



**Information and Communication Technologies Integration into Early Childhood
Development Education in Masvingo Province, Zimbabwe: A Critical Analysis**

by

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

Doctor of Philosophy in Computer Science Education

at the

University of KwaZulu-Natal

Supervisor: Professor D. W. Govender

January 2019

ABSTRACT

ICT integration has been considered a silver bullet in different studies internationally. As a result, the multi-faceted Zimbabwean primary education system has made initiatives to adopt ICT. Early Childhood Development (ECD) has not been an exception to this as it is currently in the process of integrating ICTs into its curriculum. Teachers are now required to keep current with this development by integrating it into their classes. The aim of this study was to critically analyse the integration of ICTs in ECD education from the teachers' perspective. The general image emerging from the literature about developing countries' ICT education was that it is marred by severe lack of ICT resources, infrastructure, competence and funding challenges. To this end, research questions examined teachers' ICT integration attitudes, competencies and challenges, and how ICT integration can be improved for ECD education. The Diffusion of Innovations and the Unified Theory of Acceptance and Use of Technology theories guided this study as analytic frameworks. A sequential explanatory mixed-methods approach using a cross-sectional survey was employed. Data were generated through questionnaires, interviews and focus group discussions in two phases. Questionnaires were administered in phase 1; interviews and focus group discussions in phase 2, based on outcomes of phase 1. The results indicated that the teachers' attitudes were mostly positive. The research also unveiled the dearth of ICT resources and infrastructure in schools and ICT competencies among ECD teachers. To overcome resource constraints, the study discovered that teachers subserviently conformed to their employers' requirements by using their personal resources. The most significant predictors of ECD teachers' attitudes, accounting for 87.6% of the variance, were Perceived Usefulness, Extrinsic Motivation, Perceived Behavioural Control and Complexity. Therefore, there is need to embed ICT integration requirements into ECD education policies; for more parental and alumni support through fundraising activities; to improve training and extend it to all teachers prior to ICT integration. It is recommended that government urgently drafts an ICT policy on ECD education backed by an ICT audit conducted in all primary schools; recruits ECD experts to spearhead ICT integration; electrifies schools in rural areas; and introduces an ICT integration levy.

Keywords: ICT integration, ECD education, Zimbabwe, Masvingo, Attitude, Perceptions, Competence, Predictor, DOI, UTAUT

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Information and Communication Technologies (ICT) integration into Early Childhood Development (ECD) education in Zimbabwe: A critical analysis by Ronald Manhibi A thesis submitted in fulfilment of the requirements for the degree of Doctor of Philosophy in Computer Science Education at the University of KwaZulu-Natal Supervisor: Professor D. W. Govender January 2019 ABSTRACT ICT integration has been considered a silver bullet in different studies internationally. ICTs are gradually becoming part of the Zimbabwean education system. Early Childhood Development (ECD) has not been an exception to this as it is currently in the process of integrating ICTs into its curriculum. Teachers are now required to keep current with this development by integrating it into their classes. The aim of this study was to critically analyse the integration of ICTs in ECD education from the teachers' perspective. The general image emerging from the literature about developing countries' ICT education was that it is marred by severe lack of ICT resources, infrastructure, competence and by funding challenges. To this end, research questions examined teachers' ICT integration attitudes, competencies and challenges, and how ICT integration can be improved for ECD education. The Diffusion of Innovations and the Unified Theory of Acceptance and Use of Technology theories guided this study as analytic frameworks. A sequential explanatory mixed-methods approach using a cross-sectional survey was employed. Data were generated through questionnaires, interviews and focus

DEDICATION

I dedicate this thesis to my late father, David Kwirirai Manhibi; you will forever be my source of motivation and inspiration.

May your soul rest in peace.

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TABLE OF ABBREVIATIONS

ACOT	Apple Classroom of Tomorrow
ADEA	Association for the Development of Education in Africa
AfDB	African Development Bank
AU	African Union
CK	Content knowledge
DOI	Diffusion of Innovation
DSI	District Schools Inspector
EAI	Equally Appearing Intervals
ECD	Early Childhood Development
ECE	Early Childhood Education
EFA	Education for All
EM	Extrinsic Motivation
FC	Facilitating Conditions
HSSREC	Humanities and Social Sciences Research Ethics Committee
ICT	Information and Communications Technology
IS	Information Systems
IT	Information Technology
ITU	International Telecommunication Union
KIE	Kigali Institute of Education
LDC	Least Developed Country
MEPD	Ministry of Energy and Power Development
MHTESTD	Ministry of Higher and Tertiary Education, Science and Technology Development
MICTPCS	Ministry of Information Communication Technology Postal and Courier Services
MoPSE	Ministry of Primary and Secondary Education
NREN	National Research and Education Network
PCK	Pedagogical Content Knowledge
PE	Performance Expectancy
PED	Provincial Education Director
PEOU	Perceived Ease of Use
PK	Pedagogical knowledge
PU	Perceived Usefulness
R&D	Research and development

REN	Research and Education Network
SADC	Southern African Development Community
SDC	School Development Committee
SDG	Sustainable Development Goal
SI	Schools Inspector
SNV	Stichting Nederlandse Vrijwilligers
SPSS	Statistical Package for Social Scientists
STEAM	Science Technology Engineering Arts and Mathematics
STEM	Science Technology Engineering and Mathematics
TAM	Technology Acceptance Model
TCK	Technological Content Knowledge
TK	Technology knowledge
TPACK	Technological Pedagogical and Content Knowledge
TPB	Theory of Planned Behaviour
TPCK	Technological Pedagogical Content Knowledge
TPK	Technological Pedagogical Knowledge
TRA	Theory of Reasoned Action
TSP	Transitional Stabilisation Programme
TVET	Technical and Vocational Education and Training
UK	United Kingdom
UKZN	University of KwaZulu-Natal
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	The United Nations International Children's Emergency Fund
UNOCHA	The United Nations Office for the Coordination of Humanitarian Affairs
UPR	Universal Periodic Review
USA	United States of America
USF	Universal Service Fund
UTAUT	Unified Theory of Acceptance and Use of Technology
UTAUT	Unified Theory of Acceptance and Use of Technology
WEF	World Education Forum
WOZA	Women of Zimbabwe Arise
ZIMASSET	Zimbabwe Agenda for Sustainable Socio-Economic Transformation

SECTION ONE: INTRODUCTION, LITERATURE REVIEW, THEORETICAL FRAMEWORK AND METHODOLOGY

Chapter One – Introduction

1.1 Information and communication technology integration in early childhood education – Background

1.1.1 Introduction

According to Bilbao-Osorio and Dutta (cited in Tarisayi & Manhibi, 2017c, p. 34), “advances in the field of ICT have drastically changed teaching and learning because they can perform a variety of tasks that could not be easily performed before they emerged”. Young learners now need to be “highly qualified in order to keep up with the economic, intellectual and cultural progress demanded by our societies” (Rodriguez, 2012, p. 47). Fernandez and Mena (as cited in Rodriguez, 2012, p. 47) suggest that teachers’ roles and conceptions of teaching have also changed since they have to develop new competencies involving ICT tools for personal and professional use. Globally, the concept of ICT in education came to the fore about five decades ago when the calculator was first used as a tool for improving students’ mathematics skills (Flosse Posse, 2005; UNESCO, 2014; White, 2008).

Recent trends and developments have made ICT a topical issue in the context of education in general and Early Childhood Development (ECD) in particular. The World Bank and The United Nations International Children's Emergency Fund (UNICEF) recognises the provision of ECD services as a key developmental goal that gears up young children to be technologically competent in today’s digital economy (Kim, 2016; Nziramasanga, 1999; UNICEF, 2015). Contemporary literature indicates that the African Union (AU) set up a ministerial forum on the integration of ICT in education and training as part of its 50-year guiding strategy from 2013 to 2063 (AfDB, 2016a; The African Union Commission, 2015). The ministerial forum has been advocating for member states to integrate ICT into their education systems. Zimbabwe has not been an exception to this development as evidenced by the country’s ICT educational programmes (Dokora, 2015; Nziramasanga, 1999). Nziramasanga (1999, p. 243) reports that “there is a tendency to introduce new subject areas without the requisite textbooks,

equipment and expertise”. The Ministry of Primary and Secondary Education (MoPSE) has been unveiling ICT-related reforms in a marathon-like way, which has been criticised for exerting pressure on educators who are required to comply (Gambanga, 2016). Ihmeideh (cited in Mndzebele, 2013a, p. 1) claims that “in Africa, the introduction of computers into primary and secondary education is a recent phenomenon”. Based on the ICT integration initiatives described above, Zimbabwe, in sub-Saharan Africa, seems to be in its infancy in the introduction of ICT in basic education.

1.1.2 Policy positions

In 2001, MoPSE drafted an ICT policy on education to pave way for the government’s ICT education integration programmes. The policy outlined the requirements for achieving maximum integration in terms of computer equipment for teaching, learning and professional development for teachers. According to Andrew and Durand (2001, p. 7), the policy stipulated that “ICT provides educators with a powerful new tool to enhance the learning opportunities for students and the professional development opportunities for the teachers”. Key education policy frameworks formulated for ECD since 2000 include: Secretary’s Circular Number 14 of 2004 (Zimbabwe); Statutory (SI) 106 of 2005 (Zimbabwe); Director’s Circular Number 12 of 2005 (Zimbabwe); and Director’s Circular Number 48 of 2007 (Zimbabwe) (Gunhu, Mugweni, & Dhlomo, 2011; Samkange, 2016).

The second national ICT policy unveiled in 2016 and launched in 2018, states that some of the ICT sector challenges include inadequate information communications infrastructure; inadequate commercial electricity; and a low digital literacy level (Machivenyika, 2018; MICTPCS, 2016). A recent Zimbabwean study revealed that “teachers also lacked competence, in-service training and technical support, as well as Technological Pedagogical Content Knowledge [TPCK] on how to integrate ICTs into teaching and learning” (Mandina, 2015, p. 95). Ms. Oley Dibba-Wadda, ADEA Executive Secretary (cited in AfDB, 2016a), speaking at the second African Ministerial Forum on ICT Integration in Education and Training confirmed that “ICT integration in the education sector is a technical and policy issue that would guarantee continuous training to both the teacher and learner” in Africa. Cheung et al. (2016, p. 46) argued that “whether a new technology can be successfully introduced in classrooms also depends on teachers’ attitudes towards technology, as teachers, in general,

have the autonomy to choose the technology that fits their pedagogical needs". This study regarded educators as the key ICT users and knowledge disseminators in the Zimbabwean education system, and therefore conducted a critical analysis of the use of ICT in ECD education teaching and learning activities.

1.1.3 ICT integration in education

Developed countries have been known to be fire-starters in integrating ICT into the education sector for teaching and learning purposes, with the developing countries often lagging behind, only to implement such innovations decades later. The penetration of ICT in Africa and other developing countries has been slow due to the factors mentioned above. According to the African Development Bank (AfDB) (2016a), once ICTs have become part of the education system, successful implementation and integration of the technologies is imminent. Previous studies have shown that adoption and integration processes of ICTs into the primary and secondary school education curriculum in this part of the world is dependent on the attitudes and perceptions of the stakeholders (regulators, educators and other learning facilitators), (Abraham & Wadhvani, 2013; AfDB, 2016a; Balanskat, Blamire, & Kefala, 2006; Govender, 2006; Konyana & Konyana, 2013; Livingstone, 2012; Mandina, 2015; Nziramasanga, 1999; Özdemir, 2017; Pohio, 2009; Rodriguez, 2012; The African Union Commission, 2015; UNESCO, 2002; Yildirim, 2007). However, most of these studies have not focused on the acceptance and adoption of ICT for teaching and learning activities in ECD education. Hence, the focus of this study was to evaluate the extent to which ICT was being integrated into elementary education, based on the teachers' experiences. Although attitudes are modelled as key in the prediction of teachers' ICT integration behaviour, other factors such as their competencies, teaching environment and access to ICT have also been found to be potential barriers in low-resourced schools (Eickelmann & Vennemann, 2017; Fu, 2013; Tondeur, Aesaert, Prestridge, & Els Consuegra, 2018).

1.1.4 ICT integration into ECD education

The developed world has a set of its own challenges in implementing ICT in the education sector. One of the United States of America's (USA's) major drawbacks is the small workforce available for teaching early childhood learners, as the sector is among some of the lowest-paid white-collar jobs in the region (Morgan, 2005). Musarurwa (2011a), further revealed that

early childhood education is still in its infancy around the globe and thus more research is required to understand ICT integration programmes designed for this sector. The USA Office of Educational Technology (cited in Livingstone, 2012, p. 2) reports that developed regions such as Europe and America in “recent years have seen a steady embedding of digital and networked technologies in the classroom, with widespread use of interactive whiteboards, virtual learning environments, educational computer games and increasing reliance on internet application including email and e-learning for both classroom and independent study”. Eurydice (also cited in Livingstone, 2012, p. 2) observed that according to a 2006 pan-European survey, “in comparison with the situation in 2001 ... the use of new technologies to teach reading at school has increased”. A European report on the impact of ICT on schools also revealed that “schools in most countries, however, are in the early phase of ICT adoption, characterised by patchy uncoordinated provision and use, some enhancement of the learning process, some development of e-learning, but no profound improvements in learning and teaching” (Balanskat et al., 2006, p. 2).

The integration of ICT in general and of ICT tools into the primary school education curriculum is yet to be fully realised in most developing African countries (Kashora, Chikwiri, & Kuranga, 2018; UNESCO, 2015). Teaching how to use ICTs for aiding teachers in the classroom and teaching how to teach ICTs are some of the conflicting roles that teacher training colleges have in trying to support education sector reforms. According to Musarurwa (2011a), one of the reasons why this challenge remains unaddressed, is that related government programmes are often implemented separately. Senator David Coltart, the Zimbabwean Minister of Education, Arts, Sports and Culture (MoEAS&C) from 2009 to 2013 (cited in Kamwendo, 2012) affirmed that “Zimbabwe’s education system has been regarded as one of the best in Africa but recently it has been falling behind the times. The global trends in the use of ICTs in education have left gaps in our education system.” It is against this background that this study critically analysed the integration of ICTs in Masvingo province, Zimbabwe from the ECD teachers’ perspective.

1.2 Rationale and significance of the study

The education ministry’s move to change the orientation of the national curriculum comes with its merits and demerits that need to be understood so that such programmes are

constantly improved should there be any future planned programmes (Dokora, 2015). Phiri (2016, p. 78) argues that

investing heavily in procuring computers and other ICT facilities would remain futile if the people who are supposed to use the said ICT tools are ignored ... computers and ICT facilities are useless in themselves if people who are supposed to use them are absent or do not appreciate such technologies ... teachers are a key component in the delivery of technological innovation in the classroom.

The initiative comes at a time when Zimbabwe is hard hit with a serious economic crisis that can pose a major threat to the proper implementation of rolling out a new curriculum framework, as the quality of education standards has been falling (Kamwendo, 2012; Makochekanwa, 2016; Murisa, 2010; ZIMCODD, 2016). Their opinions, the educators' feelings and attitudes will determine the success of MoPSE's ICT programmes. This will also have a knock-on effect on the kind of support that they will give towards the implementation of the programmes.

This study is significant in that it contributes to the professional development of ECD educators in the area of ICT by examining their teaching experiences of using it in their classrooms, which can potentially cascade to the learners. Musarurwa (2011a) asserts that the integration of ICT has been unprecedented but has not been met with an equal effort by teacher education colleges to expose and train teacher trainees in the use of ICT in the classroom. The study of educators' attitudes toward the integration of ICT could provide an important opportunity for understanding the professional development of educators from a Southern African perspective as Zimbabwe is situated at the epicentre of the region (UNESCO, 2015). This could potentially impact on the critical ICT integration decisions made by policymakers in the region as the researcher is of African descent.

According to Haymore-Sandholtz, Ringstaff, and Dwyer (as cited in Lloyd, 2005, p. 7) an Apple Classroom of Tomorrow (ACOT) study for the 1985–1995 period reported and concluded that there are four conditions for the effective integration of ICT in education. These may be summarised as being:

1. “the adoption of innovations and the creation of a collaborative environment are complementary conditions for change;
2. innovations introduced at only one level of the system are not likely to succeed;
3. the introduction of technology to schools can act as a catalyst for change, thereby enhancing restructuring efforts; and
4. teacher commitment to an innovation will not occur until they see a positive impact on their teaching.”

The conditions from the ACOT study are part of the researcher’s motivation to examine the integration of ICT in Zimbabwean ECD education as this part of the world has very few research materials on this matter. Based on the findings of this study, missing conditions can be identified and MoPSE will be more informed should there be any future technology integration programmes.

The researcher’s experience as an ICT lecturer at the Reformed Church University and external examiner of teacher education ICT programmes in local tertiary institutions awakened a desire to pursue a study on ICT integration in ECD education. The ICT competencies exhibited by the educators when they enrolled for the in-service Bachelor of Education (BEd) programme also led the researcher to seek to understand how ICT implementation was being facilitated by these educators. In addition to the abovementioned reasons, the study was also premised on the researcher’s participation in the curriculum review process. An evaluation of contemporary and completed research could imply that the implementation and use of ICTs in ECD education in the Zimbabwean context is an under-researched area that warrants an in-depth analysis.

1.3 The research problem

In spite of the opportunities afforded to Zimbabwean ECD teachers deployed to Masvingo province, their competences, attitudes and challenges engaging with ICT are still to be explored and understood. The discussion whether ICT has been successfully adopted well in the contexts of developing countries like Zimbabwe has been a subject of contemporary academic articles, yet little research on the views of the participants has emerged. Based on this it became critical to seek answers to the key question: To what extent, if any, does the

Masvingo province teachers' attitudes towards ICT, their ICT competences and challenges they face affect ICT integration into teaching and learning processes?

1.3.1 Purpose of the study

The aim of this research was to assess the use of ICTs for teaching and learning at the ECD educational level from the educators' perspective (UNESCO, MoEAS&C, & MHET, 2001). The research study was based on the critical questions listed below:

1.3.2 Aim

The aim of this research was to assess the use of ICTs for teaching and learning at the ECD educational level from the educators' perspective (UNESCO et al., 2001). The research study was based on the critical questions listed below:

1.3.3 Critical questions

1. What are the attitudes of ECD teachers in Masvingo towards the implementation of ICT in the ECD Curriculum? (Chapter Six)
2. What ICT competence do ECD teachers in Masvingo have in order to engage with ICT integration in teaching and learning? (Chapter Seven)
3. What are the challenges faced by ECD teachers when trying to integrate ICTs in teaching and learning processes? (Chapter Eight)
4. What is the best predictor of educators' attitudes towards ICT integration in ECD education? (Chapter Nine)
5. How can the integration of ICT in ECD education be enhanced? (Chapter Ten)

1.4 Definition of key terms used in this study

1.4.1 ICT

According to UNESCO (2002, 2014), ICT is defined as the combination of informatics technology with other related technologies, specifically communication technology. ICT has been defined differently depending on one's worldview and its importance in one's

environment. Blurton (cited in M. P. Mishra, Sharma, & Tripathi, 2008, p. 1) describes ICT as a “diverse set of technological tools and resources used to communicate, create, disseminate, store and manage information”.

The World Bank Group (2002, p. 3) regards ICT as “consist[ing] of hardware, software, networks, and media for collection, storage, processing, transmission, and presentation of information (voice, data, text, images)”; while Toomey (cited in Lloyd, 2005, p. 3) believes ICT

generally, relates to those technologies that are used for accessing, gathering, manipulating and presenting or communicating information, which could include hardware (e.g. computers and other devices); software applications; and connectivity (e.g. access to the internet, local networking infrastructure, video conferencing).

Based on the definitions above, ICT refers to a multiplicity of technologies and services used for communicating and managing information. In this study, ICT will be used to refer to the field of information communication technology tools used for teaching and learning purposes in the education sector.

1.4.2 Early childhood development

According to Wood (2015), ECD is a stage in life of critical change and development, spanning from birth to age eight where children attain the physical and mental skills they will use for the rest of their lives. In this study, ECD will be used to refer to services for children between birth and eight years of age, and the developmental stage of children between birth and eight years of age. In the Zimbabwean education system, school going-children in the ECD classes A and B will be aged 4–5 years and 5–6 years respectively.

