the laptops, we use them.*

4.6.2.2. Access and age of teachers

Three HoDs in the sampled population reported that not all their teachers in the department have GDE distributed laptops. This is evident from two of the HoDs when they remarked that:

> HoD 1 : *…some of my teachers don't have the gadgets, they don't have a laptop…*
>
> HoD 4 : *Not everybody has a laptop.*

Where her teachers did receive laptops from the GDE, HoD 5 indicated that at times the laptops did not have a CD drive and if one needed to play a CD-Rom it meant sourcing an external drive. She makes this point when she stated:

> *And the laptops we receive from the department don't take CDs. So, you need to go buy for yourself this external thing you put in the CD as well.*

Furthermore, eight of the ten HoDs in the sampled group indicated that there is a shortage of smart boards in their schools. These smart boards are mainly provided by the GDE in classrooms and are at times fitted with an interactive board as well for the teacher. For example,

HoD 6 stated:

> *Our classrooms are not having the smart boards. Only four classes out of forty.*

And HoD 5 remarked that in her school:

> *There's only six smart boards but specifically that are being used by the grade 12 classes.*

HoD 1 indicated that whilst some teachers did have interactive boards, others did not have any ICT device for use in teaching and learning, when she commented that:

> *I don't have an interactive board and the teachers who have, others they don't have any ICT gadget at all.*

Where schools used ICT devices like data projectors to supplement the smart boards in their classrooms, access to this was limited. This HoD 10 explained when she said:

> *We've got limited, even there we only have two projectors. One is used by one teacher, another one is for the office. So, we don't have access also to the projector.*

The comments from HoD 10 also suggest that whilst her school has two data projectors, these are inadequate to compensate for the lack of especially interactive and smart boards.

When it came to the age of teachers and ICT integration in schools, the comments from HoD 2, 7 and 9 indicated that these three HoDs observed that younger teachers fared better with ICT integration:

HoD 2 : *I can say with the older ones it might be problematic because they're taking long to understand the laptops. But, with the younger teacher it's so easy.*

HoD 7 : *We have teachers who are still stuck with the old method of teaching and learning. They don't want to, to venture into the new technology that we have here.*

HoD 9 : *The younger people they'll find they'll, they more techno savvy and then little bit younger, they are only using technology now.*

The above comments from HoDs in the sampled group suggest that access to these ICT tools and devices to use when integrating ICTs into teaching and learning, for example smart boards and data projectors is very limited in their schools.

4.6.2.3. Misuse of ICT tools, gadgets and devices

Like discipline issues, misuse of ICT tools and devices is more often associated with learners rather than teachers. However it is HoD 4 who makes reference to teachers when he comments about teacher training and development above. In addition, HoD 7 made a similar observation when referring to the smart boards:

> *Some teachers, maybe it's because of lack of development or training, they are not using them properly.*

It is important to note these comments from HoD 7 as the misuse of this type of equipment could result in its mal-functioning which may be costly to repair. As HoD 9 stated:

> *Learners must be taught to respect the smart board, even us, how we use the smart board. And we must realise its expensive equipment and if something happens will they replace it?*

The remark by HoD 9 about misuse of equipment refers to both teachers and learners and it is towards the learners that the discussion now turns.

4.6.3. Learner related

4.6.3.1. Access

From the interviews it seems that about three years ago, the sampled schools were all given tablets by the GDE for their grade12 learners. However, due to various reasons these tablets were not provided to learners during the year this study was undertaken. In addition, besides the limitation of data that his learners' experience, HoD 3 also mentioned challenges with the type of phones learners have:

> *With the learners, the limitation of data and the kind of phones that they have.*

Whilst teachers experience challenges with Wi-Fi access, the same applies for learners. This is evident when HoD 4 remarked:

> *Learners went to the principal just to say they also want to access Wi-Fi.*

4.6.3.2. Misuse of ICT tools and devices

The misuse of ICT equipment is briefly examined in the literature review and expressed as a teacher related challenge above. The following comments by HoDs in the sampled group reflect the concern they have around learners misusing their ICT devices. HoD 2 referred to the condition of the tablets when learners returned them at the end of the year:

> HoD 2 : *…like towards the end of the year. By the time they had to retrieve them. Most of them were broken.*

HoDs 3, 4, 5 and 7 indicated how learners misuse ICT tools and devices when they watch videos or listen to music that has little or nothing to do with the subject content.

> HoD 3 : *They started watching all those things, games and no longer using it for the purposes they were given.*

HoD 4 : *…and also learners, I think they need to be guided because some of them ended up misusing these devices. With learners some they ended up now using those tablets for games, downloading music.*

HoD 5 : *….these learners most of the time were playing music, they were loading their own videos that they liked and doing stuff, other than school stuff.*

Whilst HoD 7 also made reference to learners' misusing ICTs he also provides some type of socio-economic background of his learners in linking this with what learners do with the devices:

HoD 7 : *Most of our learners they come from very poor backgrounds and because of that, once they receive a tablet, they use it for the wrong reason, because it is something that they have received, maybe for the first times in their lives, maybe at grade 12.*
Instead of sticking to the correct purpose of the use of the tablet, they now used it for personal things, which is non-academic.
They would play games, they would be watching movies, on those tablets instead of doing their school work, that is in class.

His comments are very important in that they serve as a reminder that some learners, especially grade 12 learners who receive these tablets, maybe interacting with these devices and the Internet for the first time in their lives. There could be a tendency that they would want to explore the Internet and download things like movies, videos and music which interest them but have little or no links to the subject content under study in the classroom.

4.6.4. Other

4.6.4.1. Safety and security

At least eight of the ten HoDs in the sampled group indicated that at one time or another, their school had been broken into in the recent past. It would appear that ICT tools and devices, like computers and tablets have been the biggest targets in these burglaries.

This was clearly evident in the remarks made by HoD 5:

There was a break-in at the office and some stuff was stolen from the two offices, the principal's office and the clerk's offices. It was computers, from the principal's office.

HoD 4 referred to some of these burglaries which happened in his school, school C consisting entirely of pre-fabricated classrooms, as shown in Table 3.1 to indicate what he believes the thieves were after:

> *These people are stealing these devices like nobody's business. There was a burglary, remember these are fab, they were using a grinder opening a hole, take all the laptops in the office.*

The learner tablets that the GDE had supplied to schools in the recent past, have also become a target for thieves. Evidence of this was found when HoD 1 remarked:

> *Schools were given tablets as a kick start, so we had a bit of break-ins.*

In addition, HoD 9 feels that teachers in her school are too scared to use ICT tablets for learners as it is a security risk. In referring to tablets that was sponsored to her school, she stated:

> *We have a cabinet with tablets, but people are too scared to take them out because you must account for the tablets. So, I think that is now a resource that we are not really using.*

Within the South African context, this is another important sub-theme to keep in mind given the challenges the country has with the high crime rates that had been reported, at the time of this study. This issue is further explored in Chapter Five.

