UNIVERSITY OF
KWAZULU-NATAL

THE USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES (ICTS) BY GRADE 11 LEARNERS AND TEACHERS AT PUBLIC SECONDARY SCHOOLS WITHIN DR   NKOSAZANA DLAMINI ZUMA MUNICIPALITY, KWAZULU-NATAL

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in the Information Studies Programme, School of Social Sciences, College of Humanities,

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DECLARATION

I, Andile Pheneus Ndimbovu, declare that:

1. The research reported in this dissertation, except where otherwise indicated, is my original research.

2. This dissertation has not been submitted for any degree or examination at any other university.

3. This dissertation does not contain other persons' data, pictures, graphs or other information unless specifically acknowledged as being sourced from other persons.

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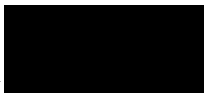
Supervisor: Dr Zawedde Nsibirwa

Signed

DEDICATION

This dissertation is dedicated to the glory of the Almighty God. I also dedicate it to my beloved mother and wife for their support.

ABSTRACT

The study examined the use of information and communication technologies (ICTs) by grade 11 learners and teachers at public secondary schools within Dr Nkosazana Dlamini Zuma Municipality, KwaZulu-Natal. It looked into the types of ICT resources that are used by learners and teachers; the learners and teachers' attitude towards using ICTs; the learners and teachers' competence in the use of ICTs; challenges faced by learners and teachers in using ICTs; and, finally, solutions to improve the ease of use of ICTs. Two public secondary schools, namely Sonyongwana High School and Ginyane High School were surveyed. The survey design allowed methodological pluralism for the collection of both quantitative and qualitative data. The tools used for data collection were a questionnaire for the learners and a semi-structured interview schedule for the teachers. Pre-testing of the research instruments, triangulation of research data, and consideration of ethical issues helped ensure the validity and reliability of the results. The quantitative data were analysed with SPSS and the qualitative data were analysed through the use of content analysis. The Technology Acceptance Model (TAM) (Venkatesh and Davis, 1996) was employed as the theoretical framework for the study. All learners (100%) sampled completed the questionnaire while 64% of the sample of teachers were interviewed.

The study found that the ICT infrastructure is not adequate in secondary schools with the learners using their smartphones and tablets to access information. Most of the surveyed learners have a positive attitude towards using ICTs while only a few learners viewed the use of ICTs in a negative light. The majority of learners felt that they had sufficient skills to use ICTs but there was a substantial minority (39%) who felt that they did not have such skills. The majority of learners indicated that learning to use ICTs would be easy for them. Most teachers interviewed were positive towards using ICTs for curriculum delivery with only a few having a negative attitude in this regard. As with the learners, most teachers in the two secondary schools considered themselves competent in using ICTs. However, challenges that faced secondary school learners and teachers included the cost of access to ICTs, the lack of training for ICT usage, viruses, unreliable sources and the shortage of computers. Recommendations, in the main, revolved around the need for ICT infrastructure and training both of which are contingent on adequate funding being provided. Also pointed to is the need for government to provide free data and tablets to learners.

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Finally, I present my gratitude and my great respect to my friends and colleagues for their words of encouragement and support during this research project. In so many different ways you made me realise that this was a cause worth fighting for.

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LIST OF ABBREVIATIONS

CAPS	Curriculum and Assessment Policy Statement
COVID-19	Corona Virus Disease 2019
DFID	Department for International Development
DoE	Department of Education
Dr NDZ	Doctor Nkosazana Dlamini Zuma
DSTV	Digital satellite television
ELITS	Education Library Information and Technology Services
FET	Further education and training
GET	General education and training
HoD	Head of department
ICT	Information and communication technology
IFLA	International Federation of Library Associations and Institutions
ITU	International Telecommunication Union
MTN	Mobile Telephone Network
NGOs	Non-governmental organisations
OECD	Organisation for Economic Co-operation and Development
SABC	South African Broadcasting Corporation
SA	South Africa
SPSS	Statistical Package for Social Sciences
TV	Television
UKZN	University of KwaZulu-Natal
UNESCO	United Nations Educational, Scientific and Cultural Organization
UN	United Nations
USAID	United States Agency for International Development

CHAPTER ONE: INTRODUCTION TO THE STUDY

1.1 Introduction

This study investigated the use of information and communication technologies (ICTs) by grade 11 learners and teachers at public secondary schools within the Dr Nkosazana Dlamini Zuma (Dr NDZ) Municipality KwaZulu-Natal. This foundational chapter, among other aspects, introduces the background to the study and the research problem. It outlines the research objectives and research questions of the study. The chapter also provides an overview of the research design and methods applied in the study. The chapter ends with an outline of the structure of the dissertation and a summary.

1.2 Background to the study

The development of ICTs and the Internet have undergone rapid progression over the past 20 years. Mamba and Isabirye (2015: 11) pointed out that the associated increase in the popularity of the Internet and the rapid growth of ICTs may have positive effects on the potential for e-learning if teachers increasingly utilise available technologies to enhance their learners' learning experiences. Siddiquah and Salim (2017) point out that ICT is vital for social life, business, and the economy to meet the demand of modern information society and education progress. Use of ICT in education improves the quality and quantity of education and causes better innovative, creative and cognitive thinking, higher productivity, efficiency, and educational outcomes. Siddiquah and Salim (2017) further stated that ICT facilitates both instructional and learning processes and greatly influences teaching and learning at higher education. It enhances the students' learning, helps the students learn new skills set, promotes social mobility, helps the citizens compete in a worldwide economy, and thus has a multiplier effect across the education system. According to International Telecommunication Union (2019) ICT issues in schools are the lack of trained teachers, the major obstacle in the use of ICT in rural education is the lack of knowledge and skills. Mamba and Isabirye (2015) indicated that shortage of time in schools, teachers are usually burdened with multiple tasks other than teaching.

Moreover, they have to teach all types of subjects along with ICT. They do not have time to design, develop and incorporate technology into teaching and learning. Mkhize (2018) reveal that insufficient funds is another issue using ICT; appropriate and latest hardware and software

facility availability determines the effective and efficient usage of technology. In developing countries, technology implementation into education systems is a difficult task as it requires a magnum of funds, infrastructure and support facilities. Meyer and Gent (2016) point out that the challenge of language and content is the main issue in ICT usage; a large proportion of the educational software produced in the world market is in English. , The majority of online content is available in English. In developing countries, English language proficiency is not high, especially outside the urban areas, which becomes a serious barrier to maximizing the educational benefits of ICT. The researcher believes that using ICTs in schools will prepare the current generation of learners for tertiary education and the workplace where ICTs, especially computers, the Internet and related technologies, have become global. ICTs in public schools will help learners and teachers improve their knowledge and find appropriate and relevant information resources. As for the learners, learning will be made easier and more fun if the diffusion of ICTs is done properly. The learners and the teachers must be both information and computer literate to access accurate information. As noted by Odede and Nsibirwa (2018), information literacy is an essential and indispensable skill as technology is rapidly evolving and there is advancement in electronic information sources. Digital literacy, as defined by Bothma, Cosijn, Fourie and Penzhorn (2017), is being able to navigate various digital platforms and understand, assess and communicate through them. Signs of a digitally literate individual include finding the right tools to consume information and share and create content for others.

As the use of electronic information resources continues to rise, especially within higher institutions of learning, students are expected to develop the required information literacy and digital literacy skills. Odede and Nsibirwa (2018) further state that these skills enable individuals to handle the changing contents of computer and information resources and know where and how to look for the resources. The students of higher education, primarily those coming from secondary schools, face the problem of using multiple formats of information resources. There is, therefore, an urgent need for learners and teachers to be information literate as this would guarantee their effective use of electronic information resources. Kankam (2017: 107) points out that "the external barriers that are common to learners include slow and poor internet connections, access restrictions, and inadequate facilities (computers and computer

laboratories)". Yet, the White Paper on e-Education (Department of Education, 2004: 29), Section 5.30 states:

> At the provincial level, the Department of Education will establish the desired level of technology resources (hardware and software) for each General Education and Training (GET) and Further Education and Training (FET) institution and assess the adequacy of existing equipment and facilities.

There thus appears to be a disjuncture between policy and practice with regard to ICT provision in educational institutions.

1.2.1 Background information on the geographical area

The study focused on selected public schools in the Dr NDZ Municipality situated in the southern part of KwaZulu-Natal within the Harry Gwala District, which borders the Eastern Cape and Lesotho (See Figure 2 below). It is the largest of the four municipalities in the district, accounting for just over a third of its geographical area. It was established by the amalgamation of the Ingwe and Kwa Sani local municipalities in August 2016. The Municipality's area is 3 602 square kms, and the main towns include Creighton, Himeville and Underberg.

KwaZulu-Natal, also referred to as KZN, is a province of South Africa created in 1994 when the Zulu Bantustan of KwaZulu ("Place of the Zulu" in Zulu) and the Natal Province were combined. It is located in the northeast of South Africa, enjoying a long coastline beside the Indian Ocean and sharing borders with three other provinces(Eastern Cape, Free State and Mpumalanga), and Mozambique, Swaziland and Lesotho. Its capital is Pietermaritzburg, and its largest city is Durban (Encyclopaedia Britannica, 2018).

The Dr NDZ Municipality has 29 secondary schools. In this study, the researcher targeted two public schools with computer laboratories in Ward 8 of the Municipality to investigate the use of ICTs by the learners and teachers in the schools. These schools include; Sonyongwana high school and Ginyane high school. These schools are situated in a rural area with not enough ICT infrastructure. Networks in this area are very slow that make using ICTs more challenging.

Figure 1: Harry Gwala District Municipality map

Source: Harry Gwala district municipality map (2018)

1.3 Research problem

Dzansi and Amedzo (2014) observed that learners in many public secondary schools, particularly in rural areas, lack digital literacy and access to ICTs. Furthermore, Jansen (2015) in an article in *The Mercury* newspaper revealed that many schools in KwaZulu-Natal do not have access to computers due to a lack of ICT infrastructure such as physical space, furniture, computers and Internet connectivity. The article by Jansen (2015) and the study by Sundarjee, Ntuli and Chikasa (2014) indicated that most schools do not have enough skills and infrastructure to operate computers with ease. As computers form the backbone of today's information economy, those learners who do not have the necessary skills must attain them before entering the university and the workplace. Kankam (2017: 107), Mkhize (2018) and Nsibirwa and Odede (2018) revealed that the level of ICT infrastructure and support is a significant factor in the use of ICTs by school teachers and learners. While many schools do not have ICT infrastructure, those that do have other issues, for example, learners having to walk a long distance to reach school and thus not having enough time to access computers. The reality for most learners is that they are not able to do their assignments using computers. They are limited to textbooks and when they go to university they are faced with problems because they do not have computer skills. At university, the lecturers often use various platforms in online teaching and learning such as Zoom, Ms Teams and Moodle and their usage has increased significantly as a result of the COVID-19 pandemic. Students without the

necessary computer skills (and access to the needed technology) are at a distinct disadvantage. They may also find it challenging to use the library at institutions of higher learning, as one needs computer skills to use the catalogue. Sundarjee, Ntuli and Chikasa (2014) pointed out that some teachers need to be trained to get computer skills. Dzansi and Amedzo (2014: 342) asserted that while many urban schools in South Africa are currently fully equipped with ICTs there are, however, still difficulties in integrating ICTs into rural schools.

1.4 Significance of the study

This study investigated the use of ICTs by learners and teachers in selected secondary schools in the Dr NDZ Municipality. It is anticipated that the study will contribute to the Department of Education (DoE) and school library policy in terms of the usage, access, and dissemination of information. White Paper on e-Education revealed that the policy intention is not just to build technical skills but also to use ICTs to extend and improve educational experiences across the curriculum (Department of Education, 2004). Education Library Information and Technology Services (ELITS) (2012) stated that while many school libraries in KwaZulu-Natal might lack the infrastructure, financial resources, skills and specialist knowledge, every learner and educator should, in principle, have access to the technology for information, collaboration and professional development purposes. Therefore, every school should attempt to acquire the most basic technology facility but not to the detriment of paper-based resources. According to Sutori (2016), South African education institutions in general, and the schools and FET college sectors in particular, are set to grow significantly in relation to ICT access, teacher training, and professional development and usage. This study sought to explore the challenges that the learners and teachers encounter when accessing and using ICTs and in doing so, suggest possible solutions to these challenges.

1.5 Aims and objectives of the study

The study aimed to investigate the use of ICTs by learners and teachers in two secondary schools within the Dr NDZ Municipality. This aim was achieved through the following objectives:

1. To determine the types of ICTs that are used by learners and teachers in the selected KwaZulu-Natal secondary schools.
2. To determine the learners and teachers' attitudes towards using ICTs.

3. To assess the learners and teachers' competence in the use of ICTs.
4. To identify challenges faced by learners and teachers in the use of ICTs.
5. To suggest solutions to improve the ease of use of ICTs at secondary schools in the Dr NDZ Municipality.

1.6 Research questions

In the light of the aim and the objectives above, the following research questions were posed:

1. What types of ICTs are used by learners and teachers in the selected KwaZulu-Natal secondary schools?
2. What are the attitudes of learners and teachers towards the use of ICTs?
3. How competent are learners and teachers in the use of ICTs?
4. What are the challenges learners and teachers face in the use of ICTs?
5. What are the solutions to improve ease of use of ICTs at secondary schools in the Dr NDZ Municipality?

1.7 Scope and delimitations

The study focused on two selected secondary schools within the Dr NDZ Municipality in the KwaZulu-Natal Province. There are a large number of schools in the Municipality and due to time and other resource constraints (and the nature of a short dissertation), the researcher limited the study to two secondary schools (Sonyongwana Secondary School and Ginyane Secondary School) that have computer laboratories. The schools are situated in Ward 8, the ward with the highest number of schools. Given the above constraints, the study also only focused on grade 11 learners who were 18 years of age or older. Parental consent for their participation was not necessary and it was assumed that they would be more likely to participate than learners in grade 12 (matriculants) and would also be able to meaningfully contribute to the study.

1.8 Research methodology and methods

This section briefly presents the research methods and design that were used in the study. More detail concerning the research methodology is presented and discussed in Chapter three.

The study adopted the post-positivism paradigm because it allows the combination of methodologies, enables methodologies to complement individual limitations and exploits respective benefits. The study also employed the mixed-method approach and the survey design as such a design allows methodological pluralism and more than one data collection technique (Creswell, 2014). The population of the study comprised grade 11 learners and teachers (including principals) of Sonyongwana Secondary School and Ginyane Secondary School. Simple random sampling was used for the selection of the learners while purposive sampling was used for the selection of teachers. The data for the study were derived from responses to questionnaires (directed at the learners) and interviews (used with the teachers). The Statistical Package for Social Sciences (SPSS) version 21 was used to generate descriptive statistics and frequency tables. Content analysis was used to analyse qualitative data. Data were coded, thereby reducing large mountains of raw data into small, manageable piles (Neuman, 2006). This was achieved by organising data systematically in a standard format that allowed the researcher to draw conclusions about the characteristics and meaning of the recorded data (Babbie, 2011).

1.9 Definitions of key terms and concepts

This section outlines the operational definitions of key terms used in the study. According to Kumar (2014), "operational definitions" are applied to explain key terms used in a study.

Information

Bothma et al. (2017: 123) defined information as "data that is accurate and timely, specific and organized for a purpose, presented within a context that gives it meaning and relevance, and can lead to an increase in understanding and decrease in uncertainty."

Information and Communication Technologies (ICTs)

ICTs is a "compound term that is used to refer to the meeting of a wide collection of new technologies currently being developed and used in the creation, processing and transmission of information" (Karsenti, Collin and Harper-Merrett, 2011: 83).

Information literacy

According to the International Federation of Library Associations and Institutions (IFLA) (2019: 24), "information literacy is the adoption of appropriate information behaviour to identify, through whatever channel or medium, information well fitted to information needs, leading to the wise and ethical use of information in society."

Computer literacy

Bothma et al. (2017: 173) defined computer literacy as a "level of familiarity with the basic hardware and software (and now Internet) concepts that allows one to use personal computers for data entry, word processing, spreadsheets, and electronic communications".

Digital literacy

"Digital literacy is the ability to navigate various digital platforms and understand, assess and communicate through them" (Bothma et al., 2017: 221).

1.10 Ethical considerations

The study ensured that the University of KwaZulu-Natal's research ethics policy was closely followed. Doing so involved, amongst other commitments, obtaining gatekeepers' permission to conduct the study and the informed consent from learners and teachers to participate in the study. Ethical considerations are further outlined in Chapter three.

1.11 Structure of dissertation

The dissertation is structured according to the following chapters:

Chapter one addressed the general problem area, explained the reason for choosing the topic, outlined the research approach, the study's scope and delimitations, its significance, aim, objectives and research questions. It also provided definitions of key terms and concepts.

Chapter two provides a comprehensive survey of prior research on the use of ICTs in secondary schools. An outline and discussion of the theoretical framework underpinning the study, namely the Technology Acceptance Model (TAM), is also included in this chapter.

Chapter three presents the research methodology and methods selected to investigate ICT use in the two selected secondary schools within the Dr NDZ Municipality. The chapter includes

the research approaches, research paradigm and design, the population, sampling techniques, data collection methods, and instruments used for data analyses.

Chapter four presents the results from the questionnaire and interview questions. The results are presented in the form of tables and figures.

Chapter five discusses the results in light of the relevant literature and the theoretical framework.

Chapter six, the final chapter, presents the conclusions and recommendations of the study. Suggestions for further research are also given.

1.12 Summary

Chapter one introduced the study by highlighting its main components. The chapter presented the background to the study and outlined the research problem, followed by the study aim, objectives and research questions to be asked. The study's significance, scope and delimitations were also discussed. The research design and the methods used were briefly presented. Definitions of key terms were provided and the structure of the dissertation, by chapter, outlined.

Chapter two, which discusses the theoretical framework and literature review, follows.

CHAPTER TWO: THEORETICAL FRAMEWORK AND LITERATURE REVIEW

2.1 Introduction

This chapter reviews relevant theory and literature on the use of ICTs by learners and teachers in secondary schools. A thorough review of related literature for a study is the foundation as well as inspiration for useful and substantial research (Kankam, 2017). Therefore, a good review of related literature provides a robust foundation to rely on when conducting a research project.

Chapter two is divided into two main parts. The first part discusses the theoretical models that could have been used to underpin the study and address the study's objectives as listed in Chapter one. The emphasis is on the third of the models discussed, namely, the Technology Acceptance Model (TAM) which was the model adopted for the study. The second part of the chapter reviews the empirical and descriptive literature on the use of ICTs by learners and teachers in secondary schools in general.

2.2 Principal theory upon which the study was constructed

Three theories were proposed to explain the user's acceptance of new technologies and their intention to use them. These were the Theory of Reasonable Action (TRA) (Fishbein and Ajzen, 1975), the Theory of Planned Behaviour (TPB) (Ajzen, 2002), and the aforementioned TAM (Davis, Bogozzi and Warshaw, 1989). Each of the possible theories is discussed and, as noted above, emphasis is given to the TAM as it was the model adopted for the study.

2.2.1 Theory of Reasonable Action (TRA)

According to Fishbein and Ajzen (1975), the TRA is one of the most popular theories. The model predicts motivational influences on human behaviour under volitional control, showing a causal chain that links behaviour with attitude and subjective norms (Godin, 1993: 1391). Fishbein and Ajzen (1975) defined "attitude" as the individual's evaluation of an object and the authors defined "belief" as a link between an object and some attribute. "Behaviour" was defined as a result or intention. According to the authors, attitudes are affective and based upon a set of beliefs about the object of behaviour. The TRA is described as follows:

the most proximal cause of the behaviour is behavioural intention (what one intends to do and not to do). Behavioural intention, in turn, is determined by attitude (one's evaluation of the behaviour) and subjective norm (one's evaluation of what important others think one should do), either of which might be the most critical determinant of any particular behaviour" (Fishbein and Ajzen, 1975).

According to Taylor and Todd (1995), the TRA has been criticised in many ways. Possibly the most extensive commentary has pertained to the distinction between attitude and subjective norm. An individual's attitude toward a behaviour is a function of beliefs concerning the perceived consequences of performing a specific action and a personal evaluation of the consequences (Godin, 1993). Lai (2017) revealed that attitudes are affective and based upon a set of beliefs about the object of behaviour, for example, the use of the smartphone is convenient. A second factor is the person's subjective norms of what they perceive their immediate community's attitude to particular behaviour to be, for example, my peers are using smartphones, and having one provides status. Overall, the TRA was able to help in understanding the decision-making process underlying exercised behaviour. Silva and Dias (2007) pointed out that the TRA has been widely researched and used to make accurate predictions of human psychological choices among alternatives in many situations, such as voting in elections and alcoholic drinks consumed.

2.2.1.1 Relevance of the TRA

The TRA asserts that the direct determinants of individuals' behavioural intentions are their attitude toward performing the behaviour and their subjective norm associated with the behaviour (Fishbien and Ajzen, 1975). The TRA was relevant to this study, which sought to determine predictors of users' preferences for digital information. The study aimed to investigate the use of ICTs in secondary schools within Dr NDZ Municipality. The TRA provides a framework to discern the reasons for individual behaviour and to decipher individuals' actions, "by identifying, measuring and combining beliefs relevant to individuals or groups, allowing us to understand their own reasons that motivate the behaviour of interest" (Mutsvunguma, 2013: 14). However, the TAM (see below) was chosen for this study because the TRA is a general behavioural model that does not specify the beliefs that are operative for

a particular behaviour, in this case, technology adoption and the use of digital information (Davis, Bogozzi and Warshaw, 1989: 984).