1.4.3 Integration

“Integration” has many definitions depending on the context. InFocus (2011, p. 2) defines it “as a continuum, or a set of ordered stages, that describes the type and degree of connectedness between programs and services” and Margaret Rouse (cited in Ehrens, 2015) defines it as the act of bringing together smaller components into a single system that functions as one. When integration is related to the implementation and use of ICT, it is called ICT integration. According to Dockstader (1999, p. 74), “technology integration is having the

curriculum drive technology usage, not having technology drive the curriculum and organising the goals of curriculum and technology into a coordinated, harmonious whole". Hay (cited in Lloyd, 2005, p. 6) viewed "ICT integration as an equation made up equally of three domains, namely information literacy, information policy, and knowledge management"; while Wang and Woo (2007, cited in Bahati, 2010, p. 8 quoted Earle, 2002) to define it as the "process of using an ICT tool to enhance student learning. It is more of a process rather than a product."

1.4.4 Attitude

Attitude is a state of the mind towards something that can be used to explain an individual's behaviour towards it. It can take one the following three forms: positive, neutral and negative, based on other factors such as beliefs, feelings, experiences, environment and knowledge level (Culbertson, 1968; Pickens, 2005). According to Allport ((1935, p. 810) cited in Banaji & Heiphetz, 2010, p. 351; Pickens, 2005, p. 44), an attitude is defined "as a mental or neural state of readiness, organised through experience, exerting a directive or dynamic influence on the individual's response to all objects and situations to which it is related." In this study, ECD teachers were the subjects whose attitude was being investigated.

1.4.5 Competence and competency

According to Vincent (2008, p. 1) competence "is the quality or state of being functionally adequate or having sufficient knowledge, strength and skill. Competence is another word for an individual's know-how or skill". Schroeter (2009, p. 2) asserts that "competence refers to a potential ability and/or a capability to function in a given situation. Competency focuses on one's actual performance in a situation. This means that competence is required before one can expect to achieve competency." For the purposes of this study competence, competency and competencies are terms used to refer to the ICT skills exhibited and/or possessed by the educators in ECD education.

1.4.6 Predictor

Nugent (2013) defines a predictor as "a variant or other data utilised to approximate or foretell future performance, wellbeing, or another status". A predictor can be determined after a comprehensive analysis of all variables under consideration.

1.4.7 Teacher

In Zimbabwe, the term teacher (also referred to as educator), refers to an education practitioner, who imparts his or her acquired knowledge to learners in the primary and/or secondary education level at a formal or informal school. Senge ((2000, p. 26) cited in Zombwe, n.d., p. 3) said that a teacher is “an expert who is capable of imparting knowledge that will help learners to build, identify and to acquire skills that will be used to face the challenges in life. The teacher also provides the learners with knowledge, skills and values that enhance development.” In the context of this study, which was conducted in Zimbabwean primary schools, the terms teacher and educator are used interchangeably.

1.5 Outline of the research design and methodology

This study principally employed mixed methods to collect and analyse data. Questionnaires, focus group discussions and interviews were the methods used to generate data from a sample of 350 ECD teachers in the seven districts of Masvingo province. The sequential exploratory method was particularly employed where the quantitative data was collected in phase 1 and qualitative data collected upon generating themes in phase 2 of the study. Data was analysed and presented separately based on the critical research questions driving the study. Three hundred-and-nine questionnaires were returned and 306 were used in the data analysis. In the qualitative phase, 26 interviews and six focus group discussions were conducted. The next section presents the thesis structure.

1.6 Structure of thesis

This thesis is organised into 11 chapters that have been categorised into three sections as listed below. Section one outlines the introduction, literature review, theoretical framework and methodology in chapters one, two, three and four respectively; section two has a discussion of the data collection, data analysis and presentation of the study findings in Chapters Five to Ten; while section three concludes the thesis by summarising, interpreting the recommendations and suggesting future research in one chapter, Chapter Eleven.

SECTION ONE – INTRODUCTION, LITERATURE REVIEW, THEORETICAL FRAMEWORK AND METHODOLOGY:

Chapter One: Introduction and background – outlines the background, critical research questions, rationale and key definition of terms of the study. The chapter concludes by presenting the structure of the thesis.

Chapter Two: Literature review – is a review and synopsis of all the key related literature compiled for giving relevance to this study. The chapter's content is grounded on the critical questions drawn for this study.

Chapter Three: Theoretical framework – presents key theories used to explain technology and Information Systems' integration in previous studies. A theoretical framework mapped from the discussed theories is outlined at the end of the chapter.

Chapter Four: Research design and methodology – concludes the section by outlining the research design and methodology employed in this study. This includes the population, study site, sample, sampling procedure, justification of the items included in the data collection instruments, data collection procedure and the limitations of the study.

SECTION TWO – DISCUSSION OF RESULTS AND FINDINGS:

Chapter Five: Discussion of the data analysis process – introduces the section by highlighting the mappings between the theory and the actual research study by presenting the research questions for analysis and giving an outline of how the data is presented and discussed in Chapters Six to Ten. The demographic data is also presented and discussed based on the critical questions.

Chapter Six: Perceptions and attitudes of ECD educators – is a discussion of the data collection and analysis of data related to the educators' attitudes critical question. The chapter also presents findings in particular reference to research question one.

Chapter Seven: ICT competencies of ECD educators – is an outline and discussion of the data collection, data analysis and findings in particular reference to research question two, which queries the ICT-related competencies possessed by ECD teachers.

Chapter Eight: ICT integration challenges faced by ECD educators – outlines a discussion of the data collection and analysis, and presents findings in particular reference to research

question three. Critical question three asks about the challenges particularly faced by ECD teachers.

Chapter Nine: Best Predictor of ECD Educators' Attitude – is a discussion of the data collection, data analysis and findings in particular reference to research question four. This chapter also presents a proposed model based on the predictor of ECD educators' attitudes.

Chapter Ten: Enhancement of the ECD education – ICT integration programmes – is an outline of the key challenges found in this study with particular reference to research question five. The implications of the qualitative data collected to answer the question of how ICT integration in ECD education can be enhanced have also been presented and discussed in the chapter.

SECTION THREE - CONCLUSION:

Chapter Eleven: Findings and Recommendations - concludes the thesis with a summary of findings, interpretations and recommendations to enhance ICT integration in ECD education. Suggestions for future research have also been made in this section.

1.7 Conclusion

This chapter is an introductory outline of the research study, which comprises the background, rationale, critical questions and the key definitions to be used in the report. The last section of the chapter outlines the contents of each of the chapters contained in this thesis. The next chapter is a synthesis of the key literature reviews to this study.

Chapter Two – Literature Review

"No child can leave school and believe they are educated when they have no literacy in ICT. It is important to make sure that both the young and old are able to access computers located in schools. Every school is now a community centre." Dr Lazarus Dokora, Former Zimbabwean Minister Primary and Secondary Education, 2013–2017. (Netsianda, 2015)

2.1 Introduction

The background of this study in the previous chapter notes that there is a significant difference between ICT integration programmes in the developed world and those implemented in the developing world. Educators' attitudes, competencies and resource challenges, which include electricity and computers, have been named as some of the factors slowing down the inception of ICT in African education systems (Al-Sulaiman, 2010; Govender, 2006; Hamed, 2014; Mandina, 2015; MICTPCS, 2015, 2016; Mndzebele, 2013a; Phiri, 2016; Pohio, 2009). Based on the previous studies in the background section above, it was also established that the primary and secondary school education curriculum ICT integration programmes have been dependent on the attitudes and perceptions of educators and administrators (AfDB, 2016a; Balanskat et al., 2006; Govender, 2006; Konyana & Konyana, 2013; Livingstone, 2012; Mandina, 2015; Nziramasanga, 1999; Phiri, 2016; Rodriguez, 2012; The African Union Commission, 2015; UNESCO, 2002).

This chapter is a synopsis of key literature compiled for giving relevance to this study. The literature in this section has been reviewed under subheadings driven from the critical research questions outlined in the previous chapter. The chapter examines the concepts of ICT integration in education, educators' attitudes and competencies in order to provide a background of the Zimbabwean education system, key debates and findings of previous research in the area of ICT education. The chapter concludes by highlighting the need to conduct further ICT integration research in the Zimbabwean ECD education context at the end of the chapter. The next sub-section reviews literature on attitudes and perceptions of educators towards ICT integration programmes.

2.2 Attitudes and perceptions of educators towards ICT integration programmes

This section gives an outline of attitudes through reviewing some of the formal definitions found in the literature, how they are formed and measured and their most important constructs. The section concludes by reviewing the literature on educators' attitudes towards ICT integration programmes.

2.2.1 Definitions of attitude

Attitudes have been subjects of research for many years dating as far back as the beginning of the 20th century (Fazio & Olson, 2003; Pickens, 2005; Zainal Abidin, Ibrahim & Akiah, 2011). As noted in section 1.4.4, which defines attitude, attitude is a latent condition that mainly exists in one's mind, and can only be visible in more observable realms (as revealed by MacCorquodale and Meehl (1948) cited in Fazio & Olson, 2003, p. 140). Banaji & Heiphetz (2010, p. 350) argued that "if attitudes are predispositions to act favourably or unfavourably, then the attitudes that one has should predict one's behaviours".

According to Culbertson (1968, p. 79), 20th century psychologists seemed to conclusively agree that attitude involves these three things:

an attitude object (an object or event, defined and dependent upon the attitude holder), beliefs (also defined in the attitude holder's mind, whether the attitude object is bad or good) and behaviour (deportment towards the attitude object, for example, educators that have favourable attitudes towards ICTs tend to use them as instructional tools in their classrooms, while those with unfavourable attitudes do not make significant efforts of using them).

Furthermore, Krosnick, Judd and Wittenbrink (2005, p. 22) claimed that attitudes are "focused on a particular entity or object, rather than all objects and situations with which it is related". Based on Eaton and Viser's (2008, p. 1721) review, "attitude importance, however, is not defined in terms of how it is represented mentally, but how it is experienced subjectively". Attitudes are studied and used to study subjects and objects for their ability to be able to determine a person's personality through his or her evaluative reactions towards something. Earlier research concluded that attitude cannot be accurately measured by literally asking someone whether he or she has a positive, neutral or negative attitude

because people can lie when directly asked about their opinion (Culbertson, 1968). Section 2.2.2 below describes the foundational background of attitudes and how it applies to the context of this study.

2.2.2 Foundational background of attitudes in research

The equally appearing intervals (EAI) method, which made the most impact at the beginning of the 20th century among attitude measurement techniques was devised by Thurstone (cited in Fabrigar & Krosnick, 1995). The technique worked by generating a pool of statements, each representing some classification of positivity or negativity towards an attitude object. These statements were then graded by a panel of judges on a scale of 1 to 11, with a high number representing a higher degree of positivity. The median rating of the statements was deduced and the final statement set was then constructed to represent each of the 11 intervals (Fabrigar & Krosnick, 1995). Although the EAI was one of the most reliable methods of measuring attitudes (in terms of correlations and yielding a satisfactory validity), it was also one of the most complex (Fabrigar & Krosnick, 1995; Likert, 1932).

The Likert Scale was offered as a simpler alternative to Thurstone's evolutionary EAI in 1932. Rensis Likert published his classic research in 1932 on a simpler way to measure attitudes. He argued that Thurstone's evaluation had discrepancies in that it made an unverified assumption that "scale values of the statements are independent of the attitude distribution of the readers who sort the statements" (the judges) and it was a very tiresome exercise to measure attitudes using it (Likert, 1932, p. 5). Krosnick Judd and Writtenbrink's (2005, p. 32) review reinforced that "in contrast to Thurstone's method, statements expressing neutrality are not included" when employing Likert's method.

Likert's method (often referred to as the Likert Scale) also generated a pool of statements reflecting positivity or negativity towards an attitude object. The next stage was to indicate the degree of agreement or disagreement on a 5-point scale. The 5-point response options were pre-set (strongly disagree, disagree, neutral, agree or strongly agree) for the participants to choose a response that best described their degree of disagreement or agreement. Based on the participant's response, "for statements expressing favourable views of the object, responses are coded 1, 2, 3, 4 and 5; for statements expressing unfavourable views of the

object, responses are reverse coded as 5, 4, 3, 2 and 1” (Krosnick et al., 2005, p. 32). “A summation of the items is calculated to produce an overall score for each item. Items displaying low/poor correlation were deleted from the total score, to leave those with a high level of correlation, which would be used to compute the final index of the attitude” (Fabrigar & Krosnick, 1995, p. 43).

Based on previous work on attitude measurement by Thurstone in 1927 and Likert in 1932, Osgood, Suci and Tannenbaum (cited in Krosnick et al., 2005) also published the semantic differential method in 1957. The semantic differential was based on a 7-point scale which made use of a set of adjectives to calibrate an attitude evaluation like good-bad and pleasant-unpleasant among others. According to Krosnick, Judd and Writtenbrink (2005), the method worked by having six vertical lines intersecting with a long horizontal line to produce seven sections representing the degree of the attitude (from a negative response to a positive response). The points at the end of the horizontal line had the two antonyms selected for statements like bad on the far-left and good at the far-right end. The far-left end represented the highest level of bad (extremely bad), while the far-right end represented the highest level (very good) and the mid-point would be neither good nor bad. Krosnick, Judd and Writtenbrink (2005), asserted that contemporary research involving attitude measurement employed a modification of the 1957 semantic differential where the scale is calibrated with no horizontal line but with points 1–7 running from negative to positive levels, and where the attitude score is equal to the average scores for each item.

The Thurstone and Likert methods required the preparation of statements prior to the classification of attitudes, which is a very laborious process for people conducting an attitude assessment (Krosnick et al., 2005). As a result, some researchers using the procedures in modern research administer the questionnaire with limited question items taking cognisance of the labour-intensive process ahead of them. Krosnick, Judd and Writtenbrink (2005) pointed out that the new trend in attitudes was the assessment of single statements or questions with simpler wordings, which can potentially make it very difficult to use methods such as the EAI, Likert Scale and the semantic differentials. Fabrigar and Krosnick (1995, p. 43) observed that “it is often not practical to measure attitudes using one of the above methods, because they involve multiple items per attitude and sometimes involve elaborate pretesting.

Especially surveys in which attitudes towards dozens of objects are assessed, it is not feasible to obtain multiple measures of each attitude.”

Although contemporary researchers are using single items to measure attitudes, traditional methods utilising pools of statements are stronger at ensuring a higher degree of reliability unbiased conclusions. Hence, for this study, the Likert Scale was particularly chosen and used to measure attitudes in section two of the questionnaire (refer to Appendix A for the questionnaire used in this study). The next sub-section outlines how attitudes can be classified and concludes by explaining how it relates to this study.

2.2.3 The classic tripartite component model of attitudes in relation to this study

The tripartite component model is an attitudinal framework described in the following example reworded to fit the context of this study; one’s negative attitude towards using ICTs as teaching and learning tools might appear in favourable *beliefs* (“[A computer really simplifies my day in the ECD classroom, all I have to do is click]”), *feelings* (“[The play images projected by a digital projector on the whiteboard make me feel complete and motivated to continue teaching]”) and *behaviour* (“[I use ICTs as teaching and learning tools and will continue using them in my ECD class because they simplify my work]”) (Fazio & Olson, 2003, p. 140). Based on the paraphrased example above the tripartite component model suggests that we cannot possibly get into a person’s mind to discern his attitude on a certain attitude object.

However, if the individual’s attitude in that particular instance were to be explored it would “be observable in reported thoughts, feelings and behaviour” towards the attitude object, which implies that for the attitude to be complete, all three attributes should manifest as espoused by Rosenberg and Hovland (1960) cited in Fazio & Olson (2003, p. 140). The tripartite framework provides a way of cataloguing attitudes using the three attributes (affect, cognition and behaviour), thereby guiding studies on the formation of attitudes and change, and matching the inherent distinction between the attributes (Fazio & Olson, 2003).

Although the tripartite model seems to exhaust all the possibilities of how attitudes can be formed, it requires the existence of all three components/attributes of attitudes to map out an evaluative propensity. Fazio and Olson (2003, p. 140) revealed that later researchers on

attitudinal instances suggested that “attitudes can form as a result of any one (or a combination) of the three components, and, moreover, that which forms the roots of the attitude has implications on the strength and persistence of the attitude”. Breckler and Wiggins and Rosenberg (1989) and (1968) respectively, cited in Fazio & Olson (2003), argued against the tripartite view that the three components should be consistent with each other by pointing out the subtle distinctions and inconsistencies between the components. A review of these views would invalidate the tripartite model’s standpoint.

The major shortcoming of the model is noted where it assumes that affect and cognition responses always lead to attitudinal behaviour, which might not always be the case as one’s behaviour might not always reveal one’s attitude. This makes it very difficult for one to measure attitudes based on the attitude holder’s reported thoughts; Culbertson’s (1968, p. 80) example lucidly explains this shortcoming: “A person may say he likes a proposed school tax only to vote it down on election day when he or she really faces possible loss of some of his hard-earned cash”, should the tax reform be adopted. Based on the conflicting evidence in the literature highlighted above, it can be concluded that the measurement and determination of an individual’s attitude pertaining a certain object, subject or event cannot always be benchmarked against or based on the behaviour construct. Figure 2.1 shows the relationship between attitude, beliefs, feelings and behaviour based on the tripartite component model. As noted above the educators’ reported thoughts on ICT integration may not always imply that they are going to behave in a certain way, hence the need to consider that in this study.

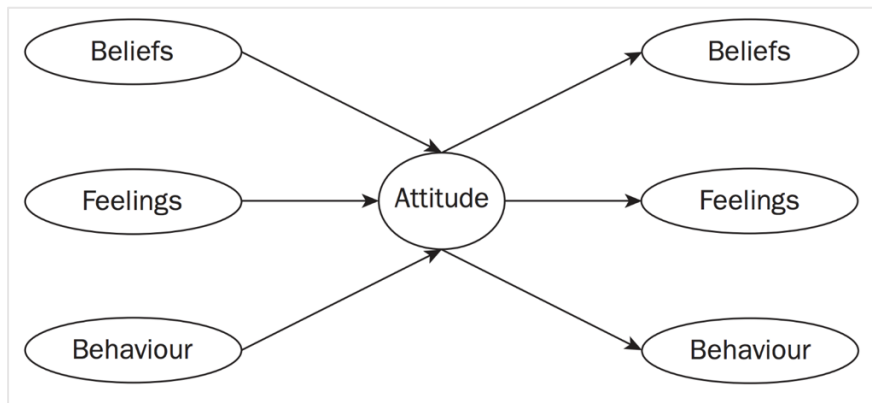


Figure 2.1: The tripartite component model
 (Source: Maio & Augoustinos, 2005, fig. 17.2)

2.2.4 Knowledge level (competence) in relation to attitude

Culbertson (1968, pp. 81–82) presents the view that the knowledge level impacts on one’s individual attitude by asking the questions that follow:

1. “How many specific skills and needed facts does the audience client have?”

Mapping the abovementioned question to the context of ECD teachers, successful integration of ICTs as teaching and learning tools in ECD education without the teachers’ competence to use them may be a difficult task.

2. “How many fine distinctions does one make in thinking about the topic, and are these distinctions helpful in understanding?”

If one is an ECD teacher faced with adopting or rejecting the use of ICT as a teaching and learning tool in his or her classroom, what kind of prior experience and/or thoughts can make one to arrive at a decision? Hence, it may be key for one to make a clear distinction of one’s view pertaining the integration of ICT into his or her classroom, which can be deduced as the individual’s attitude towards the subject. These fine distinctions can also be used to predict the ECD teacher’s behaviour based on his or her attitude.

3. “Does one view the problem from several perspectives rather than one narrow viewpoint?”

The ECD teachers' plans on whether they are interested in participating in further ICT-related training and when they would want to participate if they are interested are an example of an evaluation of whether their perspectives are diverse or not. It was the object of this study to find out if the questions asked by Culbertson still hold true, if asked for the Zimbabwean context, also dealing with attitudes. The literature on the established consequences of attitudes has been reviewed below.