4.6.4.2. Staggered implementation

The GDE is using a staggered implementation process to make schools fully ICT functional. As part of this, teachers at grades 10, 11 and 12 were trained a few years ago on ICT competencies for teaching and learning, like operating a smart board whilst grade 8 and 9 teachers were being trained at the time of conducting this research study. However, it seems that this staggered approach raises challenges for some HoDs in the sampled group. This is evident in the remarks of HoD 6 and HoD 9 when they stated:

> HoD 6 : *They are training the grade, the senior phase teachers, grade 8 and 9. They are busy training them on those smart boards, but still they'll, if they are not going to apply that knowledge, it will just be a waste of time.*

> HoD 9 : *The problem is, they stagger the implementation. It would've been nice if we all were trained at the same time.*

As HoD 9 stated, one of the challenges of this type of approach is by the time the teacher receives the ICT equipment, they may have lost the skills to operate the

equipment because of the large gap between the training and the actual utilisation of the equipment. This she reiterated when she stated:

> *I was trained with the first phase but I never use the smart board, so which means by the time I get a smart board, I must be trained again.*

4.6.4.3. Buildings and Infrastructure

Just as the literature identifies the issue of buildings and infrastructure as being important in the successful integration of ICTs in education, so too have some of the HoDs in the study identified challenges around this.

HoD 7 who is stationed in a school entirely made of pre-fabricated classrooms emphasises this condition during his interview, when he stated:

> *This school infrastructure wise is poorly developed. They are mobile classes.*

Another challenge that HoDs in the sampled group refer to is the large, overcrowded classrooms. It would seem that there are too many learners in one class in some of the schools selected for the study. Also, the current buildings at these schools make it difficult to cater for these large classroom sizes.

The overcrowded classrooms are a challenge as identified by HoD 3 when he stated:

> *You can't have 80 learners in one classroom, with one device.*
> *The other thing I've observed, the classrooms are too crowded and very large classrooms. Like one class that I had with 75 learners in one.*

Similarly, HoD 5 also observed that the large learner numbers are challenging to deal with. She made reference to her neighbouring feeder school, where the issue of large classrooms in terms of learner numbers is already starting in grade 1, when she stated:

> *Like now grade 8s, we have classes of sixty, fifty something. if you go next door, the primary school, their grade 1s, they are sixty in the class. So, you can imagine the kind of foundation those kids have.*

4.6.4.4. Government

Other challenges identified by the sampled group of HoDs relate to the DBE or government. This is evident in the remarks by HoD 6 when he stated:

> *Our education system is delaying things, doing things very slow. It doesn't take things serious, so their pace is very slow, is very slow. That's why we are behind as compared to other countries all over the planet, of the world...*

HoD 7 puts forward a recommendation, were he to lead the Ministry of Education:

> *As a minister I have to send a ministerial delegation to these summits and learn a lot so that ICTs in my country, in the Department of Education is taken care of.*

However, HoD 7 still remains critical of government initiatives in integrating ICTs into education, more especially in referring to previously disadvantaged schools when he stated:

> *I still feel more could be done by the government to help under, help these under privileged learners, under resourced schools to, to make the pace move faster.*

4.6.4.5. Workloads and time to manage

It would appear that HoDs in the sampled group have almost the same teaching load as their teachers, yet they also have to engage in various management functions related to teaching and learning. As HoD 9 explained it:

> *You are still actually a post level one educator, but you have the title of HoD and then you still need to, to manage the team.*

In referring to whether he conducts class visits, HoD 6 indicated that because of his workload he does this 'spiritually' more than physically:

> *Because of the amount of work, that the load that you also have. You might find that during the year, for throughout the year, you, you visit spiritually.*

In addition, HoDs 5 and 6 also note that time is a challenge in managing the teaching and learning process:

> HoD 5 : *There is no time to be efficient and to be passionate about what you do. You just running around.*

> HoD 6 : *The challenge is that you don't have enough time with my teachers.*

HoD 1, who has developed her own management and information system to assist with managing teaching and learning in her department, also notes that in relation to her SAMIS, it takes time to do what she is doing. She alludes to this when she stated:

> HoD 1 : *For me time it's a challenge. Time will be a challenge because it takes time to do what I do in such a way.*

4.6.4.6. Discipline

Whilst the analysis of the data has referred to ICTs and discipline, it is important to note HoD 6's comments as a reminder of the discipline issues facing many schools. If left

unattended or if disciplinary issues spiral out of control, it could impact on many school related issues and not just ICTs.

HoD 6 referred to how disciplinary issues could impact negatively on teachers when he stated:

> *Teachers are very much stressed, even going to classes because of the lack of discipline.*

4.6.4.7. Literacy and Numeracy

Other comments of various HoDs in the sample group, make reference to the low levels of literacy and numeracy that these HoDs observe in some of their learners. For example, HoD 5 noted:

> *The learners can't read and write.*

The literacy levels that HoD 9 referred to are important especially for learners who have chosen to do maths and sciences subjects into grade 12:

> HoD 9 : *For me it's difficult for me to see now a grade 10 child that doesn't read or write. I've never experienced this before and especially learners doing maths and science…. it seems that their cognitive levels are lower. A child may drop out for different reasons, but not because of he couldn't read or write.*

However, HoD 9 also remarked :

> *Learners, we have challenges with reading. Somehow they enjoy coding, they enjoy the robotics program. So, maybe it would've enticed them to enjoy school more.*

Apparent from HoD 9's comments is that she is already identifying an alternative for those learners who are less interested in some of the content offered by the current curriculum. It is HoD 10 who shared a similar view when she remarked about the low literacy levels amongst learners. However she made reference to typing skills when she stated:

> *Like now, in the SBST, we've got challenges of learners that cannot write but they can type.*

It is evident that the various management functions as they relate to teaching and learning appear abound with challenges that we need to take cognisance of in attempting to integrate ICTs into education.

4.7. Summary

This chapter presented the findings from the data analysis of the interviews of school managers, namely HoDs about how they use ICTs to manage the teaching and learning process. In assisting with presenting the data from these interviews, the findings were categorised and presented according to themes and subthemes that captured the central and predominant ways in which HoDs use ICTs to assist with managing teaching and learning. The findings revealed that whilst HoDs perceive various benefits associated with using ICTs for teaching and learning and the management of this, the process is laden with challenges.

The findings also revealed what HoDs in the sampled group perceived to be the main functions in managing teaching and learning. These functions were used to explore how school managers use ICTs to assist in the managing the teaching and learning process. However, it would seem that in attempting to achieve this, the process is also beset with challenges.

In Chapter Five a discussion of the findings, recommendations and concluding remarks of the study is presented.

CHAPTER FIVE

Discussion of Findings, Conclusions and Recommendations

5.1. Introduction

This chapter presents an overview of the main findings and foregrounds these findings within the theoretical framework of the research study. In light of the various findings, I also revisit the aim of my study and explain how emerging themes from the data analysis link with the research questions of this study. Important information emerging from the study and suggestions for further research is presented. Hereafter, the chapter concludes with recommendations for policy and practice in the integration of ICTs in teaching and learning and in supporting the management of this process.

5.2. Summary of emerging themes and the research questions

Whilst it is important to provide a summary of the main categories and various themes which emerge from this study, it is also essential that these are linked to the aims and research questions I have stated in Chapter One. My aim in this research study was to explore the use of ICTs amongst secondary school managers, specifically mathematics and sciences HODs in six Gauteng secondary schools. I asked three critical questions related to this. Firstly, I wanted to know how mathematics and sciences HoDs understood ICTs and its use in teaching and learning and what they felt the benefits were of using ICTs in this process. Secondly, I wanted to establish how the selected group of HoDs had used ICTs as a tool to assist with managing the teaching and learning process. Thirdly, I explored what challenge(s), if any, the selected group of HoDs had encountered in using ICTs in teaching and learning and to assist with the management of this in their schools.