2.2.2 Theory of Planned Behaviour (TBP)

The TRA outlined above was extended to the TPB by Ajzen (2002). Shih and Fang (2004) believed that the TBP is a theory that links one's beliefs and behaviour. The theory states that intention towards attitude, subject norms, and perceived behavioural control shapes an individual's behavioural intentions and behaviours. Three kinds of consideration guide human behaviour and these are behavioural beliefs, normative beliefs, and control beliefs. In their respective aggregates, behavioural beliefs produce a favourable or unfavourable attitude toward the behaviour, normative beliefs result in a subjective norm, and control beliefs give rise to perceived behavioural control (Noar and Zimmerman, 2005). In combination, the attitude towards the behaviour, the subjective norm, and the perceived behavioural control lead to behavioural intention. In particular, perceived behavioural control is presumed to affect actual behaviour directly and affect it indirectly through behavioural intention (Ajzen, 2002).

Godin (1993) indicated that the TPB also has a belief-based structure formed by the perceived presence or absence of required resources and opportunities, the anticipated obstacles and impediments, and the perceived power of a particular control factor to facilitate or inhibit the performance of the behaviour.

2.2.2.1 Relevance of the TPB

According to the TPB, antecedents of intentions and actions are attitudes, subjective norms and perceived behavioural control (Mutsvunguma, 2013). The TPB is an extension of the TRA, so the relevance of this theory to the study is less when compared to the TAM (see below) as the TPB predicts deliberate behaviour. Shih and Fang (2004) indicated that the TPB does not guide on how to promote behavioural change. Although it is used in explaining, measuring, and predicting behaviour, it does not specify techniques that can be applied to change behaviour.

2.2.3 The Technology Acceptance Model (TAM)

This study used the TAM as it was considered more relevant to the study than either the TRA or the TPB. The studies by Mutsvunguma (2013) and Kankam (2017) used the TAM as their

theoretical framework. These studies revealed that the TAM is more relevant than any other theory when a researcher wants to investigate the behaviour of users in the use of ICTs. Roberts and Henderson (2000) also used this model in examining government workers' experiences in the use of computers; Tao (2008) used the TAM to determine students' intentions to use electronic resources; and Vijayasarathy (2004) applied the TAM to explain consumer intention to use online shopping. Venkatesh and Davis (1996) observed that user unwillingness to accept and use available information systems is an important issue that can cause a system failure. Computer systems cannot improve organisational performance if they are not used and that resistance to end-user systems by managers and professionals is a widespread problem (Venkatesh and Davis, 1996). To better predict, explain and increase user acceptance, there was a need to understand why people accept or reject computers. Adapted from the TRA, the TAM was developed to explain the determinants of computer acceptance; that is, in general, it was capable of explaining user behaviour across a broad range of end-user computing technologies and user populations, while at the same time being both parsimonious and theoretically justified (Davis, Bagozzi and Warshaw, 1989).

The TAM suggests that perceived ease of use and perceived usefulness are important predictors that determine the user's attitude toward his or her intention to actual system use (Venkatesh and Davis 1996). Usage behaviour was identified as a direct function of behavioural intention which, in turn, is a function of attitude toward usage, reflecting either favourable or unfavourable feelings towards the technology (Yusoff et al., 2009). Venkatesh and Davis (2000) explained that the crucial point of the TAM is that adoption behaviour is determined by individual acceptance which is determined by perceived ease of use and perceived usefulness. The model further explained that perceived ease of use and perceived usefulness were hypothesised to be directly influenced by external variables which tend to vary, depending on the specific technology being studied (Venkatesh and Davis 1996).

The TAM (Figure 1) is based on Fishbein and Ajzen (1975) TRA. According to the TRA (as pointed to above), an individual's intention to perform a behaviour is a function of his/her attitude toward the act or behaviour and social norms. An individual's attitude predicts his/her intention and intention shapes the actual behaviour (Fishbein and Ajzen, 1975).
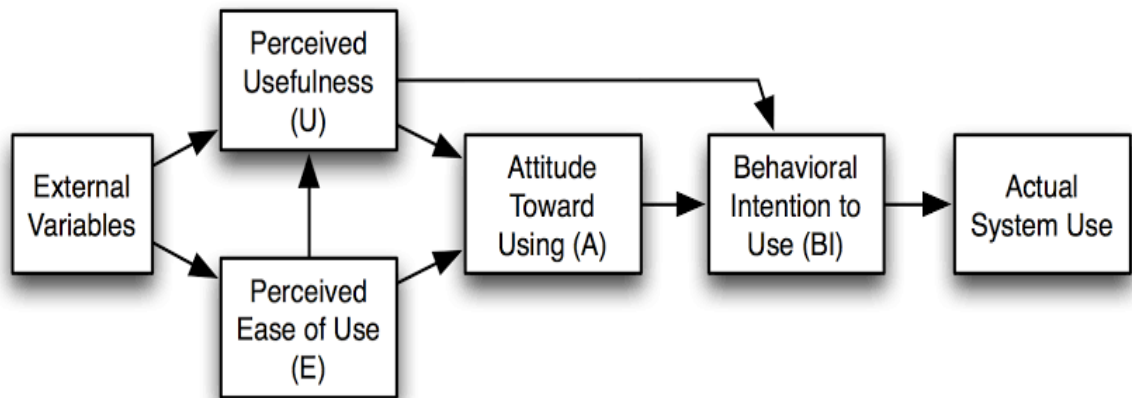
Figure 2: Technology Acceptance Model (TAM)
(Venkatesh and Davis, 1996).

Venkatesh and Davis, (1996) claimed that Perceived Ease of Use (PEOU), Perceived Usefulness (PU) and Attitude Towards Use (ATT) are the three fundamental determinants of users' acceptance of technology.

The six TAM components are explained as follows:

External Variables (EV)

It is the contextual factors that affect the actual use of the system – these factors could be individual differences and system characteristics. EV provide the possibility of examining the contextual factors which are often significant barriers to actual system use (Szajna, 1996). They are those factors outside of the theoretical model that have the possibility of causing a positive or negative effect on system use. Previous studies that adopted the TAM identified two main categories of EV – individual differences and system characteristics (Gefen and Straub, 1997). Individual differences identified included competency, domain knowledge, self-efficacy, gender, language, age and education. System characteristics included accessibility, visibility, interface and relevance (Gefen and Straub, 1997). However, in this study, the external variables were individual differences stemming from disadvantaged family background, skills, knowledge and language. Also applicable were the ICT infrastructure at home, the family

finances, as well as the fact that some learners were not allowed to have and others did not own smartphones.

Perceived Ease of Use (PEOU)

PEOU is the degree to which a person believes that using a particular technology would be free from effort. It is defined as the extent to which an individual assumes that utilising an information system would be free of physical or mental effort (Davis, Bogozzi and Warshaw, 1989). Considering the complexity of data processing for decision support, the perception of a system's ease of use may significantly affect the level of its adoption by prospective users. If, for example, an individual is given a piece of technology that is challenging to use, the chances are high that it will likely not be used when an alternative method exists (Venkatesh, Morris, Davis and Davis, 2003).

Perceived Usefulness (PU)

PU is the degree to which a person believes that using a particular system would enhance his or her job performance. Within the context of adopting and using new technology within a workplace, Venkatesh, Morris, Davis and Davis (2003) explained that the essential predictor of an employee towards adopting and using new technology is their perception of the usefulness of that particular technology. It has a direct impact on adoption intention because users are more willing to use a technology if it can provide valuable functions.

Attitude Toward Using (ATT)

ATT is an individual's positive or negative feelings about performing the target behaviour. Attitude guides the individual's behaviour by filtering information and by shaping his or her perceptions of the world (Davis, 1989). The TAM theorises that a user's attitude, which reflects favourable or unfavourable feelings towards using an information system, is determined jointly by perceived ease of use and perceived usefulness (Venkatesh and Davis, 1996). The resultant attitude towards using technology determines the behavioural intention to use or not to use technology. Thus, a person who believes that performing a behaviour will lead to mostly positive results will have a favourable attitude, while a negative outcome will have an unfavourable attitude.

Behavioural Intention (BI)

According to Venkatesh and Davis (1996), BI is the degree to which a person has formulated conscious plans to perform or not perform some specified future behaviour. Venkatesh and Davis (1996) further stated that the TAM claims that intention is a proper surrogate to examine and predict a user's behaviour toward a particular technology. Results from several studies have shown a significant correlation between behavioural intention and usage behaviour. User behaviour is influenced mainly by behavioural intention; thus, behavioural intention plays a vital role in predicting usage behaviour.

Actual Use (AU)

Venkatesh, Morris, Davis and Davis (2003) pointed out that "if users intend to use a specific technology, they use it". Therefore, AU is an essential variable in technology acceptance, as it appears to be an excellent surrogate measure for the effective deployment of information systems resources in an organisation.

2.2.3.1 Relevance of the TAM

The TAM was initially developed to understand the causal relationship between external variables and user acceptance of computer-based applications. The scales, PEOU, PU, ATT, AU and external variables were adopted for use in the present study (Venkatesh et al., 2003).

This study adopted the TAM to understand the determinants influencing the use of ICTs in secondary schools. The study was conducted as a result of an observation that most rural schools do not make sufficient use of ICTs even if they have ICT infrastructure. For this reason, the TAM was applied in the study to determine predictors of users' preferences for the use of ICTs in secondary schools. The TAM is a proven framework capable of predicting the acceptance of technology. The relevance of its constructs to the use of ICTs was validated in the present study. As outlined below, the objectives of the study were centred on the TAM's constructs, namely, PEOU, PU, ATT, AU and external variables.

Objective 1: To determine the types of ICT resources that are used by learners and teachers in the selected KwaZulu-Natal secondary schools

ICT infrastructure is a TAM external variable that was identified as necessary in the study because the use of ICTs is only possible when adequate ICT facilities are in place. In addition, it is a significant issue worth investigating, especially within the African region, where systems are still being set up in financially challenged economies.

Objective 2: To determine the learners and teachers' attitudes towards using ICTs

The user attitude towards digital information is addressed by the TAM's attitude construct. The studies by Mutsvunguma (2013) and Kankam (2017) have examined how attitude can positively or negatively affect an individual's acceptance or rejection of technology.

Objective 3: To assess the learners and teacher's competence in the use of ICTs

The TAM suggests that perceived ease of use and perceived usefulness can indirectly be affected by external variables. The level of competency was identified as an external variable that can indirectly affect technology acceptance behaviour towards the resource.

Objective 4: To identify challenges faced by learners and teachers in the use of ICTs

The TAM external variables, such as ICT infrastructure, skills for using ICTs, funds for conducting training and buying necessary ICT infrastructure were the challenges that can limit people in using ICTs.

Objective 5: To suggest solutions to improve the ease of use of ICTs at secondary schools in the Dr NDZ Municipality.

This objective was addressed by the TAM's primary determinants, namely, PEOU and PU. Studies by Mutsvunguma (2013), Olasina (2014) and Kankam (2017) highlighted the importance of PEOU and PU as essential determinants in predicting a person's behaviour to technology acceptance.

Table 1: **Relationship between TAM components and research questions**

	TAM components	Research questions	Important variables to be addressed
1.	External Variables	What types of ICT resources are used by learners and teachers in the selected KwaZulu-Natal secondary schools?	ICT infrastructure e.g., software, computers, smartphones, tablets, fax machines.
		What are the challenges learners and teachers face in the use of ICTs?	ICT infrastructure, funding, training, skills, and competency.
2.	Attitude Toward Using (ATT)	What are the attitudes of learners and educators towards the use of ICTs?	The positive and negative attitudes towards using ICTs.
3.	Behavioural Intention (BI)	How competent are learners and teachers in the use of ICTs?	Results in school work (digital literacy and computer literacy) e.g., class marks. Performance in curriculum delivered.
4.	Perceived Ease of Use (PEOU) and Perceived Usefulness (PU)	What are the solutions to improve ease of use of ICTs at secondary schools in Dr NDZ Municipality?	Actions that need to be taken to improve the use of ICTs e.g., training, funding, user-friendly technology.

2.3 Empirical literature on the use of ICTs

The role of this section is to position the study in the existing body of knowledge. In addition, it will evaluate what has been done on the subject and identify research gaps that provide the rationale for the study. Thus, a literature review aims to gain "general familiarity with the current research conducted in a subject area" (Kankam, 2017: 52) and, according to Somekh

and Lewin (2011: 17), it puts the "research project into the context by showing how it fits into a particular field." Moreover, a literature review "enables a researcher to develop a clear understanding of the research topic; establish what has already been researched on the topic and identify gaps, which the researcher's own study can fill" (Kankam, 2017: 53).

2.3.1 The development and use of ICTs in schools

The International Telecommunication Union of the United Nations (UN) is not alone in recognising the power and potential of ICTs. The plan of action decided on at the first phase of the World Summit on the Information Society (WSIS) called upon international organisations and financial institutions to develop strategies for the use of ICTs to promote sustainable development and for achieving the goals expressed in the United Nations Millennium Declaration (International Telecommunication Union, 2019).

According to Mamba and Isabirye (2015: 135), the UN published the Millennium Development Goals in 2000 to address a series of social development issues. Mamba and Isabirye (2015: 135) stated that the declaration of these goals brought considerable focus on ICT. Mamba and Isabirye (2015) further pointed out that the World Summit's principles on the Information Society include, but are not limited to, the building of information infrastructure through telecommunication and investment in technology, achieving universal and equitable access to information technology, and making information a common good.

Meyer and Gent (2016) revealed that international best practice is to use technology as an enabler of the education process. They further stated that pedagogy and the role of the teacher are central. Critical success factors include solutions being tailored to the readiness of schools to adopt technology and being designed taking cognisance of resource constraints and requirements for successful handover. A holistic view is essential, and must incorporate multiple dimensions in creating solutions, include multiple role players, and cater to multiple levels within the education system.

Odede (2013) pointed out that the education system's capacity to integrate ICTs in support of education needs to be developed. The focus should shift from learner performance to capacity development. A phased approach with appropriate interim targets needs to be taken. Progress

should be measured against multiple criteria, and the focus should be on measuring the capacity of the system to integrate technology and the capacity of teachers to incorporate technology into the process of teaching and learning.

According to Meyer and Gent (2016), the following initiatives are key to making progress:

> Ensuring strategic alignment for ICT integration at all levels of the education system; increasing the focus on pedagogy in ICT initiatives; developing the skills, confidence and desire of teachers to integrate ICTs into teaching and learning; focusing on sustainable interventions: moving from pilots to integrated solutions.

According to the United Republic of Tanzania (2008), its ICT policy for basic education acknowledged that the use of ICT devices in education includes mobile phones, TV, radios, computers, digital cameras and scanners all of which improve the quality of access to information. However, it has been found that few teachers use the ICTs in classrooms irrespective of the investments made in the ICT supportive infrastructures in teacher training colleges and a few secondary schools.

2.3.2 ICT policy in South African education

In South Africa, progressive ICT policies introducing new technologies in the educational system have been launched. The intention is to improve the lives of future generations, equip learners and teachers with relevant skills, and ameliorate inequality. Moreover, there is an emphasis on relevant content, irrespective of the socio-economic background of the learners (Department of Education, 2004). The Department of Education (DoE) published the White Paper on e-Education, in which it committed to developing ICT capabilities amongst all school children from grade 1 to 12 (Department of Education, 2004).

The Curriculum and Assessment Policy Statement (CAPS) (South African Department of Basic Education, 2018) shows that to improve implementation, the National Curriculum Statement was amended, with the amendments coming into effect in January 2012. A single comprehensive Curriculum and Assessment Policy document was developed for each subject to replace subject statements, learning programme guidelines and subject assessment

guidelines from grades R to 12. The CAPS (South African Department of Basic Education, 2018: 36) further states:

> the curriculum is designed to introduce learners to the breadth of information technology. In information technology, learners will use appropriate techniques and procedures to plan solutions and also devise algorithms to solve problems using suitable techniques and tools. The learners will understand and use appropriate communication technologies for information dissemination and appreciate and comprehend the various system technologies used to develop a computer-based system. Learners will also understand that all ICT systems are built upon software engineering principles; will understand and use Internet technologies for various tasks; comprehend and apply the concepts of data and information management to understand how a knowledge-driven society functions; and understand the social implications of ICTs and how to use technologies responsibly.

The Department of Education (2004: 23) White Paper on e-Education revealed that the policy intention is not just to build technical skills but also to use ICTs to extend and improve educational experiences across the curriculum. Section 5.30 of the White Paper states:

> At the provincial level, the Department of Education will establish the desired level of technology resources (hardware and software) for each General Education and Training (GET) and Further Education and Training (FET) institution and assess the adequacy of existing equipment and facilities. At the very least, every GET and FET institution will have access to technology in order to access electronic 24 National Guidelines for School Library and Information Services learning materials; connect to information sources outside the classroom; communicate with others in and beyond institutional boundaries; collaborate with others in and beyond institutional boundaries; and create and add to the knowledge base (Department of Education, 2004: 29).

The Education Library Information and Technology Services (ELITS) (2012: 15) stated that "while many school libraries in KwaZulu-Natal might lack the infrastructure, financial resources, skills and specialist knowledge, every learner and educator should, in principle, have access to the technology for information, collaboration and professional development

purposes". Therefore, every school should attempt to acquire the most basic technology facility but not to the detriment of paper-based resources.

The introduction of ICT as part of school libraries should be planned in a thoughtful and integrated way, informed by relevant national and provincial policies relating to ICT provision, and in conjunction with an overall ICT plan and a well-defined information literacy policy within the school (South African Department of Basic Education, 2018). ICT's introductions should be based on a practical and positive vision concerning how technology use will enhance teaching, learning and management in the school. It should be integrated with a range of other resources (print and non-print) for teaching and learning in the classroom and used for information and communication and administrative purposes. ICTs should also be used for the design of projects with the teacher-librarian and educator working in collaboration (ELITS, 2012). The CAPS (South African Department of Basic Education, 2018) shows that infrastructure, equipment and finances for the ICTs are the school's responsibility. In information technology, learners must work individually on a computer during contact time and need access to the Internet. Schools should have a business plan for the ICTs that addresses the initial capital layout for setting up a computer laboratory.

The layout should provide for the following:
- Entry-level computers (to ensure a lifespan of 4 to 5 years), networked, and with one computer per learner per period (during contact time) to provide sufficient computers to enable the practical examination to be completed in two sittings.
- One high-speed printer per computer room, Internet access, data projector or demonstrating software, and software (operating system, office suite, security software antivirus, Internet security, software for solution development).

2.3.3 Status of ICT in education in South Africa

The introduction of ICT in South African education has been undertaken by various role players but is often fragmented. The organisations involved in these initiatives range from non-governmental organisations (NGOs) and solution providers to research institutions and provincial and national departments of education (Meyer and Gent, 2016). Even though the departments of education are mostly the long-term custodians of such efforts, a clear integrative strategic direction is often lacking. According to Kwet (2014), the fairly recent Operation

Phakisa Education 2014 initiative developed a national vision for ICT in education. It defined six pillars and these pillars are:

- Connectivity
- E-Learning content
- Devices
- Training and development
- Support, security and maintenance
- Refurbishment and renovation.

According to Meyer and Gent (2016), the implementation of ICTs is slow and capacity is limited even though strategy and policy exist. Objectives are not clear, and a strategy that is integrated across the system is lacking. Access to technology is limited and there is unequal across provinces and quintiles. In the absence of clear, integrative provincial strategies, progress is fragmented and driven by solution providers. Solutions, in turn, are not cognisant of resource constraints. Significant room for improvement exists on seven different dimensions of the education system. System-wide change management needs to be prioritised, and ICT-enabled assessment needs consideration. Meyer and Gent (2016) further stated that ICT is relevant within education as a means of supporting a process of teaching and learning, and is best employed in support of a value creation process. It is not a focus in itself. In addition, technology has a separate and distinct role in enabling the business and administration of education.

ICTs and the Internet have undergone rapid progression over the past years. Mamba and Isabirye (2015: 11) pointed out that the associated increase in popularity of the Internet and rapid growth of ICTs may have positive effects on the potential for e-learning if teachers increasingly utilise available technologies (even though they are limited) to enhance their learners' learning experiences. Learning is enhanced by finding suitable information sources. However, in the current COVID-19 pandemic, ICTs are more effective for e-learning to help learners and tertiary students continue their studies while they are at home.

COVID-19 has increased the use of online learning worldwide as people are forced to stay at home to curb the spread of the pandemic. However, what has been offered as an easy technology solution in place of face-to-face teaching time has highlighted deep inequality when it comes to broad connectivity, access to sophisticated hardware and most revealingly, family stability in households to make online learning possible for some learners (Bizcommunity, 2020).

According to a *News24* article by Singh (2020a), online education has been demystified for many people during the lockdown. While distance learning has been available in South Africa for a long time, online education, which is very different, is still an emerging field compared to other countries. It is generally favoured for the flexibility to manage time and workload while balancing other responsibilities. Singh (2020b) points out that for some it may be the only option if they are geographically far from a physical school. However, COVID-19 has made online learning a necessity, and it may not be just a short-term emergency solution (Singh, 2020b).

In South Africa, since the COVID-19 pandemic was declared a natural disaster, most people are social distancing, some people are staying indoors, schools are rotating and universities are closed but continue with online teaching and learning. The statement by the Minister of Basic Education, Angie Motshekga on 26 March 2020 revealed that the DoE is working closely with key partners to coordinate and make available content tailored to support learners' educational and health needs during the national lockdown. The following resources are available for e-learning:

- Broadcast lessons working with the SABC TV and radio.
- DSTV channel 180.
- E.tv has allocated a dedicated channel for 3 months on the open view platform.
- Broadcast of lessons on community radio stations around the country.
- Electronic readers available via all platforms (such as Canvas, Moodle, Edmodo, Zoom, Schoology, Sakai, Showbie, iTunes U, Google Classroom, Blackboard) in partnership with Vodacom, MTN, Telkom and Cell-C.