2.2.5 Established consequences of attitudes (resistance to change)

According to Culbertson (1968, p. 82), "strong attitudes are like blocks of granite – you must hit them hard with some sort of persuasive communication to break them ... theoretical and research considerations suggest that, if attitude intensity is high, strength is also apt to be high". The more uncertain and negative impacts of ICTs on the teachers' work, the more good/better things we would need to change the minds of the teachers that have made up their minds not to use them as teaching and learning tools in their classrooms. Krosnick and Petty, (cited in Eaton & Visser, 2008, p. 1720) highlighted that "strong attitudes are those that resist change in the face of attack, persist over long spans of time, and exert a pronounced impact on thought and behaviour"; while Eaton and Visser (2008, p. 1720) purported that "predicting an individual's behaviour with respect to a given object requires not only knowing his or her attitude towards the object but knowing the strength of that attitude as well. If the attitude is strong, it will be highly predictive of the individual's behaviour, but if the attitude is weak, it will provide little leverage for predicting behaviour". This study took note of the variations associated with the strength of the attitudes as highlighted in the above-mentioned literature. The data collected and presented in section two of the report indicates this by showing the apparent skew in the positive direction of the educators' attitudes.

2.2.6 ICT integration from the perception of the educator

Pohio's (2009) review highlighted that a paradigm shift in the perception of ICT use in ECD education was particularly experienced in the past decade. Pohio further notes that debates used to be focused on whether it was really necessary or not to utilise ICT as an educational tool within ECD education and whether its use benefited ECD children or not. The last two decades have seen ICT penetration growing rapidly in the education sector, such that teachers

will now be required to integrate it into their teaching to keep up, thereby replacing some of their traditional teaching methods with ICT tools (Ghavifekr et al., 2013).

A Saudi Arabian study found that “while the policymakers interviewed in the study qualitatively perceived the teachers as having a negative attitude towards ICT integration in the Science curriculum, quantitative data from the teachers pointed to a high interest (90%) in ICT integration” (Al-Sulaiman, 2010, p. i). In support, Hammed (2014, p. iii) further claimed that “enthusiasm and positive attitudes do not always lead to high levels of ICT integration ... much of the integration is achieved in an informational, teacher-centred/traditionalist manner ... The results revealed that teachers’ pedagogical beliefs and their relationship to teaching practices strongly influenced integration practices.” Mukhari’s (2016) findings affirm that teachers’ confidence and negative attitudes towards ICT integration could be caused by a lack of proper policy implementation and connection between theory and practice. In Croatia, Kelentrić (2013, p. 4) suggested that “preservice education of teachers is crucial for building positive attitudes and experience around ICT”.

This study made an evaluation of Zimbabwean ECD teachers working in Masvingo province. To determine the ECD teachers’ attitudes required by “Critical Question One – What are the attitudes of ECD teachers in Masvingo towards the implementation of ICT in the ECD Curriculum?”, this study included question items in the instruments (refer to Questionnaire, No. 13, Appendix A; Interview, No. [1-3], Appendix B; and, Focus Group Discussion, No. [1-3], Appendix C). Attitudinal data were collected and analysed as a whole (Questionnaire No. 13 [Item 1-20], Appendix A), and also in three categories: affective (Questionnaire, No. 13 [Items 1-6], Appendix A), cognitive (Questionnaire, No. 13 [Items 7 -15], Appendix A), and behavioural (Questionnaire No. 13 [Items 16-20], Appendix A).

The literature on African education’s ICT integration programmes suggested that most of the educators believe that the absence of ICT resources and infrastructure at home and at the workplace (school) is their largest barrier to ICT integration (Gumedze, 2017; Markon, 2013; Nangue, 2011; Zaitz, 2016). In Markon’s (2013, p. viii) study, teachers identified (in)competence, “lack of familiarity of ICT resources and lack of ICT skills” as the greatest barriers to ICT integration (refer to section 2.6 for a more detailed outline of ICT integration challenges) and he believes that overcoming these barriers can help cultivate the

development of positive attitudes. Sections 2.2.4 and 2.2.5 above highlighted the need for new information to change one's attitude and behaviour, which may affect educators' perceptions in both negative and positive ways. Buabeng-Andoh (cited in Markon, 2013, p. 20) asserts that "while fear of failure and uncertainty about the material they would present are the most significant hurdles for teachers, teachers' positive attitude and perception play a larger role in teacher adoption than do computer competency or perceived usefulness". The scholarly works cited above established that the lack of ICT-related competencies/skills among teachers, access to educational technology, confidence in using ICTs in the classroom and infrastructure are the key challenges noted for the educators integrating ICTs.

Based on the literature reviewed in this chapter, my study assessed the ECD teachers' ICT competencies (refer to Questionnaire No. [6-19], Appendix A; Interview No. [1, 3 and 4], Appendix B; and Focus Group Discussion, [1, 3 and 4], Appendix C) and challenges (refer to Questionnaire No. [10, 20-22], Appendix A; Interview No. [1, 4-8 and 10], Appendix B; and Focus Group Discussion, No. [1, 4-8 and 10] Appendix C) to answer "Critical Question Two "What ICT competence do ECD teachers in Masvingo have in order to engage with ICT integration in teaching and learning?" and "Critical Question Three – What are the challenges faced by ECD teachers when trying to integrate ICTs in teaching and learning processes?" In my analysis, ECD teachers' ICT competencies were broken down into core competence and overall competence (a more detailed outline is found in Chapter Seven). Items included in the research instruments are based on the Diffusion of Innovations (DOI) and Unified Theory of Acceptance and Use of Technology (UTAUT). The next sub-section is a brief review of educators' attitude predictors.

2.2.7 Educators' attitude predictors

Some of the sub-sections above reported that attitude may be modelled as a mental state that can be used to predict behaviour. Palak and Walls (2009) studied teachers who resisted ICT integration and found attitudes to be their strongest predictor of whether they were going to adopt ICT in their classrooms or not. In addition, Paraskeva, Bouta and Papagianni (2008) revealed how they found past experience with technology to be a strong predictor of educators' ICT integration intent and how it is strongly correlated to their attitudes. Fu (2013, p. 118) suggested that "although teachers' attitudes towards ICT use were found to be the

strongest predictor of ICT in education integration, the impact of their beliefs and confidence in using ICT should not be disregarded either”.

Mashile (2016, p. 27), however, argues that “some research remains unconvinced on whether or not educator beliefs and attitudes are significant predictors of technology use in the classroom”. Cullen and Greene (2011) used teachers’ motivation variables as dependent variables and found attitude to be the most dominant predictor of both intrinsic and extrinsic motivation of technology use. Farmery (2014, p. 100), moved the discussion to the teachers’ proficiency and frequency of use by noting that “teachers that make frequent use of ICT at home also have generally positive views of using ICT to support teaching and learning. However, limited home use may be a poor predictor of views of ICT as some teachers with low self-confidence in their ICT ability and low home use of ICT, had positive views of ICT.” Zaki found that the most significant predictor of internet use in the ECD classrooms in both countries “was the teachers’ positive beliefs that the internet is a useful resource in the classroom” (2013, p. iii).

This study attempted to determine the key predictors of educators’ attitudes by using inferential statistics and regression analysis in a bid to answer “Critical Question Four – What is the best predictor of educators’ attitudes towards ICT integration in ECD education?”, (refer to Questionnaire No. [12-19], Appendix A; Interview No. [9], Appendix B; and Focus Group Discussion, No. [9] Appendix C). The next sub-section concludes this section by spelling out why this study is centred on assessing the effect that ECD teachers’ attitudes have on ICT integration.

2.2.8 Why study attitudes when evaluating ICT integration into ECD education?

After reading the literature compiled to understand the relevance and intersection of attitudes in ICT integration research, one is bound to develop an attitude on whether to continue reading the report or not. As noted in section 1.1, there are few or no studies explicitly reporting ICT integration in Zimbabwean ECD education. The changes that have been made to the ECD curriculum require ICT competencies and integration from ECD teachers if they are going to use it as a teaching and learning tool in their classrooms, hence the need to evaluate their attitudes, as they are believed to have an impact on their

subsequent behaviour (Ajzen & Fishbein, 1980; Balanskat et al., 2006; Fishbein & Ajzen, 1975; Moore & Benbasat, 1991; Nangue, 2011; Rogers, 2003).

This study also attempted to review and suggest a way forward by answering “Critical Question Five – How can the integration of ICT in ECD education be enhanced?”, (refer to Questionnaire No. [9, 20 and 21], Appendix A; Interview No. [4-8 and 11], Appendix B; and Focus Group Discussion No. [4-8 and 11] Appendix C). The next section presents an overview of ICT in education.

2.3 ICT integration in Zimbabwean education

According to the Zimbabwean national ICT policy (2016), the registration of high ICT penetration indicators that include mobile device usage at 90% and internet penetration at 45% makes the integration of ICTs in the education sector more justifiable than ever. The 2016 ICT policy on education (2016c) highlights the importance of ICT in the Zimbabwean education sector. With ICT in education tagged as one of the priorities of the MoPSE Education Sector Strategic Plan (2017), its impact and importance in the sector cannot be disputed. This section reviews the literature on ICT and education; sub-section 2.3.1 presents an overview of the Zimbabwean education system.

2.3.1 Overview of the Zimbabwean education system in relation to ECD education

Zimbabwe is a landlocked country located in the Southern African region with a population of just over 13 million as at 2013, based on the 2012 census (Konyana & Konyana, 2013). Zimbabwe is a multi-lingual country, which inherited English from the colonial master Great Britain as its official language of communication. The formal education system followed by the nation is 7-4-2-4 (excluding 2 years for ECDA and ECDB), i.e. seven years of primary school, four years of secondary school (ordinary level), two years of post-secondary/high school (advanced level) and four years tertiary education (university/Polytechnics/teacher training college) (MoPSE, 2017; UNESCO et al., 2001).

Figure 2.2 illustrates the stages undergone by school-going children and young adults to fulfil the requirements of Zimbabwean education. Chikutuma and Mawere (2013) described how

the general populace has been traditionally using terms like preschool and zero grade to refer to the schooling phase of children in the ECD classes as highlighted in Figure 2.2.

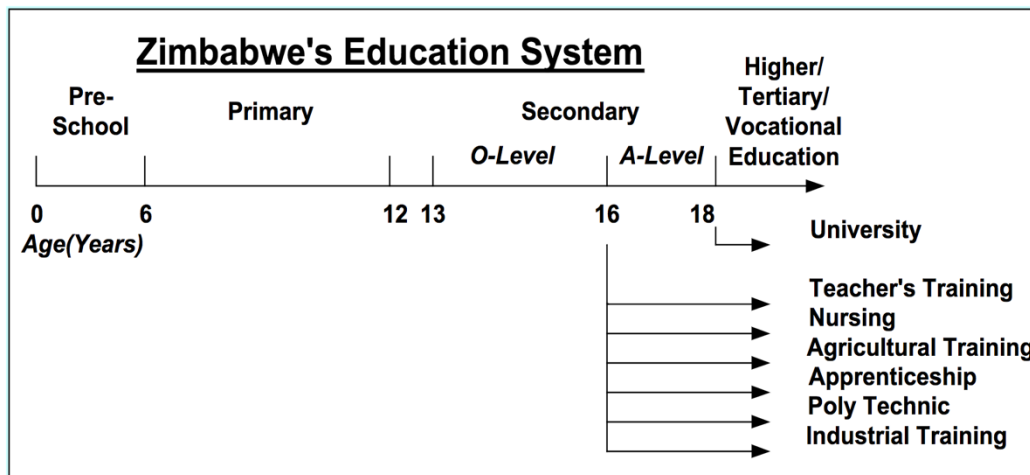


Figure 2.2: Overview of the Zimbabwean education system
 (Source: UNESCO et al., 2001, p. 10)

Additionally, Shizha and Kariwo (2011) revealed that Zimbabwe inherited its colonial masters' main education framework, which is based on the 1979 Education Act. Independence was attained almost four decades ago in 1980, and since then the education sector has been evolving; primary education was made free and compulsory at independence, and by the end of the first decade, Zimbabwe had achieved a universal primary education system. Primary school, secondary school and university enrolments increased by about one 100%, 800% and 300% respectively during the first decade after independence (Konyana & Konyana, 2013; Nziramasanga, 1999; UNESCO et al., 2001). Since 1980, education-related expenditure has been high because the government wanted to redress the imbalances of the colonial era (Shizha & Kariwo, 2011). The educational imbalances were such that white people were allowed to attend all available school levels with no restrictions, while black people were subjected to a bottle-neck system that allowed only a select few to proceed upon completing a level.

The government's move to abolish primary school tuition fees at independence in 1980 to boost enrolments, make primary education a basic human right and compulsory changed the living conditions of the general populace but it brought its own share of challenges. Some of the challenges included understaffing (inadequately qualified teachers to meet the growing

number of school-going children), insufficient resources (like textbooks, chalk and teaching guides) and financial constraints (Makuvaza & Gatsi, 2014; Nziramasanga, 1999; UNESCO et al., 2001). In spite of the achievements and challenges experienced during the post-1980 education sector era, the period saw the government conducting a Presidential Commission of Inquiry led by Dr Nziramasanga to conduct a comprehensive education curricula evaluation in 1999. The commission noted some of the above-mentioned challenges and advocated for an outcomes-based curriculum framework that puts more emphasis on learning areas and continuous assessments (Nziramasanga, 1999).

Based on the Nziramasanga (1999) commission of inquiry's findings, new policies were drafted to improve the delivery and quality of education. According to MoPSE (2017), the Nziramasanga commission resulted in an ECD regulations' statutory instrument that gave the education ministry authority to setup ECD education structures in 2004. The Secretary's Circular Number 14 in 2005 birthed ECD education by directing all primary schools to attach two ECD classes, ECD A (3-4-year olds) and ECD B (4-5-year olds) (Chikutuma & Mawere, 2013; Makuvaza & Gatsi, 2014; MoPSE, 2017; Nhaka Foundation, 2012). An extract from the Nhaka Foundation's (2012) website outlines the reason why ECD was introduced below:

The Commission found that many children in rural and poor communities did not have access to Early Childhood services. The aim of the 2004 policy framework is to make official the ECD programme under the Ministry of Education, Sport and Culture (MoES&C), increase equity and access to ECD provisions, and enhance quality education.

The National Early Childhood Development programme was addressed primarily to preschool children in rural areas who had never had access to these services. A community development approach underpinned the rollout of the ECD centres. With a limited focus on minimum criteria and lack of capacity at the community level to make significant contributions, the standard of facilities and activities varied substantially. In 2004, a national review of the education system recommended that ECD is integrated into education structures rather than running parallel to them.

Most schools have no classrooms for ECD children. Moreover, the number of children in each class was too large failing to meet the required teacher-pupils' ratio of 1:20. Our experiences in some of the schools show that some of the

teachers in ECD have as many as 40 children! In most provinces of the country, a critical deficit of trained teachers with ECD qualifications has been discovered. Overall, the ECD A and B classes have been manned by untrained staff (para-professionals) and this practice militates against attainment of quality education. We are then involved together with the Ministry of education in the training of these paraprofessionals so that they provide quality care and education to the children.

Makuvaza and Gatsi's (2014, p. 370) study concurred with Nhaka Foundation's findings that some ECD centres are still being staffed "by para-professionals who have a reasonable understanding of child development issues", (refer to sub-section 2.4 for a detailed review of the role of para-professionals in Zimbabwean ECD education). They also pointed out that teacher training colleges have started aggressively recruiting and training ECD teachers who are expected to bridge the gap of qualified ECD specialists. Chikutuma's (2013) research on the quality of ECD services offered in primary schools revealed that school heads incompetently managed the ECD curriculum, ECD personnel qualifications were varied, and that there was a scarcity of financial and human resources. Dozva and Dyanda's (2012, p. 57) study highlighted that in Zimbabwean ECD education, "major challenges include limited leave of absence for infant teachers to upgrade themselves professionally ... failure to attract male practitioners into ECD training ... inadequate supply of material resources, limited local literature and published research studies in ECD and unregulated accreditation of paraprofessional training". Opportunities identified by Dozva and Dyanda (2012, p. 57) include: "Government scholarships in accredited programmes, a responsive ECD policy framework, the autonomy of universities to accredit programmes and development of a career path for ECD graduates at various levels". Dozva and Dyanda further highlighted the need for accredited training for paraprofessionals and increased training capacity for ECD teachers at all levels in their recommendations.

The Zimbabwean ECD education system, like any other education system, has pros and cons. One of the reasons why the ECD education system is where it is may be that it was formally introduced in the Zimbabwean primary education curriculum system barely two decades ago in 2004, during a period when Zimbabwe's financial woes were just starting (Masunda, 2014; MoPSE, 2016c, 2017; Murisa, 2010). The next sub-section gives an outline of studies on ICT integration ECD education.

2.3.2 ECD education and ICT integration

According to Oldridge (2010, p. i), ECD education has “many layers of support necessary to ensure teachers continue to move forward on this journey are not well understood”. Pohio (2009) qualitatively highlighted the potential that ICT has if ECD teachers have the necessary ICT competencies and recommended an in-depth investigation to find out more about their personal experiences with ICT integration. In addition, Hammed (2014) conducted a comparative study of four ECD centres in Saudi Arabia and two in Scotland. Hammed found that Scotland was at an advanced stage because it adopted an ICT integration policy on ECD education, while Saudi Arabia was still at the initial stage. Hammed concluded by suggesting that “ICT cannot be integrated without considering the ECE (Early Childhood Education) learning environment, and neither a purely bottom-up nor top-down approach to ICT integration suffices. Instead of integrating ICT at a desirable level, a monitored and more systematic approach is called for – one that captures the intricacies of the bi-directional relationships between ecosystems that affect integration practices and encourages thinking of integration as a dynamic and continuous process”, (2014, p. iv).

The studies reviewed above are some of the key examples of ICT integration research on ECD education and they seem to be highlighting that disparities exist between ICT integration in the developing and developed countries. This does warrant further research in the area in the Zimbabwean context. The next sub-section is an overview of the implementation of ICT in the Zimbabwean ECD curriculum.

2.3.3 Implementation of ICT in the Zimbabwean ECD curriculum

After the 2012 census, the Zimbabwe National Statistics Agency (Zimstat) estimated the population at 13,061,239 people, with 67% living in the rural areas and 33% in the urban areas (ZimStat, 2013). The National 2012 Census report also found that about 19.2% of the population was enrolled in primary schools (ZimStat, 2013). According to UNICEF (2015, p. 1), the ministry of “Primary and Secondary Education was allocated US\$810.43 million, about 20.3% of total budget [which is] higher than the sub-Saharan Africa average of 16.5% of the state budget”. However, 98.4% of this budget allocation is for employment costs (educators’ salaries). These statistics indicate that a major amount of the national education budget

finances the wage bill and a small allocation of 1.6% is set for other uses like resourcing teaching and learning centres, owing to inadequate government revenue inflows.

Excerpts from the Presidential Commission of Inquiry into Education and Training report of 1999 suggest, reveal and confirm the following (Nziramasa, 1999):

Ensuring a bias towards the study of mathematics, science and technical subjects including computer literacy from early stages of education ... (p. 234)

[T]here is a tendency to introduce new subject areas without the requisite textbooks, equipment and expertise ... (p. 243)

The Commission acknowledges that Zimbabwe is deficient in computer education and needs to take deliberate planned steps to rectify the situation through the integration of ITC in the curriculum ... (p. 247)

As a result of the abovementioned statements, the president of Zimbabwe embarked on a nationwide drive, which equipped about 25% of primary and secondary schools with computers and printers to set up ICT structures from 2000 to 2005, mainly targeting schools situated in rural areas where ICT penetration had yet been experienced (MoPSE, 2016c; Southern Eye, 2014). Konyana and Konyana (2013) observed that most rural schools that received computers from the government have not yet fully embraced the ICT curriculum owing to a number of challenges, which include lack of proper infrastructural facilities such as computer laboratories and electricity as well as lack of trained ICT teachers. Another Zimbabwean study further revealed that “teachers also lacked competence, in-service training and technical support, as well as Technological Pedagogical Content Knowledge [TPCK] on how to integrate ICTs into teaching and learning” (Mandina, 2015, p. 95).

A curriculum review enacted to bring education sector reforms into action based on the education and training report gave birth to a curriculum framework, which was approved for implementation by the cabinet in September 2015 to service primary and secondary schools for seven years, starting from 2015 up to 2022 (Dokora, 2015). The curriculum framework has a number of changes to the 2011 curriculum that include the introduction of ICT as a standalone learning area, which is going to be taught in primary schools from the early childhood level to grade 7, where it was taught as part of other subjects in the previous

curriculum (MoPSE, 2016b, 2016a). Speaking at a curriculum review workshop, the Deputy Minister of Primary and Secondary Education, Professor Mavima, implied that the smooth implementation of the new curriculum means that teachers and other stakeholders concerned, like teacher training lecturers, might need capacity-building training to align them with the new curriculum (Sunday Mail, 2016). According to Dokora (2015), it was envisaged that the curriculum being unveiled will impart lifelong orientated skills that will complement the pathways to professional and adult life, which include Science, Technology, Engineering and Mathematics (STEM) by the introduction of ICT as a tool and learning area from the grassroots level.