It is clear from Figure 5.1 that the various categories of emerging themes from my research study relate directly to my three research questions. Themes and sub-themes from category one and two as classified in the data analysis, provide some answers to question one of my research study, as shown in Figure 5.1. Those themes and sub-themes emerging from the third and fourth category offer some answers to my second research question. Themes linked with this question also provide some answers to the main aim of my research study which was to explore how school managers like HoDs use ICTs to assist with managing teaching and learning.

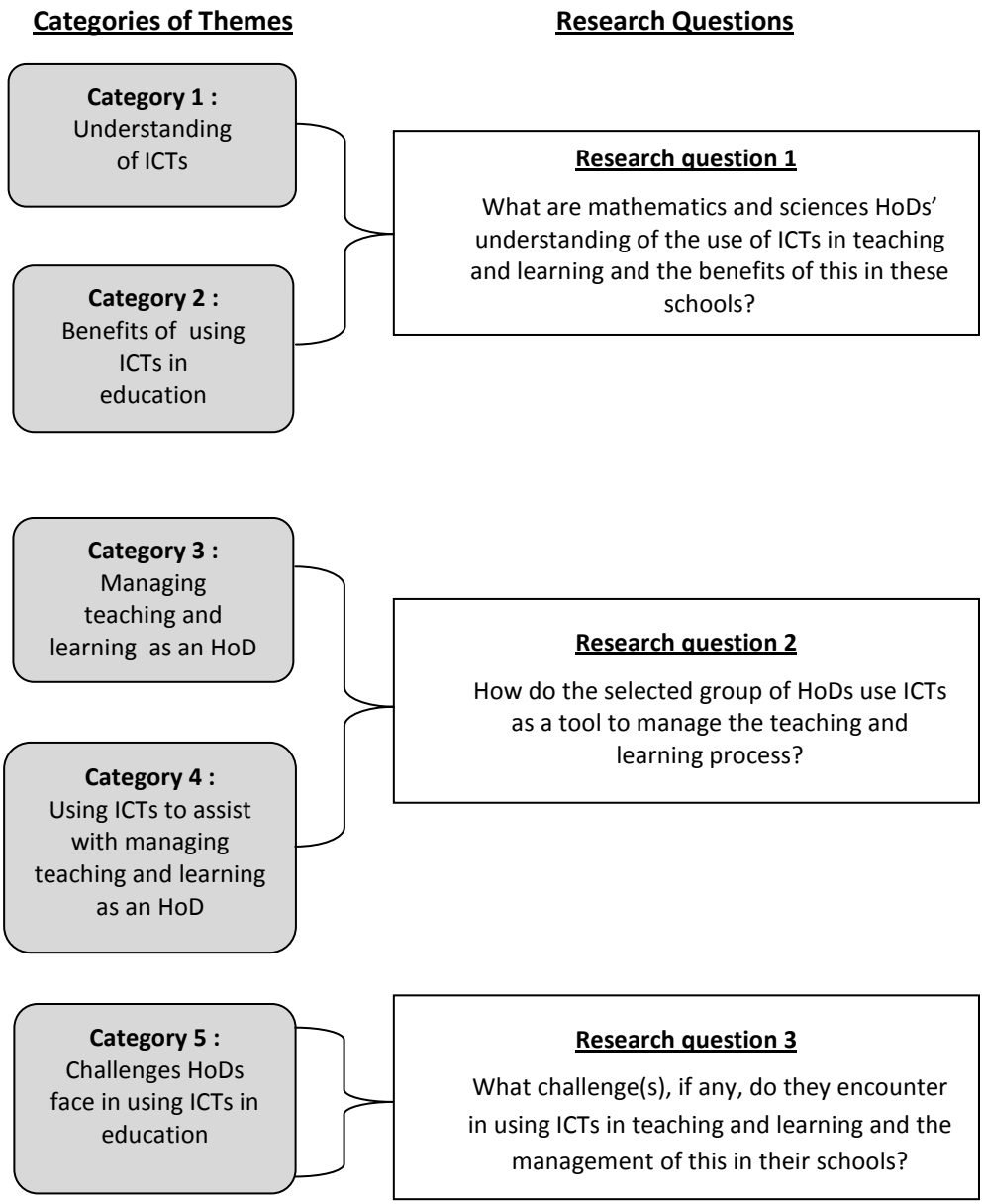

Figure 5.1. The relationship between categories of emerging themes and the research questions

It is the themes and sub-themes as shown in Figure 5.1, which emerge from category five that provide an indication of the challenges faced by HoDs in using ICTs in this study and at the same time offer answers to my third research question. Hence, an overview of the findings is presented according to the five categories of themes identified during the data analysis, in relation to my three research questions and the aim of my study.

Firstly, the meaning and understandings of ICTs in education and specifically teaching and learning amongst school managers is examined. Secondly, I readdress and explain

the benefits expressed by HoDs of using ICTs in teaching and learning. These two categories of themes and sub-themes provide further answers to my research question one which looks at what mathematics and sciences HoDs' understanding of the use of ICTs in teaching and learning and the benefits are, in their schools.

Before considering how ICTs are used by school managers, I examine what HoDs perceive to be their functions in managing teaching and learning. Fourthly, I focus on the main aim of this study which was to explore how these school managers use ICTs to assist with managing teaching and learning. In so doing, several themes and sub-themes as explained in the data analysis emerge. These themes and sub-themes from categories three and four are linked to my second research question and aim of the study which was to explore how HoDs use ICTs to assist with managing the teaching and learning process.

Lastly, and as a fifth focus of the discussion, I revisit the challenges faced by school managers in integrating ICTs into teaching and learning and in the management of this which provides me answers to my third research question.

5.2.1. HoDs definition and understanding of ICTs in education and research question one

In the literature review it was noted that Castells (1999) argued that one of the forces that drives society is technology and some of the changes in society would not have been possible, without ICTs. Tinio (2003), in describing these changes, also referred to it as being powered by technology. It is interesting in the findings of this study that school managers like HoDs also associated their definitions and understanding of ICTs in education to the technological advancements and changes in society. The rapid changes or technological revolution is even referred to by one of the HoDs in the study as the Fourth Industrial Revolution.

Furthermore, in expanding on their understanding of ICTs, all HoDs in this study mentioned a number of ICT tools and devices that have become available as a result of these rapid technological changes, which makes it easier to accomplish a range of tasks. This finding is in line with the literature where Tinio (2003) suggests that the advancements in ICTs have seen the creation of various tools and devices that have made it easier than ever to communicate, share, store and manage information. Also, all HoDs in the study mentioned ICT tools and devices which could be encompassed in the working definition of the concept explained in Chapter One of this study, which also

provides some answers as to their own understanding of ICTs in teaching and learning and to my first research question.