- 2Enable App as a freely downloadable educational platform with more than 2000 electronic readers in the indigenous languages.

- Promote the African Storybook series through the 2Enable App.

- The National Reading Coalition has identified extensive lists of additional resources and organizations that are willing to make their materials available.

- Free access to Siyavula Maths and Science support in partnership with MTN.

- Free access to the Vodacom Virtual Classroom (South African Government, 2020).

According to a *News24* article by Ngqakamba (2020), many rural schools in KwaZulu-Natal lack ample network connections making it difficult for them to interact with other platforms. The network in rural areas is poor and, in addition, parents cannot afford to buy data bundles for learners. The schools in these areas are short of ICT infrastructure and this makes it challenging for learners to continue their studies.

The researcher believes that most schools and universities across the country will not necessarily be returning to mass face-to-face teaching soon. Given this, schools and universities that do not have sufficient ICT infrastructure should request more support from the government and NGOs. Online education could thus be a long-term endeavour in South Africa that ultimately becomes a critical part of the teaching and learning strategies into the future.

2.3.4 ICT Infrastructure in secondary schools

ICT infrastructure includes computer hardware, software and communication networks. A computer (or another device such as a tablet or smartphone) with an Internet connection and proper software installed is necessary for gaining access to online electronic resources. Without this infrastructure, it is not possible to use electronic resources (Mutsvunguma, 2013). South Africa has a host of dispersed and uncoordinated programmes and systems used to promote ICT usage at various levels of the education system, particularly in the formal schools' sector (Sobikwa and Ditsa, 2017: 3). Sobikwa and Ditsa (2017) indicated that ICTs were introduced during the 1980s in South African schools, primarily in private schools and a few well-resourced government schools. Computers were used mainly for administrative purposes, such as student records, recording examination marks, producing school reports and creating timetables, but this changed with the continuous advances in ICT (Sobikwa and Ditsa, 2017).

The study by Sundarjee, Ntuli and Chikasa (2014) revealed that the level of ICT infrastructure and support is not a significant predictor of ICT usage by school teachers. Although the schools may have enough ICT infrastructure and support, it is not guaranteed that the teachers will utilise ICTs in their curriculum. An article in *The Mercury* newspaper by Jansen (2015) revealed that in KwaZulu-Natal, the Okuhle High School in Umlazi is equipped with e-resources for teaching and learning. Thirteen schools in the Pinetown and Umlazi districts took part in a pilot scheme in which tablets and e-books were used to teach maths and natural science in grades 8 and 9. One thousand five hundred schools in KwaZulu-Natal were equipped with laptops and tablets but most of the learners did not have access to these devices (Jansen, 2015).

According to Vodacom SA (2019), the Vodacom Foundation launched its education ecosystem for online teaching and learning. In supporting the government's comprehensive approach to delivering on its Education Vision 2030, every school by 2030 will have enough ICT infrastructure and the required ICT skills. The Vodacom education ecosystem supports the provision of quality education. Vodacom SA (2019) further stated that the Vodacom Foundation provided 3 000 schools in South Africa with ICT equipment and connectivity at no cost. In addition, it provided teachers and learners with digital literacy skills enabling them to do their school work through ICTs (Vodacom SA, 2019).

During this time of COVID-19, the use of electronic information resources continues to rise, especially within higher institutions of learning. Here, students are expected to develop the required information literacy and digital literacy skills. Odede and Nsibirwa (2018) stated that these skills enable individuals to handle the changing contents of computer and information resources and to know where and how to look for the resources. Students in higher education face the problem of using multiple formats of information resources. There is an urgent need for learners and teachers to be information and digitally literate as this would help guarantee their effective use of electronic information resources.

Kankam (2017: 107), Mkhize (2018) and Nsibirwa and Odede (2018) revealed that the level of ICT infrastructure and support is a significant factor in the use of ICTs by school teachers and learners. While there are schools that do not have ICT infrastructure, those schools that do have other issues, for example, learners having to walk a long distance to get to school and thus

not having enough time to access computers. Furthermore, while some schools do have an ICT infrastructure, it is inadequate in meeting the ICT-related needs of the schools.

The researcher believes that using ICTs in schools will prepare the current generation of learners for tertiary education and the workplace where ICTs, especially computers, the Internet and related technologies have become commonplace. ICTs in public schools will help learners and teachers to improve their knowledge and to find appropriate and relevant information resources. As for the learners, learning will be made more accessible and fun if ICT diffusion is appropriately done. The learners and the teachers must be both information and computer literate to access accurate information. As pointed out by Odede and Nsibirwa (2018) in the previous chapter, information literacy is an essential and indispensable skill as technology is rapidly evolving as is the advancement in electronic information sources. Digital literacy, as defined by Bothma (2017: 73), concerns navigating various digital platforms and understanding, assessing, and communicating through them. Some signs of a digitally literate individual include finding and using the right tools to consume information and share and create content for others.

2.3.5 Digital literacy in schools

Digital literacy requires critical thinking skills, an awareness of the necessary standards of behaviour expected in an online environment and an understanding of the social issues created by digital technologies (Adeleke, 2017). Matlala (2015) indicated that public schools in South Africa could look forward to joining the digital education revolution as some of their private school counterparts have been experiencing for the past few years. However, education experts have cautioned against a rush to provide tablets and other digital infrastructure before a solid strategy and fundamentals have been put in place. President Cyril Ramaphosa in his State of the Nation address on 13 February 2020, announced that government would, over the next six years, provide every school child in South Africa with digital workbooks and textbooks on a tablet device (South African Government, 2020: 18).

Odede (2013: 58) believed that the use of the ICTs is spreading rapidly into education particularly in high schools, with a huge impact in many areas and covering all the subjects that are taught. Learners are using them to support the attainment of learning outcomes. Outside

the school's daily activities, learners may use ICTs to access and complete assignments and other school-related tasks given by their teachers. Matlala (2015: 31) argued that ICTs are a valuable source of information learners frequently use to supplement traditional educational methods. For example, to complete a given task, teachers may ask learners to find specific websites to gain more in-depth knowledge about a particular topic thereby highlighting more information to the learners. Kankam (2017) pointed out that the use of ICTs provides a vast number of educational benefits to learners including offering a host of ideas, a broad array of information, and engaging, interactive opportunities to teachers and learners.

2.3.6 The attitudes of learners and teachers towards using ICTs

In many educational institutions, technology has been seen as one of the critical drivers for the improvement of teaching and learning. The use of ICTs helps facilitate learning for both teachers and learners in the classroom. Achieving meaningful use of ICTs in the field of education can be influenced by many factors including technology availability, accessibility of ICT equipment, and technical and administrative support (Al-Ruz and Khasawneh, 2011; Fu, 2013; Lin, Wang and Lin, 2012; Srivastava et al., 2014). Among these factors, users' attitudes towards using technology could impact teaching and learning in the classroom (Abedalaziz et al., 2013).

- **Teachers' attitudes towards using ICTs**

Teachers' attitudes to the use of ICTs for teaching and learning purposes have a significant effect on the utilisation of ICTs. Those teachers that have a positive attitude towards the utilisation of ICT for teaching and learning purposes are likely to integrate ICTs into their curriculum (as opposed to those teachers that have a negative attitude towards ICT integration) (Sundarjee, Ntuli and Chikasa, 2014). Wastiau, Blamire, Kearney, Quittre, Van de Gaer and Monseur (2013) conducted an exploratory study probing secondary education teachers' attitudes towards and beliefs about ICT integration. Findings showed that roughly 25% of the participants used ICT for preparation and communication purposes rather than for instruction delivery or assigning students ICT-based tasks (Wastiau et al., 2013). The need to convince teachers of the utility of ICT in schools, the insecurity about success in ICT training and the fear that learners might be more knowledgeable about computers were additional factors that shaped teachers' attitudes in the study (Wastiau et al., 2013).

- **Learners' attitudes towards using ICTs**

Al Mahmud (2011) researched learners' attitudes towards the use of ICTs. The research found that most of the learners have positive attitudes regarding the use of ICTs. Moreover, no significant differences between boys and girls were found. Tabar (2014) revealed that the learners use ICTs for different goals as well as for academic and entertainment reasons. Tabar (2014) stated that learners show positive attitudes regarding using ICTs and that no significant differences exist between learners' attitudes in using ICTs. However, Ahmad (2012) found that learners who had received training showed strong positive attitudes toward using ICTs. An earlier study by Sarfoet (2011) showed that learners from urban areas possessed a more positive perception of ICTs than learners from rural settings. In addition, Sarfoet (2011) found differences between the two groups of learners in terms of their usage of ICTs for learning purposes.

2.3.7 Factors influencing usage of ICTs

According to Sobikwa and Ditsa (2017: 91), schools are expected to equip learners with the basic technological skills required in modern society. However, schools are administratively, professionally and politically complex organisations. They are also an open social system, interrelating with their external environment (Sobikwa and Ditsa, 2017: 81). Sobikwa and Ditsa (2017: 87) argued that ICTs have not permeated to a great extent in learning institutions in many developing countries due to socioeconomic and technological circumstances. These circumstances influence the integration and usage of ICTs in schools. ICT usage in education constitutes the current political, socio-cultural, economic and technological space just like television, radio and other media.

- **Economic factors**

Economic factors are the important facets that guide the adoption and usage of ICTs in a country (Rajesh, 2003). Many countries often acquire costly systems without making provision for building sufficient infrastructure to run them. This may lead to the failure of ICT usage due to the lack of funds. According to Mdlongwa (2012), developing countries often lack the initial allocation and matching funds to make feasible investments in ICTs. In South Africa, the provincial education departments, in most cases, provide schools with several computers. Schools located in the middle- to high-income areas raise their financial resources through

parent donations, whereas schools in low-income areas have no such opportunities (Sobikwa and Ditsa, 2017).

- **Socio-cultural factors**

Sobikwa and Ditsa (2012) defined culture as a complex whole that includes beliefs and any other capabilities and habits by a human being as a member of the society. Therefore, teachers' perceptions and attitudes of the traditional classroom cultural needs should be considered when using ICTs in the classroom. The culture of classroom teaching and learning has been firmly built into the psyche of the teaching community. This often exhibits resistance to implementing technological change that forces a change in the role of the teacher from being a storehouse of all learning to a manager of the teaching-learning process (Mdlongwa, 2012).

- **Technological factors**

Technological factors were defined by Rajesh (2003) as technological resources that determine the adoption and usage of ICTs in any society. Technological factors are critical drivers for the changing educational practices and have a potentially significant impact on classroom practices in general (Sobikwa and Ditsa, 2017). Bladergroen et al. (2012) stated that ICT skill levels are critical for teachers' successful usage of ICTs in schools.

- **Political factors**

Political factors were defined by Rajesh (2003) as the perceptions and attitudes of a political system that greatly affect the acceptance and growth of technology in any society. Furthermore, in countries where ICTs have political support, people are motivated to use them. Political commitment is required at all levels of government to encourage teachers to use ICTs in their classrooms (Sobikwa and Ditsa, 2017).

2.3.8 Barriers to using ICTs in schools

Researchers and educators have offered different categories to classify the factors that discourage teachers from using ICTs in the classroom. An example of such a classification is that of Wastiau et al. (2013) and includes personal, school-related, technical and pedagogical factors. By personal barriers, reference is made to those personal qualities and choices that deter teachers from integrating ICTs in their instructional practices. For instance, it has been

revealed that female teachers show less confidence in using computers, and they display more significant computer anxiety than males. However, some studies (Al Mahmud, 2014; Duran, 2013) reported that gender differences towards computer use are dwindling, whereas others (Karsenti, Collin and Harper-Merrett, 2011; Mamba and Isabirye, 2015) showed that male teachers were more optimistic about ICT than females who were either undecided or negative. Age differences have also been reported to hinder the implementation of ICT in teaching (Wastiau et al., 2013).

Technical concerns are also of importance in the success or failure of ICT integration into the educational environment. Among such concerns are resources availability, time constraints and educational software. The shortage of computers and educational software may have severe repercussions for the potential use of ICTs to aid the teaching process (Sundarjee, Ntuli and Chikasa, 2014). Research conducted to assess the availability of resources and how this can affect teachers' perceptions and attitudes towards ICTs indicated that good practices were reported in schools that include high-quality ICT resources (Mdlongwa, 2012).

A survey conducted in Europe reported that many schools, colleges, and education departments showed resistance in embracing technological innovations within their educational plans and policies (Wastiau et al., 2013). However, having addressed the barriers mentioned above (personal, school-related and technical) teachers should utilise ICTs within a framework that allows for learner autonomy, collaborative learning, experiential learning, problem-solving, higher-order thinking skills and life-long learning.

Mkhize (2018) pointed out that another major challenge of ICT implementation in schools that is often not discussed is the language barrier. English is the dominant language of the Internet, with about 80% of online content being in English, and most educational software packages are produced in English (Mdlongwa, 2012). Mdlongwa (2012) explained that the challenge in most developing countries like South Africa is that English is not the mother tongue of most people, and this can prevent both teachers and learners from effectively using the ICT software or hardware available. Thus, it is paramount that meaningful local content in local languages is developed to assist both learners and teachers in integrating ICT into the curriculum.

The study by Mkhize (2018) revealed that there is a limited understanding of the purpose of e-learning amongst teachers and learners, which is reflected in the teachers' limited use of ICTs for information presentation. This, in turn, diverts from the role of e-learning which is to create a learner-focused environment. The main barrier affecting teachers and learners' ability to implement e-learning is the lack of sufficient ICT resources, information and computer literacy skills and maintenance of ICT equipment. As a result, e-learning takes place in an ad hoc rather than a structured manner. Kankam (2017: 107) pointed out that in Ghana "the external barriers that are common to learners include slow and poor internet connections, access restrictions, and inadequate facilities (computers and computer laboratories)."

2.3.9 Learners and teacher's competence in the use of ICTs

Garcia-Valcarce and Arras (2011) revealed that the core competencies of digital information are:

- Related to the use of ICT in classroom presentations and activities.
- Related to the use of skills and knowledge to create and manage complex projects, solve problems in real-world situations, collaborate with others and make use of information and networks of experts.
- Related to the ethical, legal and responsible use of ICT.

The length of ICT experience implies exposure to different applications and higher levels of familiarity with various software packages (Mutsvunguma, 2013). In the present study, user competency in using digital information is an essential measure of digital content familiarity. Although competency may not directly impact usage behaviour, it helps users learn how to work with electronic resources with ease. Furthermore, usage is more predictive when individuals have prior experience with technology.

According to Torres-Gastelu and Kiss (2016), there are three types of competencies concerning using ICTs:

- **Basic competencies dimension**

Basic competencies can be considered fundamental for proper scholarly performance. This dimension is related to activities such as interaction with others through the digital media, the

use of models to explore complex topics, the application of tools used to find information from various sources, the productive use of applications and the use of primary information resources (Garcia-Valcarce and Arras, 2011).

- **Application competencies dimension**

Garcia-Valcarce and Arras (2011) stated that application competencies are related to the use of ICTs in various activities. Activities include the creation of work as a medium of expression, the planning and the resolution of problems through digital resources, the participation in groups that use these tools, and effective communication using a variety of information resources.

- **Ethical competencies dimension**

Ethical competencies are related to ICT use for learning purposes and not for purposes that do not involve learning. According to Torres-Gastelu and Kiss (2016), in this dimension, the researcher can ask learners questions based on the use of ICTs for learning purposes.

2.3.9.1 Teacher's competence in the use of ICTs

According to Mkhize (2018), the acquisition of ICT skills alone for teachers is not enough to effectively utilise ICT pedagogically. While it may be relatively simple to teach how to use technology, this is not the case for learning how to use technology as an educational tool. Dzansi and Amedzo (2014) argued that while teachers need ICT skills, they also need knowledge and skills to use ICTs in pedagogy. More often than not, ICT skills professional development focuses on teaching technical skills without showing teachers how to integrate these skills into their specific subject areas.

Sundarjee, Ntuli and Chikasa (2014) pointed out that teacher training in the form of isolated skills on hardware and software can have a limited impact on teacher practice. The authors further stated that isolated skills acquired during workshops and courses do not guarantee their use by teachers when they return to their classrooms. Consequently, sufficient attention needs to be focused on the transferability of the acquired skills in the classroom (Sundarjee, Ntuli and Chikasa, 2014).

Dzansi and Amedzo (2014) observed that many public secondary schools, particularly in rural areas, lack digital literacy and access to ICTs. The article by Jansen (2015) and the study by Sundarjee, Ntuli and Chikasa (2014) indicated that most schools do not have enough skills and infrastructure to operate computers with ease. As computers form the backbone of today's information economy, it is imperative that those learners who do not have the necessary skills must attain them before entering the university and the workplace.

2.3.9.2 Learner's competence in the use of ICTs

The competencies that learners have for using technological tools productively and ethically in the search and organisation of information, problem-solving and collaborative work, and improving their communication processes are vital for efficiently responding to the demands that arise in teaching contexts that significantly integrate ICT.

According to Torres-Gastelu and Kiss (2016), rural schools identified the following challenges that need to be addressed to reap the full benefits of ICTs in classrooms: lack of access to technology; lack of computer literacy amongst learners; the absence of a properly developed curriculum for integrating ICTs into subject teaching; and the need for student-centred learning and outcome-driven educational approaches. In addition, although the learners were positive about the uses of technology, they all sadly lacked the skills to implement and use it in their classrooms.

2.3.10 Digital divide in schools

Even though the concept of the digital divide has been widely debated, it still means differences in access to ICTs. Gudmundsdottir (2010: 177) stated that the digital divide can be caused by socio-economic status, class, and computer access. It is important to note that the digital divide can be related to factors other than having access to a computer or the Internet, for example, the lack of skills to adequately utilise such access. Czerniewicz and Brown (2013: 47) claimed that when providing material access to ICTs it is essential to find out their location, availability, and adequacy for use.

Mutula and Mutula (2007: 137) characterised the digital divide as a reflection of broad socio-economic inequalities caused by many factors such as income level, high cost of access,

insufficient infrastructure, insufficient telecommunication network, geographic location, and political influence. Gudmundsdottir (2010) argued that access to and the use of ICTs in South Africa show the correlation between inequality and ICTs. The White Paper on e-Education in South Africa emphasised that the digital divide is also about accessing local content, local websites, and local language content (Department of Education, 2004). The digital divide moves from the local differences in every country between the rich and the poor, the educated and uneducated, and the powerful and marginalised, to the more specific linguistic and cultural divide. The digital divide is connected to the use of English, the dominance of the English language and culture and the divide these bring in terms of access to and use of knowledge (Gudmundsdottir, 2010: 177).

2.4 Summary

The purpose of this chapter was to review the literature on the use of ICTs in secondary schools. To begin with, various theoretical models were discussed and the TAM was identified as the most suitable model to predict the usage of ICT in schools. The TAM has been widely used in information technology and information systems research. The study's research objectives covered by the TAM's constructs were PEOU, PU, ATT, AU and external variables. Background information on the geographical region in which the two selected secondary schools were located, was provided. Finally, many empirical studies on the use of ICTs in schools were identified in the literature and these were discussed under various headings. These headings, include; ICT policy in South African education, the status of ICT in secondary schools, ICT infrastructure in secondary schools, digital literacy in secondary schools, the learners and teachers' attitude towards using ICTs, factors influencing usage of ICTs, the learners and teachers' competence in using ICTs, barriers to ICT usage and digital divide in schools.

Chapter three follows and comprises the research methodology adopted by the study.

CHAPTER THREE: METHODOLOGY AND METHODS

3.1 Introduction

The research methodology is the overall plan that a researcher makes to conduct a particular study. According to Creswell (2014), "research methods are a way to establish the result of a given problem on a specific matter or problem that is also referred to as a research problem." There are three major research methods: qualitative method, quantitative method, and mixed-method (Nestor, 2012: 45). This chapter provides an overview of the research methodology adopted to answer the research questions of the study. In doing so, the research paradigm, research approach, research design, population, data collection instrument and data analysis methods that were used in the study are outlined and discussed.

3.2 Research paradigm

Stringer (2013) states that from experience, the understanding and setting of the research paradigm are, without a doubt, the most confusing part of the research process for a researcher. Research paradigms such as positivism, post-positivism, critical theory, and constructivism are ways explaining the basic set of beliefs that the researcher has at a philosophical level and how this influences the way the researcher does the research. A paradigm is the entire constellation of beliefs, values and techniques shared by members of a given (scientific) community (Pickard, 2013: 6). There are four research paradigms, namely, are positivism, post-positivism, critical theory and interpretivism/constructivism (Pickard, 2013).

Positivism argues for the existence of a true and objective reality that can be studied by applying natural sciences and scientific inquiry methods and principles. Furthermore, it maintains that the study's object is independent of researchers, knowledge is discovered and verified through direct observations or measurements of phenomena, and facts are established by taking apart a phenomenon to examine its parts (Maree, 2016: 142). According to Pickard (2013), post-positivism is considered a contemporary paradigm that developed due to the criticism of positivism. Pickard (2013) further states that post-positivism believes in a single reality, however, acknowledging that reality can never be fully known and efforts to understand reality are limited due to the human beings' sensory and intellectual limitations. The aim of post-positivist research is prediction and explanation. The interpretivism/constructivism

paradigm maintains that social subjects and problems cannot be studied through positivism. Constructivists believe that the world is multifaceted and that multiple realities are constructed, experienced, and interpreted differently by different people. People give meaning to their experiences based on their experience of interaction with others, and the community and social system in which they live (Kumar, 2014: 31).

This study used post-positivism in that it accommodates both qualitative and quantitative approaches. The results (see Chapter four) were thus expressed in words and numbers as both qualitative and quantitative methods were used.