The former minister of MoPSE indicated in his foreword to the revised 2016–2020 Education Sector Strategic document that the ministry had extensively consulted and reviewed submissions from all stakeholders concerned before producing an updated curriculum (MoPSE, 2017), in spite of the sentiments of the teachers' trade union who claimed that the ministry rushed implementation without considering the issue of resources, as reported by Pindula News (2017a). Pindula News (2017b) also reported that the trade unions strengthened their claim by highlighting that the implementation of the new curriculum was forcing teachers to use their own funds due to a lack of resources.

Before the 2015 curriculum framework, ICT was taught and used at early childhood centres and primary schools using a different syllabus, which was not as detailed as the one drafted under the updated curriculum framework. The new ECD curriculum that puts emphasis on practical assessments and embraces ICT by advocating for its integration into the education system is based on a report that was drafted about 18 years ago in 1999 (Nziramasanga, 1999) and a needs assessment conducted in 2014 (MoPSE, 2016b). The researcher has been involved in the ICT training of practising teachers who sometimes viewed the subject as complex. In Zimbabwe, primary school teachers are required to teach all subjects as opposed to secondary school teachers, who are regarded as specialists in specific subject areas (Gambanga, 2016). This can potentially affect the educators' behaviour, perceptions, attitudes and ability to participate in the ICT integration programmes. This study regarded educators as the key drivers of the ICT integration process as they are the ones on the ground.

Based on the MoPSE's current policy position regarding the teaching and use of ICT in the ECD classroom, ICT is an important tool that can be used in moulding little children for the future. However, the main programmes seen to be spearheading ICT integration like the updated curriculum framework, along with other education sector reforms to improve the quality of education at this time, can be viewed from a technological adoption point of view, where some factors influencing the successful introduction of teaching ICT at primary level seem to be uncertain (Dokora, 2015; MoPSE, 2016c, 2017; Nziramasanga, 1999). This study is, therefore, an exploration of the teaching of ICTs at ECD level, in a bid to answer the question: "Do Early Childhood Development (ECD) educators utilise ICT as tools in their teaching and learning processes?"

2.4 Policy frameworks and ICT integration in education

Policy frameworks are universal guidelines outlining how issues relating to a subject matter are handled. Universal bodies tackling ICT and educational policy issues without borders are the United Nations (UN), the AU in Africa and Southern African Development Community (SADC). During the 70th UN meeting held on 25 September 2015, the Sustainable Development Goals (SDGs) were adopted as the course of action to be taken by all nations that are members of the UN up to 2030, which led to the Education 2030 Agenda (also known as the Incheon declaration of May 2015), which was set up at the World Education Forum (WEF) in the same year (Kim, 2017; UNESCO, 2017c, 2017b). Upon commissioning the Education 2030 Agenda, the WEF organised an international Conference on ICT and Post-2015 Education Agenda in Qingdao, China in May 2015.

Apart from the collective efforts of forums at the UN level, other regional bodies have also been helping nations in their regions to set up ICT policies on education. Among them are the Asian Pacific Ministerial Forum on ICT in Education (UNESCO, 2017b) and the African Ministerial Forum on ICT Integration in Education and Training (AfDB, 2016b) for the Asian and African regions respectively. The 2015 international ICT conference held in Qingdao to craft an ICT education agenda gave birth to the International Forum on ICT and Education 2030, which produced what is now known as the Qingdao Statement (UNESCO, 2017a, 2017c). The Qingdao Statement is an international high-level declaration of strategies that act

as a set of universal guidelines for integrating ICT solutions into the education sector to achieve UN's SDG 4.

According to eTransform Africa (2012, p. 5),

developing countries, however, have experienced difficulties in adopting policies and regulations to rapid changes in technology and market structure. In some instances, policies concerned with ICT and education are not complemented by policies in other relevant areas, such as telecommunications, that support such development. Furthermore, ICT policies are not always accompanied by detailed implementation plans or commitment from the government to implement them.

Zimbabwe is one of the countries experiencing delays in the implementation of ICT-related policies due to lack of committed resources and concrete government plans to spearhead this. In Zimbabwe, policy frameworks governing the deployment and use of ICT in education include the Presidential Commission of Inquiry into Education and Training (CIET) OF 1999, Curriculum Framework for Primary and Secondary Education of 2015, the Draft ICT Policy on Education of 2016 and the Zimbabwe National Policy for e-Government of 2016 (MoPSE, 2016c). Figure 2.3 illustrates the interplay between policy statements (from institutions like the MoPSE, governments, AU and the UN), the stakeholders (educators, parents and the business community), human capital and resources' investments required for ICT integration to be a success.

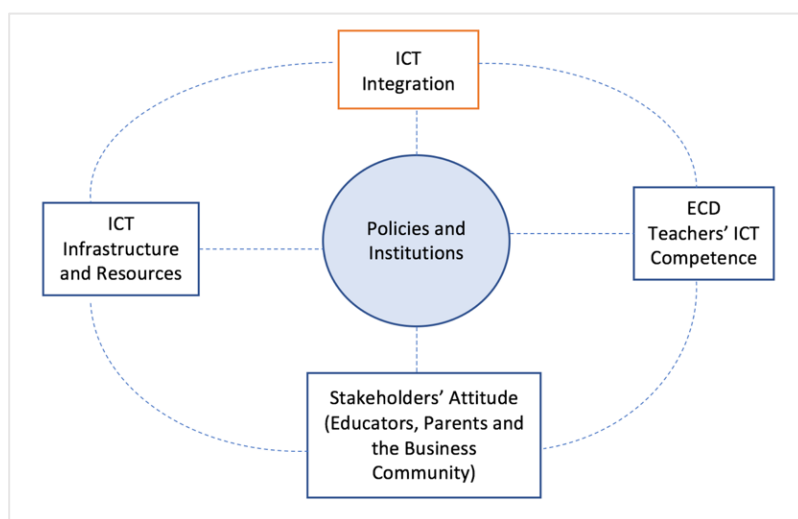


Figure 2.3: Interplay between policies, stakeholders and ICT integration

(Adapted from Hanna, Transforming to a Networked Society, Guide for Policy Makers; The Earth Institute Columbia University, 2017, p. 10)

The following sub-sections give a synopsis of the policy frameworks based on the international and regional view.

2.4.1 ICT Integration and the UN Agenda 2030

There is no doubt that ICT now plays a pivotal role in connecting our everyday lives, hence the call by educationists to fully integrate it into the education system. Based on the pace at which education policymakers in developed countries were formalising ICT policy frameworks on education, the Millennium Development Goals were formulated with this in mind, consequently resulting in the Education for All (EFA) goals (UNESCO, 2014). The first EFA goal is explicit in advocating for the expansion and improvement of early childhood care and education. The World Summit on the Information Society that convened in 2003 and 2005 enabled governments to set up clear commitments to outline how an inclusive information society could be realised. Target two in their plan of action required that governments connect all their secondary and primary schools with ICT by 2015 (UNESCO, 2014). However, this could not be achieved given the uneven economic backdrops of countries in the UN (UNESCO, 2017d).

In the UN International Plan of Action, Agenda 2030 (UNESCO, 2017d), SDG 4 is the one that particularly resonates with the EFA goals. SDG 4 reads: “ensure inclusive and equitable quality education and promote lifelong learning opportunities for all”, (as documented by Kim, 2017, p. 6). Achieving SDG 4’s targets would also help in the realisation of the EFA goals. As noted in the introductory paragraph (refer to sub-section 2.4) of this sub-section an International Forum on ICT and Education 2030 was enacted to ensure that ICTs can be used to accelerate the achievement of the targets. Paragraph 10 of the Incheon declaration states that “ICTs must be harnessed to strengthen education systems, knowledge dissemination, information access, quality and effective learning, and more effective service provision”, (Kim, 2017, p. 4). Based on the International Telecommunication Union’s (ITU’s) estimates, The Earth Institute Columbia University (2017, p. 21) claims that “by 2015, 95% of the world’s population and 85% of people living in the LDCs, were covered by a mobile-cellular signal; but only 29% of the population in rural areas had access to a mobile-broadband network”.

According to Steukers (2017, p. 7),

The importance of integrating ICTs is featured in the Global Development Agenda, more specifically in [Sustainable Development Goal] SDG9 on Innovation as well as SDG4, which commits the international community to ensure inclusive and equitable quality education and to promote lifelong learning opportunities for all.

Zimbabwe's MoPSE signed the Qingdao Declaration in 2015, which committed it to achieving SDG 4 and 9 by 2030 (G.-J. Kim, 2017; Steukers, 2017; UNESCO, 2017d). This commitment is the one of the most visible international push for the country to support ICT integration in education at a national level. The government's commitment to achieving universal access to ICT in education for all is positive for Zimbabwean ECD education (African Union Commission, 2016; Kozma, 2011; UNESCO, 2017a). Although the government has boldly adopted the United Nations' recommendations through the Qingdao Declaration, full ICT integration in ECD education is yet to be achieved due to the challenges recorded. One of the key barriers noted at a UNESCO Southern Africa Regional Meeting on ICTs in Education was

“Attitudes of administrators, teachers (the use of computers for educational purposes might be a threatening step because there is often little expertise, and teachers and administration are reluctant to take the first step) and motivation”, Carolyn Medel-Anonuevo speaking at the UNESCO Southern Africa Regional Meeting on ICTs in Education, (Steukers, 2017, p. 8)

The next section is an outline of African regional policy bodies' positions in relation to ICT in education.

2.4.2 Regional (Africa) view of ICT integration into the education system

A ministerial forum on the integration of ICT in education and training has been enacted to make sure that the SDG on improving Africa's education quality is achieved by 2063 (AfDB, 2016a; African Union Commission, 2016; The African Union Commission, 2015). In 2016, the second African Ministerial Forum was held in Abidjan in June 2016 under the theme “Advancing inclusive knowledge societies in Africa to implement Africa's Agenda 2063 and the SDGs” (AfDB, 2016b). The forum is an advocate for governments affiliated to the regional body to move from policy to action by setting up accountability strategies that pave the way for a monitoring and evaluation process. Participants included African ministers and policymakers in charge of education, scientific research and ICT; technical ICT experts from

technical agencies, universities, research institutes and the private sector that are involved in the development and implementation of ICT integration policies in education.

The AU, which is one of the most influential regional bodies in African politics, has included the integration of ICTs into the education sector as part of its 50-year guiding strategy from 2013 to 2063. The excerpts below have been extracted from the popular version document outlining the expectations of the SDG on education of the Agenda 2063 and the AfDB 2016 document respectively:

From early childhood education to primary, secondary, technical, vocational and higher education, Africa will witness a true renaissance, through investments made by governments and the private sector in education and through growth and expansion of industries in the fields of technology, science, research and innovation. In the Africa of 2063, at least 70% of all high school graduates will go on to have tertiary education at technical and vocational education and training (TVET) institutions, and universities with 70 per cent of them graduating in the sciences, technology and innovation programmes, to lay the foundation for competitive economies ... (The African Union Commission, 2015, p. 5)

ICT integration in the education sector is a technical and policy issue that would guarantee continuous training to both the teacher and learner”, Oley Dibba-Wadda, Association for the Development of Education in Africa (ADEA) Executive Secretary, speaking at the second African Ministerial Forum on ICT Integration in Education and Training. (AfDB, 2016b)

The excerpts quoted above show that African industry and commerce are concerned about ICT-related education for the future of the region. Based on these passages, ICT integration can be considered among emerging technology initiatives and innovations being crafted to change African society for the better. To this end, 2014 saw the adoption of the Continental ICT Strategy for Africa in Addis Ababa, which sat in 2016, to draft an ICT education strategic plan for AU states for the period 2016–2025 (shortened CESA 16-25). To implement, monitor and evaluate the strategic plan, the Science, Technology, Innovation Strategy for Africa (STISA) 2024 was put in place (African Union Commission, 2016).

The Economic Community of West African States (ECOWAS) has taken a position that every state in the region should integrate ICT in its education sector (ECOWAS, 2017). The regional

body made an additional step of cultivating the formation of National Research and Education Networks and partnering with Cisco to implement the Cisco education initiative in the region (ECOWAS, 2017). The Connect Africa Summit Commitments, Eastern African Backbone Infrastructure Network (EAC-BIN), Central Africa Backbone, North Africa Backbone, West Africa Regional Communications Infrastructure Program and Regional Communications Infrastructure Program are some of the African region goals and projects for closing ICT infrastructure gaps across the continent that the World Bank, the AfDB and the ITU have been sponsoring in the region (AfDB, 2013).

The SADC has also set up a framework for making sure that the region achieves SDG 4 of the UN Agenda 2030. The master policy framework is called SADC Infrastructure vision 2027 (SADC, 2012) and it is employing a sub-framework called SADC Digital 2027 Agenda (Chigazira, 2015; UNESCO, 2016). In 2017, a Ministerial forum responsible for Education, Training, Science, Technology and Innovation met in Ezulwini, Swaziland (now the Kingdom of Eswathini) to review the region's ICT strategic plan on education (SADC, 2017). The next section presents an overview of Zimbabwe's ICT policy frameworks on education.

2.4.3 Zimbabwe – The government's ICT policies on education

According to ITU (2016a), Africa is one of the continents with the highest number of developing and least developed nations in the world. ICT policies on education in Zimbabwe have been in draft form for the past decade. Two notable drafts are the 2001 version and the 2016 version. Similarly, Uganda created a draft ICT policy on education in 2003, which was still in their cabinet for ratification and approval in 2012, while the Senegalese, who adopted an ICT policy on education in 2009, are yet to experience its impact (eTransform Africa, 2012). The first Zimbabwean Education Ministry's (2001, p. 17) draft ICT policy of 2001 addressed how issues relating to equipping teachers with ICT competencies and statements and requisite infrastructure (ICT facilities) would be dealt with. The ministry points out the need for training and motivating teachers to make ICT integration a success. Almost 20 years later when the 2016 draft ICT policy document was presented for review, MoPSE (2017, p. 37) confirmed that

ICT has been included in the school curriculum as a response to the global use of technology as an important learning tool, as a set of skills that children need on

entering higher education or the employment sector and for improved institutional management and administration. The teaching and use of ICT in schools need to be framed by a policy that will maximize use for learning and will provide safeguards against the unrestricted use and the attendant dangers. The policy on the provision of ICT in schools will identify how to address equity concerns. MoPSE will develop an ICT policy and guidelines for the use of ICT in schools.

Both the 2016 draft ICT policy on education and the 2016–2020 Education Sector Strategic Plan documents outline an urgent need to resource schools with the proper ICT facilities and tools to make ICT integration a reality in all parts of the country (MoPSE, 2016c, 2017). The two documents give a synopsis of the key challenges and conclude by suggesting strategies to be followed by all stakeholders (parents, teachers, administrators and the business community) in order to successfully resource and implement ICTs in the schools. The existence of the policies discussed in this section are clear indicators that the implementation plans are in place, but the unanswered question would be: “What has been stopping the execution of these policies?” The next section is an overview of the Zimbabwean economy in relation to the education sector.

2.4.4 Zimbabwe’s economy and the education sector

As outlined in the sections above, Zimbabwe has an educational history before 1980 (pre-independence era, education during the colonial period) and after 1980 (post-independence era, education after independence, from 1980 to present day). According to recent literature outlining the Zimbabwean education system, the path to educational freedom has not been easy as policies, reforms and national agendas had to be effected to make it a reality (Dambudzo, 2016; Dokora, 2015; MoPSE, 2016c, 2017; Nkala, 2017). Before 1980, Zimbabwe was a British colony, a period known for putting a clear distinction between Black and White education systems (Tarisayi & Manhibi, 2017a). When Zimbabwe attained its independence in 1980, it adopted a driving principle called “growing with equity”, which was more inclined towards socialism, so as to redress the inequalities that existed in the education system before 1980 (UNESCO et al., 2001). Once that was in place, economic policies to facilitate the financing of education sector reforms followed.

In order to put education policies and reforms into actionable processes after the first decade of independence (1980 – 1990), the government enacted the following national development agendas after 1990 as shown in Table 2.1.

Table 2.1: Zimbabwean national development agendas since 1990

National Agenda	Description	Period
Economic Structural Adjustment Programme (ESAP)	Privatisation of state-owned enterprises	1991–1995
Zimbabwe Programme for Economic and Social Transformation (ZIMPREST)	Creating a stable macroeconomic environment to achieve a higher and improved standard of living	1996–2000
Millennium Economic Recovery Programme (MERP)	To arrest economic decline	2001–2002
Ten Point Plan based on Agriculture	Short-term plan to get Zimbabwe moving again	2002
National Economic Revival Programme	Economic revival plan to avert "national instability"	2003–2004
Macroeconomic Policy Framework	Crafted to stabilise the economy	2005–2006
National Economic Development Priority Programme (NEDPP)	Joint economic revival effort by government and the private sector, designed to create economic stability	2007
Zimbabwe Economic Development Strategy (ZEDS)	Aborted during conception	2008
Short-Term Emergency Recovery Programmes (STERP I & II)	To reverse negative growth-rates, devaluation of the currency, low productive capacity, job losses, food shortages, poverty and massive de-industrialisation	2009–2012
Zimbabwe Agenda for Sustainable Socio-Economic Transformation (ZIMASSET)	Towards an empowered society and a growing economy	2013–2018
Transitional Stabilisation Programme	To address the country's economic woes by stimulating macroeconomic stabilisation in the private sector	2018–2020

(Sources: Government of Zimbabwe, 2018; Kanyenze, 2016; MoLSS&ILO, 2011; Ruwo, 2014)

There are conflicting views about how the economic reforms have changed the Zimbabwean education sector. Literature reveals that some view these economic blueprints as successful in tackling their goals, while others believe they fell short on implementation resulting from the lack of political will and proper funding structures (Government of Zimbabwe, 2013;

Moyo, 2013; Mpofu, 2013; ZIMCODD, 2016). As highlighted in the national agendas Table 2.1, since 1990 the government has been crafting economic blueprints to provide a panacea to the country's economic woes.

Table 2.2: Projected growth for the education sector

Sector	2013	2014	2015	2016	2017	2018
	Projected%	Projected%	Projected%	Projected%	Projected%	Projected%
Education	5.5	4.0	4.5	5.0	4.5	4.4

Source: Adapted from the Zimbabwe Agenda for Sustainable Socio-Economic Transformation (ZIMASSET) Blueprint document (Government of Zimbabwe, 2013)

ZIMASSET, the 2013 to 2018 economic blueprint, projected the growth ratios displayed in Table 2.2. The economic blueprint also spelt out how it intended to make the nation “computer literate by lifting all district education and ICT infrastructure by 2018”. According to ZBC (2014), since the launch of the ZIMASSET economic blueprint, ministries responsible for education have been realigning the curriculum with the economic blueprint. While its goals could be achieved, it was difficult given the fact that the implementation of the economic blueprint presented problems in other sectors of the economy. This was evidenced by the cash crises that the country faced during the period (Chitiyo, Vines, & Vandome, 2016; Makochekanwa, 2016; Mlambo, 2016; The Zimbabwean, 2016; ZIMCODD, 2016). To replace ZIMASSET, the Transitional Stabilisation Programme was launched in October 2018 (Government of Zimbabwe, 2018 refer to Table 2.1). The Transitional Stabilisation Programme is aimed at solving the liquidity challenges limiting activity in all sectors of the economy, including education. Despite the cash crisis in Zimbabwe, the 2016 budget showed that the education sector had the highest allocation as displayed in Figure 2.4 below.

The literature in the above paragraphs notes that in spite of the challenges affecting the Zimbabwean economy it puts a notable value on the MoPSE as evidenced by their projected growth of the education sector (refer to ZIMASSET in Table 2.2 above) and the percentage that was taken by the Primary and Secondary Education Ministry in the 2016 national budget

(refer to Figure 2.4 below). The next sub-section is a review of the government’s position on ECD education, based on the 2018 national budget.