From the data analysis it is further evident that some HoDs in the study view ICTs as a way of using new technology in teaching. For these HoDs, technology was seen as almost essential in assisting with teaching. This was more especially the case where HoDs were able to expose learners to various multimedia like videos and animations to enhance the teaching and learning situation. These findings draw attention to Fu's (2013) contention in the literature that teaching and learning are no longer dependent on the printed text. It is in the multimedia, as Salomon (1979) explained in the literature, that when presented in both a verbal and a visual form, people learn new and abstract terms more easily. These findings provide some answers to my first research question and also begin to examine what HoDs in this study viewed as the benefits of using ICTs in teaching and learning and the management of this process. It is towards these benefits that the discussion of the findings now turns.

5.2.2. The benefits expressed by HoDs of using ICTs in teaching and learning and research question one

HoDs expressed various benefits associated with integrating ICTs into teaching and learning. The responses of some of the HoDs to this provided further answers to my first research question in that HoDs expanded on their understanding of ICTs in teaching and learning and also provided some answers as to how they value ICTs as a tool to assist with managing teaching and learning. In Chapter Four, in the data analysis it was established that some HoDs found that using ICTs made their lesson preparation and the delivery of lessons in the classroom easier. This was especially so when HoDs had access to ICT devices for teaching, including computers and smart boards. Whilst these HoDs prepared and delivered their lessons with the support of ICT devices, they were not using any complex ICT management system for these lesson plans.

However, in the literature, Blau and Presser (2013) note that when using an ICT management system it makes lesson delivery and homework easier to upload and access for learners. Teachers could now focus more of their time on responding to questions from learners and preparing them for assessments. The implication of this is that HoDs need to create, store and share electronic lesson plans. The next step will be to input these lesson plans into an ICT management system referred to by Blau and

Presser (2013) which could make more time available to teachers for engaging with learners and preparing them for assessments.

In using various ICT tools and devices, including videos, animations, computers and interactive and smart boards for teaching, some of the HoDs linked this practice to the higher interest shown by learners in the classroom. In addition, some HoDs felt that this allowed learners to access and seek subject knowledge and information on their own. This process was no longer confined to the teacher but became a two-way process, with both the teacher and the learner being actively involved in seeking out the subject knowledge and information.

This finding of using ICT tools to discover learning topics and solve problems is acknowledged in the literature. It is Fu (2013) who suggested in the literature review of this study that in using ICTs, knowledge acquisition is easier for learners and subject concepts are understood as learners engage in the exploration of knowledge and information. In addition Brush, Glazewski and Hew (2008), noted in the literature that by using ICT tools for exploring subject knowledge, learners begin to solve problems with these tools during the learning process.

Another finding related to HoDs' perception of how they thought ICTs benefited learners was that some felt that especially grade 12 learners are able to download question papers and memos which are then used to assist learners in preparing them for their examinations. However, these HoDs were concerned that when the GDE introduced tablets to grade 12 learners, the activity of downloading question papers and memos by learners seemed to be the major benefit of integrating ICTs into teaching and learning.

So, whilst it is encouraging that learners have greater access to subject knowledge and information, with ICT tools as suggested in the literature (Fu, 2013) and they are able to solve problems with these (Brush, Glazewski and Hew, 2008), if they are only able to access and download past question papers, it limits their exposure. This does not allow them opportunities to explore subject knowledge and information in a manner where learning becomes a two-way process of teacher and learner being actively engaged in the learning process.

HoDs also expressed other benefits related to integrating ICTs into teaching and learning. The majority of HoDs indicated that in using ICT tools and devices it made their tasks go quicker and faster which in turn saved time and made it easier to

complete these tasks. This finding corroborates the suggestion by Prokopiadou (2011) in the literature which stated that ICTs are increasingly integrated into schools to facilitate a variety of administrative tasks and activities. The finding is further maintained with reference to the e-Education policy in the literature review which acknowledged that in the automating processes, ICTs save school managers time which can be used for instructional leadership issues. Whilst many benefits have been identified by school managers like HoDs, it is important to note that these HoDs have also identified challenges in the integration of ICTs into schools. Findings around these challenges are discussed later in this chapter.

5.2.3. The various functions as perceived by HoDs in managing teaching and learning and research question two

It was important to establish what HoDs in this study perceived to be functions of teaching and learning, prior to exploring how these HoDs used ICTs to assist with managing teaching and learning. As indicated in the literature, managing teaching and learning at school has been identified as one of the most important activities and functions of school leaders (Bush, et al., 2009). From the data analysis it is apparent that school leaders and managers like HoDs expressed various functions that they performed in this regard. The findings revealed that all HoDs in the study acknowledged that one of their main functions in managing teaching and learning was to track and monitor curriculum coverage by the teachers in their departments.

HoDs indicated that they tracked and monitored the teacher's curriculum coverage in the reports the teacher prepared as well as in the work covered in learners' books. This was then compared to the ATPs developed by the DBE for the subject or phase to check if the teacher complied with specifications and guidelines. At times, class visits were also conducted by HoDs to monitor if the teachers' lesson preparation and delivery was in accordance with the subject content in the CAPS. This finding of HoDs tracking and monitoring curriculum coverage is in corroboration with the literature. As an example, Ali and Botha (2009) found that the main responsibility of HoDs was curriculum delivery and monitoring the teaching and learning process which was important in contributing to school improvement. Therefore, monitoring and controlling the teachers' work in relation to curriculum coverage through sampling learners' work and classroom visits emerged as components of tracking curriculum coverage, a perceived function of managing teaching and learning by HoDs in this study.

Furthermore, HoDs also identified other functions they perceived to be part of managing teaching and learning including the management of assessment, policy implementation and planning, managing LTSM and discipline. With the management of assessment it was found that some of the HoDs referred to their department's assessment plans or the school-based assessment and linked this to curriculum coverage and the ATPs. In addition, the majority of HoDs indicated that they complete quality control tasks for assessment. It was found that this was primarily in the form of pre- and post-moderation of assessment tasks and achievements.

In the literature, it is Lee and Dimmock (1999) who suggested that managing the curriculum would include elements like planning, allocating resources, monitoring and evaluating the educational program of the school and staff. Clearly from the findings, the management of assessment is also an important component of curriculum coverage. In addition Clarke (2007) has suggested that school managers perform a range of functions and duties like amongst other implementing policy, planning and controlling discipline. This further lends support in this study to the findings that school managers like HoDs perform a range of functions. In addition, half the HoDs in the sample indicated that part of their functions include maintaining both learner and teacher discipline issues, especially attendance. A small number of HoDs indicated that they manage the LTSM of their departments.

Currently not much has been written about how each of the various functions that HoDs are responsible for interact with each other and the impact this has on the management of teaching and learning, in light of how HoDs lead and manage their departments. Hence, it would seem that more research is required to establish how HoDs employ the various management functions in achieving the department or/and school goals. Existing literature and findings largely suggest that in managing teaching and learning, HoDs are required to perform a variety of tasks ranging from implementing, tracking and monitoring curriculum coverage, to functions which include policy implementation, planning, managing LTSM and maintaining discipline. These findings offer a type of benchmark against which HoDs in this study perceived to be some of their functions, which in turn provided some answers to my second research question.