3.3 Research design

Research design is defined by Babbie (2011: 91) as an overall strategy to integrate the different components of the study coherently and logically, thereby ensuring that the researcher addresses the research problem effectively. Four types of research designs are used in the social sciences, namely, case studies, field studies, survey studies, and experiments (Kothari, 2014: 275). According to Kumar (2014: 230), a case study uses a single person or organisation in a research study. Nestor (2012: 233) stated that in a field study, instead of asking participants to come to a strange laboratory setup to be studied, the researcher observes participants in their natural environments. A survey is defined by O'Leary (2014: 56) as a method of collecting information by asking questions. Sometimes interviews are done face-to-face with people at home, in school, or at work. Finally, an experiment is when the researcher creates two or more groups of people to compare (Kothari, 2014: 17).

The study used the survey method to collect the required data from teachers and learners of the two secondary schools in the Dr NDZ Municipality. O'Leary (2014) emphasised that researchers can get hundreds of people to complete the survey in a relatively short period.

3.4 Research approach

Research methods (or approaches) are strategies, processes or techniques utilised in the collection of data or evidence for analysis to uncover new information or create a better understanding of a topic. There are three major research methods: qualitative method, quantitative method, and mixed-method (Nestor, 2012: 45). According to Ranjit (2014: 211),

the quantitative approach is also known as the traditional, positivist, experimental or empiricist approach. However, Clarke (2005: 213) stated that a quantitative approach is the systematic empirical investigation of observable phenomena via statistical, mathematical or computational techniques. Clarke (2005: 215) explained that a qualitative approach is described by terms such as constructivism, naturalism, interpretivism, and post-positivism. A qualitative approach is primarily exploratory research; it is used to understand underlying reasons, opinions, and motivations. It provides insights into the problem or helps to develop ideas or hypotheses for potential quantitative research. A mixed-method approach is defined by Bulsara (2006: 6) as a method for conducting research that involves collecting, analysing and integrating or mixing qualitative and quantitative approaches in a single study.

This study used a combination of qualitative and quantitative methods. Although the study used a combination of the two methods, it could be considered more quantitative in nature. The interview schedule used for the teachers contained both open-ended (qualitative) and closed-ended questions. The former questions resulted in more in-depth responses. The questionnaire directed at learners was largely quantitative in nature containing, in the main, closed-ended questions. The research or data collection instruments are discussed in more detail at 3.6 below.

3.5 Target population

The population is defined by Babbie and Mouton (2011: 310) as a large collection of individuals or objects that is the main focus of a scientific query. However, due to large population sizes, the researcher often cannot test every individual in the population because doing so would be too expensive and time-consuming. This is the reason why researchers rely on sampling techniques.

The target population for the study comprised grade 11 learners and teachers from the two selected secondary schools (Sonyongwana and Ginyane). In 2020 the population of grade 11 learners from the two schools was 329, and that of the teachers (including principals and heads of departments (HoDs)) was 28. Thus, the total population was 357.

3.5.1 Sampling procedure

According to Trochim (2008: 111), sampling is the process of selecting units, for example, people or organisations from a population of interest, so that by studying the sample, the researcher may somewhat generalise the results back to the population from which they were chosen. There are two types of sampling: probability sampling and non-probability sampling (Trochim, 2008: 111).

Probability sampling is any sampling method that utilises some form of random selection (Babbie, 2014). Types of probability sampling are: simple random sampling, stratified random sampling, systematic random sampling, cluster random sampling and multi-stage sampling (Ranjit, 2014: 343). Babbie (2014: 220) describes simple random sampling as a probability sampling type in which the units composing a population are assigned numbers. A set of random numbers is then generated and the units having those numbers are included in the sample. Kumar (2014: 222) refers to systematic sampling as a probability sampling method in which sample members from a larger population are selected according to a random starting point and a fixed, periodic interval. According to Clarke (2005: 223), stratified random sampling involves dividing a population into smaller groups known as strata. In stratified random sampling, the strata are formed based on members' shared attributes or characteristics. A random sample from each stratum is then taken in a number proportional to the stratum's size compared to the population. These strata are then pooled to form a random sample. Cluster random sampling is defined by Babbie and Mouton (2011: 345) as a sampling technique used when natural but relatively heterogeneous groupings are evident in a statistical population. It is often used in marketing research. In this technique, the total population is divided into groups (or clusters) and a simple random sample of the groups is selected. Khumar (2014: 227) states that multi-stage sampling can be a complex form of cluster sampling because multi-stage sampling involves dividing the population into groups. Then, one or more clusters are chosen randomly, and everyone within the chosen cluster is sampled.

According to Kothari (2014: 343), non-probability sampling does not involve random selection. Types of non-probability sampling are convenience sampling, purposive sampling, quota sampling, and snowball sampling. According to Maree (2016: 346), a convenience sample is made up of people who are easy to reach. An example would be a pollster

interviewing shoppers at a local mall. O'Leary (2014: 200) describes purposive sampling as a type of non-probability sampling in which the units to be observed are selected based on the researcher's judgement about which ones will be the most useful or representative (and thus also called judgement sampling). Khumar (2014: 200) describes snowball sampling as a non-probability method, often employed in field research whereby each person interviewed may be asked to suggest additional people for interviewing. Finally, according to Babbie (2014: 201), quota sampling is a type of non-probability sampling in which units are selected into a sample based on pre-specified characteristics so that the total sample will have the same distribution of characteristics assumed to exist in the population being studied.

This study used a non-probability sampling technique, purposive sampling, to select principals, HoDs and teachers in the two selected schools. A probability sampling technique, simple random sampling, was used to select the grade 11 learners in the two selected schools.

3.5.2 Sample size

According to Krejcie and Morgan (1970: 75), the sample size can be determined by using a census for a small population, imitating a sample size of similar studies, using published tables, and applying formulas to calculate the sample size.

Table 2 below (taken from Krejcie and Morgan, 1970) indicates that if the population is 340, the sample size will be 180 with a confidence level of 95. The grade 11 learners' total population in the two schools was 329. The researcher used a population size of 340 because it is closer to 329 (the grade 11 total population for the two schools).

Table 2: **Table for determining sample size for a given population**

N	S	N	S	N	S	N	S	N	S	N	S	N	S
250	152	**340**	**180**	480	214	800	260	1300	297	2000	322	4000	351
260	155	360	186	500	217	850	265	1400	302	2200	327	4500	354
270	159	380	191	550	226	900	269	1500	306	2400	331	5000	357
280	162	400	196	600	234	950	274	1600	310	2600	335	6000	361

N = Population size
S = Sample size
Source: Krejcie and Morgan (1970)

Table 3. below shows the total number of grade 11 learners in each of the two schools.

Table 3: Total number of learners in grade 11

Schools	Grade 11
Sonyongwana SS	173
Ginyane SS	156
Total	**329**

The formula for calculating the sample size for each grade is:

$$\text{Sample size } = \frac{No.\,of\ Grade\ y\ learners}{Total\ learner\ population}\ X\ 180$$

Table 4 below depicts the number of grade 11 learners from each school comprising the sample.

Table 4: Sample size for grade 11 learners

Schools	Grade 11
Sonyongwana SS	95
Ginyane SS	85
Total	**180**

The total number of staff that were supposed to be interviewed was 28 teachers of grade 11 including HoDs and principals but only 18 (64%) participated. As discussed above, the staff were purposively selected.

3.6 Data collection instruments

Data collection instruments are defined by Baglione (2011: 31) as devices used to collect data, such as a paper questionnaire or computer-assisted interviewing system. Three types of data collection instruments can be used to collect information and these are questionnaires, interviews, and observation (Maree, 2014: 245). For the purposes of the study, the researcher used the interview and questionnaire as data-gathering instruments. These instruments were adapted from the study titled "Internet-based information behaviour of high school learners in the Ashanti region of Ghana" (Kankam, 2017: 145). Kankam (2017) successfully collected

data using the instruments to study Internet access with respondents similar to the ones in the current study.

3.6.1 Interviews

According to Babbie (2014: 281), an interview is a data collection encounter in which one person (an interviewer) asks questions of another (a respondent). Interviews may be conducted face-to-face or by telephone. O'Leary (2014: 203) states that the different types of interviews include non-directive, informal, informal but guided, semi-structured, and structured but open-ended. A non-directive interview is an interview in which questions are not prearranged. Unstructured or non-directive interviews generally have no set format. The lack of structure allows the interviewer to ask questions which next come to their mind up and interrogate points of interest as they go on further (O'Leary, 2014). According to Clarke (2005: 60), during the informal interview, the interviewees do not have to answer a pre-set of questions that might be found confusing or which they cannot answer. Using an informal but guided interview, the interviewer does not ask a pre-set of questions in the same order (Nestor, 2012: 94). According to Kothari (2014), a semi-structured interview is open-ended, being flexible to new ideas that can be brought up during the interview depending on the interviewee's answers. Semi-structured interviews provide qualitative data and create an understanding of the issue for both the researcher as well as the interviewee. With a structured but open-ended interview, the interviewer gives pre-set questions in a predetermined order to every interviewee. The questions are open-ended, which will not result in "Yes" or "No" answers to the questions (Kothari, 2014: 56).

A semi-structured interview schedule was used to interview teachers and HoDs of the two schools and the schedule included 16 questions (see Appendix 4). The following areas, based on the objectives of the study, were covered in the interviews:

- Background information related to the teachers that took part in the study (questions 1-4).
- The types of ICTs that the schools have, the ICTs used, the purpose of ICT usage, and the place where teachers usually use ICTs (questions 5-8).
- The teacher's attitude towards using ICTs (questions 9-11).

- The teacher's competence towards using ICTs (questions 12-14).
- Challenge's teachers face with the use of ICTs and the solutions to improve the ease of use of ICTs (questions 15-16).

In line with the semi-structured nature of the interview, the questions were both closed- and open-ended. However, the interview schedule comprised mainly of open-ended questions (13) and had only three closed-ended questions. It was, therefore, used to collect mainly qualitative data.

3.6.2 Questionnaires

Lee (2008: 42) defined questionnaires as a series of questions that the researcher uses to gather information from people. The use of questionnaires has a distinct advantage in that a respondent's anonymity can be better assured. There are two broad types of questionnaires, namely, structured and unstructured questionnaires (Lee, 2008). According to Lee (2008: 197), structured questionnaires have definite and concrete questions and are prepared well in advance. They initiate a formal inquiry, check the data previously accumulated and are used in studies on economics, social problems, and administrative policies and changes. Questionnaires can also be categorised based on the nature of the questions asked: open-ended questionnaire, closed-ended questionnaire and a mixed questionnaire (containing both types of questions) (Baglione, 2011: 201). According to Baglione (2011: 105), the open-ended questionnaire is designed to encourage a full, meaningful answer using the subject's own knowledge and feelings. Open-ended questions do not provide any structure for the respondents' replies. Lee (2008: 201) states that closed-ended questions limit respondents' responses in that they are limited to the stated alternatives, such as a "Yes" or "No". The respondent cannot express his/her judgment, while in a mixed questionnaire, questions are both closed- and open-ended. The questionnaire is mainly used in the field of social research.

According to Baglione (2011), unstructured questionnaires are usually formulated around open-ended questions and thus can be equated with the open-ended questionnaire described above. Open-ended questions may give more valid data, as respondents can say what is important to them and express it in their own words. However, the data are difficult to measure and understanding is required when using the data. Baglione (2011) further stated that coding

of the answers alters the actual replies given by respondents by linking responses that are not identical. Unstructured questionnaires are used by anti-positivists and are preferred by them because they produce qualitative data.

The researcher used a structured questionnaire (see Appendix 3) to gather data from the sample of grade 11 learners in the two selected secondary schools within the Dr NDZ Municipality. The questionnaire was divided into six sections, similar to the interview schedule described above. It had 10 closed-ended questions and five open-ended ones used for specifying options that were not included amongst the closed-ended questions.

3.7 Data collection procedures

Data were collected in adherence to the National and UKZN COVID-19 guidelines. While face-to-face interviews had been planned, the COVID-19 pandemic and subsequent regulations meant that telephonic interviews had to be conducted. Consent forms were sent to the teachers, principals and HoDs in January 2021, and once consent had been obtained the telephonic interviews were conducted from the 15th to the 18th of February 2021. As noted above, the total number of staff that were supposed to be interviewed was 28, comprising the grade 11 teachers, the HoDs and the two principals from the two selected schools. However, only 18 (64%). The 18 participants comprised 15 grade 11 teachers and three HoDs. Neither of the two principals participated.

Questionnaires, with consent forms attached, were distributed to learners in November 2020. The researcher sanitised his hands before and after printing the questionnaires and packed them in boxes. The boxes were taken to the two schools and the researcher, with the assistance of the class teachers, distributed the questionnaires to the selected 180 grade 11 learners (see below). Due to time constraints, the questionnaires were distributed and collected on the same day, that is, 9 November 2020. Adhering to COVID-19 protocols, the researcher provided hand sanitiser and sprayed learners hands before they collected and completed the questionnaires. The sample of 180 grade 11 learners who were 18 years of age or older were randomly selected from the population of 329 grade 11 learners in the two schools. The selection of the sample of learners was done by the researcher with the assistance of clerical staff in the two schools.

3.8 Reliability and validity

Reliability is the degree to which a test consistently measures what it sets out to measure while at the same time yielding the same results (Babbie 2011: 324). Babbie (2011) further stated that reliability is the quality of the measurement method that suggests that the same data would have been collected each time in repeated observations of the same phenomenon. This means that the higher the consistency in the results, the greater the measuring procedure's reliability. According to Babbie (2011: 325), validity refers to a measure that accurately reflects the concept it is intended to measure.

To enhance reliability and validity in the study, a pretest was done at the Centocow High School within the Dr NDZ Municipality in August 2020. According to Kothari (2014), a pretest is done to check if the instruments are suitable, assess whether the line of questioning and instructions are appropriate and whether the instruments are understandable. Kothari (2014) further states that a pretest is carried out to eliminate any possible errors that could hinder the gathering of adequate and reliable data. Doing the pretest helped the researcher correct spelling, adjust the layout, and add some relevant questions that were missing. In terms of the latter, two questions were added – one concerning the amount of time learners spent using ICTs and one concerning the learners' positivity towards using ICTs. As per Nestor (2012), the validity of the research was also enhanced by using two methods (qualitative and quantitative) and two sampling procedures (simple random sampling and purposive sampling) to collect data. Finally, using the TAM to create questions (learners' attitudes towards using ICTs and learners' competence in the use of ICTs) was also a means to achieve reliability (Mutsvunguma, 2013).

3.9 Data analysis

Data analysis is defined by Maree (2016: 160) as the practice in which raw data are ordered and organised so that valuable information can be extracted. There are essentially two types of data analysis, namely, qualitative and quantitative data analysis (Babbie, 2011). Qualitative data analysis involves the opinions of the respondents. This method does not involve statistics or numerical information (Babbie, 2011). According to Babbie (2011), qualitative data analysis involves categorising meaning, summarising meaning and structuring meaning using narrative. Data collected from open-ended questions are grouped into categories or themes (Kothari, 2014: 125). Quantitative data analysis does not rely much on observation or interviewing but

focuses on collecting numeric data and statistics. Types of quantitative data analysis are descriptive statistics using tables and charts, and inferential statistics that deal with testing hypotheses (Kothari, 2014). Data collected in the study were checked for completeness, consistency and reliability. This process is known as data cleaning. Subsequently, data were sorted and coded. Coding is the process of structuring data into an analytical form (Birley and Moreland, 1998).

The quantitative data collected were analysed using SPSS and bar graphs, pie charts and tables were used to present the results. Content analysis was used to analyse the qualitative data. Data were coded, thereby reducing large "mountains" of raw data into small, manageable piles (Neuman 2006). This was achieved by systematically organising data into a standard format that allowed the researcher to draw conclusions about the characteristics and meaning of recorded data (Babbie, 2011).

3.10 Ethical considerations

Babbie (2014: 378) refers to ethical consideration as methods, procedures or perspectives for deciding to act and for analysing complex problems and issues. The basic ethical principles in human research are respect for persons, beneficence, and justice. Individuals should be treated as autonomous agents. The researcher must ensure that the subject has received full disclosure of the nature of the study, the risks, benefits and alternatives with ample opportunity to ask questions. The researcher should give forethought to the maximisation of benefits and reduce the risk that might occur from the research. Injustice occurs when some benefit to which a person is entitled is denied without good reason or when some burden is imposed unduly (Babbie, 2014).

As noted in Chapter one, the University of KwaZulu-Natal's research ethics policy was strictly followed. Thus, amongst other issues, gatekeepers' permission was sought and obtained, as was the informed consent of the participants.

3.11 Summary

Chapter three discussed the philosophical underpinnings embedded in the chosen methods, both qualitative and quantitative, involving questionnaires and interviews to collect data. The

research methods used to collect data were presented, and the research design, paradigms, data collection techniques and data analysis methods were discussed. SPSS was used to organise and analyse the quantitative data collected (mainly from the questionnaires), and content analysis was used to analyse the qualitative data collected (mainly from the interviews). Reliability and validity of the results were discussed and these were largely ensured through pretesting of the instruments. The chapter ended with a brief discussion of the ethical considerations of the study.

Chapter four, the analysis and presentation of the results of the study, follows.

CHAPTER FOUR: DATA ANALYSIS AND PRESENTATION

4.1 Introduction

The study aimed to investigate the use of ICTs in secondary schools within the Dr NDZ Municipality. The TAM underpinned the study. A mixed-method approach was used, with a survey study design. Two secondary schools within the Municipality were selected and the population comprised grade 11 learners, teachers, HoDs and principals in the two schools. Data were collected using questionnaires from a sample of 180 learners and 18 teachers and HoDs were interviewed. Quantitative analysis was carried out using SPSS and, as reflected below, pie charts, bar charts and tables present the results. Content analysis was used to analyse the qualitative data.

The results presented below are organised thematically based on key variables derived from the theoretical framework and research questions (see Table 1). The results cover the biographical data, the types of ICT resources that learners in the two selected secondary schools use, the learners and teachers' attitudes towards using ICTs, the learners and teachers' competence in using ICTs, challenges faced by the learners and teachers in the use of ICTs, and solutions to improve the ease of use of ICTs at the two schools.

In presenting the results and in line with the ethical guidelines, no names are used and the two schools are referred to as S1 and S2. Prior to the presentation of the results, the response rates achieved are briefly outlined.

4.2 Response rates

A response rate for a study is "the number of people participating in a survey divided by the number selected in the sample, in the form of a percentage" (Babbie, 2014: 278). The response rates for the two groups of respondents (learner and teachers) are presented below.

All 180 grade 11 learners who were identified in the sampling participated in the study yielding a response rate of 100%. However, only 18 teachers (including three HoDs) participated in the interviews out of a total of 28 teachers (including the two principals who subsequently did not participate) yielding a response rate of 64%. Of the eight teachers who did not participate, five

were unreachable over the period during which telephonic interviews were conducted, one teacher was too busy taking care of a very sick family member, and the two remaining teachers were found to be no longer working at the schools.

4.3 Presentation of results

The results of the questionnaires and interviews are presented separately with the results of the former being presented first. Due to rounding off of the percentages, some of the totals do not always add up to 100% precisely.

4.3.1 Learners' questionnaire results

This section presents the results of the learners' survey.

4.3.1.1 Demographic data

Demographic data relating to the sampled learners were elicited from two questions that were asked in Section one of the questionnaire. The questions concerned the gender and age of the grade 11 learners.

Gender of learners

Table 5 below presents the results relating to the gender of the respondents.

Table 5: Gender of learners

(N=180)

Gender	Count	Percent
Male	72	40
Female	108	60
Total	180	**100**

(Source: Field data, 2020)

Table 5 above depicts that of the 180 respondents who participated in the study, 72 (40%) were male and 108 (60%) were female.

Age of learners

Table 6 below indicates the age of the respondents.

Table 6: Age of learners

(N=180)

Age (years)	Count	Percent
18	68	38
19	59	33
20	53	29
Total	**180**	**100**

(Source: Field data, 2020)

The highest number of respondents, 68 (38%) were 18 years old, followed by 59 (33%) respondents who were 19 years old. Fifty-three (29%) respondents were 20 years old and there were no respondents over the age of 20 years.

Proportion of respondents from each school

Figure 3 below shows the proportion of respondents from each of the two secondary schools.
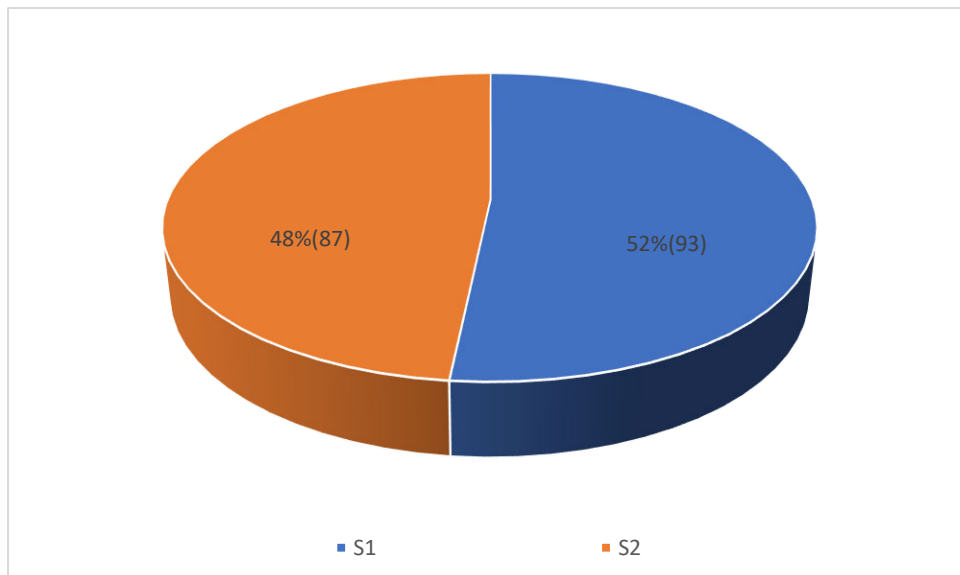
Figure 1: Proportion of respondents from each school

(N=180)

(Source: Field data, 2020)

As can be seen, respondents were fairly evenly split between the two schools with 93 (52%) from S1 and 87 (48%) from S2.