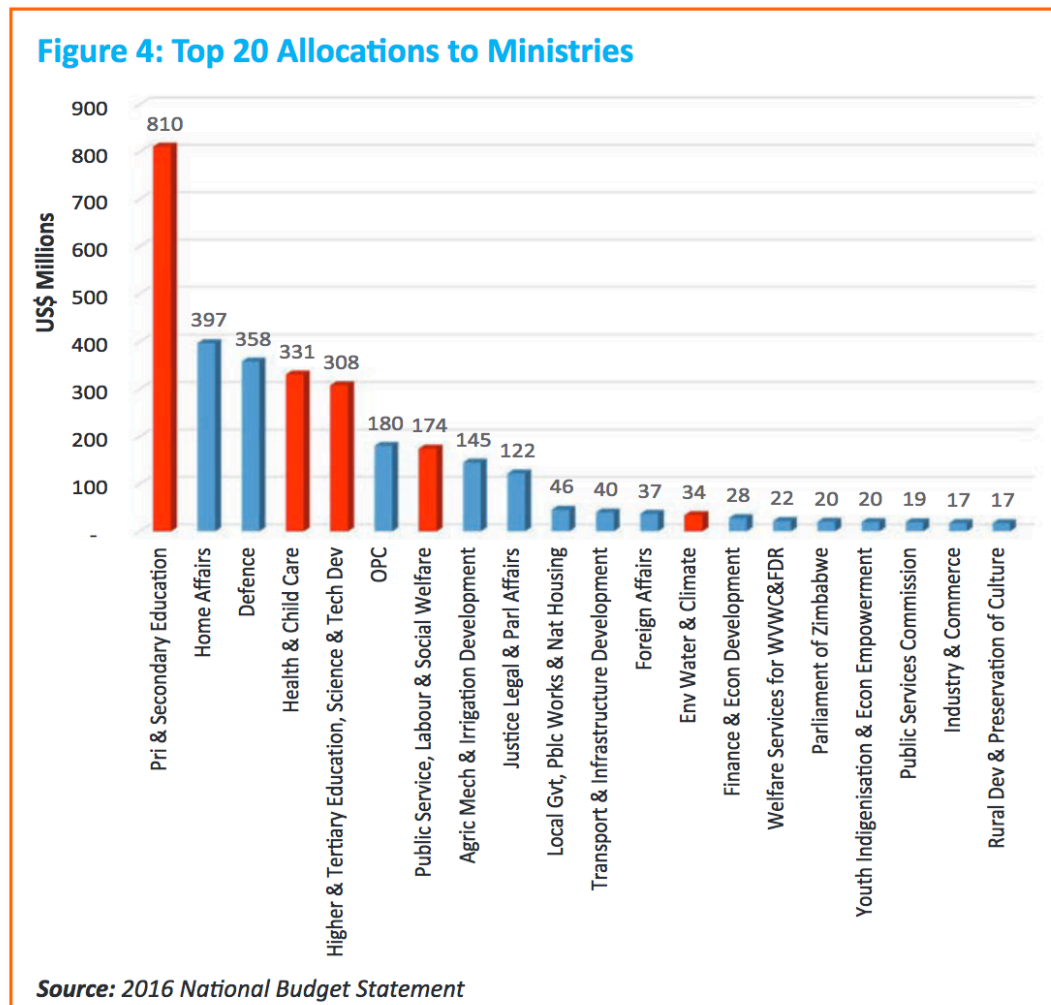


Figure 2.4: Zimbabwean National 2016 Budget

(Source: UNICEF, 2015, p. 3)

2.4.5 ECD education and the Zimbabwean National Budget

The years before 2017 saw provision for ECD education being increased in the Zimbabwean national budget. However, the 2018 national budget presented in December 2017 shocked many people as the government dropped MoPSE’s request to recruit 5,907 new ECD teachers required to bridge the gap created by the lack of ECD teachers in primary schools (Chinamasa, 2017, pp. 13–14). The Minister of Finance and Economic Planning on presenting the 2018 national budget said:

In this regard, government will continue to complement the efforts of parents, particularly in urban areas with the major interventions being to provide the necessary guidance over ECD curriculum and teaching standards ... This

development will, therefore, obviate the need for recruitment of an additional 5,907 teachers at the Budget expense for ECD levels, consistent with His Excellency's vision of re-orienting resources towards other development programmes in line with the 'New Economic Order' ... Parents and communities' participation in supporting the provision of ECD schooling services will save the fiscus an additional US\$36 million in employment costs per annum. (Pindula News, 2017c)

This seems to be an antithesis of some of the policies that the government set in the same year (2017). The new position contradicts the policy that required primary schools to reserve grade one places for children who would have attended ECD classes at registered institutions. Earlier in 2017, the Permanent Secretary had confirmed the implementation of the policy, which was set to start this year (2018) in the statement below:

Be warned! ... Children will not proceed to grade one. They will need to go to a conventional institution and start from the beginning, at ECD like everybody else. Imagine your child at seven or eight joining four-year-olds in the ECD A class because of their parents' decision. (Tshuma, 2017)

The fact that the government is now shifting the responsibility of new ECD teachers to the parents as noted in the Finance and Economic Planning Minister's statement can potentially affect the ECD teachers' attitudes and slow down the ICT integration programmes. This shows the government's priority status as far as ECD education is concerned. The next section presents a review of the ICT tools, initiatives and professional development.

2.5 ICT in education initiatives and professional development

According to UNESCO and the Zimbabwean ministries of education (2001, p. 11), "teacher education is provided at fourteen colleges with mostly three-year programmes leading to the diploma in education". ICT is part of the teacher education training curriculum, but its implementation has also been characterised with lack of competence challenges noted in the previous sections (Mandina, 2015; Musarurwa, 2011b; Musingarabwi, 2017). Abraham and Wadhvani (2013, p. 907) suggested that "ongoing teacher training and support is critical to the successful utilisation of ICTs in education. Teacher professional development is a process, not an event." UNESCO (2017d) as an international guide to nations affiliated to it acknowledges that the power of ICT in education can be used to provide teachers with

ongoing professional development even in remote areas with very limited infrastructure through the use of mobile devices, including cell phones.

In the African region, South Africa is among those who have managed to make strides in the area of developing ICT infrastructure in schools. By 2009, it is reported that at least 85% of all public schools had been electrified, which enabled them to be able to pilot the use of mobile learning in their schools (eTransform Africa, 2012). The findings of eTransform Africa's (2012) research describe how South Africa has managed to embrace Open Educational Resources by unveiling the Thutong and Siyavula projects that helped teachers to professionally develop themselves by creating teaching and learning material freely on the platforms. Senegal and Uganda's focus in terms of ICT teacher professional development focus has been on ICT literacy, while South Africa's focus, which is a step ahead, has partnered with large technology corporations to develop its teachers. Programmes under this partnership include The Commonwealth ICT Integration Certificate, Intel Teach and Microsoft PiL (eTransform Africa, 2012). In Botswana, Gill (2017, p. 433) found that "primary schools were equipped with televisions, video cassette recorders, and satellite dishes". The next section is a more detailed review of the literature on ECD teacher training in Zimbabwe.

2.5.1 ECD teacher training in Zimbabwe

The introduction of ECD into the Zimbabwean education system in 2004 meant that there was a need to increase the number of qualified ECD teachers to support the newly introduced education department (VVOB, 2014). Seke Teachers' College was the first college to offer an ECD-specific teacher training programme in 2004, with 10 other teachers' colleges and universities following at least a year later (Munjanganja & Machawira, 2015). MoPSE (2017) asserts that the shortage of trained and qualified teachers still exists. Based on the data collected by the end of 2015, MoPSE (2017, p. 45) claims that the data

demonstrates a disparity of enrolment and teacher to pupil ratio by district and province, raising issues of equity that need to be resolved. There has been a steady increase in the number of ECD teachers since 2012 with 12,124 qualified ECD teachers in 2014. However, 49% of the teachers remain as paraprofessionals, who are untrained teachers almost invariably women, most of whom teach in school-based centres (ECD A and B) but who have not undergone any formal training in ECD and who are supported by community-based funds. The poor uptake of

qualified teachers to the public sector, often due to the remoteness of ECD centres and the attraction of the private sector for qualified teachers is a challenge for MoPSE. Private provision is important and MoPSE will focus on strategies to relieve the pressure on rural areas. In the meantime, some 9,954 paraprofessionals have been trained by MoPSE and will remain an interim support to the system while qualified teachers are trained and recruited.

Munjanganja and Machawira, conducting an EFA goals review research in Zimbabwe on behalf of UNESCO, also found that

the number of qualified teachers serving ECD centres is small, with the best-staffed province of Harare at 60% while others have generally 40% and below. There is a need to increase enrolment of ECD trainees at teachers' colleges and absorb paraprofessionals who meet the required academic qualifications to train as teachers. (Munjanganja & Machawira, 2015, p. 20)

The two excerpts presented above highlight the lack of ECD teachers in Zimbabwean primary schools, although the teachers' training centres have been recruiting high numbers of trainee teachers (Dozva & Dyanda, 2012). In support of the excerpts above, Figure 2.5 shows that in 2017, ECD education had the lowest number of qualified teachers in Zimbabwe. Based on the review of literature above, if a large number of teachers practising as paraprofessionals do not qualify to be admitted in a teachers' college or university, this can potentially pose challenges for the ICT integration programmes.

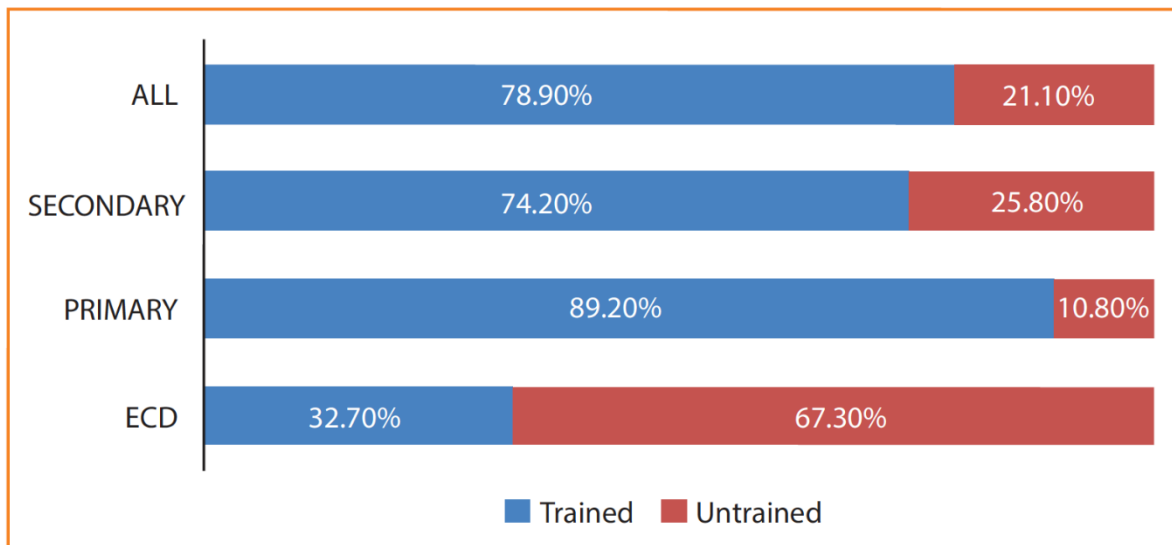


Figure 2.5: Percentages of trained and untrained teachers

(MoPSE, 2017, p. 12)

Shown below are policy statements pertaining to ICT skills development in relation to the Zimbabwean context. According to MoPSE (2017, p. 51), in 2015, “MoPSE initiated a ‘Teacher Capacity Development’ programme in which the government provides tuition fees to advance teachers’ competencies in areas where there are gaps, such as in indigenous languages, math and ICT. The programme is implemented by universities and through in-service and part-time training, [and] there are currently 2,500 teachers in the programme”. In addition to the MoPSE’s efforts, the national ICT policy stipulates that:

The Government of Zimbabwe intends to increase ICT usage in primary and secondary schools through enhanced teaching and learning through ICTs. Most schools do not have reliable connectivity due to electricity problems and high internet costs. This policy aims to provide connectivity in all schools further bridging the urban-rural digital divide and enhancing teaching and learning through the use of technology tools and promoting universal computer literacy in Zimbabwe’s schools. Therefore, it is necessary for Zimbabwe to adopt strategies that ensure resources are maximized in order to realise ICT policy goals as follows:

- a) Work with relevant institutions and government departments to develop programs that increase ICT human resource capacity and skills.
- b) Facilitate the deployment and exploitation of ICTs in the educational system from primary school upwards. Work with the relevant Ministries to include ICT training and education in schools, colleges and universities.

c) Provide equitable access to ICT enabled education and training in all parts of the country, including disadvantaged communities. (MICTPCS, 2016, p. 31)

The national ICT policy extract above highlights that the government is aware of the challenges and benefits of ICT in education and is keen on helping people from all communities. Moyo et al. (2012, p. 149) recommended “that para-professionals should be paid proper salaries similar to temporary teachers engaged in the formal school system”, while Bukaliya and Mubika (2012, p. 233) found 90% of their participants indicating that the lack of trained personnel and resources has led to their communities engaging the services of paraprofessionals. Chikutuma (2013, p. 146) also concluded her research by highlighting that her findings “proved that good staff training, as a quality indicator, showed that ECD children who had highly qualified personnel had higher educational and social outcomes as opposed to the ECD children whose teachers were paraprofessionals and showed low educational and social outcomes”. According to eTransform Africa (2012, p. 5),

ICT can facilitate a transition of the role of the teacher in the classroom into that of an instructional manager helping to guide students through individualized learning pathways, identifying relevant learning resources, creating collaborative learning opportunities, and providing insight and support both during the formal class time and outside of contact time. Unfortunately, however, most professional development programmes tend to concentrate on teaching educators how to use the technology itself. Professional development needs to focus on how to mentor and guide learners in this environment.

The Zimbabwean ECD education system has been faced with a number of challenges as noted in the literature reviewed above. Chiparange (2016, p. 359) recommends that “there should be a co-ordinated plan for the training of paraprofessionals by the government to ensure an even platform for pupils on their entry into formal education”. The next sub-section outlines the UNESCO ICT competence framework for teachers, an international standard that has been adopted globally to help in the design of ICT competencies for teachers who will engage in ICT integration activities.

2.5.2 UNESCO ICT competency framework for teachers

The UNESCO ICT competency framework for teachers (ICT-CFT) was created to be an international standard that guides professional learning providers, education policymakers

and teachers in member states in developing national ICT competency standards specifically for teachers in their region (UNESCO, 2011). First launched in 2008, the UNESCO ICT-CFT emphasises that it is not enough for teachers to have ICT skills and be able to teach them to their students (UNESCO, 2008). Teachers need to be able to help the students become collaborative, problem-solving, creative learners through using ICT so they will be effective citizens and members of the workforce. The framework, therefore, addresses all aspects of a teacher's work which include understanding ICT in education; curriculum and assessment, pedagogy, ICT; organisation and administration; and teacher professional learning, as illustrated in Figure 2.6.

THE UNESCO ICT COMPETENCY FRAMEWORK FOR TEACHERS			
	TECHNOLOGY LITERACY	KNOWLEDGE DEEPENING	KNOWLEDGE CREATION
UNDERSTANDING ICT IN EDUCATION	Policy awareness	Policy understanding	Policy innovation
CURRICULUM AND ASSESSMENT	Basic knowledge	Knowledge application	Knowledge society skills
PEDAGOGY	Integrate technology	Complex problem solving	Self management
ICT	Basic tools	Complex tools	Pervasive tools
ORGANIZATION AND ADMINISTRATION	Standard classroom	Collaborative groups	Learning organizations
TEACHER PROFESSIONAL LEARNING	Digital literacy	Manage and guide	Teacher as model learner

Figure 2.6: UNESCO ICT competency framework for teachers

(Source: UNESCO, 2011, p. 3)

The framework is arranged in three different approaches to teaching (three successive stages of a teacher's development). The first is technology literacy, enabling students to use ICT in order to learn more efficiently. The second is knowledge deepening, enabling students to acquire in-depth knowledge of their school subjects and apply it to complex, real-world problems. The third is knowledge creation, enabling students, citizens and the workforce they become, to create the new knowledge required for more harmonious, fulfilling and prosperous societies. This framework is one of the guidelines standardised for all nations who want to develop ICT competencies for teachers at all levels. The next section outlines how the curriculum is designed and developed in Zimbabwe.

2.5.3 Curriculum development and implementation

Since 1980, various evaluative studies have been conducted on learning and on the efficacy of foreign donor interventions in improving teaching and learning; on the appropriateness of curricula; and on teacher motivation and on the impact of untrained teachers on students' performance (UNESCO et al., 2001). Curriculum reforms are not designed and implemented haphazardly in Zimbabwe. Before reforms are implemented, base-line surveys are conducted to establish if there is a real need to implement reforms. At the implementation stage, there is continuous annual monitoring and evaluation of reforms through observations, questionnaires and annual reports. One might argue that it could be desirable that a permanent body of experts be established outside the ministries of education to monitor and evaluate the design and implementation of curriculum reforms and to advise government timely of policy changes.

The 2001 ICT policy on education stipulated that:

A large body of research shows that adequate training of teachers to use ICT effectively in the classroom is an essential prerequisite for success. Such training must achieve several distinct goals:

a) The teacher should be a confident computer-user who transmits positive attitudes to students. The attitude is at least as important as the level of skill, teachers and students can learn together if they are enthusiastic and believe that they will be successful. All teachers thus require computer literacy training, unless they already possess it.

b) Teachers should be trained to help students acquire basic computer literacy: the skills common to the use of all software packages. A smaller number of specialised "ICT teachers" who are charged with teaching computer use and more advanced ICT as a subject will require this training in greater depth.

c) Teachers of individual subjects should be trained in the applications of ICT. Subject area specialists, curriculum officers, etc., would need such training in greater depth to take leading roles in matters such as software selection and implementation, in-service professional development, etc. (Andrew & Durand, 2001, p. 17)

The policy statements are explicit on what the education ministry expected from a teacher regarding the use of ICT at the beginning of the 21st century. According to MoPSE (2016b, 2017) many practicing teachers received training and efforts were made to make sure that pre-service training programmes took on board the new initiatives. However, the existence of problems and constraints in the following areas: methodology (some teachers are failing to embrace modern methods of teaching that incorporate ICTs) and examinations (some teachers teach for the examination and this results in pupils failing to develop lifelong skills), prompted for an updated national curriculum. The next section reviews the literature on research and education networks in Africa.

2.5.4 Research and education networks

The emergence of national research and education networks in Africa has resulted in the reduction of ICT services' prices by at least 10% for education (eTransform Africa, 2012). A research and education network (REN) is an organisation set up to broker service level agreements for educational institutions. There are regional and national RENs; examples of regional RENs are GÉANT in Europe, RedCLARA in Latin America and UbuntuNET in Eastern and Southern Africa (as reported by Foley, 2016). African countries whose national REN projects have successfully kicked off are South Africa, Kenya, Nigeria, Zambia and Ghana (eTransform Africa, 2012; Foley, 2016; Taylor & Abbott, 2015). ZARNet is the first Zimbabwean national REN project, which was established in 1997 (ZARNet, 2017). The higher education arm of the education sector set up another national REN to complement the services that ZARNet was set to offer to them (which they call the Zimbabwe Research and Education Network) as they believe that ZARNet has been marred with a lot of mismanagement, thereby failing to fulfil its mandate (Ndebele, 2015). The next section is an outline of the Zimbabwean ECD teacher training system in relation to ICT. It gives an overview of the opportunities and challenges of integrating ICT in education.

2.6 Opportunities and challenges of ICT Integration in ECD education

The literature reviewed above has highlighted that there are benefits and challenges faced by educators in trying to implement the government's ICT-related programmes. MoPSE (2016c) noted that ICT can strengthen teaching and learning processes, increase access to information

and equip teachers and learners with skills that they will need should they decide to further their studies and secure better employment opportunities; however, MoPSE (2017, p. 9) reported that the “lack of classrooms or classrooms in a poor state of repair leads to large class sizes, few or no laboratories and ICT centres which when in place are often poorly equipped. [These] all act as a disincentive for children to enter or to attend school.” This subsection presents some of the key benefits and barriers to ICT integration in ECD education.