5.2.4. HoDs utilising ICTs to assist with managing teaching and learning and research question two

The findings from the study indicate that HoDs do utilise ICTs to assist with managing teaching and learning. The data analysis reveals that all HoDs in the study use ICT tools like Whats App and emails to communicate with and amongst their teachers, the SMT, staff and the subject advisors. It was found that each HoD in the study belonged to at least two or more school linked Whats App groups. These were either subject or phase groups, school SMT groups, school staff groups, district subject or phase groups or district professional learning community groups.

It was further found that whilst email was also used as a communication platform, the Whats App application seemed to be used most often and was preferred over any other ICT-linked one. This is another significant finding in that HoDs in the study reported that Whats App district groups made it easier to communicate with subject advisors who frequently send HoDs curriculum-related information, through this medium. This finding corroborates the literature where Tinio (2003) has indicated that these ICT tools and devices make it easier than ever to communicate and share information. However, there was some caution voiced by one of the HoDs that communicating school-related issues through too many school Whats App groups could become a challenge to deal with.

From the literature and the findings discussed thus far, it is clear that whilst managing teaching and learning is a core function of HoDs, a component of this namely monitoring curriculum coverage of teachers, stands out as a priority function for HoDs. The findings from the study indicate that HoDs also utilise ICTs to assist with this. As an example, all HoDs complete various curriculum monitoring and management forms, as explained in Chapter Four, when reporting on curriculum coverage to the DBE through their district offices and subject advisors.

This is encouraging to note in that the DBE has in the e-Education policy committed to develop some of these standardised forms and templates for schools to assist with school management, as alluded to in the literature review. Hence, it was found in this study that through the district developed CMM forms, schools are able to report on the tracking and monitoring of curriculum coverage for their teachers, subjects and phases in the school. In addition, it was found that some HoDs use ICT devices like computers to complete, store, share and print the CMM forms which they could always refer to

later on. Some of these HoDs also used the computer for assisting with other functions like developing meeting templates and for uploading learner scores. However, it was also found that only one HoD uses her computer to do more than completing some of these administrative tasks and functions.

The findings reveal that whilst HoD 1 also completes these forms and administrative tasks using her computer, she has used the district CMM form as a basis in creating and developing her own ICT linked management and information system to track and monitor curriculum coverage. This, she has achieved by creating and developing Excel spreadsheets for each of her teachers, where as explained in Chapter Four she links the teachers' ATPs and the SBAs to this. In this way, as she receives CMM forms and reports from her teachers, she enters and updates them electronically on the teachers' Excel spreadsheets she has created. Consequently, she is able to generate various reports and even comply with the district CMM forms. HoD 1 is the only HoD that is doing this as all the other HoDs only keep copies of the CMM forms on their computers or file hard copies of these, after completing these forms.

Interestingly, HoD 1 as evident from the data is passionate about using computers and explained that she has always used ICTs even before they were introduced into schools. In expressing her positive attitude towards integrating ICTs into teaching and learning, this HoD lends further support to the literature which suggests that teacher attitudes and beliefs are important in this process (Bingimlas, 2009; Botha, 2013; Fu, 2013). In addition, as reported in the data analysis this HoD together with only one other HoD holds the highest qualification in the sampled group, a Masters degree in Education. HoD 1, as shown in Chapter Four in Table 4.1, is also the youngest of all the HoDs interviewed for this study. However, HoD 1 along with HoD 9 also has the most number of years experience as an HoD, which is 13 years.

These findings suggest that by developing and creating her own ICT linked management and information system for her department she is ahead of her colleagues in the sampled population in using ICTs to assist with managing teaching and learning. Also, as shown in Chapter Three, Table 3.1, HoD 1 hails from a quintile five school which is located in a former white suburb of South Africa. This finding confirms my own contention articulated in Chapter Three, which is that the differences in how HoDs use ICTs to assist with managing teaching and learning are also as a result of the location of the schools, the conditions and the contexts in which HoDs teach and manage.

The finding of one HoD being able to capitalise on the district CMM form by creating and developing her own ICT linked management and information system, whilst small, is somewhat encouraging. In the literature, research indicates that ICTs were being used more for administrative rather than management functions of the school (Hoque, et al., 2012a and 2012b). It would appear that the findings in this study corroborate this as all schools in the sample appear to be at a very early stage in ICT-linked educational management and administration. This is further supported by Forrester (2019) in the literature who found that schools were using ICTs to complete daily tasks and not leveraging the data to augment and transform these operations.

Another significant finding in this regard is that schools are not fully utilising the SA-SAMS introduced into schools by the DBE. This system, as noted in the literature review, is able to assist with completing various school management functions. This lack in using SA-SAMS is clearly evident when some HoDs remarked how limited SA-SAMS is. Some of these HoDs indicated that the system was only used by schools to enter learner marks in order to generate learner report cards. Again, this finding is supported in the literature by others like Bosker, et al., (2007) who suggest that even where schools do have some form of ICT management and information system, these systems tend to be used for clerical and administrative purposes and not to support higher order managerial tasks. In addition, this finding is further corroborated in the literature by Shah (2014) who suggested that educational management systems are being used in schools for a variety of administrative tasks, including monitoring attendance and updating learner records.

Thus, whilst the literature recognises that ICTs make it easier for school managers to communicate and complete various functions, it is apparent that the majority of HoDs are not fully utilising what these ICT tools and devices have to offer. However, it is important that the findings of this study are also explored within these and other findings like for example those by Manduku, et al., (2012). These authors suggested in the literature that school management had not fully realised the potential of embracing ICTs to assist with various functions due to a lack of various elements including skills, knowledge and finance. Hence, the authors suggest that due to the many constraining factors or challenges in integrating ICTs into schools, many school managers go back or continue with more traditional ways of completing these functions. This suggestion could be true of this research study as well and therefore it is appropriate to also note

the findings of this study in relation to the constraints and challenges faced by HoDs in using ICTs in teaching and learning and in the management of this process.

These findings provide further answers to my second research question, which is also the aim of this study.

5.2.5. The challenges expressed by HoDs in using ICTs in teaching and learning and in assisting with the management of this and research question three

In the literature review Bingimlas (2009) suggested that an important step in improving the quality of teaching and learning with ICTs is to note the constraints and challenges of integrating ICTs into education. The implication is that this makes it easier to act on these in ensuring the successful integration of ICTs into teaching and learning. With this in mind, the discussion of the findings now examines what HoDs expressed to be challenges in integrating ICTs into teaching and learning and the management of this. In providing answers to my third research question, I have opted to utilise the same four categories I identified in the literature review in presenting these findings, namely technological, teacher related, learner related and other.

With regard to technological barriers it was found that HoDs expressed the view that access to ICT devices was a challenge in schools. These included a shortage of computers and smart boards for teachers, and tablets and smart phones for learners. This finding supports the contention in the literature which suggest that a key constraining factor to ICT integration in teaching and learning was a lack of hardware (Pelgrum, 2001; Wilson-Strydom et al., 2005; Hodgkinson-Williams et al., 2007; Padayachee, 2017). Furthermore, Blignaut and Howie (2009) noted that in most schools in developing countries all teachers do not use ICTs in their classrooms as widely as their peers in the more industrialised countries, which seemed to be the situation in this research study, undertaken in a developing country. As mentioned in the literature review if the lack of access to hardware persists, it could lead to a broadening of the so-called digital divide (Mikre, 2011) between the ‘haves’ and the ‘have-nots’ in society.