4.3.1.2 Types of ICTs that learners use

The purpose of Section two (question 2.1) was to find out from the respondents the types of ICTs that they use. Results are reflected in Table 7 below.

Note: totals are not provided as multiple answers were received.

Table 7: Types of ICTs used by learners

(N=180)

Types of ICTs	Count	Percentage
Laptops	83	46
Tablets	93	52
Smartphones	129	72
Desktops	18	10

(Source: Field data, 2020)

Table 7 shows that the largest number of respondents, 129 (72%) used smartphones to access information. This was followed by 93 (52%) respondents who used tablets and 83 (46%) used laptops to access information. The least used ICT was desktops – used by 18 (10%) of the respondents.

4.3.1.3 Learners' attitudes towards using ICTs

Table 8 below reveals the learners' attitudes towards using ICTs. Respondents in Section three of the questionnaire were presented with a series of statements (reflecting attitudes) and a five-point Likert Scale was used to ascertain their level of agreement with the statements. Results are presented in Table 8 below.

Table 8: Learners' attitudes towards using ICTs

(N=180)

Learners' attitudes	Strongly agree		Agree		Neutral		Disagree		Strongly disagree		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Using ICTs is a good idea	84	47	66	37	0	0	13	7	17	9	180	100
It beneficial to use ICTs	75	42	87	48	0	0	10	6	8	4	180	100
Using ICTs is favourable for me	68	38	52	29	5	3	35	19	20	11	180	100
Positive towards using ICTs	78	43	69	38	7	4	17	9	9	5	180	100

(Source: Field data, 2020)

The results relating to each of the statements are described below:

Using ICTs is a good idea

The respondents were asked to indicate whether they thought using ICTs was a good idea. As can be seen in Table 8 the vast majority of respondents, 150 (83%) either strongly agreed or agreed that using ICTs was a good idea. Thirteen (7%) of respondents disagreed with the statement while a surprising 17 (9%) respondents strongly disagreed that using ICTs was a good idea.

It is beneficial to use ICTs

The respondents were asked their extent of agreement with the statement "I really find it beneficial to use ICTs". Just under half of the respondents, 87 (48%) agreed with the statement while 75 (42%) respondents strongly agreed. On the other hand, only 18 (10%) respondents either disagreed or strongly disagreed that ICTs were beneficial for them.

Using ICTs is favourable

Just under a third, 55 (31%) of the grade 11 participants either disagreed or strongly disagreed with the statement "Using ICTs is favourable for me". Those respondents who either agreed or strongly agreed with the statement numbered 120 (67%) which is quite substantially less than

the results for the first two statements above. Five (3%) respondents were not willing to give an opinion.

Learners' positivity in using ICTs

Seventy-eight (43%) respondents strongly agreed with being positive towards using ICTs while 69 (38%) agreed with being so. A total of 33 (18%) respondents were either neutral or disagreed (including strongly disagreed) with being positive towards the use of ICTs.

4.3.1.4 Amount of time spent using ICTs

Question 3.6 determined the number of hours per week respondents spent using ICTs. Results are reflected in Figure 4 below.
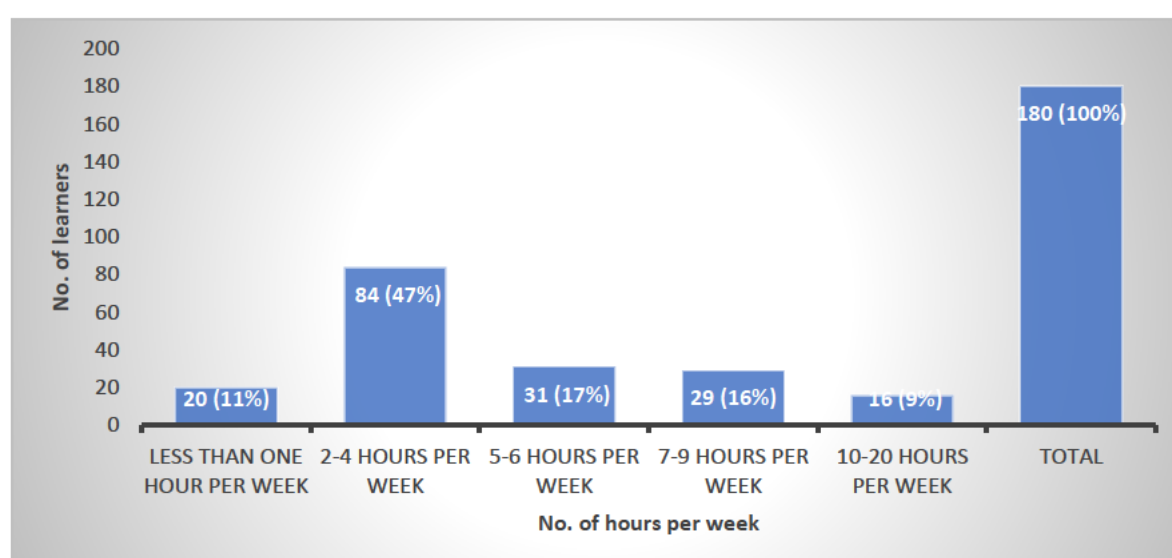
Figure 2: Amount of time spent using ICTs

(N=180)
(Source: Field data, 2020)

The highest number of respondents, 84 (47%) indicated that they spend two to four hours per week using ICTs. Seventy-six respondents (42%) used ICT for more than five hours per week and of these 16 (9%) used ICTs between 10 to 20 hours per week. A small minority 20 (11%) indicated that they use ICTs for less than one hour per week.

4.3.1.5 Learners' competence in the use of ICTs

Section four of the questionnaire determined the respondents' competence in the use of ICTs. Respondents were asked if they have sufficient skills to use ICTs and a second question determined whether they had received any training regarding the use of ICTs. Table 9 below reflects the results of the two questions.

Table 9: Learners' competence in use of ICTs

(N=180)

Learners' competence	Yes		No		Total	
	Count	Percent	Count	Percent	**Count**	**Percent**
Sufficient skills to use ICTs	109	61	71	39	**180**	**100**
ICT training	11	6	169	94	**180**	**100**

(Source: Field data, 2020)

A substantial minority 71 (39%) or respondents felt that they did not have sufficient skills to use ICTs while 109 (61%) felt they had sufficient skills. With regard to training a substantial majority, 169 (94%) respondents indicated that they had not received any training regarding ICTs.

4.3.1.6 Challenges faced by learners in the use of ICTs

Several challenges in using ICTs to access information have been identified by various studies. Section five of the questionnaire aimed to determine from learners the challenges they faced when using ICTs. Respondents were provided with a list of possible problems (challenges) and were asked to indicate those which were applicable. An "Other" option was also provided. Table 10 below presents the results.

Note: totals are not provided as multiple answers were received.

Table 10: Challenges faced by learners in the use of ICTs

(N=180)

ICT challenges	Count	Percent
Inaccurate information	11	6
Unreliability of sources	43	24
Difficulty in locating relevant information	17	9
Cost of access to ICT	60	34
Viruses	56	31
Lack of skills	25	14

(Source: Field data, 2020)

The most mentioned challenge faced by the respondents was the "Cost of access to ICT" being mentioned by 60 (34%) of the 180 respondents. The next most mentioned challenges were "Viruses" and the "Unreliability of sources" being mentioned by 56 (31%) and 43 (24%) respondents respectively. The remaining listed challenges listed received less than 15% of responses and no "Other" challenge was mentioned by the respondents.

4.3.1.7 Learners' solutions to improve the ease of use of ICTs

The purpose of Section six "Solutions to improve the ease of use of ICTs" was to establish from the respondents whether learning to use ICTs would boost their confidence when using ICTs to access information. The respondents were asked to indicate their agreement or disagreement via a five-point Likert scale with two statements and a question. The results are presented in Table 11 below.

Table 11: Solutions to improve the ease of use of ICTs

(N=180)

Statements	Strong agree		Agree		Neutral		Disagree		Strong disagree		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent	**Count**	**Percent**
Learning to use ICTs would be easy for me	86	48	66	37	5	3	15	8	8	4	**180**	**100**
Would you find it easy to get information using ICTs to do what you want to do?	78	43	12	7	11	6	72	40	7	4	**180**	**100**
It would be easy for me to become skilful at using ICTs	65	36	76	42	9	5	13	7	17	9	**180**	**100**

(Source: Field data, 2020)

Table 11 above shows that the majority of respondents were confident in their belief that learning to use ICTs would be easy for them in that 152 (84%) either agreed or strongly agreed with the statement. Twenty-three (12%) respondents, however, disagreed. Interestingly, a substantial minority of respondents, 79 (44%) disagreed or strongly disagreed that they would find it easy to get information using ICTs to do what they want to do. As with the first statement a majority of respondents, 141 (78%) displayed confidence in that they agreed with the statement that "It would be easy for me to become skilful at using ICTs". However, there were 30 (17%) respondents who displayed a lack of confidence in that they disagreed with the statement.

4.3.2 Teachers' interview results

As discussed above and in the previous chapter, interviews were conducted with 15 teachers and three HoDs giving a total of 18 interviews. Also as previously mentioned, the areas covered in the interviews were similar to those in the questionnaire directed at the grade 11 learners. The results are presented below beginning with demographic data.

4.3.2.1 Teachers' demographic data

This section presents the age, gender, job title and qualification of the teachers who participated in the survey. For confidentiality, the four job titles used are junior teachers, senior teachers and HoDs.

Age of teachers

Table 12 below shows the age of the teachers that participated in the study.

Table 12: Age of teachers

(N=18)

Age	Count	Percentage
20 - 25	1	6
26 - 30	1	6
31 - 35	0	0
36 - 40	6	33
41 - 45	3	17
46 - 50	6	33
51 - 55	1	6
Total	**18**	**101***

(Source: Field data 2021)

*The column does not add up to 100% due to rounding off of percentages

Table 12 shows that most of the teachers that participated in the study, 16 (89%) were 36 years or older and of those, six (33%) were between the ages of 36 and 40 years and a similar number between 46 and 50 years. Two (12%) were under the age of 30 years and one (6%) between 51 and 55 years of age.

Gender of teachers

Table 4.9 below shows the gender of the teachers who participated in the study.

Table 13: Gender of teachers

(N=18)

Gender					
Male		Female		Total	
Count	Percentage	Count	Percentage	**Count**	**Percentage**
9	50	9	50	**18**	**10**

(Source: Field data 2021)

In terms of gender, there was an equal number, namely, nine (50%) male and female respondents.

Teachers' job titles

Table 14 below shows the job titles of the teachers that participated in the study.

Table 14: Teachers' job titles

(N=18)

Job titles	Count	Percentage
Junior teacher	3	17
Senior teacher	12	66
HoDs	3	17
Total	**18**	**100**

(Source: Field data 2021)

As can be seen in Table 14 above, the majority of the respondents, 12 (66%) stated that they were senior teachers.

Teachers' qualifications

In question 1.4 teachers were asked about their qualifications. Eight (44%) of the respondents had a Bachelor of Education (B.Ed.) degree. This was followed by six (33%) who had a Post-graduate Certificate in Education. Finally, one (6%) respondent had a doctoral Degree (PhD) in Education and one an Honours degree in Education.

4.3.2.2 ICT resources that exist in the school

This section presents the types of ICTs that exist in the two selected schools, the ICTs that teachers use, where the teachers use them and for what purposes.

Types of ICTs in the schools

The respondents in question 2.1 were asked the types of ICTs that their schools have. The 10 respondents from school 1 (S1) indicated that "the school has a computer laboratory with computers, printers and tablets". It was mentioned that projectors are sometimes used. The eight respondents from the second school (S2) also mentioned "their school having a computer laboratory with a few computers and printers".

Types of ICTs used by teachers

In question 2.2 the respondents were asked what types of ICTs they use. Eight of the 10 teachers from S1 used laptops, smartphones, tablets and desktops to access information. Six of the teachers from S2 used their laptops, smartphones and the remaining two used desktops.

Where teachers usually use ICTs

In question 2.3 the respondents were asked where they usually used ICTs. Six teachers from S1 revealed that they usually used ICTs at school and at home. Two respondents mentioned that they usually used ICTs at Internet cafés to connect to the Internet. Four teachers from S2 pointed out that they usually used ICTs at home to prepare their work for the next day. The remaining four teachers from S2 stated that they usually used ICTs at the school.

Purpose of using ICTs

The final question in this section (question 2.4) asked respondents what their purpose for using ICTs was. Six respondents from S1 indicated that they used ICTs to access information and for curriculum development. Four respondents from S1 indicated that "using ICTs is time-consuming but that it is faster than using chalk and a blackboard and is easier for learners to understand as the projector can display pictures and show videos". Six respondents from S2 indicated that they use ICTs for curriculum delivery and to print and photocopy notes, test papers and reports. Two respondents from the same school said they used ICTs to store learners' information.

4.3.2.3 Teachers' attitudes towards using ICTs

Section three of the interview schedule determined teachers' attitudes towards using ICTs. The respondents were asked if they like to use ICTs for curriculum delivery, whether ICTs have influenced curriculum delivery, and whether their usage of ICTs was improving their teaching performance.

Attitudes towards using ICTs in curriculum delivery

The respondents asked whether they like to use ICTs for curriculum delivery. Most (7) respondents from S1 indicated that they liked to use ICTs for curriculum delivery. One senior teacher felt that the use of ICTs for curriculum delivery was not a good idea. Two respondents who stated that they like to use ICTs for curriculum delivery added that the use of ICTs is faster, less time consuming, and learners understand more easily if they watch videos. Three respondents were concerned that the lack of ICTs skills in school teachers could be a problem. One respondent felt that most of the senior teachers did not have the desired skills for using ICTs and that they needed training in this regard.

All eight of the respondents from S2 indicated that they liked to use ICTs in curriculum delivery. They added that they felt good about using ICTs, that ICTs were faster than using manual methods, and that ICTs helped learners understand when they watched videos via a projector. It was also pointed out that learners can ask questions via social networks after school. The only problem identified relating to ICTs in curriculum delivery was that of Internet connectivity.

ICTs influence curriculum delivery

The respondents were asked whether ICTs have influenced curriculum delivery. Five respondents from S1 pointed out that "ICTs have indeed influenced curriculum delivery". According to one respondent, "ICTs help teachers to deliver curriculum easy and fast". The respondent went on to say that learners understand the curriculum faster and ICTs are mostly used. Not all respondents were in agreement however, and one respondent stated that "ICTs [are] not influencing the curriculum delivery mostly in rural areas teachers and learners are not familiar with these ICTs."

All eight teachers from S2 agreed that ICTs have influenced curriculum delivery. It was pointed out that most of the teachers have their own laptop that makes curriculum delivery easier. It was also pointed out that most learners use smartphones to learn and retrieve information for assignments.

Use of ICTs and teaching performance

In question 3.3 the respondents were asked whether the usage of ICT was improving their teaching performance. All the participating teachers from S1 answered in the affirmative. Six of the teachers mentioned that they used videos to make learners understand easily and used social networks to communicate with learners while at home. They also used ICTs to get more knowledge from different experts around the world.

Five of the eight respondents from S2 indicated that using ICTs was improving teaching performance. They saved information using laptops and sent notes/or information to learners instead of writing on the board. They also used projectors to display information during class hours. One of the teachers indicated that ICTs do not improve teaching performance. It was also pointed out that most of the teachers and learners do not have skills for using ICTs, and that makes it more challenging to deliver information to learners using ICTs.

4.3.2.4 Competence in the use of ICTs

In Section four, three questions relating to the competence of teachers in using ICTs were asked. The teachers were asked if they have the skills for accessing information using ICTs, how they rated their ICT skills, and whether they had received training regarding the use of ICTs. The results are presented in Tables 15, 16 and 17 below.

Skills for accessing information using ICTs

The respondents were asked if they have the skills for accessing information using ICTs. Table 15 presents the results.

Table 15: Teachers' skills for accessing information using ICTs

(N=18)

Skills	Count	Percentage
Yes	17	94
No	1	6
Total	**18**	**100**

(Source: Field data 2021)

Table 15 above shows that the vast majority of the respondents, 17 (94%) considered themselves as having the skills for accessing information using ICTs.

Rating of ICT skills

Respondents were then asked to rate their ICT skills on a Likert scale ranging from excellent to very poor. Table 16 below presents the results.

Table 16: Teachers' rating of ICT skills

(N=18)

Rating	Count	Percentage
Excellent	0	0
Good	14	78
Not sure	0	0
Average	3	17
Poor	1	6
Very poor	0	0
Total	**18**	**101***

(Source: Field data 2021)

*The column does not add up to 100% due to percentages being rounded off.

As is evident in Table 16, the majority of respondents, 14 (78%) rated their ICT skills as good while three (17%) rated their skills as average.

ICT training

Table 17 below presents the responses to question 4.3 which asked respondents if they had received training regarding the use of ICTs.

Table 17: ICT training

(N=18)

Training	Count	Percentage
Yes	17	94
No	1	6
Total	**18**	**100**

(Source: Field data 2021)

The results in Table 17 above mirror those in Table 15. As can be seen, the vast majority of respondents, 17 (94%) stated that they had received training in ICTs.

Those respondents who had received training were asked where they had received their training. Eleven of the 17 respondents indicated that they received ICT training during their studies at tertiary institutions. Five respondents indicated that they received ICT training in community programmes.

4.3.2.5 Challenges teachers face in the utilisation of ICTs

Section five comprised one open-ended question which asked respondents what problems (challenges) they encountered (if any) when using ICTs. The results are reported below.

Problems encountered in the use of ICTs

Most of the respondents, eight out of 10, from S1 pointed out that they have a shortage of computers. They have a large number of learners and do not have enough computers to teach them computers lessons. A lack of skills on the part of the teachers was mentioned as a challenge as was the lack of training in the use of ICTs. One respondent stated that "learners come from different backgrounds and some do not have smartphones, making it difficult to use ICTs in curriculum delivery".

Seven of the eight respondents from S2 echoed the problems mentioned by teachers in S1, namely, "insufficient computers for use by learners and the lack of computer training on the part of the teachers". It was pointed out that while the teachers may have skills, the technology keeps changing constantly. Internet connectivity was mentioned as a problem as well as having to use their own data to access information (which can be costly).

4.3.2.6 Teachers' solutions to improve ease of use of ICTs

In Section six, the final section, respondents were asked in an open-ended question what solutions can be employed to overcome the challenges encountered. The results are presented below.

Solutions that can be employed

What came through clearly from most respondents from both schools, 14 (78%) was that more funds for ICT infrastructure and training are needed. A need for basic computer training for both teachers and learners was also pointed to. It was also suggested that the government needs to provide free data and tablets for learners to use at home.

4.4 Summary

Chapter four presented the results of the study. The data for the study were collected from two sources: self-administered questionnaires that were used with the grade 11 learners and semi-structured interviews that were used with the teachers. A total of 180 learners from the two secondary schools completed and returned the questionnaires and 18 teachers were interviewed. Results pertaining to the grade 11 learner were presented first followed by those pertaining to the interviews held with teachers and both sets of results were largely in agreement. Tables, figures and descriptive text were used to present the results.

The next chapter, Chapter five, discusses the results of the study.

CHAPTER FIVE: DISCUSSION AND INTERPRETATION OF RESULTS

5.1 Introduction

This study aimed to investigate the use of ICTs in secondary schools within the Dr NDZ Municipality. Two high schools were surveyed, namely, Sonyongwana High School and Ginyane High School. These two schools are public schools that have computer laboratories, as described in Chapters one and four. The study collected and analysed both qualitative and quantitative data to address its objectives and questions. The study employed the TAM (Venkatesh and Davis, 1996) as its theoretical framework.

This chapter discusses the results presented in Chapter four. In doing so, the literature review components of the study are linked with the study results. This process is guided by the study's objectives and research questions and the model employed as the theoretical framework. Themes derived from the objectives and research questions provide the basis for the discussion and these are as follows:

- The types of ICTs that are used by learners and teachers.
- Learner and teachers' attitudes towards using ICTs.
- Learners and teachers' competence in the use of ICTs.
- Challenges' learners and teachers face in the use of ICTs.
- Solutions to improve the ease of use of ICTs.

The results pertaining to the grade 11 learners are discussed first followed by those of the teachers.

5.2 Discussion of results pertaining to grade 11 learners

To begin with, the demographic characteristics of the grade 11 participants surveyed are discussed in light of the theoretical framework underpinning the study.

5.2.1 Demographic profile of respondents in light of the TAM

As already indicated and discussed, the TAM was used as the theoretical framework for the study. Learners and teachers were described as ICT users in this study since the TAM suggests that perceived ease of use and perceived usefulness are important predictors that determine the user's attitude towards intention to actual system use (Venkatesh and Davis, 1996). The learners who participated in the survey were described based on gender and age. (The teachers were described based on gender, age, qualification and position.)

External variables such as social influence are important factors in determining attitudes. According to Venkatesh and Davis (1996), when external variables such as skills, knowledge and ICT resources are in place, people will have a positive attitude and intention to use the technology. However, the perception may change depending on age and gender because everyone is different. According to Gefen and Straub (1997), individual differences identified included competency, domain knowledge, self-efficacy, gender, age and education. ICT characteristics included accessibility, visibility, interface and relevance. However, in this study, the external variables were individual differences in terms of participants' skills and knowledge. Hence, the study found that most learners were positive towards using ICTs. Venkatesh and Davis (1996) revealed that there are contextual factors that affect the actual use of the system and these factors could be individual differences (competency, domain knowledge, age, gender, education, and language) and system characteristics (accessibility, visibility, interface and relevance).