2.6.1 Benefits of ICT integration in ECD education

Venkatesh and Davis (2000) believed that the benefits of ICT were highly dependent on the users’ ability to embrace it into their environment and social system. ECD teachers can only understand the real benefits of ICT as educational tools in their classrooms if they have the right ICT skills and competencies as espoused by ITU (2016b). Al-Sulaiman (2010) found that in spite of the training programmes extended to teachers and education officials, some of them remained unconvinced of the benefits of ICT to their teaching and learning processes. The key benefits of ICT in education have been highlighted in this section according to previous studies and policy statements. In the following extracts, Fu (2013, p. 114) reveals the benefits realised when ICT tools are integrated into the education system:

Assists students in accessing digital information efficiently and effectively

ICT is used as a tool for students to discover learning topics, solve problems, and provide solutions to the problems in the learning process. ICT makes knowledge acquisition more accessible, and concepts in learning areas are understood while engaging students in the application of ICT.

Supports student-centred and self-directed learning

Students are now more frequently engaged in the meaningful use of computers (Castro Sánchez and Alemán 2011). They build new knowledge through accessing, selecting, organising, and interpreting information and data. Based on learning through ICT, students are more capable of using information and data from various sources, and critically assessing the quality of the learning materials.

Produces a creative learning environment

ICT develops students’ new understanding in their areas of learning (Chai, Koh and Tsai 2010). ICT provides more creative solutions to different types of learning

inquiries. For example, in a reading class, e-books are commonly used in reading-aloud activities. Learners can access all types of texts from beginning to advanced levels with ease through computers, laptops, personal digital assistants, or iPads. More specifically, these e-books may come with some reading applications, which offer a reading-aloud interface, relevant vocabulary-building activities, games related to reading skills and vocabulary acquisition, and more. Therefore, ICT involves purpose designed applications that provide innovative ways to meet a variety of learning needs.

Promotes collaborative learning in a distance-learning environment

Koc (2005) mentioned that using ICT enables students to communicate, share, and work collaboratively anywhere, any time. For instance, a teleconferencing classroom could invite students around the world to gather together simultaneously for a topic discussion. They may have the opportunity to analyse problems and explore ideas as well as to develop concepts. They may further evaluate ICT learning solutions. Students not only acquire knowledge together but also share diverse learning experiences from one another in order to express themselves and reflect on their learning.

Offers more opportunities to develop critical (higher-order) thinking skills

Based on a constructive learning approach, ICT helps students focus on higher-level concepts rather than less meaningful tasks (Levin and Wadmany 2006). McMahon's study (2009) showed that there were statistically significant correlations between studying with ICT and the acquisition of critical thinking skills. A longer exposure in the ICT environment can foster students' higher critical thinking skills. Thus, schools are strongly advised to integrate technology across all of the learning areas and among all learning levels. Where this is done, students are able to apply technology to the attainment of higher levels of cognition within specific learning contexts.

Improves the teaching and learning quality

... there are three important characteristics are needed to develop good quality teaching and learning with ICT: autonomy, capability, and creativity. Autonomy means that students take control of their learning through their use of ICT. In this way, they become more capable of working by themselves and with others. Teachers can also authorise students to complete certain tasks with peers or in groups. Through collaborative learning with ICT, the students have more opportunity to build new knowledge onto their background knowledge and

become more confident to take risks and learn from their mistakes. Further, Serhan (2009) concluded that ICT fosters autonomy by allowing educators to create their own material, thus providing more control over course content than is possible in a traditional classroom setting. ... By using ICT, students' creativity can be optimized. They may discover new multimedia tools and create materials in the styles readily available to them through games (Gee 2007, 2011), CDs, and television. With a combination of students' autonomy, capability, and creativity, the use of ICT can improve both teaching and learning quality.

Supports teaching by facilitating access to course content

Watts-Taffe et al. (2003) found that teachers can act as catalysts for the integration of technology through ICT. If the encouragement, equipment, and necessary technical support are available from institutes for the teachers, developing an ICT class will be easier for them. The main responsibilities of these teachers will be changing their course format, creating and explaining the new assignments, and arranging for the computer lab through their technology learning specialists or assistants. In sum, as Reid (2002) has indicated, ICT offers students more time to explore beyond the mechanics of course content allowing them to better understand concepts. The use of ICT also changes the teaching and learning relationship. Based on the findings of Reid's study, teachers reported that the relationship between teacher and learner is sometimes reversed with regard to information technology. This relationship boosts students' confidence when they are able to help teachers with technical issues in the classroom. Therefore, ICT changes the traditional teacher-centered approach, and requires teachers to be more creative in customizing and adapting their own material.

The extracts above take note of benefits of the students and ECD teachers engaging with ICT integration in the classroom. The 2001 MoES&YA ICT policy on education document, which was prepared by Andrew and Durand (2001, p. 6), stipulated that

research has shown that ICT can provide stakeholders and administrators with new tools for increased communication for management efficiencies, and teachers and learners with improved learning opportunities by:

- empowering citizens, managers and other stakeholders by enabling online teamwork for increased participation, collaboration and information sharing through the use of email, the Web and other remote collaboration tools.

- enabling the rapid creation and inexpensive distribution of educational information and knowledge.
- encouraging professional development, in-service training, remote support and mentoring for lifelong learning for teachers, managers and other citizens.
- facilitating fast and easy access to information and expertise around the world.
- increasing motivation through the use of multimedia (sound, video, graphics, animation and text.)
- allowing each student to learn at his or her level and speed thereby giving pupils greater control over their own learning.
- enhancing the development of the abilities of mentally and physically challenged students.
- promoting active rather than passive learning.
- engaging students in research, data analysis and problem-solving, thereby facilitating higher-order thinking processes such as synthesising, interpreting and hypothesising.

Pohio's study generated the following ECD context benefits:

the acquisition of literacy experiences; understanding the actual processes involved when using resources, for example, how to turn the camera on and which button to press to take the photo, and the ways in which the written and visual information displayed enabled children to be more active participants in their own learning, reflecting and reviewing their ideas ... ICT encouraged children to work collaboratively, solving problems and offering them ideas when working together with these resources. (2009, p. 72)

... has the ability to increase the visibility of children's learning through for example their portfolios. The way in which this information was presented, by the inclusion of digital photographs, learning stories, exemplars of children's visual artworks, for example, was considered to provide more accessibility to parents." (2009, p. 73)

Al-Sulaiman (2010, p. 100) found that ICT raises children's motivation, elevates the teachers' role by enhancing the flow of ideas and also reduces the time normally used by the teacher to plan and execute lessons as he or she can reuse material that he or she would have prepared for one lesson. Tongkaw (2011) believed that improving productivities and improving communication are some of the benefits of ICT in education. Masango (2014) concluded his study by pointing out how ICT integration has been found to improve collaboration between teachers. This section presented an in-depth extrapolation of the key benefits for ICT integration in education as noted in the literature. The following sub-section discusses the key barriers to ICT integration found in the reviewed literature.

2.6.2 Barriers to ICT integration

An ICT integration study carried out by Buabeng-Andoh (2012) found that despite the investments that have been made in ICT globally, its integration and adoption remain limited. Mukhari (2016, p. iv) conducted a study in South African urban schools, which identified barriers to the successful integration of ICT as "inadequate ICT infrastructure, teachers' lack of ICT skills and low level of ICT proficiency, inadequate training, negative attitudes and poor teacher confidence. Other factors included a lack of ICT leadership, funds and technical support". Essop (2013) conducted a comparative qualitative ICT integration study of schools in two different continents where there were ample technology resources for teachers to work with. The first school was located in South Africa, while the second school was in the UK. The study discovered that all participants were skilled in the technical use of ICT but not in the pedagogical use of ICT; and that the two schools had divergent barriers. The main ICT integration barriers for the South African school were lack of a stable internet connection and support from the stakeholders (parents and administration) while for the UK school the barrier was due to the lack of time for teachers to schedule and plan lessons with ICT integration. Koehler et al. (2013, p. 14) claimed that

Social and contextual factors also complicate the relationships between teaching and technology. Social and institutional contexts are often unsupportive of teachers' efforts to integrate technology use into their work. Teachers often have inadequate (or inappropriate) experience with using digital technologies for teaching and learning. Many teachers earned degrees at a time when educational technology was at a very different stage of development than it is today. Thus, it is

not surprising that they do not consider themselves sufficiently prepared to use technology in the classroom and often do not appreciate its value or relevance to teaching and learning. Acquiring a new knowledge base and skill set can be challenging, particularly if it is a time-intensive activity that must fit into a busy schedule. Moreover, this knowledge is unlikely to be used unless teachers can conceive of technology uses that are consistent with their existing pedagogical beliefs (Ertmer, 2005). Furthermore, teachers have often been provided with inadequate training for this task. Many approaches to teachers' professional development offer a one-size-fits-all approach to technology integration when, in fact, teachers operate in diverse contexts of teaching and learning.

An American survey on teachers' ICT integration challenges identified lack of time, ICT equipment and professional development as some of the major barriers (Hutchison, 2009). In Saudi Arabia, Al-Sulaiman's (2010, p. 111) participants indicated six main barriers that include: "lack of infrastructure for ICT, shortage of finance, lack of cooperation between boys' and girls' education agencies, lengthy approval processes, lack of technical support, and types of school buildings". Gray (2011) conducted a study in Western Australia that found a lack of computers, software, audio-visual resources, budget allocation and confidence to be the teachers' perceived barriers. Alev (2003) adds that overcrowded classrooms were one of the major barriers to successful integration in Turkey. In Namibia, Afunde (2015), found that teachers indicated that lack of competence, access to computer rooms and internet access were the key barriers preventing them from successfully integrating ICT into their classrooms. Also noteworthy are the key barriers to ICT integration in Africa as a whole (as reported by eTransform Africa, 2012, p. 15), which include:

the absence of comprehensive policies which enable and support interventions and which are supported by clearly defined and resourced strategies for implementation at the national level as well as at the level of educational institutions; lack of financing and prioritisation of ICT investments; limited infrastructure of the kind required to support the use of ICT in education; lack of capacity at all levels to integrate and support the use of ICT in education effectively; lack of necessary ICT skills among teachers, and of the specific training needed to be able to use ICT appropriately in the classroom; and lack of accurate, comprehensive, up-to-date data on education.

The barriers to ICT integration discussed in this section can be collapsed into three categories, as reported by Buabeng-Andoh (2012): teacher-level (those affecting the teacher), school

level (those affecting the school) and system level (those affecting regulating organisations like the MoPSE). According to Buabeng-Andoh (2012, p. 148)

teacher-level barriers include lack of teacher ICT skills; lack of teacher confidence; lack of pedagogical teacher training; lack of follow-up of new and lack of differentiated training programmes. The school-level barriers comprise absence of ICT infrastructure; old or poorly maintained hardware; lack of suitable educational software; limited access to ICT; limited project-related experience; lack of ICT mainstreaming into the school's strategy and the system-level barriers include a rigid structure of traditional education systems; traditional assessment; restrictive curricula and restricted organisational structure.

This resonates around educators not having the ICT competences, confidence and resources that enable them to engage with ICT integration. The teachers' teaching experience has also been cited as one of the factors that can determine their attitude and behaviour to engage or not to engage with ICT integration. The next sub-section reviews literature that highlights the barriers that have been recorded in the Zimbabwean context.

2.6.3 Barriers to ICT integration in Zimbabwe

This section documents key Zimbabwean ICT policy statements relating to ICT integration challenges at the national level and education in particular. MoPSE (2017) identified a lack of funds and ICT equipment as the key external barriers to the successful implementation of ICT in Zimbabwean schools. The 2016 national ICT policy noted the following as the ICT sector challenges (MICTPCS, 2016, p. 14):

a) "Inadequate communications infrastructure: –

While there has been a significant rollout of communications infrastructure with 2G exceeding 75% population coverage (as at 31 December 2015), high-speed broadband coverage is still patchy with most rural and remote areas remaining uncovered due to a non-holistic approach to universal service. Broadband coverage in rural and remote areas remains low. Coverage is mainly concentrated in affluent urban areas. This is widening the urban-rural digital divide against the principle of equitable access.

b) Inadequate commercial electricity: –

The national power grid does not cover the whole country, which leaves a significant population dependent on alternative power sources which tend to be more expensive. Even those who are on the national grid experience erratic supply. This shortage has had adverse effects on the development and use of ICTs.

c) Inadequate ICT skills: –

There is a shortage of ICT skilled manpower to roll out ICT programmes. This shortage has a knock-on digital literacy which drives uptake and usage of ICT services. There is a need to integrate ICTs in the education curricula commencing from early childhood education level as well as promote ICTs uptake within communities.

d) Low digital literacy level: –

The education curriculum does not include ICT, therefore the level of digital literacy at the grassroots level is very low to stimulate service uptake and usage, especially in rural areas.

e) Limited local ICT innovation, research and development (R&D) and entrepreneurship: - There is no framework for R&D to stimulate innovation and harness the potential of ICTs in promoting entrepreneurship.

The national policy extracts above highlight the challenges whose existence the Ministry of ICT, Postal and Courier Services acknowledge. As espoused by Nhaka Foundation (2012), the introduction of ECD education in Zimbabwean education was motivated by the lack of access to early childhood care services in the remote and rural areas of the country. Challenges a) and b) mainly affect remote and rural areas where most telecommunications providers do not have a presence and commercial electricity has not yet been rolled out, which clearly shows how this could slow down the process of ICT integration in Zimbabwean schools. ZIMSTAT (cited in MICTPCS, 2016, p. 31) revealed that (as of 2011) Zimbabwe's education policy resulted in an overall literacy rate of 97%. However, in spite of the high literacy rate recorded by ZIMSTAT, challenges c) and d), state that there is a general inadequacy of ICT skills and low digital literacy in the country; the education sector has also not been spared as noted in the 2016 draft ICT policy for primary and secondary education (MoPSE, 2016c). According to the 2016 draft ICT policy on primary and secondary education (MoPSE, 2016c,

p. 6), the most significant challenges recorded for primary and secondary education are as follows:

Technical

- Unavailability of power supply from the national grid in some areas and limited alternative sources of power
- Inadequate ICT tools
- Limited access to communication infrastructure
- The absence of a Cybersecurity Framework

Human Resources

- Inadequate ICT knowledge, skills and competencies at all levels in all areas, including teaching and learning, management and administration.

Organisational

- Inadequate numbers of skilled ICT personnel
- Limited resources (Finance)
- Limited financial prioritisation for ICT-related programs”

The policy extracts presented above are some of the key barriers noted in Zimbabwean literature. As noted by Manaligod (2012, p. iv), “the benefits of ICT have not trickled into the classroom. ICT integration remains to be learning about, rather than learning with ICT tools”. ICT can only be successfully integrated into the education system if the strategies put in place to make this a reality are fully exploited. The next section is an outline of some the strategies for enhancing ICT integration in education.

2.7 Strategies for enhancing ICT integration in education

According to Palak and Walls’ (2009) study teachers mainly used ICT to support their traditional teaching approaches and rarely used it to foster student-centered learning. Mafang’ha (2016), suggested that there is a need for teachers to be equipped with ICT-related

competencies that are classroom-context based at the teachers' training colleges. Mikre (2011, p. 14), reviewing the role of ICT in the developing world's education system proposed the improvement of the "overall standard of education by reducing the gap in quality of education between schools in urban and rural areas, initiation of smart school with objectives to foster self-paced, self-assessed, and self-directed learning through the applications of ICTs, and developing ICT policy for education and training". A study conducted by Chitanana and Govender (2015) found that "Bring Your Own Device" policies could be used as a technical solution in an environment where the resources are limited. However, the system only works when the environment is equipped with the basics (like a source of power, bandwidth and a computer network), which may not be readily available in rural Zimbabwean schools as noted above.

A review of literature by Fu (2013, p. 115) encouraged "schools to create a platform that helps teachers share their ICT-related experience by offering teachers with low proficiency in ICT an opportunity to observe those who use it in their classrooms; provide and support ICT competence related activities at the schools for both teachers and learners; cultivate positive attitudes on the significance and relevance of ICT integration in instruction/education; and provide ample technical support at the school". According to Seegobin (2012), there is a need for the creation of an ICT integration monitoring and evaluation mechanism for schools and education departments, the prioritisation and creation of a school ICT policy and the ICT skilling of school management so that they can spearhead ICT integration programmes at the school level. Nangue (2011) believed that it is critical to set up school policies that recognise all the ICT-related costs required to successfully integrate ICT into primary schools.

eTransform Africa (2012, pp. 18–24) presenting their sub-Saharan African research findings made the recommendations listed below for regulators and policymakers:

1. Establish an enabling policy environment
2. Widen access to ICT infrastructure and connectivity
3. Harness ICT to improve management and administration
4. Harness digital learning resources

5. Build Human Capital
6. Ensure funded projects contribute to national policies and objectives
7. Consider an investment in the enabling policy environment
8. Consider investments to build capacity at a regional and continental level
9. Continue to test pilot projects to fund innovative technologies
10. Ensure that intellectual capital generated by funded projects is shared
11. Undertake an evaluation and impact assessment of regional initiatives”

Further, Henoeh (2015) studying how student teachers use and integrate ICT during teacher practice sessions recommends the expansion of teaching pedagogies to allow the more ubiquitous use of ICT by student teachers thereby making their lessons more exploratory for learners and not just completing the syllabus content. In this regard, the mentor’s role would be regulating the use of ICT as tools in the classrooms. However, this cannot be achieved if the mentor is not ICT literate. Zaki (2013, p. iv) recommended that there is a need for the “understanding of cross-national early childhood teachers’ beliefs and comfort levels regarding their ICTs and internet classroom practices in both established and emerging economies”. Markon (2013, p. 51), on the other hand, believed that “without support, the staff can develop a negative attitude towards ICT and ultimately not integrate ICT into their lessons. Creating strong, inclusive policies with ample support and encouragement for teachers can provide a framework for a successful school ICT integration program.”

In Rwanda, Munyengabe, Yiyi, Haiyan, and Hitimana (2017, p. 7201) suggest that the government should “support teachers to have their own laptops and other advanced technological tools, provide required infrastructures and increase teachers’ motivation by reducing all challenges attached to the shortage of financial payments”. Brush, Glazewski and Hew’s (2008) study, which found that pre-service teacher training may not be demonstrating the key technology integration methods and adequate content for technology-based instruction, recommended the need for a revamp of the teachers’ training curricula to include this. Chen (2008) concludes his research by suggesting that researchers could help alleviate some of the challenges faced by teachers by documenting empirical evidence (with detailed

steps) of how teachers who have successfully integrated ICT into their pedagogical goals and needs have done it.

Özdemir's (2017, p. 519) study on teachers' views on barriers to ICT integration suggested some of the strategies quoted below to enhance ICT integration in relation to this study:

In-service courses should be given to teachers to integrate field knowledge with ICT. The curriculum should be integrated with ICT. Schools' fibre internet infrastructure should be established. Teachers should have unlimited access to the internet in the school environment. Tablet distribution should be made to the students and they should be provided with access to the internet in the school environment. Interesting materials that are compatible with the acquisitions should be developed. Software that teachers can use easily should be developed and provided free of charge. (Özdemi, 2017, p. 519)

The literature presented in this section highlighted the need for skilled teachers, the creation of an ICT-enabled and -resourced environment for both the learner and the teacher, and building the teachers' confidence by encouraging them to integrate ICT into their daily classroom. Although the majority of the studies reviewed above highlight that the main problems are associated with resourcing the primary schools and a lack of government support for ICT education policies there is no guarantee that if the strategies presented above are implemented full ICT integration will be achieved. On the contrary, generalising the educational environments could also help resolve the problems using the strategies compiled in this section. This study took the same approach used in the reviewed studies.

Figure 2.7 and Figure 2.8 are frameworks containing guidelines for ICT adoption in schools at the introductory stage. Figure 2.7 emanated from Nangue's (2011) ICT integration study in Cameroon. In Figure 2.7 ICT integration is at the nucleus of the diagram. A sound ICT policy plan, ICT management and professional learning are petals moderated by culture and ICT use for effective ICT integration.

Figure 2.8 takes a sequential approach, which adds the element of monitoring and evaluation at the end of the cycle. Creating guidelines that can be universally applied to any environment can be a very difficult task. This section reviewed some of the strategies that were recommended in previous studies; the next section is a conclusion of this chapter.