In relation to software, it was found that some HoDs in the study expressed the view that certain software they received from the department was not in the language of learning and teaching of the learners and this was a constraining factor. This finding is also corroborated in the literature by other research studies namely Hodgkinson-

Williams et al., (2007). These authors also referred to how issues of connectivity and the costs of data could contribute to the success of ICTs in schools. The findings of my research study, in relation to connectivity indicate that the majority of HoDs mentioned that both teachers and learners have challenges in accessing the school Wi-Fi. In most cases, connectivity to the school Wi-Fi where available, was limited to a very small area near the principal's office. Some of these HoDs indicated that the limited connectivity to the Internet had a negative impact on integrating ICTs in teaching and learning.

Furthermore, from the data analysis it can be revealed that half of the HoDs in this research study expressed the opinion that data costs in South Africa are high. In addition, at the time of this research study, the Competition Commission of South Africa found that service providers had been charging very high rates as compared to what they charged in other countries they operated in and that they needed to reduce the cost of data to users in South Africa. The literature also acknowledges the high costs of data in South Africa when authors like Hodgkinson-Williams et al., (2007) caution that unless these costs are reduced, schools will continue to remain constrained in integrating ICTs into teaching and learning.

It was also found that two schools in this study of six schools, lacked adequate buildings and infrastructure. As shown in Table 3.1, school C and school D were built of and continue to consist of prefabricated classrooms only. This is important to note as these infrastructural challenges as suggested in the literature (Mikre, 2011; Khan et al., 2012; Albugami and Ahmed, 2015) could hamper the successful integration of ICTs into schools.

Mikre (2011) in the literature also identified power shortages and inadequate electricity supplies as infrastructural challenges. In this research study it was found that some of the HoDs viewed the current power outages and electricity cuts by the country's power utility Eskom as having a negative effect on teaching and learning. This 'load-shedding' as coined by Eskom, or power cuts and outages, was found by HoDs to impact negatively in attempting to integrate ICTs into teaching and learning.

As for teacher related challenges, the issue of access to ICT devices has already been noted. However, another important finding from this research study is that some HoDs expressed the view that both teachers and learners at times, misused the available ICT devices like computers and interactive and smart boards. Whilst this finding as it relates to learners is discussed later, some of the HoDs in the study attributed a lack of teacher

ICT competencies to a lack of teacher training and development. Even when ICT training was provided, some HoDs indicated that there were challenges around this as well.

Also, a staggered type of implementation strategy is being used by the GDE to integrate ICTs into schools. It was found that grade 10, 11 and 12 teachers representing the FET phase of schooling had been given some training on ICT competencies about three years ago, whilst grade 8 and 9 teachers, representing the GET phase of schooling were being trained at the time the research study was being conducted. According to some HoDs this created a challenge as it was found and acknowledged that not all schools in the sample had adequate access to ICT devices like interactive and smart boards. This meant that whether teachers were trained some time ago or now, they had little opportunities to practise the skills acquired during the training, in the absence of relevant ICT devices.

This finding corroborates the literature where Dlamini and Mbatha (2018) suggested that the ICT professional development needs of teachers are not being addressed in a substantial and efficient way. This, the authors suggest, exists even though there is an interest from teachers to develop their ICT skills and competencies. Furthermore, Padayachee (2017) observed that teachers were receiving inadequate support to integrate ICTs into teaching and learning.

Another teacher-related finding emerging from this study is that some HoDs expressed the view that the age of teachers also influenced how these teachers took to and integrated ICTs into teaching and learning. Some HoDs in the study are of the opinion that younger teachers are more mindful of technology and more techno-savvy as compared to their elder colleagues. This finding supports similar findings in the literature where it was noted by Padayachee (2017) that some teachers resisted the integration of ICTs into teaching and learning as they felt they were too old to be learning new things.

Some HoDs also indicated that they did not have enough time to manage their departments and teachers as they carried the same teaching load as their own teachers. This finding is confirmed in the literature by various authors (Harris et al., 2019; Ali and Botha, 2009; Bush, 2009). Even HoD 1, from school A who is making the most of the district CMM forms by creating and developing her own management and information system expressed the view that it takes a lot of her time developing and

updating the teachers' Excel spreadsheets. However, the literature and the findings also show that by using ICTs in the teaching and learning situation, it could save school managers much needed time, which could be used to accomplish other management functions.

In examining learner related challenges expressed by HoDs in the sample, learner access to ICT devices has been discussed as part of the findings. The misuse of these devices by learners will now be addressed. It was found that half the HoDs expressed the view that learners misused the available ICT devices at school. This was explained by one of HoDs who indicated that some learners returned the school tablets provided to them by the GDE, in a poor condition. Other HoDs expressed the view that learners misused ICT devices like tablets when they visited websites or watched videos on the Internet which are not related to the subject content. Some of these HoDs also indicated that learners downloaded music and played video games with these devices.

This finding is corroborated in the literature which found that there is a tendency for learners to visit or engage in other activities through their ICT devices, besides only completing subject or study related tasks and activities (Mikre, 2011). However, as one of the HoDs in my research study cautioned, it is also important to understand the learners' socio-economic backgrounds and the context they find themselves in. For example, this HoD remarked that for some of the grade 12 learners it was the first time they had been exposed to ICT devices like tablets and at times even the Internet. The implication of this is that it would be expected that these learners will be curious and will therefore tend to explore and navigate various Internet sites and find things that are of interest to them and not necessarily engage with the subject content.

It was also found that some HoDs expressed the view that learner literacy and numeracy levels were low. These HoDs were concerned that some learners, who were at this senior phase of schooling, lacked reading and writing skills. Interestingly, one of these HoDs indicated that whilst some learners were experiencing this difficulty, they were however able to type. Another of the HoDs mentioned how the learners seemed to be more interested in coding and robotics. In the literature, Czerniewicz and Hodgkinson-Williams (2005) suggested that nowadays learners grow up in a digital culture and are experiencing new ways of learning, exactly what these two HoDs refer to. The authors continue by suggesting that by coming to terms with the digital identities

of local youth, it places teachers in better positions to design appropriate interventions for their learners.

Other significant challenges noted amongst HoDs in this study relate to safety and security of ICT devices and the role of government. It was found from the interviews that the majority of HoDs reported that the schools they were currently teaching in had at one point or another been broken into, in the recent past. These HoDs indicated that the target of these break-ins were the ICT devices at school, more especially computers and tablets. This finding is supported by the literature where Padayachee (2017) noted that teachers are concerned about the physical security and safety of ICT equipment at schools. Again, the finding is significant, especially in the South African context where recent crime statistics of burglaries and theft remain high. Clearly if our schools continue to be at risk of organised crimes targeting ICT equipment, schools will be constrained in integrating ICTs into teaching and learning and the management of this.

In referring to the role of government, the findings show that whilst some HoDs appreciated what the GDE had done to integrate ICTs into schools, some also felt that the South African government had not been doing enough and were lagging behind. An example of this is the e-Education policy with aims and goals, whose deadlines have long passed. One of the HoDs indicated that more could be done by the government to assist particularly under privileged and under resourced schools. This finding is echoed in the literature by, amongst others, Czerniewicz and Hodgkinson-Williams (2005) who indicated that unlike other countries, ICT integration in South Africa is not being driven by top-down policies and funding incentives. Furthermore, Isaacs (2007) suggested that the lack of co-ordination of ICT programs amongst various groups, including government, was a major challenge to its integration in teaching and learning. Therefore, these findings provide some answers to my third research question.