5.2.2 Types of ICTs that are used by learners

ICT infrastructure is another TAM external variable identified as important in the present study because ICTs and their use are only possible when adequate ICT facilities are in place. Mutsvunguma (2013) pointed out that ICT infrastructure includes computer hardware, software and communication networks. As has been noted previously, a computer (or another device) with an Internet connection and proper software installed is necessary for gaining access to online electronic resources. In order to collect and interpret data about the ICT infrastructure of the surveyed learners, the respondents were asked the types of ICTs that they used. ICTs mentioned by the learners were computers, printers, laptops and tablets. The responses, therefore, confirm Jansen's (2015) contention that 1 500 schools in KwaZulu-Natal

were equipped with resources such as computers, laptops and tablets. However, Jansen did make the point that most of the learners do not have access to these devices.

More specifically, results indicated that the most used ICTs by the surveyed learners were smartphones being used by 129 (72%) of the learners. This was followed by tablets used by 93 (52%) learners and laptops used by 83 (46%) of learners. A small minority of learners, 18 (10%) indicated that they used desktops. The responses show that one of the external variables that can limit learners using ICTs (to access information) is, apart from a lack of skills (see below), limited financial resources. While the number of learners using the various ICTs was surprisingly high, the results confirm Jansen's point above that not all learners have access to ICT resources to use. The literature also confirms that while many schools and their libraries in KwaZulu-Natal currently lack the infrastructure, financial resources, skills and specialist knowledge, every learner and educator should, in principle, have access to the technology for information, collaboration and professional development purposes (Education Library Information and Technology Services, 2012). The CAPS (South African Department of Basic Education, 2018) has revealed that infrastructure, equipment and finances for ICTs are the school's responsibility and that in information technology, learners must work individually on a computer during contact time and need access to the Internet. In the light of the results of this study, this is not always possible.

5.2.3 Learners' attitudes towards using ICTs

Kankam (2018) points out that the use of ICTs provides a vast number of educational benefits to learners including offering a host of ideas, a broad array of information and engaging, interactive opportunities to teachers and learners. It was evident from the responses of the grade 11 learners (see Table 8) that a substantial majority of them either strongly agreed, 84 (47%) or agreed 66 (37%) that "Using ICTs is a good idea". Interestingly, 16% of the learners disagreed with the statement but unfortunately, no provision was made in the questionnaire to ascertain their reasons for disagreement. There was no significant difference between girls and boys in the study concerning their attitudes towards using ICTs. As with the current study, Al Mahmud (2011) who investigated learners' attitudes towards the use of ICT found that most of the learners had positive attitudes regarding its use. Moreover, as in the current study, Al

Mahmud (2011) also found no significant difference between boys and girls in their attitudes to technology.

In a similar vein, the responses to the statement "I really find it beneficial to use ICTs" was overwhelmingly positive with 162 (90%) of the learner participants agreeing (either strongly agree or agree). Again, only a small minority, 18 (10%) were in disagreement. The responses from the learners were encouraging since the vast majority indicated that using ICTs is beneficial for them, so it is promising that all learners should end up using ICTs to, for example, access information to help them with school work. Several studies (Al-Ruz and Khasawneh, 2011; Fu, 2013; Lin, Wang and Lin; 2012; Srivastava et al., 2014) confirmed the view that using ICTs helps facilitate teaching and learning for both teachers and learners in the classroom and are thus beneficial.

The TAM theorises that a user's attitude, which reflects favourable or unfavourable feelings towards using an information system, is determined jointly by perceived ease of use and perceived usefulness (Venkatesh and Davis, 1996). In this study, the user is a learner and the information system are the ICTs. The responses from the learners in terms of the statement "Using ICTs is favourable for me" were again positive with 68 (38%) learners strongly agreeing with the statement and 52 (29%) learners agreeing. However, the percentages here are not as high as with the first two statements and this is further illustrated by the 55 (31%) learners who disagreed with the statement. Thus, the negative view regarding the favourableness of ICTs could well be a reflection of limited access to the resources on the part of some learners as a result of limited finance and limited infrastructure including access to the Internet. The lack of skills may also be a contributing factor. Sobikwa and Ditsa (2017) study confirmed that ICTs have not permeated many learning institutions in many developing countries, due to the numerous socioeconomic and technological barriers or challenges. Arguably, this situation would negatively impact on users or potential users' attitudes toward ICTs.

When asked whether they were "positive to using ICTs" learners' responses were again largely affirmative with 147 (82%) either agreeing or strongly agreeing with being positive. Twenty-six (14%) were in disagreement and this negative attitude again possibly reflecting or being a consequence of their lack of access to financial resources and ICT infrastructure as well as the

possibility of inadequate ICT skills on their part. The findings of Al Mahmud (2011) regarding learners' attitudes towards the use of ICTs noted above are again relevant here. However, the number of learners with negative attitudes towards ICTs is of concern.

5.2.4 The amount of time learners spend using ICTs

Previous studies that adopted the TAM identified two main categories of external variables, namely, individual differences and system characteristics (Tabar, 2014). Individual differences identified included competency, domain knowledge, self-efficacy, gender, language, age and education. System characteristics included accessibility, visibility, interface and relevance (Tabar, 2014). In the current study, the amount of time spent using ICTs can be linked with these categories, namely, individual differences and system characteristics. When asked the amount of time they spend using ICTs, 135 (75%) reported spending less than five to six hours per week and only 15 (9%) reported spending 10 to 20 hours per week using ICTs. The learners' responses thus showed that most learners use ICTs for an hour or less a day and some substantially less than this. The researcher believes that the relatively small amount of time most learners spend using ICTs is due to a lack of access to ICTs, a lack of ICT skills, and a lack of Internet connectivity and data. The absence of these barriers would, arguably, result in more hours being spent using ICTs. It needs to be pointed out that there are schools that do not have ICT infrastructure such as a computer laboratory at all, and those that have ICT infrastructure have other issues, for example, learners not having enough time to access computers as the school computers are used during school hours. Sobikwa and Ditsa (2017) pointed out that factors such as digital literacy, knowledge, availability and accessibility of ICT resources influence the time spent using ICTs for learning and teaching practices in particular.

5.2.5 Learners' competence in the use of ICTs

According to Mkhize (2018), the acquisition of ICT skills alone is not enough to effectively utilise ICT pedagogically. The article by Jansen (2015) and the study by Sundarjee, Ntuli and Chikasa (2014) indicated that learners in most schools do not have enough skills and there is insufficient infrastructure to operate computers with ease. However, a majority of the grade 11 learners in the current study, 109 (61%) were of the opinion that they had sufficient skills to use ICTs. It needs to be noted that learners were not "tested" and there is the possibility that there were learners who overestimated their ICT competency. Nonetheless, a majority of the

learners believed they had sufficient skills. However, a substantial minority, 71 (39%) of the learners highlighted that they did not have sufficient skills to use ICTs. It does need to be borne in mind that the grade 11 learners are the generation of the 21st Century (Millennium generation) and were thus born during a time when technology (generally speaking) is readily available. Odede (2013: 58) stated that the use of the ICTs is spreading rapidly into education particularly in high schools, with a huge impact in many areas and covering all the taught subjects. It is, arguably, a matter of time before all high schools in KwaZulu-Natal are similarly impacted.

Sundarjee, Ntuli and Chikasa (2014) pointed out that training in isolated skills on hardware and software can have a limited impact on learner practice. However, the vast majority of grade 11 learners in the current study, 169 (94%) stated that they had not received any training at all regarding ICTs. While this finding does not necessarily imply that learners do not have ICT skills (as one can be self-taught particularly in this digital era) it does provide some explanation why so many learners believed that they had insufficient skills to use ICTs. Jansen (2015) and Sundarjee, Ntuli and Chikasa (2014) confirmed that most school learners do not receive ICT training to operate computers with ease.

5.2.6 Challenges faced by learners in the use of ICTs

In the study, learners were asked what problems they encountered when using ICTs. Interestingly, access to ICTs per se did not emerge as a problem (an "Other" option in addition to the fixed responses was provided) but rather the "Cost of access to ICT" being mentioned by the largest number of learners, that is, 60 (34%). The next most mentioned problems were "Viruses" and the "Unreliability of sources" being mentioned by 56 (31%) and 43 (24%) of respondents respectively. Interestingly, only 25 (14%) of the learners mentioned "Lack of skills" as a problem as opposed to the 71 (39%) learners who mentioned having insufficient skills in the previous question. The reason for this discrepancy is not clear. These results are largely consistent with the literature concerning ICTs in other developing countries. Kankam (2017: 107) in a study of high school learners in Ghana, for example, pointed out that "the external barriers that are common to learners include slow and poor Internet connections, lack of ICT skills, access restrictions, and inadequate facilities (computers and computer laboratories)."

5.2.7 Learners' solutions to improve ease of use of ICTs

Sundarjee, Ntuli and Chikasa (2014) pointed out that learners need to be trained to get computer skills. When asked whether they agreed with the statement "Learning to use ICTs would be easy for me" the vast majority of grade 11 learners were confident in their responses with 152 (85%) either agreeing or strongly agreeing with the statement. A small minority 23 (12%) were in disagreement, being of the opinion that it would not be easy for them to learn to use ICTs. It is evident that learners could use ICTs if they received training and there was sufficient ICT infrastructure. Vodacom SA (2020) revealed that by 2030 every school would have enough ICT infrastructure and required ICT skills.

However, the confidence levels of the grade 11 learners were not as high in terms of their being able to get information using ICTs. When asked whether they agreed or not with the question "Would you find it easy to get information using ICTs to do what you want to do?" only half (50%) of the learners either agreed or strongly agreed with the question. While 11 (6%) of the learners were neutral, it was a substantial minority of learners, 79 (44%) who disagreed with the statement indicating that they perceived finding information using ICTs as a daunting task and thus questioning their ability to do so.

Finally, the confidence levels of the learners were again high in relation to the third statement "It would be easy for me to become skilful at using ICTs". Here,65 (36%) of the learners strongly agreed and 76 (42%) agreed with the statement. Again, a small minority, 30 (16%) were not of the view that it would be easy for them to become skilful at using ICTs. Thus, except for their ability to use ICTs to get information, the majority of grade 11 learners were positive in terms of their ability to learn to use ICTs and thus become skilful in their use. It is evident that solutions to improve the use of ICTs lies in relevant training being provided. It is also evident that information retrieval skills need to be part of the training. Matlala (2015) indicated that public schools in South Africa could look forward to joining the digital education revolution. As noted in Chapter two, President Cyril Ramaphosa in his State of the Nation address on 13 February 2020 announced that every learner in South Africa would, over the next six years, be provided with digital workbooks and textbooks on a tablet device (South African Government, 2020). Should this occur, what is going to be crucial for the ultimate success of this rollout, is training in the use of the ICTs.

5.3 Discussion of results pertaining to teachers

The associated increase in popularity of the Internet and rapid growth of ICTs may have positive effects on the potential for e-learning. For this to occur, teachers need to increasingly utilise available technologies (even though they may be limited) to enhance their learners' learning experiences mindful of the fact that learning is enhanced by finding suitable information sources (Mamba and Isabirye, 2015: 11). This section of the chapter discusses the results of the interviews held with 18 grade 11 teachers (including HoDs) from the two selected high schools. As noted and discussed, the study employed the TAM as its theoretical framework. Before discussing the results, the effect of external variables on ICT use by teachers is briefly discussed.

5.3.1 Effect of external variables on ICT use by teachers

According to Szajna (1996), external variables provide the possibility of examining the contextual factors which are often significant barriers to actual system use. They are those factors outside of the theoretical model that have the possibility of causing a positive or negative effect on system use. The study by Sundarjee, Ntuli and Chikasa (2014) revealed that ICT infrastructure and support are not a significant predictor of ICT usage by school teachers. Although the schools may have enough ICT infrastructure and support, it is not guaranteed that the teachers would utilise the ICT in their curriculum. However, in contrast, Kankam (2017: 107), Mkhize (2018) and Nsibirwa and Odede (2018) found that the level of ICT infrastructure and support is a significant factor in the use of ICT by both school teachers and learners.

5.3.2 Types of ICTs that are used by teachers

The development of ICTs and the Internet have undergone rapid progression over the past years. As pointed out, ICT infrastructure includes computer hardware, software and communication networks (Mutsvunguma, 2013). The responses from the participating grade 11 teachers in the two schools revealed that different types of ICTs existed in the schools, namely, computer laboratories with computers, printers, projectors, and tablets although S1 appeared to be better resourced. When asked what types of ICTs they use, it was found that most respondents used their laptops, smartphones, tablets and, to a lesser extent, desktops to access information. The respondents further indicated that they mostly use ICTs at home and school while two mentioned using ICTs at an Internet café to connect to the Internet. Home

usage of ICTs by four of the teachers was linked to preparing their work for the next day. The final question regarding ICTs usage asked respondents the purpose of their ICT usage. The most mentioned purposes were using ICTs to access information and for curriculum development. While some respondents indicated that using ICTs was time-consuming it was faster than using the traditional chalk and blackboard. They also stated that it was easy for learners to understand pictures and videos displayed using a projector. Six respondents pointed to ICTs being used for printing and photocopying notes, test papers and learners' reports. This latter finding is in accordance with the findings of Sobikwa and Ditsa (2017) who, in their study, revealed that computers in schools were used mainly for administrative purposes, such as student records, recording examination marks, producing school reports and creating timetables. Finally, a few respondents revealed that they use ICTs to store learners' information.

Thus, while the two selected schools have ICT infrastructure, it was not sufficient for all the teachers to use ICTs for curriculum delivery. There were too many learners and an insufficient number of computers available to accommodate all the school learners. Furthermore, the laboratory computers had no connections to the Internet. This is a major shortcoming in terms of accessing the vast amounts of resources available online. As the literature has indicated and pointed out, a computer (or another device) with an Internet connection and proper software installed is necessary to gain access to online electronic resources. Without this specific infrastructure, it is not possible to access and use online electronic resources (Mutsvunguma, 2013). In terms of integrating ICTs in curriculum delivery, Wastiau et al. (2013) conducted an exploratory study probing secondary education teachers' beliefs about ICT integration. The study found that roughly 25% of the participants used ICT for preparation and communication purposes rather than instruction delivery or assigning students ICT-based tasks. These findings resonate with those of the current study in that there were teachers who used ICTs for what could be referred to as administrative purposes, that is the printing and photocopying of notes, tests and reports while others used the technology for information storage purposes.

5.3.3 Teachers' attitudes towards using ICTs

Abedalaziz et al. (2013) make the point that users' attitudes towards using technology could impact teaching and learning in the classroom. More specifically, as pointed out by Sundarjee,

Ntuli and Chikasa (2014), teachers' attitudes towards using ICTs for curriculum delivery significantly affects their utilisation of ICTs. This means that the teachers who have a positive attitude towards utilising ICT for teaching and learning purposes are likely to integrate ICTs into the curriculum while those with a negative attitude are less likely to do so (Sundarjee, Ntuli and Chikasa, 2014).

In Section three of the interview schedule respondents were asked a series of questions regarding their attitudes towards using ICTs. Most of the participating teachers from the two schools (in fact all the teachers from S2) indicated that they liked to use ICTs in curriculum delivery. Various reasons were provided for their positive attitudes. These included ICTs being faster than manual methods and learners understanding more easily if they watch videos. It was also mentioned that learners can ask questions via social networks after school. However, there were also concerns. One teacher in fact felt that the use of ICTs for curriculum development was not a good idea (but did not elaborate further) while the lack of ICT skills, particularly among senior teachers, was raised as a concern. The problem of Internet connectivity was also pointed to. As outlined in Table 12 the vast majority (16 of the 18) of the teachers were 36 years of age or older and of these, seven were older than 46 years. The researcher believes that it is possibly the more "senior" teachers who did not utilise ICTs while doing their tertiary studies and they may well be the teachers in need of training in ICT skills for curriculum delivery.

Achieving meaningful use of ICTs in the field of education can be influenced by many factors, which include technology availability, accessibility of ICTs equipment and technical and administrative support (Al-Ruz and Khasawneh, 2011; Fu, 2013; Lin, Wang and Lin, 2012; Srivastava et al., 2014). These are all factors that applied to a greater or lesser degree to the two schools in the study. In addition, one can add the attitudes of teachers to the use of ICTs as well, as outlined above, their skills in using ICTs (the issue of skills is further discussed under 5.3.4 below). When asked whether ICTs have influenced curriculum delivery, the majority of the teachers answered in the affirmative. Similar reasons to those given above were provided such as speed of delivery of the curriculum and learners' faster understanding of content. It was also pointed out that most teachers have their own laptops which makes curriculum delivery easier and that most learners use smartphones to learn and retrieve

information for assignments. A contrary opinion was provided by one teacher who felt that ICTs were not influencing curriculum delivery in rural areas and the teachers and learners in these areas were not familiar with ICTs.

In the last of the questions directed at ascertaining teachers' attitudes towards using ICTs respondents were asked if the usage of ICT was improving their teaching performance. All of the teachers from S1 and five of the eight from S2 answered in the affirmative. Various reasons were given by the respondents and these are provided in point form below:

- Use of videos help learners understand easily
- Social networks used to communicate with learners while at home
- ICTs enable the gathering of more knowledge from experts around the world
- Information is saved on laptops and notes/information are sent to learners instead of writing on the board
- Projectors are used to display information during class.

While there was one respondent who believed that ICTs did not improve teaching performance the lack of skills on the part of both teachers and learners was pointed to and this made the delivery of information to learners using ICTs more challenging.

5.3.4 Teachers' competence in the use of ICTs

According to Mkhize (2018), ICT skills alone for teachers are insufficient to effectively utilise ICT pedagogically. While it may be relatively simple to teach how to use technology, this is not the case for learning how to use technology as an educational tool. All the grade 11 teachers except for one were of the opinion that they had the skills for accessing information using ICTs. Dzansi and Amedzo (2014) argued that teachers need training in using ICTs but that they also need knowledge and skills to use ICT in pedagogy. Thus, it could be argued that while the vast majority of teachers felt they had the skills for accessing information using ICTs, they did not all have the skills necessary to integrate ICTs in curriculum delivery. This is further evident in the teachers' responses to the second question regarding teachers' competence in the use of ICTs. Here, the respondents were asked how they rated their ICT skills. Most respondents (14), rated their skills as good, three as average and one as poor. Thus, the results showed that most

of the teachers considered their skills in using ICTs as good but not all were applying them to access information for curriculum delivery. As pointed out earlier, some respondents used ICTs for administrative purposes, such as keeping learners' records and doing school reports. It is evident, however, as the study by Dzansi and Amedzo (2014) confirmed, that while teachers need ICT training, they also need digital literacy to use ICT in pedagogy.

In the third (and final) question regarding teachers' ICT competence, respondents were asked whether they had received training regarding the use of ICTs. Again, all respondents except for one indicated that they had received some form of ICT training. Eleven of the 17 respondents indicated that this training occurred during their tertiary studies while five indicated that they received training in community programmes. Sundarjee, Ntuli and Chikasa (2014) pointed out that teacher training in isolated skills on hardware and software can have a limited impact on teacher practice. It is evident that the training received by respondents did not equip all of them for using ICTs in curriculum delivery and that more specialised training in integrating ICTs into teaching practice is needed. Furthermore, it is important to bear in mind that skills acquired during workshops and courses do not guarantee their use by teachers when they return to their classrooms. Consequently, while gaining ICT skills in workshops and courses need to be provided and encouraged, sufficient attention needs to be focused on the transferability and application of the acquired skills in the classroom (Sundarjee, Ntuli and Chikasa, 2014).

5.3.5 Challenges teachers face in using ICTs

In the penultimate question, respondents were asked what problems (challenges) they encountered when using ICTs. Respondents from both schools pointed out that the schools do not have enough computers to accommodate all learners when teaching computer lessons. A lack of skills on the part of learners was mentioned as was a lack of training on their, the teachers, part. While some teachers may have the skills, it was pointed out that technology is constantly changing (and hence the need to constantly upgrade one's skills). One respondent stated that learners come from different backgrounds and some do not have smartphones making it difficult to use ICTs in curriculum delivery. Internet connectivity was also mentioned as a problem as well as teachers having to use their own data to access information which can be expensive.

The shortage of computers and educational software may have severe repercussions for the potential use of ICT to aid the teaching (and one might add learning) process by accessing relevant information for teaching (Chikasa, Ntuli and Sundarjee, 2014) and it does appear that this is a significant factor in both of the selected schools in the current study. The findings of the study by Mdlongwa (2012) differed from those of the current study. Mdlongwa (2012) assessed the availability of ICT resources and how this can affect teachers' perceptions and attitudes towards using ICT. The study found that good practices were reported in schools that include high-quality ICT resources (Mdlongwa, 2012). In the current study, it is evident that such resources were lacking and this was a significant factor impacting the use of ICTs by both the teachers and the learners. The results showed that one of the senior teachers did not have ICT skills and never attended ICT training. The point was also made that the "older" teachers were less likely to have exposure to much ICT training during their tertiary studies and thus found using ICT in curriculum delivery a challenge. This links in with the study by Wastiau et al. (2013) which revealed that age differences have also been reported to hinder ICT implementation in teaching.

5.3.6 Teachers' solutions to improve ease of use of ICTs

Matlala (2015) indicated that public schools in South Africa could look forward to joining the digital education revolution as some of their private school counterparts have been experiencing for the past few years. However, education experts have cautioned against a rush to provide tablets and other digital infrastructure before a solid strategy and fundamentals have been put in place (Matlala, 2015). When the grade 11 teachers were asked what solutions could be employed to overcome the identified challenges (problems). The dominant response from most respondents from both schools was that more funds for ICT infrastructure and training were needed. The training envisaged for both teachers and learners was basic computer training. The need for the government to provide free data (for Internet access), as well as tablets for learners to use at home, was suggested. As has been pointed out earlier in this discussion, it was announced by President Ramaphosa that the government would provide every learner in the country with digital workbooks and textbooks on a tablet device (South African Government, 2020). While this, of course, would be an extremely positive development, there is the caution of educational specialists noted above that a solid strategy and fundamentals first need to be in place. Adequate training for both learners and teachers

and ICT infrastructure development (including basics such as electricity supply) would be crucial to this process.