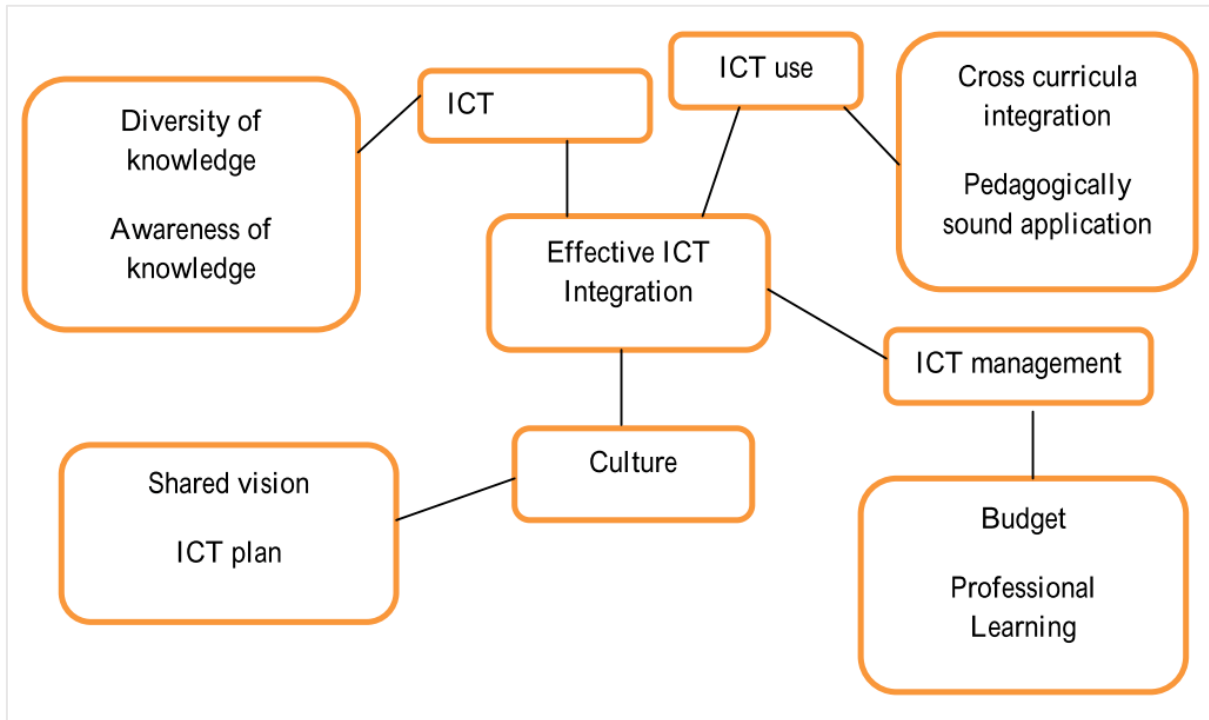


Figure 2.7: Model for effective ICT integration in primary schools

(Source: Gray, 2011, p. 356)

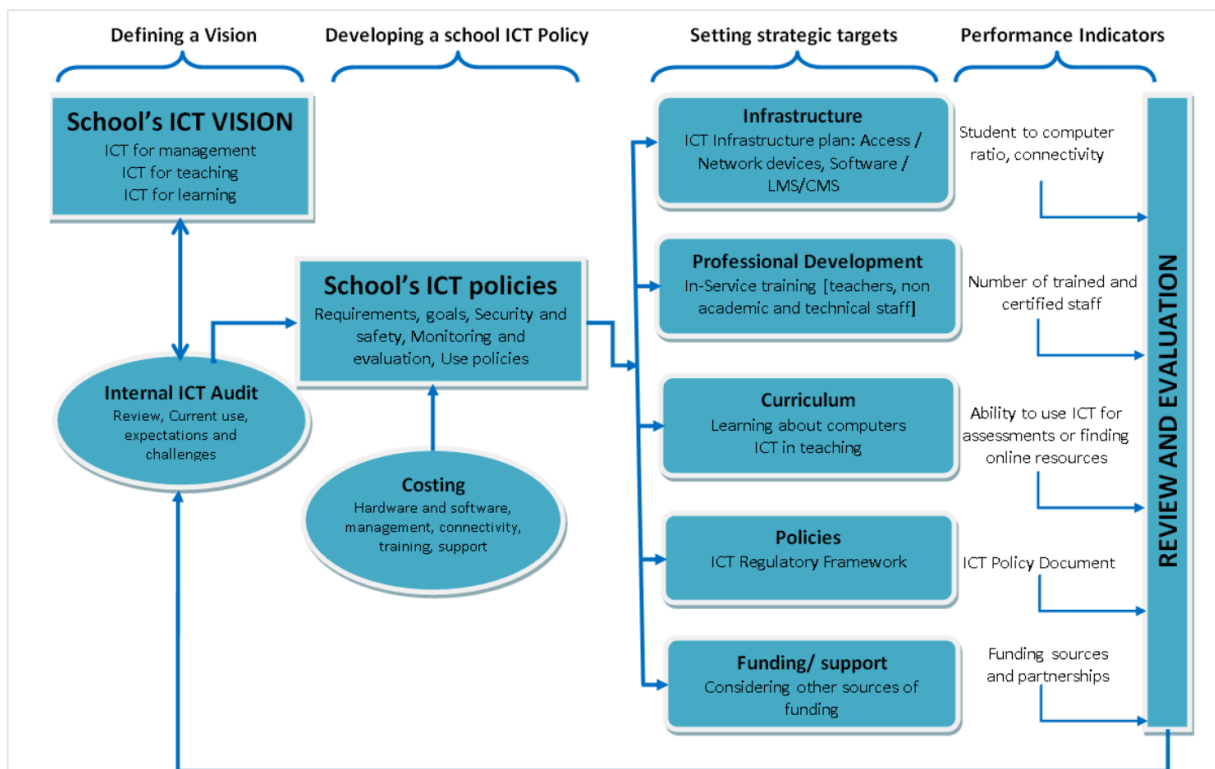


Figure 2.8: Guidelines for ICT adoption in schools at the introductory stage

(Source: Nangue, 2011, p. 118)

2.8 Conclusion

This chapter examined ICT integration literature relevant to this study. It provided an overview of educators' attitudes and perceptions; the role of ICT in ECD education; policy frameworks in relation to ICT integration; and opportunities and challenges of integrating ICT in education. Some of the literature reviewed in this chapter noted that ICT integration initiatives differ from nation to nation. Developed nations are ahead of developing nations in terms of infrastructure and policies that can drive ICT integration in primary school education. It was also noted that ICT integration in Zimbabwean ECD education is still in its initial stages based on the policy frameworks and structures referred to in the literature. Both qualitative and quantitative studies have been employed to understand teachers' attitudes and subsequent ICT integration behaviour. It is against this background that this study chose a mixed methods approach, which can exploit advantages of both methods when conducting a critical analysis. The next chapter outlines the theoretical frameworks employed in this study.

Chapter Three – Theoretical Framework

3.1 Introduction

This section outlines the key theories used in the assessment of Information Systems as they relate to this study. Theories chosen for use in this research are explained further at the end of the chapter.

3.2 Theories used in information systems research

ICT integration in the Zimbabwean ECD education system seems to be in its preliminary stages. As a start to exploring the acceptance and diffusion of ICT in ECD education, this section discusses theories that have been previously used to predict and explain IS users' attitudes and behaviour relating to technology adoption. The theories that are reviewed are the Theory of Reasoned Action (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975), Theory of Planned Behaviour (Ajzen, 1985, 1991), Technology Acceptance Model (Davis, 1989; Venkatesh & Bala, 2008; Venkatesh & Davis, 2000), Technological Pedagogical Content Knowledge (TPACK), Diffusion of Innovation (Rogers, 1983, 1995) and UTAUT (Venkatesh, Morris, Davis, & Davis, 2003). A literature-based evaluation of the abovementioned theories' applicability to ICT integration and ECD teachers' attitudes towards the integration was conducted. Some of the constructs extrapolated from these theories were validated with inferential statistics in the analysis of this study's findings in section two.

IS and ICT have been a part of our world for some decades; as a result, industry, commerce and education have been implementing them. In Africa, where there is a high concentration of developing countries, ICT initiatives are being set up on a daily basis because there is still much development occurring in many sectors of their economies (Murisa, 2010); the implementation of such initiatives can be modelled under technology adoption and acceptance studies to get more insight into which theories best suit the initiatives. According to Venkatesh et al. (2003); Silva and Dias (2007) and Otieno et al. (2016), the Theory of Reasoned Action, Theory of Planned Behaviour, Technology Acceptance Model and UTAUT are some of the models popularly used in Computer Science, IS and Information Science to understand why people choose to use or discard computer-related technology.

In addition, Dillon and Morris (cited in Samaradiwakara & Gunawardena, 2014, p. 22), assert that “acceptance can be viewed as a function of user involvement in technology use. Acceptance can be further described as the critical factor in determining the success or failure of any technology and acceptance has been conceptualized as an outcome variable in a psychological process that users go through in making decisions about technology.” Casanovas (2010, p. 76) cites Morris who defines technology acceptance as, “the degree to which individual users use a given system when usage is voluntary or discretionary (low or high acceptance).” Figure 3.1 outlines the basic concept of individual acceptance of information technology followed by the theories under review.

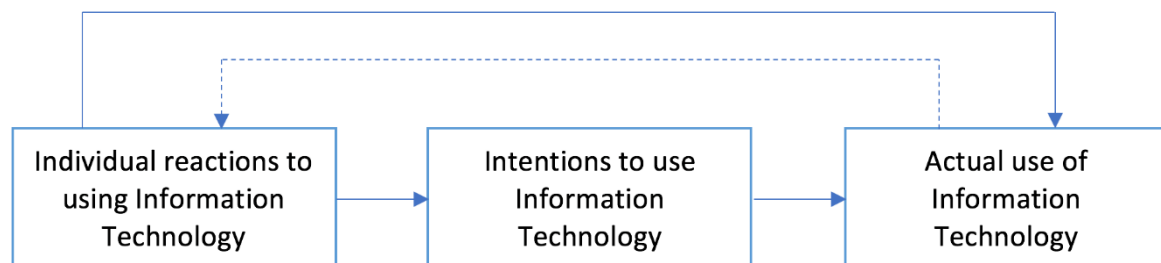


Figure 3.1: User acceptance models concept

(Venkatesh et al., 2003, p. 427)

3.3 Reasoned action theories

Reasoned action theories are centred on trying to explain how prior persuasive information leads to a change in behaviour by evaluating behaviour with the same specificity as the attitude that leads to the behaviour (Yzer, 2013). Ajzen and Fishbein (1980; 1975), affirm that the reasoned action theory was first introduced by Martin Fishbein in 1967 and later revised by Ajzen and Fishbein in the early 1970s. The theory was a result of trying to understand the discrepancies and relationship between attitude and behaviour. Fishbein and Ajzen (2010, p. 8), try to explain what beliefs are in the theories by asserting that “beliefs originate in a variety of sources, such as personal experience, formal education, radio, newspapers, TV, the internet and other media, and interactions with family and friends”. Yzer’s (2013) review of the theories considers the Theory of Reasoned Action (Fishbein & Ajzen, 1975) and the Theory of Planned Behaviour (Ajzen, 1991) as some of the key theories concerned with reasoned action. The Theory of Planned Behaviour was added to the reasoned action theory list as an

extension of the Theory of Reasoned Action in 1988. Figure 3.2 was extracted from Yzer’s (2013) review to illustrate the key components and relationships considered for both theories. The first two columns represent background factors and beliefs that lead to the attitude, perceived norm and behavioural control before the actual intention and behaviour. The theories are further discussed in the sub-sections below.

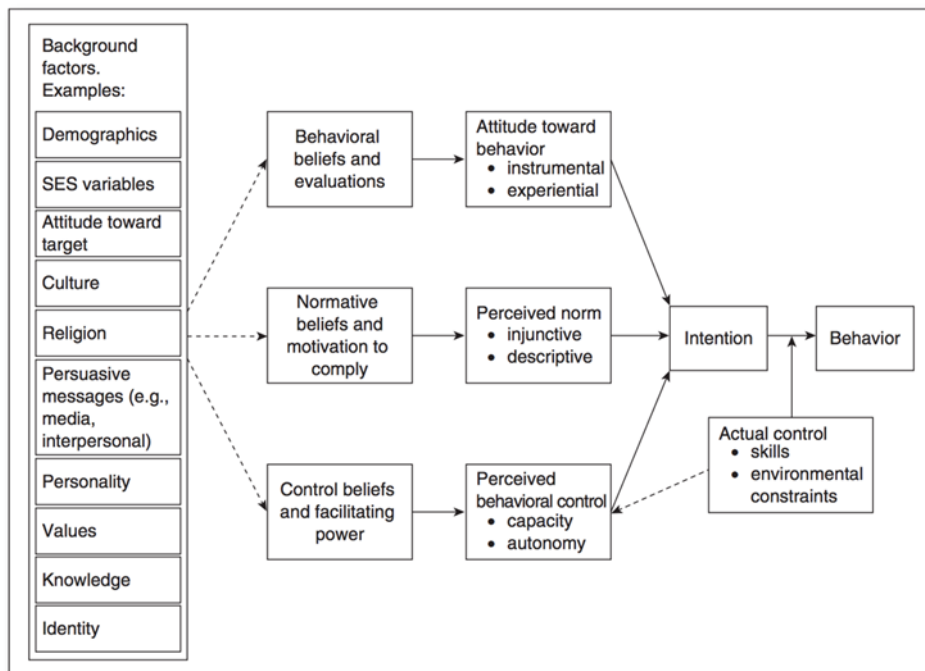


Figure 3.2: Components of reasoned action theories

(Source: Yzer, 2013)

3.3.1 Theory of reasoned action

The Theory of Reasoned Action (TRA) was formally introduced in 1967 based on three main components, which include behavioural intention, attitude and subjective norm (Fishbein & Ajzen, 1975). Trafimow (2009, p. 506) defines the TRA by highlighting that

the most proximal cause of behaviour is behavioural intention (what one intends to do or not to do as a predictor and influencer of behaviour), where the behavioural intention is determined by attitude (the individual’s positive/negative feelings used to determine one’s assessment of belief) and subjective norm (the individual’s perception of whether people important to the individual think that he or she should react in a certain way) either of which might be the most important determinant of any particular behaviour.

In Yzer's (2013, p. 122) words,

specific beliefs about a behaviour inform attitude, perceived norm, and perceived behavioural control regarding the behaviour, which in turn determine intention to perform the behaviour. If one has the necessary abilities to perform the behaviour and if there are no situational obstacles that impede behavioural performance, then intention should lead to behaviour.

Otieno et al. (2016) suggest that the Theory of Reasoned Action has been used in IS research to understand how and why people's beliefs have the potential of changing the way they act. Therefore, the Theory of Reasoned Action may be used in this study since it has been previously used in information technology integration studies.

Ajzen and Fishbein (2005) and Trafimow (2009), empirically explain how behavioural intention and attitude can be measured based on the constructs illustrated in Figure 3.2 above. Figure 3.3 shows Ajzen and Fishbein's (1975) revised TRA. Trafimow (2009, p. 506) also revealed that

beta weights obtained from multiple regression analyses, where the behavioural intention is regressed on to attitude and subjective norm. If the result is a larger attitude than subjective norm beta weight, the behaviour is deemed to be more under attitudinal than normative control, but if the reverse is true, then the behaviour is deemed to be more under normative than attitudinal control ... Thus, to form an attitude, people are assumed to sum behavioural belief-evaluation products ($\text{attitude} = \sum b_i e_i$), whereas to form a subjective norm, people are assumed to sum normative belief-motivation to comply products ($\text{subjective norm} = \sum n_i m_i$).

TRA is said to have a higher number of success stories when applied to situations where behaviour is a result of a person's volitional control.

One of the major issues emanating from the theory's criticisms is that it is not falsifiable (Trafimow, 2009). Trafimow (2009), argues that if the TRA is not falsifiable it is not a good theory regardless of how many studies it has been used in. The other shortcomings of the TRA include the measurement risks associated with confusing attitudes and norms and the assumption that an individual will always behave in a voluntary manner, thereby disregarding factors such as the individual's personality, background and demographic characteristics that

may influence their behaviour. To deal with this shortcoming, the Theory of Planned Behaviour was developed in a way that it can be able to predict a person's behaviour regardless of his or her volitional control. The TPB is discussed in the next section.

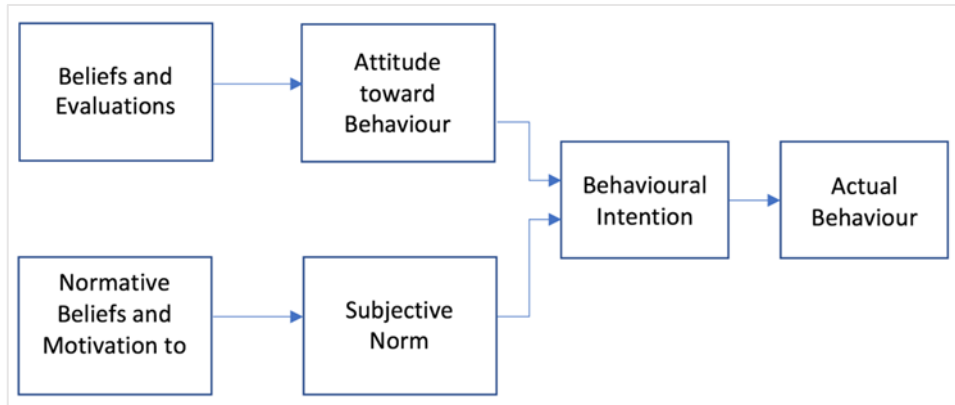


Figure 3.3: Theory of reasoned action

(Fishbein & Ajzen, 1975)

3.3.2 Theory of planned behaviour

The Theory of Planned Behaviour (TPB) is an extension of the TRA. The major difference between the TRA and the TPB is the addition of a third determinant of behavioural intention, perceived behavioural control. The TPB works by assuming that an individual's behaviour is driven by behavioural intentions, thereby predicting the individual's intention to engage in a behaviour at a specific time, place and environment (Ajzen, 1985, 1991). The three moderating variables in the TPB are an individual's attitude towards behaviour, subjective norms, and perceived behavioural control (Ajzen, 1991). Yzer (2013) notes that the TPB has been successfully applied to the understanding of an individual's acceptance of many technologies over the years. Figure 3.4 illustrates the constructs of the Theory of Planned Behaviour. Perceived Behavioural Control is determined by control beliefs and perceived power. When a person has strong control beliefs, he or she has enhanced motivation to behave in a certain way, thereby increasing the behavioural intention.

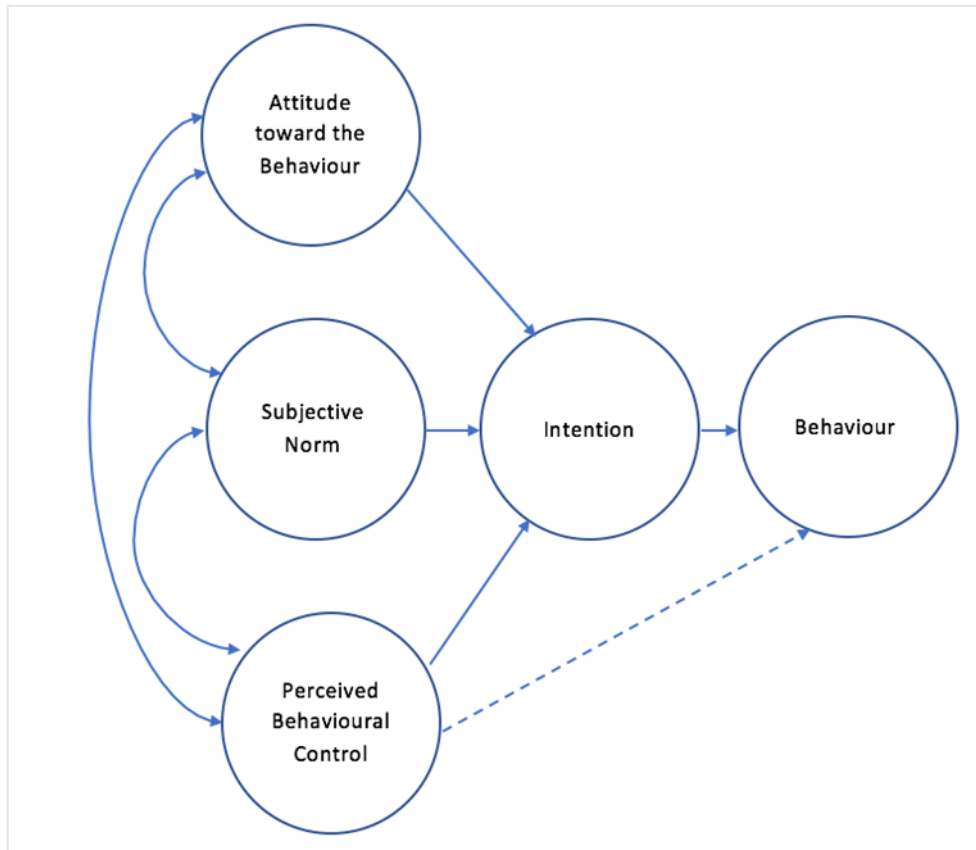


Figure 3.4: Theory of planned behaviour

(Adapted from Ajzen, 1991)

The Theory of Planned Behaviour makes the assumption that the perceived behavioural control will always predict the actual behavioural control, which may not always be the case. The Theory of Planned Behaviour is biased in that it can only be successfully used when the behaviour is not under volitional control, therefore, unconscious motives are not considered in any way (Ajzen & Fishbein, 2005; Trafimow, 2009).