From the foregoing discussion of the findings it is clear that school managers like HoDs have a definitive voice in the issues regarding ICT integration and practice in schools. The voices of these HoDs also lend support to the significant role they have in not only influencing how ICTs are integrated into teaching and learning, but how ICTs could be used to assist in the management of this in their respective schools.

Therefore, in light of the literature and findings of this study, I am of the opinion that ICT tools and devices can assist school managers like HoDs to complete various school administrative and management functions. In addition, I believe that due to various

challenges, school managers like HoDs have not yet fully realised the potential of using ICTs to assist with performing various management functions. Hence, to a large extent this study has found that school managers are using ICTs more for administrative than managerial functions.

5.3. Recommendations

A large majority of secondary school managers like HoDs are not using ICTs to assist with management functions. Therefore, in light of the findings of this research study, the following is recommended in supporting HoDs to accomplish this. Firstly, it is recommended that all teachers and learners have access to ICT devices like computers, interactive and smart boards and tablets for teaching and learning. Secondly, connectivity to networks should be made more accessible and data must be provided at no charge or at hugely subsidised costs to all teachers and learners, for the use of teaching and learning. Thirdly, it is recommended that there must be a reliable source of power for school ICT infrastructure and devices. Fourthly, schools with the support of the district office must develop and implement ICT policies aimed at achieving ICT integration and security in their schools.

As a fifth recommendation there needs to be ongoing ICT teacher professional development and support provided to teachers. Sixthly, there must be a process geared towards the strengthening of school leadership at a micro and macro level in achieving global and national ICT goals. As a seventh recommendation we need to reflect on national and provincial ICT roll-out and measure successes and challenges and advise on the best way forward. As an eighth recommendation, government must be encouraged and supported to move faster in implementing ICT policies and goals in the country.

5.4. Suggestions for future research

Given the findings of this study, it is suggested that future research studies explore how secondary school HoDs of other subjects (besides mathematics and sciences) use ICTs in teaching and learning and to assist in the management of this. Future studies could explore the understanding and role of ICTs in teaching and learning amongst primary school managers like HoDs, and how HoDs use ICTs to assist with school management. Given the plan to modernise the SA-SAMS, future studies could also

examine how and why this administration and management system could be improved for school managers and the impact of these decisions on school management.

5.5. Conclusion

The current rate of technological changes and advancements appear to be rapid and like something not seen before. As a consequence, ICTs have become building blocks in some of these technological changes we see globally and in schools specifically. Various ICT tools and devices have the potential to assist school management with the different functions they engage with, on a daily basis. Yet, school management is not taking advantage of this and my research study has found that to a large extent HoDs use ICTs for merely administrative tasks. However, gaining insight into how school managers like HoDs currently use ICTs in schools could contribute to understanding how these views may influence ICT integration, teaching and learning and the management of this process.

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APPENDICES

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APPENDIX A : University's Ethical Clearance Certificate

WITS SCHOOL OF EDUCATION

UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG

SCHOOL OF EDUCATION ETHICS COMMITTEE
CONSTITUTED UNDER THE UNIVERSITY HUMAN RESEARCH ETHICS COMMITTEE (NON-MEDICAL)

CLEARANCE CERTIFICATE	**PROTOCOL NUMBER: 2019ECE019M**
PROJECT TITLE	Exploring the Use of ICTs in Education: Evidences from South African Secondary School Managers
INVESTIGATOR	Fazel Shaikjee
SCHOOL/DEPARTMENT OF INVESTIGATOR	WITS SCHOOL OF EDUCATION
DATE CONSIDERED	15 July 2019
DECISION OF THE COMMITTEE	Approved unconditionally
EXPIRY DATE	Date of submission of the project report

ISSUE DATE OF CERTIFICATE 22 July 2019 **CHAIRPERSON** (Dr. Paul Goldschagg)

cc: Supervisor: Dr. Emmanuel Ojo

DECLARATION OF INVESTIGATOR

To be completed in duplicate and **ONE COPY** emailed to the Ethics Office: Matsie.Mabeta@wits.ac.za .

I fully understand the conditions under which I am authorized to carry out the abovementioned research and I guarantee to ensure compliance with these conditions. Should any departure be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee.

Signature

23, 07, 2019
Date

PLEASE QUOTE THE PROTOCOL NUMBER ON ALL ENQUIRIES

APPENDIX B1 : GDE Research Approval letter

GAUTENG PROVINCE
Department: Education
REPUBLIC OF SOUTH AFRICA

8/4/4/1/2

GDE RESEARCH APPROVAL LETTER

Date:	31 May 2019
Validity of Research Approval:	04 February 2019 – 30 September 2019 2019/53
Name of Researcher:	Shaikjee, F
Address of Researcher:	15 Francolin Street
	Meyersdal
	Alberton
	1447
Telephone Number:	011 867 6448/ 082 339 5257
Email address:	fazel@mpowerlearning.co.za
Research Topic:	Exploring the Use of ICTs in Education: Evidences from South African secondary school managers
Type of qualification	Masters
Number and type of schools:	Two secondary Schools
District/s/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.

03/06/2019

The following conditions apply to GDE research. The researcher may proceed with the

1

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.gpg.gov.za

APPENDIX B2 : GDE Research Approval letter (Amended)

GAUTENG PROVINCE
Department: Education
REPUBLIC OF SOUTH AFRICA

B/4/4/1/2

GDE AMENDED RESEARCH APPROVAL LETTER

Date:	19 August 2019
Validity of Research Approval:	04 February 2020 – 30 September 2020 2019/53A
Name of Researcher:	Shaikjee F
Address of Researcher:	15 Francolin Street
	Meyersdal
	Alberton, 1447
Telephone Number:	011 867 6448/ 082 339 5257
Email address:	fazel@mpowerlearning.co.za
Research Topic:	Exploring the Use of ICTs in Education: Evidences from South African Secondary School managers.
Type of qualification	Masters
Number and type of schools:	Six Secondary Schools
District/s/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:

20/08/2019

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.gpg.gov.za

APPENDIX C : School Principal's Information Form

Requesting Permission: Letter to the principal

For Attention : The Principal

Re : Permission to conduct research

Dear Sir/Madam

I, Fazel Shaikjee, am a registered student in the School of Education at the University of the Witwatersrand, Johannesburg for the Masters in Education (MEd) degree, specialising in Information and Communication Technologies (ICTs). I am conducting a study on the use of ICTs in education. My topic is entitled : '*Exploring the Use of ICTs in Education: Evidences from South African secondary school managers'*. I am inviting your school to participate in this research, the findings which will be beneficial to the school and the Department of Education.

My study examines how school managers, specifically Heads of Departments (HoDs) for mathematics and sciences, use ICTs in teaching and learning at their schools. The importance of the science, technology, engineering, and mathematics (STEM) education in global and local literature is acknowledged. This justifies my choice of STEM subjects including mathematics and sciences as the focus of my proposed study. Furthermore, the current literature I have reviewed showed that while there is so much written and published in peer-reviewed sources on the use of ICT in teaching, there is a dearth of literature on how ICTs are used in school management making the connections with teaching and learning. Specifically in South Africa, there is a dire need for research in the field.