5.4 Summary

This chapter discussed the results of the study. The discussion of the results was done in a comprehensive manner that followed the research results and literature review and aligned them, where possible, with the theoretical framework employed for the study. The results of the study relating to both the learners and the teachers in the two selected secondary schools were structured around five themes which were derived from the study's objectives and research questions. These were the ICT resources that were used, attitudes towards using ICTs, competence in the use of ICTs, challenges to the use of ICTs and, finally, solutions to improve the ease of use of ICTs.

Chapter six, the final chapter in which the study's conclusions and recommendations are presented, follows.

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

The study's results were presented in Chapter four and the discussion of the results was presented in Chapter five. This, the final chapter of the dissertation, presents a brief overview of the study and revisits the research questions on which the study was based. This is followed by the conclusions arrived at in which the significant results are highlighted and the study recommendations. The chapter ends with the limitations of the study and suggestions for further research.

The study aimed to investigate the use of ICTs in two selected secondary schools in the Dr NDZ Municipality in the Province of KwaZulu-Natal. The study was underpinned by the TAM of Venkatesh and Davis (1996) and employed a mixed-methods approach for collecting data. In terms of this approach, both qualitative and quantitative data were collected. The two data collections methods adopted were:

- Questionnaire directed at 180 grade 11 learners from the two schools selected via simple random sampling and which collected largely quantitative data.
- Interviews directed at a sample of 18 grade 11 teachers selected via purposive sampling and collecting qualitative data in the main.

In responding to the aim of the study, five research questions were posed and which provided a basis for both the questionnaire and the interview schedule:

- What types of ICTs are used by learners and teachers in the selected secondary schools in KwaZulu-Natal?
- What are the attitudes of learners and teachers towards the use of ICTs?
- How competent are learners and teachers in the use of ICTs?
- What are the challenges learners and teachers face in the use of ICTs?
- What are the solutions to improve ease of use of ICTs at secondary schools in the Dr NDZ Municipality?

Results of the study were presented in Chapter four and discussed in Chapter five. As in the discussion of the results, the research questions outlined above provide the basis for the conclusions that follow.

6.2 Conclusions of the study

The following conclusions are reached based on the results of the study as well as the literature reviewed:

6.2.1 Types of ICTs used by learners and teachers in the selected secondary schools

- Those learners who had access to ICTs used mainly smartphones, tablets and laptops – all of which could be considered portable devices. While a majority of learners had such access (72% and 52% for smartphones and tablets respectively) there are clearly several users who do not have access to ICTs at all. The relatively limited amount of time the learners spent using ICTs – the majority (75%) indicating that they spent less than five to six hours per week using ICTs – is perhaps indicative of the problems associated with access to ICTs including Internet access and the cost of data.

- All the participating teachers, understandably given their positions, used one or more of the ICTs mentioned as well as desktop computers. The places where teachers used ICTs were the Internet café (for Internet access), the schools and their homes. The purposes for which teachers used ICTs were to access information, and curriculum delivery and development. However, ICTs were also used for administrative purposes, that is, for printing and photocopying notes, test papers and reports as well as for storing learner information.

- ICT infrastructure was not adequate in the two selected secondary schools. One of the main reasons was the limited number of computers available to be used by the grade 11 learners. As a consequence, those learners who could do so used their smartphones, tablets and laptops to access information. While both schools have computer laboratories, the physical space is too small and there are insufficient computers to accommodate all the learners in a class.

6.2.2 Attitudes of learners and teachers towards the use of ICTs

- Most of the learners surveyed had a positive attitude towards using ICTs. For example, the vast majority of learners believed that the use of ICTs was a good idea and that it was beneficial to use ICTs. Interestingly not nearly as many learners believed that using ICTs was favourable for them reflecting, perhaps, their lack of access to and use of ICTs. This is possibly reflected in just under half (47%) of learners only using ICTs for two to four hours per week. Generally speaking, it was only a small minority of learners who were negative about using ICTs.

- With one exception all grade 11 teachers from the two schools were positive towards using ICTs for curriculum delivery. Benefits to using ICTs in curriculum delivery included ICTs being faster than using manual methods and that learners understand more easily by watching videos. Problems included the lack of ICT skills among teachers and that of Internet connectivity.

- The majority of teachers opined that using ICTs was improving their teaching performance and while reasons for this included being able to get more knowledge from experts around the world and being able to use social networks to communicate with learners while at home, there were also some challenges.

6.2.3 Competence of the learners and teachers in the use of ICTs

- While a majority of grade 11 learners believed they had sufficient skills to use ICTs a substantial minority (39% representing 71 learners) were of the view that they did not have sufficient skills. It is evident that most learners were self-taught in that only six percent of learners indicated that they had some form of ICT training.

- Unlike the learners, the vast majority of teachers believed that they had the skills for accessing information using ICTs and that with the exception of one (who rated their ICT skills as poor) all rated their skills as either good or average. Again, with the exception of one, all the teacher participants had received training in ICTs.

- It must be noted that respondents' competence in ICTs was not measured but rather self-reported. It could be argued that there is a tendency to overestimate one's ICT skills and the strong need for training (which emerged) on the part of both learners and teachers, suggest that ICT skills were not as good as reported.

6.2.4 Challenges learners and teachers face in the use of ICTs

- Challenges (or problems) that more than 15% of the grade 11 secondary school learners mentioned (from a list given to them) were the cost of access to ICT, viruses and the unreliability of information. The latter two do reflect the importance of having appropriate ICT skills and thus training.

- The challenge most mentioned by teachers (in response to an open-ended question) was the shortage of computers in the schools which impacts on being able to provide the large number of learners with computer lessons. Also mentioned was a lack of skills on their own and the learners' part, the cost of data to access information, lack of Internet connectivity and that not all learners have the requisite technology such as smartphones, all of which make it difficult to use ICTs in curriculum delivery.

6.2.5 Solutions to improve the ease of use of ICTs at the selected secondary schools

- The majority of grade 11 teachers from both schools pointed to more funds for ICT infrastructure and training for both teachers and learners being needed as a solution to overcome the challenges encountered. It was also suggested that the government provides free data and tablets for learners.
- While the majority of learners expressed confidence in learning to use ICTs and becoming skilful in their use, an interesting finding was the significant minority of learners (44%) who stated that they would not find it easy to get information using ICTs.

6.3 Recommendations of the study

The following recommendations are put forward in light of the results and conclusions noted above and in terms of the study's objectives:

The study's first objective was to determine the types of ICT resources that learners and teachers in the selected KwaZulu-Natal secondary schools use. It emerged that largely portable devices (smartphones, tablets and laptops) were used by both learners and teachers and while teachers had access to such devices there were several learners who did not. This points to the limited amount of time the learners spent using ICTS but, more importantly, that the ICT infrastructure at the surveyed schools was inadequate with the schools having insufficient computers to accommodate the learners. In the current economic circumstances, schools cannot solely rely on government (provincial and national education departments) and that thinking "outside the box" is needed.

- It is thus recommended the management of the two schools explore the possibility of seeking assistance from organisations such as the Department for International Development (DFID); the Organisation for Economic Co-operation and Development (OECD); the Department for International Development (DFID); Development Gateway: ICT and education-related community sites; UNESCO: resources on ICTs and education; USAID: dot-EDU; and the World Bank: ICTs and Education in providing additional ICTs such as computers and tablets, enlarging the existing computer laboratories and providing ICT training. In the interim, efforts should be made by the school libraries (where they exist) in collaboration with school management, to explore possibilities to ensure the provision of WIFI for both learners and teachers connect with their devices to access online resources. The above organisations could be approached in this regard as well as the leading cellular companies in South Africa, namely, Vodacom, MTN, Cell-C and Telkom. As outlined in the literature review Vodacom, in particular, has several initiatives relating to ICT equipment, connectivity and skills development in schools and the school management need to take a proactive approach to take advantage of these initiatives.

The second objective was to determine the learners and teachers' attitudes towards using ICTs. It was concluded that while learners, in the main, had a positive attitude towards using ICTs., there was a substantial minority who believed that using ICTs was not favourable for them. Teachers were also, in the main, positive about using ICTs for curriculum delivery.

- It is recommended that efforts in both schools be made to build on this positivity and to seek ways and means of effectively using the resources already available for

curriculum delivery while efforts are made to acquire the necessary funding for ICT infrastructure and training as outlined in the first recommendation above. Essentially focus should be on "how to make do with less" and best practices from other schools and contexts need to be investigated. Particular effort should be made to address those learners who believe that ICT usage is not favourable to them.

The third objective was to assess the learners and teachers' competence in the use ICTs. Results highlighted that while a majority of learners felt they had sufficient skills to use ICTs there was a substantial minority who felt that they did not have the skills. Furthermore, a substantial majority of learners had not undergone any form of ICT training. A lack of training was not the case with most of the teachers but it was evident that their skills in using ICTs and, in particular, integrating ICTs in curriculum delivery needed updating.

- It is recommended that companies like DYNA Training (Pty) Ltd, Transcend Corporate Advisors and Training, and Khulisane Academy (Pty) Ltd could be approached to assist with building on the existing ICT skills of the teachers in the first instance. The rationale behind this approach is that teachers, once they have the necessary skills, can more effectively assist the learners to obtain computer skills. Consideration could also be given to approaching cellular phone companies mentioned earlier to assist both learners and teachers with training in ICTs. Vodacom, for example, has several programmes such as the Mobile Education Programme, the Teachers Centre, Youth Academy and e-libraries for training learners and teachers in schools. Once again, the schools need to take the initiative in exploring the possibility of benefitting from these initiatives.

The fourth objective was to identify challenges faced by learners and teachers in the use of ICTs. The shortage of computers and space emerged as a significant concern on the part of the teachers as was the cost of data to access the Internet on the part of both teachers and learners. Resolving these issues as well as the other challenges identified is addressed by the first recommendation above.

- However, it is recommended, given the concerns relating to the cost of data, that school management add their voices to the growing call for Internet access for educational purposes to be freely available. The main cellular companies in South Africa could also

continue to be approached in this regard or, at least, to substantially reduce the cost of data.

The final objective was to suggest solutions to improve the ease of use of ICTs at secondary schools in the Dr NDZ Municipality. The main solution put forward by the teachers was funding for both ICT infrastructure and training in ICTs.

- The first recommendation mentioned above is again applicable here and every effort must be made by schools' management to secure such funding given the financial constraints, as mentioned, on the part of the government. Companies involved in ICTs (and not only cellular companies) need to be identified and approached. Foundations such as the Bill and Melinda Gates Foundation should also be considered. At the most basic level, schools should consider fundraising strategies to enable the purchasing of modern mobile devices, for example.

Lastly, it was noted that a significant minority of grade 11 learners stated that they would not find it easy to get information using ICTs and this points to the need for information literacy skills.

- Thus, the final recommendation also relates to training but, more specifically, training in information literacy skills. While training in the use of ICTs is of course essential for both learners and teachers (and integrating ICTs into curriculum delivery for the latter) any ICT training programme for learners and teachers needs to incorporate an information literacy component.

6.4 Limitations of the study

All social research comes with limitations; thus, none can be perfect (Kankam, 2017). Due to financial constraints, this study was limited to two secondary schools in the Dr NDZ Municipality. Ideally, more schools could have been involved in order to provide a more comprehensive "picture" of the use of ICTs by grade 11 learners and teachers in secondary schools in the region. Secondly, not all 28 grade 11 teachers (including the two principals) who were approached to participate in the study did so. While 18 teachers (including three HoDs) were interviewed it can be assumed, as with the number of schools participating above, that a

more comprehensive "picture" of the views of grade 11 teachers could have been achieved had all 28 teachers participated. Unfortunately, the researcher was unable to interview the principals of the two schools as their perspectives, as management, on the use of ICTs would have been valuable. However, as noted, three of the teacher participants were HoDs which did allow, to some extent, for a management perspective. Finally, the study was conducted during the time of the COVID-19 pandemic. The researcher was expected to conduct face-to-face interviews with teachers but due to the pandemic protocols, telephonic interviews were conducted. This led to the high rate of attrition mentioned above and also possibly affected the quality of the data obtained given the shortcomings associated with telephonic communication.

6.5 Suggestions for future research

The following suggestions for future research are put forward:

- This study reported on the use of ICTs in two secondary schools within the Dr NDZ Municipality in KwaZulu-Natal. It is suggested that similar studies in both under- and well-resourced schools in other municipalities and in other provinces be conducted. While these may result in similar results, they may well reveal new results thereby providing new insights into and understanding of ICT usage in schools.

- The current study was limited to grade 11 learners. It was assumed that these learners had more experience in using ICTs. However, results revealed the lack of ICT skills among a significant minority of learners and it is suggested that the studies above be conducted with learners from all grades, including primary, as intervention in this regard is needed as early as possible in the education of learners.

- The study identified the need for ICT training among both teachers and learners. It is, therefore, suggested that future studies focus on the issue of training – determining what the situation is and what needs to be done in this regard including who should be responsible for such training.

- Finally, the study explored how the TAM variables influence the actual usage of a system at a given time. As technology continuously changes and user services are

improved, there is a need to establish how such changes affect user interaction with a system. This gap in the literature needs to be filled by examining the magnitude of effects caused by such changes and exposing the different influences on the TAM variables.

6.6 Summary

In this, the last chapter of the dissertation, a brief overview of the study was provided and the research questions that formed the basis of the study were revisited. This was followed by the conclusions arrived at in which the major results of the study were highlighted. Various recommendations in the light of the objectives of the study were put forward. Training and adequate ICT infrastructure (and thus funding) were core to the recommendations. The limitations of the study were discussed and the chapter ended with suggestions for further research.

REFERENCES

Abedalaziz, N., Jamaluddin, S. and Leng, C. 2013. Measuring attitudes toward computer and internet usage among postgraduate students in Malaysia. *Turkish Online Journal of Educational Technology*. 12. Available from: https://www.researchgate.net/publication/281090107_Measuring_attitudes_toward_computer_and_internet_usage_among_postgraduate_students_in_Malaysia (Accessed: 21 March 2019).

Adeleke, O.A. 2017. An investigation of the extent of automation of public libraries in South West Nigeria. PhD Thesis. Pietermaritzburg: University of KwaZulu-Natal. Available from: https://researchspace.ukzn.ac.za/handle/10413/14491. (Accessed: 08 June 2020).

Ahmad, S. 2012. Attitudinal disposition of Nigerian university students towards social networking sites. *International Journal of Emerging Technologies in Learning (IJET),* 7(1): 62-66.

Ajzen, I. 2002. Perceived behavioural control, self-efficacy, locus of control, and the Theory of Planned Behaviour. *Journal of Applied Social Psychology*, 32(4): 665-683.

Al Mahmud, A. 2011. Students' attitude towards Internet: A study on private universities of Bangladesh. *European Journal of Business and Management*, 3(6): 9-19.

Al-Ruz, J. A. and Khasawneh, S. 2011. Jordanian pre-service teachers' and technology integration: A human resource development approach. *Journal of Educational Technology & Society*, 14(4): 77-87. Available from: http://www.ifets.info/journals/14_4/8.pdf. (Accessed: 12 April 2020).

Babbie, E. R. 2011. *Adventures in social research: data analysis using IBM SPSS statistics*. Newbury Park: Pine Forge Press.

Babbie, E. and Mouton, J. 2011. *The practice of social research*. Cape Town: Oxford University Press.

Baglione, L. A. 2011. *Writing a research paper in political science*: *A practical guide to inquiry, structure, and methods*. Thousand Oaks, Calif.: CQ Press.

Birley, G. and Moreland, N. 1998. *A practical guide to academic research*. London: Routledge.

Bizcommunity. 2020. Basic education to give an update on school reopening. *Bizcommunity News,* 12 May. Available from: https://www.bizcommunity.com. (Accessed: 15 May 2020).

Bladergroen, M., Bytheway, A., Chigona, W., Cox, S., Dumas, C. and Van Zyl, I. J. 2012. Educator discourses on ICT in Education. *International Journal of Education and Development using Information and Communication Technology (IJEDICT)*, 8(2): 107-119.

Bothma, T. J. D., Cosijn. E., Fourie. I. and Penzhorn, C. 2017. *Navigating information literacy*. Cape Town: Pearson Academic.

Clarke, A. E. 2005. *Situational analysis: Grounded theory after the postmodern turn*. Thousand Oaks, CA: Sage.

Creswell, J. W. 2014. *Research design*. 3rd ed. Los Angeles: Sage.

Czerniewicz, L. and Brown, C. 2013. The habitus of digital "strangers" in higher education. *British Journal of Educational Technology*, 44(1): 44-53.

Davis, F. D. 1989. Perceived usefulness, perceived ease of use and user acceptance of information technology. *MIS Quarterly*, 13: 319-340.

Department of Education White Paper. 2004. *White paper on e-Education*: *Transforming learning and teaching through information and communication technologies (ICTs)*. Pretoria: Government Printer.

Duran, E. 2013. Investigation on views and attitudes of students in Faculty of Education about reading and writing on screen. *Educational Research and Review*, 8(5): 203-211.

Dzansi, Y. and Amedzo, K. 2014. *Integrating ICT into rural South African schools: Possible solutions for challenges*. Bloemfontein: Kamla-Raj.

Education Library Information and Technology Services. 2012. *National guidelines for school library and information services*. Available from: https://www.education.gov.za/portals/0/documents/publications/national%20guidelines%20for%20school%20libraries_small.pdf?ver=2015-01-30-081525-540 (Accessed 23 July 2019).

Encyclopaedia Britannica. 2018. KwaZulu Natal province South Africa. Available from: https://www.britannica.com/place/KwaZulu-Natal. (Accessed: 03 July 2018).

Fu, J. 2013. Complexity of ICT in education: A critical literature review and its implications. *International Journal of Education and Development using ICT*, 9(1): 112-125.

Garcia-Valcarcel, A. and Arras, A. 2011. Information and communication technology usage and achievement of Turkish students in PISA. *Turkish Online Journal of Educational Technology*, 9(2): 116-124.

Gbolahan, O. 2014. Predictors of legislators' ICT acceptance and use in the performance of legislative functions at the Nigerian National Assembly. PhD Thesis. Pietermaritzburg: University of KwaZulu-Natal. Available from: https://researchspace.ukzn.ac.za/handle/10413/10812 (Accessed: 08 June 2020).

Gefen, D., and Straub, D. W. 1997. Gender difference in the perception and use of e-mail: An extension of technology acceptance model. *MIS Quarterly*, 21: 389-399.

Godin, G. 1993. *The theories of reasoned action and planned behavior: Overview of findings, emerging research problems and usefulness for exercise promotion*. Available from: https://doi.org/10.1080/10413209308411311 (Accessed: 11 June 2020).

Harry Gwala municipality. 2018. Harry Gwala District municipality map. Available from: https://municipalities.co.za/map/118/harry-gwala-district-municipality (Accessed: 13 June 2019).

International Federation of Library Associations and Institutions (IFLA). 2019. *Information literacy section*. Available from: https://www.ifla.org/information-literacy (Accessed: 26 February 2020).

Gudmundsdottir, G. 2010. When does ICT support education in South Africa? The importance of teachers' capabilities and the relevance of language. *Information Technology for Development,* 16. Available from: https://www.researchgate.net/publication/232924274_When_does_ICT_support_education_in_South_Africa_The_importance_of_teachers'_capabilities_and_the_relevance_of_language (Accessed: 11 April 2019).

International Telecommunication Union. 2019. *Delivering digital solutions to improve well-being and catalyze development: ITU-D Digital Services and Applications*. Available from: https://www.itu.int/itu-d/sites/ict-applications/ (Accessed: 23 September 2020).

Jansen, L. 2015. KZN pupils: Tech has improved learning. *The Mercury*, 28 July. Available from: https://www.iol.co.za/news/south-africa/kwazulu-natal/kzn-pupils-tech-has-improved-learning-1891984. (Accessed: 08 April 2019).

Kankam, P.K. 2017. Internet-based information behavior of high school learners in Ashanti region of Ghana. PhD Thesis. Pietermaritzburg: University of KwaZulu-Natal. Available from: http://researchspace.ukzn.ac.za/handle/10413/15892 (Accessed: 06 June 2019).

Karsenti, T., Collin, S. and Harper-Merrett, T. 2011. *Pedagogical integration of ICT: Success and challenges from 100+ African schools*. Ottawa, ON: IDRC.

Kothari, C. R. 2014. *Research methodology: Methods and techniques*. New Delhi: New Age International.

Krejcie, R. V. and Morgan, D. W. 1970. Determining sample size for research activities. *Educational and Psychological Measurement*, 30: 607-610.

Kumar, R. 2014. *Research methodology*. London: Sage.

Kwet, M. 2014. Operation phakisa education: why a secret? Mass surveillance, inequality and race in South Africa's emerging national e-education system. *First Monday*, 22(12). Available from: https://firstmonday.org/ojs/index.php/fm/article/view/8054/6585 (Accessed: 07 May 2020).

Lai, P. C. 2017. The literature review of technology adoption models and theories for the novelty Technology. *Journal of Information Systems and Technology Management*, 14(1): 2138.

Lee, D. S. 2008. Randomized experiments from non-random selection in U.S. House elections, *Journal of Econometrics,* 142(2): 675-697.

Lin, J., Wang, P and Lin, I. 2012. Pedagogy technology: A two-dimensional model for teachers' ICT integration. *British Journal of Educational Technology,* 43: 97-108. Available from: https://www.researchgate.net/publication/227672766_Pedagogytechnology_A_two-dimensional_model_for_teachers'_ICT_integration (Accessed: 28 March 2019).

Mamba, S. M. N. and Isabirye, N. 2015. A framework to guide development through ICTs in rural areas in South Africa. *Information Technology for Development*, 21(1): 135-150.

Maree, K. 2016. *Planning a research proposal, first steps in research*. Pretoria: Van Schaik Publishers.

Matlala, M. E. 2015. The use of the internet by grade 11 learners from selected schools in the Sekhukhune District, Makhuduthamaga Local Municipality in Limpopo Province. MIS Dissertation. Pietermaritzburg: University of KwaZulu-Natal. Available from: https://researchspace.ukzn.ac.za/handle/10413/13694 (Accessed: 08 June 2020).

Mdlongwa, T. 2012. Information and communication technology as a means of enhancing education in schools in South Africa: Challenges, benefits and recommendations. *Policy Brief*, Briefing No. 80, August. Pretoria: Africa Institute of South Africa.

Meyer, I. A. and Gent, P. R. 2016. *The status of ICT in education in South Africa and the way forward.* Available from: https://nect.org.za/publications/technical-reports/the-state-of-ict-in-education-in-south-africa/ (Accessed: 13 July 2020).

Mkhize, S. M. 2018. An implementation analysis of e-learning: a case study of Kwapata Secondary School, Dambuza Township. MSc Dissertation. Pietermaritzburg: University of KwaZulu-Natal. Available from: http://researchspace.ukzn.ac.za/handle/10413/16316 (Accessed: 06 June 2019).

Mutsvunguma, G. 2013. Predictors of users' preferences for digital information at the Oceanographic Research Institute (ORI) Library, Durban. MIS Dissertation. Pietermaritzburg: University of KwaZulu-Natal. Available from: http://researchspace.ukzn.ac.za/handle/10413/16316 (Accessed: 06 June 2019).

Mutula, S. M. and Mutula, D. L. 2007. ICT integration in Botswana secondary schools: Digital divide factor and implications for information literacy. *African Journal of Library and Information Science*, 17(2): 133-143.

Nestor, P. 2012. *Research methods in psychology*: *Investigating human behaviour*. Los Angeles, CA: Sage.

Neuman, W. L. 2006. *Social research methods qualitative and quantitavie approaches.* 6th ed. Upper Saddle River: Pearson.

Neumann, W. L. 2000. *Social research methods: qualitative and quantitative approaches*. 4th ed. Boston: Allyn & Bacon.

Ngqakamba, S. 2020. Coronavirus: authorities pull out all stops, high level meeting planned with KZN school. *News24,* 13 May. Available from: https://www.news24.com>News (Accessed 18 May 2020).

Noar, S. M. and Zimmerman, R. S. 2005. Health behavior theory and cumulative knowledge regarding health behaviors: Are we moving in the right direction? *Health Education Research*, 20(3): 275-290.

Odede, S. 2013. Attitude of undergraduates towards educational usage of the internet: A case of library schools in Delta and Edo States of Nigeria. *International Journal of Science and Technology Educational Research*, 4(4): 57-62.

Odede, I. R. and Nsibirwa, Z. 2018. Information literacy skills in using electronic information resources. *Library Philosophy and Practice*, 1947. Available from: http://digitalcommons.unl.edu/libphilprac/1947. (Accessed: 07 June 2019).

O'Leary, Z. 2014. *The essential guide to doing your research project*. London: Sage.

Padayachee, K. 2017. The myths and realities of generational cohort theory on ICT integration in education: A South African perspective. *The African Journal of Information Systems*, 10(1): 55-84.

Pickard, A. 2013. *Research methods in information*. Chicago: Neal-Schuman.

Rajesh, M. 2003. A study of the problems associated with ICT adaptability in developing countries in the context of distance education. *Turkish On-line Journal of Distance Education-TOJDE*, 4(2), April. Available from: https://tojde.anadolu.edu.tr/tojde10/articles/Rajesh.htm (Accessed: 07 June 2019).

Ranjit, K. 2014. *Research methodology*. London: Sage.

Roberts, P. and Henderson, R. 2000. Information technology acceptance in a sample of government employees: A test of the technology acceptance model. *Interacting with Computers*, 12(5): 427-443. Available from: https://academic.oup.com/iwc/article-abstract/12/5/427/714481?redirectedFrom=fulltext (Accessed: 12 July 2020).

Sarfoet, K. 2011. Technology and gender equity: Rural and urban students' attitudes towards information and communication technology. *Journal of Media and Communication Studies,* 3(6): 221-230.

Silva, P. M. and Dias, G. A. 2007. Theories about technology acceptance: Why the user accepts or rejects the information technology. *Brazilian Journal of Information Science*, 1(2): 69-86.

Singh, K. 2020a. Coronavirus lockdown: KZN Education Department to use online education to school pupils. *News24*, 24 April. Available from: https://www.news24.com/news24/SouthAfrica/News/coronavirus-lockdown-kzn-education-department-to-use-radio-classes-to-help-matric-pupils-20200324 (Accessed: 18 May 2020).

Singh, N. 2020b. KZN schools start new term online. *News24*, 17 April. Available from: https://www.news24.com/witness/news/new-term-starts-online-20200416 (Accessed: 16 May 2020).

Shih, Y. Y. and Fang, K. 2004. The use of a Decomposed Theory of Planned Behavior to study Internet banking in Taiwan. *Internet Research*, 14(3): 213-223.

Siddiquah, A and Salim, Z. 2017. The ICT Facilities, Skills, Usage, and the Problems Faced by the Students of Higher Education. *EURASIA Journal of Mathematics Science and Technology Education,* 13(8):4987-4994. Available from: DOI: 10.12973/eurasia.2017.00977a (Accessed: 18 November 2021).

Sobikwa, D. and Ditsa, G. 2017. The usage of Gauteng online schools systems for basic education in Soweto. *Journal of Information Technology & Economic Development*, 8(1). Available from: https://pdfs.semanticscholar.org/973f/335a1064f7f492957263e047fb7cc1be9ece.pdf (Accessed: 12 April 2019).

South African Department of Basic Education. 2018. *Curriculum and assessment policy statement (CAPS): Information technology.* Available from: https://www.education.gov.za/portals/0/documents/publications/caps%20commnets/fet/information%20technology%20grades%2010%20-%2012%20edited.pdf?ver=2018-08-29-154512-793 (Accessed: 06 June 2020).

South African Government. 2020. *Minister Angie Motshekga on basic education sector plans to support learners during coronavirus COVID-19 lockdown.* Available from: https://www.gov.za/speeches/minister-angie-motshekga-basic-education-sector-plans-support-learners-during-covid-19 (Accessed: 06 June 2020).

Srivastava, N., Hinton, G., Krizhevsky, A., Sutskever, I. and Salakhutdinov, R. 2014. Dropout: a simple way to prevent neural networks from overfitting. *Journal of Machine Learning Research*, 15(1): 1929-1958.

Sundarjee, R., Ntuli, M. and Chikasa, S. 2014. ICT integration in teaching: An uncomfortable zone for teachers: A case of schools in Johannesburg. *Education as Change,* 18(1): 137-150.

Stringer, E. T. 2013. *Action research*. Los Angeles: Sage.

Sutori. 2016. *South African ICT policy in education*. Available from: https://www.sutori.com/story/south-african-ict-policy-in-education--4TDZoNikwg7b9U8MpCFi64m4 (Accessed: 17 June 2021).

Szajna, B. 1996. Empirical evaluation of the revised technology acceptance model. *Management Science*, 42(1): 85-92.

Tabar, M. 2014. Factors affecting students' attitude towards technology. *International Journal of Management and Humanity Sciences,* 3(10): 3209-3214.

Tao, D. 2008. Understanding intention to use electronic information resources: A theoretical extension of the technology acceptance model (TAM). AMIA. *Annual Symposium proceedings*, 717-21. Available from: https://www.researchgate.net/publication/23463811_Understanding_Intention_to_Use_Electronic_Information_Resources_A_Theoretical_Extension_of_the_Technology_Acceptance_Model_TAM/link/543c0e2f0cf2d6698be3646f/download (Accessed: 18 August 2020).

Taylor, S. and Todd, P. A. 1995. Understanding information technology usage: A test of competing models. *Information Systems Research*, 6: 144-176.

Torres-Gastelu, C. A. and Kiss, G. 2016. Perceptions of students towards ICT competencies at the university. *Informatics in Education*, 15(2): 319-338.

Trochim, W. M. 2008. *The research methods knowledge base*. 2nd ed. Available from: http://www.socialresearchmethods.net/kb/ (Accessed: 22 April 2018).

United Republic of Tanzania. 2008. *National information and communications technology policy.* Available from: https://tanzict.files.wordpress.com/2016/05/national-ict-policy-proofed-final-nic-review-2.pdf (Accessed: 27 May 2019).

Venkatesh, V. and Davis, F. D. 1996. A model of the antecedents of perceived ease of use: Development and test. *Decision Sciences*, 27(3): 451-481.

Venkatesh, V., Morris, M. G., Davis, G. B. and Davis, F. D. 2003. User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27(3): 425-478.

Vijayasarathy, L. R. 2004. Predicting consumer intentions to use on-line shopping: The case for an augmented Technology Acceptance Model. *Information & Management*, 41: 747-762. Available from: http://dx.doi.org/10.1016/j.im.2003.08.011 (Accessed: 21 June 2020).

Vodacom SA. 2019. *Sustainability report.* 31 March. Available from: http://www.vodacom-reports.co.za/integrated-reports/ir-2019/pdf/sustainability-report.pdf (Accessed: 27 June 2020).

Wastiau, P., Blamire, V., Kearney, C., Quittre, V., Van de Gaer, E. and Monseur, C. 2013. The use of ICT in education: A survey of schools in Europe. *European Journal of Education*, Part I: 1-27.

Yusoff, Y., Muhammad, Z., Salehuddin, M., Mohd Z., Mohd, S. and Pasah, E. 2008. Individual differences, perceived ease of use, and perceived usefulness in the e-library usage. *Computer and Information Science*, 2. 10.553. Available from: https://www.researchgate.net/publication/228730428_Individual_Differences_Perceived_Ease_of_Use_and_Perceived_Usefulness_in_the_E-Library_Usage (Accessed: 11 May 2020).

APPENDICES

Appendix 1: Gatekeepers' letters

GINYANE HIGH SCHOOL P.O BOX 168 CREIGHTON 3263

08 October 2019

Dr Zaweddo Nsimbirwa (UKZN)

Dear Sir/ Madam

Reference: Confirmation Of Research authorization : Andile Ndimbovu Student number 218032315

This notification serves to confirm that Mr. Andile Ndimbovu Student number ;218032315 has been authorized by the school to collect research data on the topic : The use of ICT in secondary schools at DNZ Municipality for his cegree in Masters in Library and Information Science at the University of KwaZululu Natal.

It is anticipated that the findings of the study will be of immense contribution to the education sector.
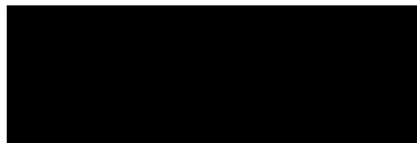
Mr L.S. Zama (Principal)
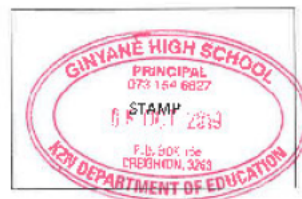
SONYONGWANA HIGH SCHOOL

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education
REPUBLIC OF SOUTH AFRICA
KwaZulu Natal Department of Education

esemfundo
ININGIZIMU AFRIKA
KwaZulu Natal Umnyango Wemfundo

Principal: Mr. N. S. Xulu

2019 OCTOBER 08

TO: Dr Zawedde Nsibirwa (UKZN)

SUBJECT: LETTER CONFIRMING THE SCHOOL ACCEPTING STUDENT TO DO A RESEARCH

FROM: THE SCHOOL PRINCIPAL

Greetings

The above matter has a reference. The school received and application from Mr Ndimbovu Andile Pheneus, that he wish to do a research with grade 11 learners on ICT programme at school. The school is now confirming that the student has been granted this opportunity to access the information with the assistance from a teacher within our school.

Hope you find the above in order.

Yours in service

KS XULU (School Principal)

Appendix 2: Consent form

Dear Participant,

My name is Andile Ndimbovu (218032315). I am a Masters (information studies) candidate studying at the University of KwaZulu-Natal, Howard College / Pietermaritzburg Campus. The title of my research is: The use of information and communication technologies (ICTs) by grade 11 learners and teachers at public secondary schools within Dr Nkosazana Dlamini Zuma Municipality, KwaZulu-Natal. The aim of the study is to assess the use and access of ICTs in selected secondary schools at Dr NDZ municipality. I am interested in interviewing you so as to share your experiences and observations on the subject matter.

Please note that:

- The information that you provide will be used for scholarly research only.
- Your participation is entirely voluntary. You have a choice to participate, not to participate or stop participating in the research. You will not be penalized for taking such an action.
- Your views in this interview will be presented anonymously. Neither your name nor identity will be disclosed in any form in the study.
- The interview will take about one hour.
- The record as well as other items associated with the interview will be held in a password-protected file accessible only to myself and my supervisors. After a period of 5 years, in line with the rules of the university, it will be disposed by shredding and burning.
- If you agree to participate please sign the declaration attached to this statement (a separate sheet will be provided for signatures)

I can be contacted at: School of Social Sciences, University of KwaZulu-Natal, Pietermaritzburg Campus, Scottsville, Pietermaritzburg.
Email: ndimbovu.andile@gmail.com
Cell: 0717921266.

My supervisor is Dr Zawedde Nsibirwa who is located at the School of Social Sciences, Pietermaritzburg Campus of the University of KwaZulu-Natal. Contact details: email: Nsibirwaz@ukzn.ac.za Phone number: 0332605685.

The Humanities and Social Sciences Research Ethics Committee contact details are as follows: Ms Phumelele Ximba, University of KwaZulu-Natal, Research Office, Email: ximbap@ukzn.ac.za,Phone number +27312603587.

Thank you for your contribution to this research.

DECLARATION

I……………………………………………………………………… *(full names of participant)* hereby confirm that I understand the contents of this document and the nature of the research project, and I consent to participating in the research project.

I understand that I am at liberty to withdraw from the project at any time, should I so desire. I understand the intention of the research. I hereby agree to participate.

I consent / do not consent to have this interview recorded (if applicable)

SIGNATURE OF PARTICIPANT   DATE

…………………………………………………………………………………

Appendix 3: Questionnaire

The survey instrument for collecting information from learners

This questionnaire is for collecting data on the use of information and communication technology (ICT) by grade 11 learners from the selected schools in the Dr Nkosazana Dlamini Zuma Municipality, KwaZulu-Natal. The study aims to investigate the use and access of ICTs in these secondary schools for information.

Please note: All the information collected in this study will be used strictly for writing academic research. Individual identification of participants is not necessary for this study.

Instructions for filling in the questionnaire

a) Indicate the most appropriate answers by a tick (√) in the brackets.

b) Where the space is provided, write your answer in it.

c) Please use a pen to answer this questionnaire.

Section One: Background information

Gender

1.1. What is your gender?

1.1.1. Male	
1.1.2. Female	

1.2. What is your age?

Section Two: Types of ICTs resources that exist in selected KwaZulu-Natal secondary schools.

(ICTs refers to technologies that provide access to information through telecommunications. It is similar to Information Technology (IT), but focuses primarily on communication technologies. This includes the Internet, wireless networks, computers, cell phones, and other communication mediums)

2.1. What type(s) of ICTs do you use? (Please select all applicable options)

2.1.1. Laptop	
2.1.2. Desktop	
2.1.3. Tablet	
2.1.4. Smart phone	
2.1.5. Other (please specify) ……………………………………………………………………………………….	

Section Three: The learners' attitude towards using ICTs.

3.1. Using ICTs is a good idea? (Please select one answer)

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

3.2. I really find it beneficial to use ICTs? (Please select one answer)

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

3.4. Using ICTs is favourable for me? (Please select one answer)

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

3.5. Are you positive towards using ICTs? (Please select one answer)

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

3.6. What amount of time do you spend using ICTs? (Please select one answer)

3.6.1. Less than one hour per week	
3.6.2. 2-4 hours per week	
3.6.3. 5-6 hours per week	
3.6.4. 7-9 hours per week	
3.6.5. 10-20 hours per week	
3.6.6. Other (Please specify…) …………………………………………………………………………….	

Section Four: The learners' competence in the use of ICTs.

4.1. Do you have sufficient skills to use ICTs?

4.1.1. Yes	
4.1.2. No	

If No, please specify what skills you require

…………………………………………………………………………………………..

4.2. Did you receive any training regarding ICTs?

4.2.1. Yes	
4.2.2. No	

If Yes, where?

……………………………………………………………………………………………
……………………………………………………………………………………………

4.3. How do you rate the level of digital literacy? (Digital literacy encompasses the knowledge and skill of using a computer and related technology to access information).

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

Section Five: Challenges faced by learners in the use of ICTs

5.1. What problems do you encounter when using ICTs? (Please select all applicable options)

5.1.2. Inaccurate information	
5.1.2. Unreliability of sources	
5.1.3. Difficulty in locating relevant information	
5.1.4. Cost of access to ICT	
5.1.5. Viruses	
5.1.6. Lack of skills	
5.1.7. Other (Please specify) ………………………………………………………………	

Section Six: Solutions to improve the ease of use of ICTs in secondary schools at Dr NDZ municipality.

The purpose of this section was to establish from learners whether learning to use ICTs would boost their confidence when using ICTs to access information.

6.1. Learning to use ICTs would be easy for me. (Please select one answer)

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

6.2. Would you find it easy to get information using ICTs to do what you want to do? (Please select one answer).

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

6.3. It would be easy for me to become skilful at using ICTs. (Please select one answer).

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

THANK YOU VERY MUCH FOR YOUR TIME AND PARTICIPATION

Appendix 4: Interview schedule

STAFF INTERVIEW

Survey interview for collecting data on the use of information and communication technology (ICT) by teachers, HoDs, and principals from the selected schools in the Dr Nkosazana Dlamini Zuma Municipality, ward 8 in KwaZulu-Natal province. The study aims to investigate the use and access of ICTs in these secondary schools.

Please note: All the information collected in this study will be used strictly for writing and academic research. Individual identification of participants is not important in this study.

Section One: Background information

1.1. What is your age?

…………………………………………………………………………………………......

1.2.What is your gender?

…………………………………………………………………………………………..

1.3.What is your position?

………………………………………………………………………………………….

1.4. What is your qualification?

…………………………………………………………………………………………..

Section Two: Types of ICT resources that exist in selected KwaZulu-Natal secondary schools.

2.1. What types of ICTs does the school have?

……………………………………………………………………………………………
……………………………………………………………………………………………
……………………………………………………………………………………………

2.2. What types of ICTs do you use?

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……………………………………………………………………………………………
…………………………………………………………………………………………..

2.3. Where do you usually use ICTs?

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2.3. What is the purpose of your ICT usage?

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……

Section Three: the teachers, HoDs and Principals attitudes towards using ICTs.

3.1. Do you like to use ICT in curriculum delivery?
If No, why not?

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……

If Yes, how do you feel about using ICTs for curriculum delivery?

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…….

3.2. Have ICTs influenced curriculum delivery?

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3.3. Is the usage of ICT improving your teaching performance?

If Yes, how?

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…….

If No, please explain why not.

…………………………………………………………………………………………………
…………………………………………………………………………………………………
…………………………………………………………………………………………………

Section Four: The teachers, HODs and Principals competence in the use of ICTs.

4.1. Do you have skills for accessing information using ICT?

4.1.1. Yes	
4.1.2. No	

4.2. How do you rate your ICT skill?

4.2.1. Excellent	
4.2.2. Good	
4.2.3. Not sure	
4.2.4. Average	
4.2.5. Poor	
4.2.6. Very poor	

4.3. Did you receive training regarding the use of ICTs?

4.3.1. Yes	
4.3.2. No	

If Yes, please specify where and when you received the training

…………………………………………………………………………………………………

Section Five: The challenges teachers face in the utilization of ICTs

5.1. What problems do you encounter if any when using ICTs?

…………………………………………………………………………………………………
…………………………………………………………………………………………………
…………………………………………………………………………………………………
…………………………………………………………………………………………………

Section Six: Solutions to improve ease of use of ICTs at secondary schools in Dr NDZ municipality

6.1. If you do encounter problems, what solutions can be employed to overcome these challenges?

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……………………………………………………………………………………………………

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THANK YOU VERY MUCH FOR YOUR TIME AND PARTICIPATION!!!

Appendix 5: Proof of editing letter

Athol Leach (Proofreading and Editing)

31 Park Rd
Fisherhaven
Hermanus 7200
Email: atholleach@gmail.com Cell: 0846667799   25 August 2021

To Whom It May Concern

This letter serves to confirm that I have edited the following Master of Information Studies (MIS) dissertation (Information Studies Programme, School of Social Sciences – UKZN) by Andile Pheneus Ndimbovu:

"THE USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES (ICTS) BY GRADE 11 LEARNERS AND TEACHERS AT PUBLIC SECONDARY SCHOOLS WITHIN DR   NKOSAZANA DLAMINI ZUMA MUNICIPALITY, KWAZULU-NATAL."

The document was edited in terms of grammar, spelling, punctuation and overall style. In doing so use was made of MS Word's "Track changes" facility thus providing the student with the opportunity to reject or accept the changes made. Please note that while I have checked for consistency of referencing in terms of format (both in-text and in the list of references), I have not checked the veracity of the sources themselves or that the bibliographic information is complete.

The tracked document is on file.

Sincerely

Athol Leach

(MIS, Natal)