The proposed study will be a qualitative research approach. Through your assistance in identifying the HoDs and with yours and their consent, I will be collecting my qualitative data through semi-structured interviews, which will be audio-taped. Each interview is expected to last between 30-45 minutes. The intended participants will be HoDs in the FET phase (Grades 10-12) involved with mathematics and physical sciences.

The research participants will not be advantaged or disadvantaged in any way. Face-to-face, semi-structured interviews will be used to collect data. Participants will be reassured that they can withdraw their permission at any time during this project without any penalty. There are no foreseeable risks in participating in this study. The participants will not be paid for this study.

The names of the research participants and identity of the school will be kept confidential at all times and in all academic writing about the study. Your individual privacy will be maintained in all published and written data resulting from the study.

All research data will be destroyed between 3-5 years after completion of the project.

Please let me know if you require any further information. I look forward to your response as soon as is convenient.

Yours sincerely,

_____ _____

Signature Date

(Fazel Shaikjee) Contact number : 0823395257 fazel@mpowerlearning.co.za

APPENDIX D : School Principal's Informed Consent

Principal's Consent Form

For Attention : The Principal

Re : Informed Consent Form

Dear Sir/Madam

Please fill in and return the reply slip below indicating your willingness as a school to be a participant in my voluntary research project called:

Exploring the Use of ICTs in Education: Evidences from South African secondary school managers

I, _____(Name and Surname) the principal of

_____

give my consent for the following:

Circle either YES or NO

Permission to be interviewed

I extend my consent for the schools' participating HoDs to be interviewed for this study. YES/NO

I know that they can stop the interview at any time and don't have to answer all the questions asked. YES/NO

Permission to be audio taped

I extend my consent for the schools' participating HoDs to be audio taped during the interview. YES/NO

I know that the audiotapes will be used for this project and study only. YES/NO

Further

I understand that:

- my name and information will be kept confidential and safe and that my name and the name of my school will not be revealed at any time.
- my teachers do not have to answer every question and can withdraw from the study at any time.
- my teachers can ask not to be interviewed or audio-taped.
- all the data collected during this study will be destroyed within 3-5 years after completion of this project.

Signature _____ Date_____

Please Note :

Should you have any queries or questions about this research or any related matters, please contact the researcher at :

Fazel Shaikjee
Contact number : 0823395257 fazel@mpowerlearning.co.za

APPENDIX E : School HoD's Information Form

Requesting Permission: Letter to the Head of Department (HoD)

For Attention : The Head of Department (HoD)

Re : Permission to conduct research

Dear Sir/Madam

I, Fazel Shaikjee, am a registered student in the School of Education at the University of the Witwatersrand, Johannesburg for the Masters in Education (MEd) degree, specialising in Information and Communication Technologies (ICTs). I am conducting a study on the use of ICTs in education. My topic is entitled : '*Exploring the Use of ICTs in Education: Evidences from South African secondary school managers'*. I am inviting your school to participate in this research, the findings which will be beneficial to the school and the Department of Education.

My study examines how school managers, specifically Heads of Departments (HoDs) for mathematics and sciences, use ICTs in teaching and learning at their schools. The importance of the science, technology, engineering, and mathematics (STEM) education in global and local literature is acknowledged. This justifies my choice of STEM subjects including mathematics and sciences as the focus of my proposed study. Furthermore, the current literature I have reviewed showed that while there is so much written and published in peer-reviewed sources on the use of ICT in teaching, there is a dearth of literature on how ICTs are used in school management making the connections with teaching and learning. Specifically in South Africa, there is a dire need for research in the field.

The proposed study will be a qualitative research approach. Through your participation as an interviewee, I will be using a face-to-face approach which will be between 30-45 minutes. The interview will be semi-structured, audio taped and transcribed for the purposes of the study.

You as the participant will not be advantaged or disadvantaged in any way. You can withdraw your permission at any time during this project without any penalty. There are no foreseeable risks in participating in this study. You will not be paid for this study. Your names and identity will be kept confidential at all times and in all academic writing about the study. Your individual privacy will be maintained in all published and written data resulting from the study.

All research data will be destroyed between 3-5 years after completion of the project.

Please let me know if you require any further information. I look forward to your response as soon as is convenient.

Yours sincerely,

_____ _____

Signature Date

(Fazel Shaikjee) Contact number : 0823395257 fazel@mpowerlearning.co.za

APPENDIX F : School HoD's Informed Consent

Teacher's/ HOD's Consent Form

For Attention : The Head of Department

Re : Informed Consent Form

Dear Sir/Madam

Please fill in and return the reply slip below indicating your willingness to be a participant in my voluntary research project called:

Exploring the Use of ICTs in Education: Evidences from South African secondary school managers

I, _____(Name and Surname) an HoD at

_____

give my consent for the following:

Circle either YES or NO

Permission to be interviewed

I would like to be interviewed for this study. YES/NO

I know that I can stop the interview at any time and don't have to answer all the questions asked. YES/NO

Permission to be audio taped

I agree to be audio taped during the interview. YES/NO

I know that the audiotapes will be used for this project only. YES/NO

Further

I understand that:

- my name and information will be kept confidential and safe and that my name and the name of my school will not be revealed at any time.
- I do not have to answer every question and can withdraw from the study at any time.
- I can ask not to be interviewed, audio taped or having photos taken of ICT equipment and facilities at the school at any time
- all the data collected during this study will be destroyed within 3-5 years after completion of this project.

Signature _____ Date_____

Please Note :

Should you have any queries or questions about this research or any related matters, please contact the researcher at :

Fazel Shaikjee
Contact number : 0823395257 fazel@mpowerlearning.co.za

APPENDIX G : Semi-structured Interview Schedule

1. Please share with me your understanding of what Information & Communication Technologies (ICTs) is/are and its use in education, specifically teaching and learning mathematics and sciences at your school? Give examples, if possible.

2. Specifically, what is it that you manage in teaching and learning and how have you used ICTs in executing your role as HoD at this school?

3. What challenge(s), *if any*, do you as HoD encounter in using ICTs to manage the teaching and learning process at your school? Kindly give me practical examples of such and share with me how you have tried to overcome this.

APPENDIX H : HoD's Information Form

INTERVIEWEE'S DETAILS

SECTION A : School Particulars

Name of Secondary School					
Province	**District**	**Contact Number**		**Email Address**	
Physical Address of School					
Name of Principal			**Cell Number**		
Name of Deputy Principal			**Cell Number**		

SECTION B : Particulars of interviewee Age : Gender :

Name(s) and Surname							
Nationality				**ID/Passport No**			
No of years teaching	**No of years as an HOD**	**Home Tel**		**Cell Number**		**Email**	
Qualifications							
Phase heading as HOD (Tick the box)		Senior			FET		
All Grades(s) and Subject(s) heading as the HOD in this phase		Grade(s)	Subject		Grade(s)	Subject	
All Subject(s) and Grade(s) currently teaching		Subject (s)				Grade (s)	

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