3.4 Technology acceptance model

Theoretically based on the TRA discussed in section 3.3.1, the Technology Acceptance Model (TAM), was a product of Davis' (1986) doctoral studies. While the TRA and TPB are generic theories for explaining human behaviour, TAM was specifically designed to be used in the evaluation of IS and technologies to explain the determinants of computer acceptance and possibly predict the users' usage behaviour (Davis, 1989; Davis, Bagozzi, & Warshaw, 1989). TAM suggests that when users are presented with a new technology or innovation, their

decision to use (behavioural intention) can be determined by the Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). Performance Expectancy (PE) is a quantification of the degree to which a person believes that using a particular system would make his current job easier, while PEOU refers to the degree to which an individual using a particular system believes that its use is free from the effort (Surendran, 2012). Davis, Bagozzi and Warshaw (1989, p. 985) claim that “generally, Technology Acceptance Model specifies general determinants of individual technology acceptance and therefore, can be and has been applied to explain or predict individual behaviours across a broad range of end-user computing technologies and user groups.”

ICT can be generally classified as a new technology in the context of this study, which examined its integration in the early childhood classroom by ECD teachers. The TAM theory has evolved over the years. Originally an attitude variable was considered as predicting the actual system usage. Davis, Bagozzi and Warshaw (1989) explained how the behavioural intention construct was added after the attitude constructs in the prediction of what motivates users to either accept or reject an Information System. According to Venkatesh and Davis (1996), Figure 3.5 illustrates the refined TAM diagram without the attitude construct, which was key in the TRA and TPB. Otieno, Liyala, Odongo and Abeka (2016, p. 4), found that the “Technology Acceptance Model is the most cited theory in many studies on IS as well as general ICT with respect to adoption of [an] innovation”. Otieno, Liyala, Odongo and Abeka (2016) also believe that TAM’s popularity may be owed to the fact that when TAM was introduced it was specifically aimed at IS and ICT implementation and adoption research.

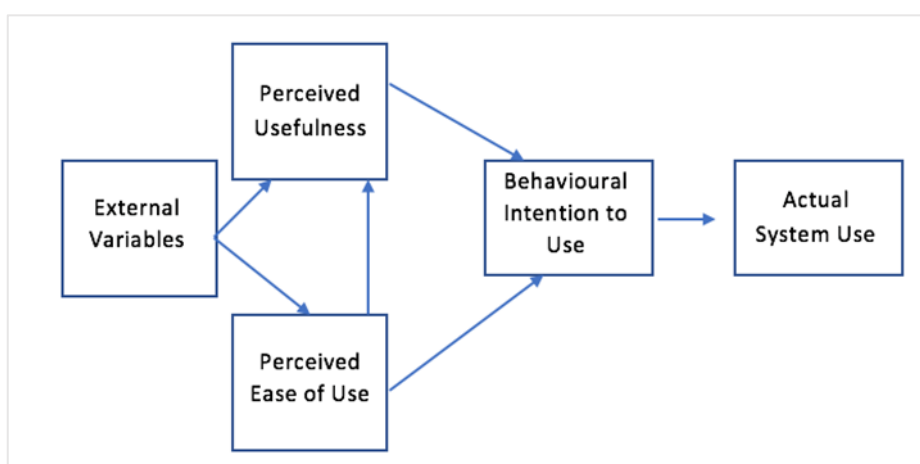


Figure 3.5: Technology acceptance model

Adapted from Venkatesh and Davis (1996)

In 2000, a variation of TAM (also referred to as TAM2) was tested and introduced by Venkatesh and Davis (2000). TAM2 tried to provide a more concrete explanation of the perceived usefulness and actual system usage intentions based on the cognitive processes and social influences that may be extrinsic to the system but having an overall effect. Figure 3.6 illustrates the new constructs and variables (Individual differences, System Characteristics, Social Influence and facilitating conditions) extending TAM to produce the presently named TAM2.

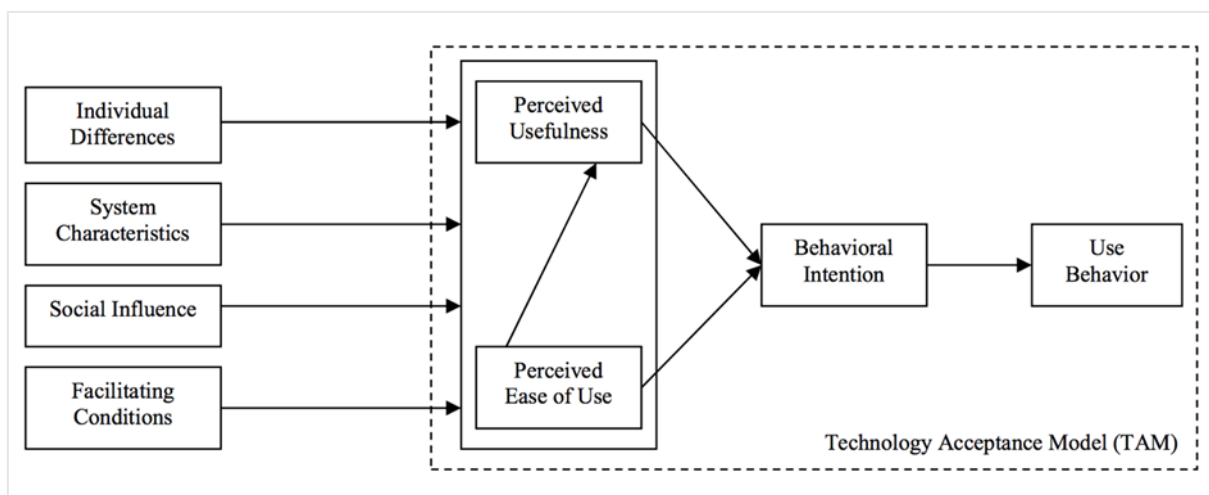


Figure 3.6: Technology acceptance model 2

(Source: Venkatesh & Bala, 2008, p. 276)

TAM was found to yield between 40% and 50% success in predicting the adoption of an IS; while TAM2 is reported to have success rates 50% to 60% success rates (Otieno et al., 2016). Extending the TAM to produce TAM2 could not fully address the underlying reasons for users' IS adoption or rejection. Venkatesh and Bala (2008) proposed a more integrated model, which suggested that the determinants of perceived ease of use will not influence perceived usefulness. A new moderating variable experience was introduced as illustrated in Figure 3.7, producing new relationships in the process. The bold lines from the experience variable in Figure 3.7 outline the new relationship in the suggested new model. The new model was called Technology Acceptance Model 3 (TAM3) since it extended TAM2 by adding new relationships. Venkatesh and Bala (2008) use validated items from previous research based on Venkatesh and Davis' (2000) study to test the UTAUT, which led to the proposal of the adoption of TAM3 in IS research.

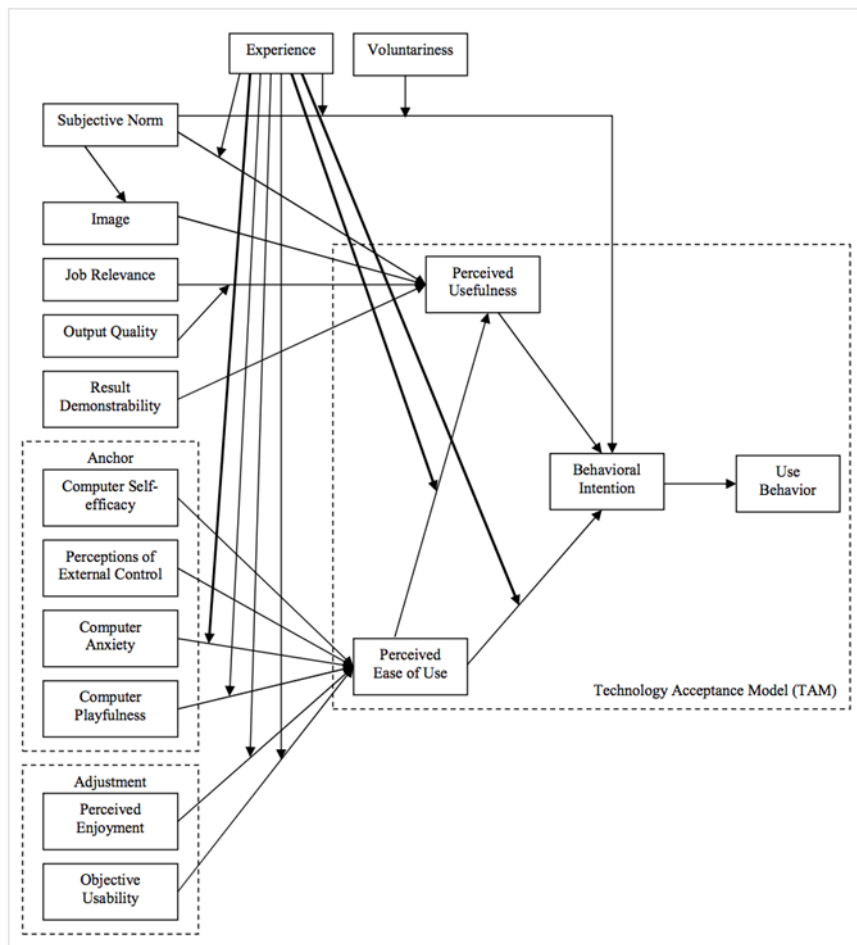


Figure 3.7: Technology acceptance model 3

(Source: Venkatesh & Bala, 2008, p. 280)

TAM and its variations (TAM2 and TAM3) could be used to answer all critical questions in this study by identifying and predicting the attitudes that could make the technology accepted or rejected in the Masvingo province primary school system. However, according to Moon and Kim (cited in Jahangir & Begum, 2008, p. 33), “although previous researchers have investigated and replicated the TAM and agreed that it is valid only when predicting the individual’s acceptance, the TAM’s fundamental constructs do not fully reflect all the specific influences of technological and usage-context factors that may alter the users’ acceptance”. In spite of the number of IS acceptance studies where TAM has been used, it may not be the best fit in the context of this study, since it has constantly been refined and extended with new constructs that have not been empirically proven in the initial proposals. Hence, TAM does not directly address other educator constructs like proficiency (content and pedagogy)

required to critically evaluate competencies and attitudes that are central to this research. The sub-section that follows gives an outline of the TPACK model.

3.5 Technological pedagogical content knowledge

The failure of the abovementioned reviewed theories to present knowledge as an important construct led to the designing of another model. Mishra and Koehler (2006) designed a model that describes the nature of knowledge needed by teachers to effectively adopt the use of ICT pedagogy called the Technological Pedagogical Content Knowledge (TPCK). The TPCK theory had its theoretical and foundational grounding hinged on Shulman's (1986, 1987) Pedagogical Content Knowledge (PCK) framework by adding the technology knowledge construct. Mishra and Koehler (2006), the initial authors of the theory, argued that TPCK should be included on the list of innovation-adoption models, specifically if the innovation in question is in ICT pedagogy and related to teachers' integration of technology. The TPCK is a contemporary theory that has been specifically designed with teachers' technology integration activities in mind.

According to Chai, Hwee, Koh and Tsai (2013), in 2008, Thompson and Mishra wrote a paper that suggested a change in the name of the framework from TPCK to TPACK to ease the pronunciation. Koehler and Mishra (2009), explicitly presented the revised version of the TPCK, now called TPACK. Chai, Hwee, Koh and Tsai (2013, p. 32) believe that:

As a form of knowledge, TPACK has been described as situated, complex, multifaceted, integrative and/or transformative ... As a framework, it has been employed to unpack ICT-integrated lessons, teachers' work with ICT, to design teacher education curriculum, to design classroom use of ICT and to frame literature review pertaining to ICT or educational technology.

The TPACK makes an attempt to provide an explanation of three forms of knowledge: Pedagogy (PK), Content (CK) and Technology (TK) as illustrated in Figure 3.8. Figure 3.8 shows the relationships between the forms of knowledge needed to explain the knowledge that is key for teachers' technology integration to happen. The intersection of all the knowledge forms is what they refer to as the TPACK (refer to Koehler & Mishra, 2009; Koehler et al., 2013; Koehler, Mishra, Kereluik, Shin, & Graham, 2014 for a more detailed review of the

TPACK). The text below is an extract from Koehler, Mishra, Kereluik, Shin, and Graham's (2014, p. 102) review of the TPACK framework;

Specifically, three major knowledge components form the foundation of the TPACK framework as follows:

CK refers to any subject-matter knowledge that a teacher is responsible for teaching.

Pedagogical knowledge (PK) refers to teacher knowledge about a variety of instructional practices, strategies, and methods to promote students' learning.

Technology knowledge (TK) refers to teacher knowledge about traditional and new technologies that can be integrated into the curriculum.

Four components in the TPACK framework, address how these three bodies of knowledge interact, constrain, and afford each other as follows:

Technological Content Knowledge (TCK) refers to knowledge of the reciprocal relationship between technology and content. Disciplinary knowledge is often defined and constrained by technologies and their representational and functional capabilities.

Pedagogical Content Knowledge (PCK) is to Shulman's (1986) notion of "an understanding of how particular topics, problems, or issues are organised, represented, and adapted to the diverse interests and abilities of learners, and presented for instruction" (p. 8).

Technological Pedagogical Knowledge (TCK) refers to an understanding of [how] technology can constrain and afford specific pedagogical practices.

Technological Pedagogical Content Knowledge (TPACK) refers to knowledge about the complex relations among technology, pedagogy, and content that enable teachers to develop appropriate and context-specific teaching strategies. The TPACK framework suggests that teachers need to have deep understandings of each of the above components of knowledge in order to orchestrate and coordinate technology, pedagogy and content into teaching. Most importantly, TPACK is an emergent form of knowledge that goes beyond knowledge of content, pedagogy, and technology taken individually but rather exists in a dynamic transactional relationship (Bruce, 1997; Dewey & Bentley, 1949; Rosenblatt, 1978) between the three components (Koehler & Mishra, 2008; Mishra & Koehler, 2006).

An important part of the TPACK framework is that TPACK does not exist in a vacuum but rather is grounded and situated in specific contexts as represented by the outer dotted circle in the TPACK diagram.

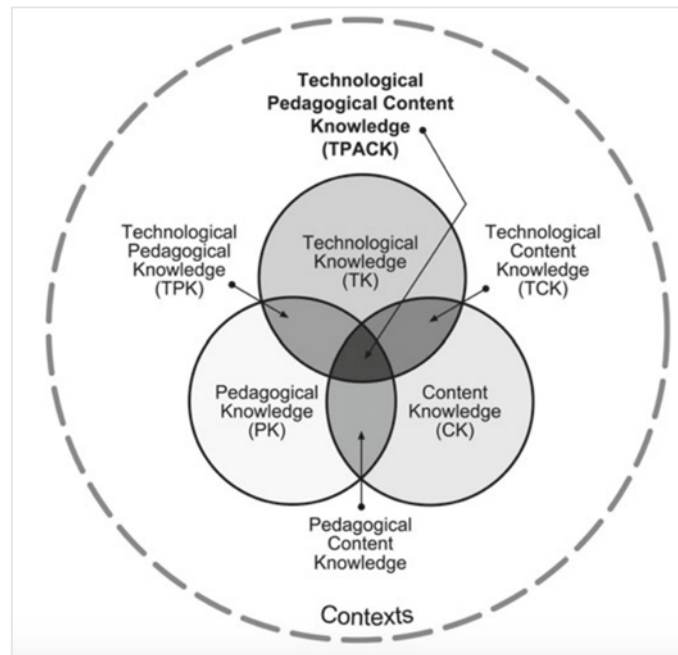


Figure 3.8: Technological pedagogical content knowledge (TPACK)

(Koehler & Mishra, 2009, p. 63; Koehler et al., 2013, p. 15)

According to Koehler, Mishra and Cain (2013, p. 16),

the outer dotted circle labelled “contexts” emphasizes the realisation that technology, pedagogy, and content do not exist in a vacuum, but rather, are instantiated in specific learning and teaching contexts. For instance, consider two different classrooms—one where each and every learner has a laptop or a mobile device with access to the internet and another, which is equipped with just one desktop machine at the front of the class. Clearly, the kinds of instructional moves the teacher has to come up with would be very different in these two contexts. Similarly, school and national policies that allow or block certain websites (such as Facebook or YouTube) change how teachers can structure their lessons and activities.

Hence, if teachers are key to the use of ICT in pedagogy, then knowledge, as described by the TPACK framework, could be considered important. Hawkrigde et al. (cited in Govender, 2006, p. 2) claim that the pedagogical rationale is one of the principal rationales for introducing technology in education. Chai, Hwee, Koh and Tsai (2013), conducted a study that found that TPACK is widely used in the Northern American region with gaps that could negatively impact

its success in future technology integration studies. While TPACK directly deals with teachers' technology integration in their classrooms, in the context of this particular study, TPACK could not be employed as it does not fully cater for the measurement of teachers' attitudes, which are also central to this study. The next section presents an outline of Rogers' Diffusion of Innovations (DOI) theory.

3.6 Diffusion of innovations

According to Korpelainen (2011), the Diffusion of Innovations (DOI), "is a general theory of how new ideas are spread and adopted in a community, and it seeks to explain how communication channels and opinion leaders shape adoption". Rogers (1995, p. 35), the original author of the theory, defines diffusion as "the process by which an innovation is communicated through certain channels over time among the members of a social system". Rogers (1995, p. 35) views an innovation as "an idea or practice that is perceived as new by an individual or other unit of adoption". Moore and Benbasat (1991) were among the first researchers to use the DOI as a tool to measure the perceptions that an individual may have of adopting an information technology innovation.

Moore and Benbasat's (1991) study confirmed that diffusion may be modelled based on Rogers' (1983) five primary characteristics of innovations when rating individual technology adoption. The characteristics include Relative Advantage, Compatibility, Complexity, Trialability and Observability. The complexity attribute has been tested and found to be negatively related to the rate of adoption. Rogers (1995) asserts that there are four key elements necessary for the diffusion process to occur which are an **innovation**, **communication channels**, **time** and the **social system**. The innovation decision making process leads to five adoption categories (**innovators**, **early adopters**, **early majority**, **late majority** and **laggards**) for members of the social system that model the rate of adoption on a normal distribution graph (from early adopters to laggards).

Furthermore, Rogers (1983, 1995, 2003) claims that users undergoing technology adoption make a decision to adopt it if they believe that technology can enhance their utility. According to Rogers (1995, p. 162) decisions made by a social system's users follow a five-step process:

1. “Knowledge – the person becomes aware of an innovation and has some idea of how it functions;
2. Persuasion – person forms a favourable or unfavourable attitude towards the innovation;
3. Decision – a person engages in activities that lead to a choice to adopt or reject the innovation;
4. Implementation – person puts an innovation into use; and
5. Confirmation – person evaluates the results of an innovation decision already made.

Therefore, a new technology will, therefore, be increasingly diffused if potential adopters perceive that the innovation:

1. Has notable advantages over previous innovations;
2. Is compatible with existing practices;
3. Is not complex to understand and use;
4. Shows observable results; and
5. Can be experimented with on a limited basis before adoption.”

When compared to traditional teaching methods, ICT can be modelled as an innovation for ECD teachers and their pupils. In their particular case, it is being integrated into the ECD education curriculum. The DOI has been used since the 1960s to analyse both individual and organisational adoption based on the innovation, communication channels, time and social system (context – in this case, ECD education) to model the implementation and adoption of innovations (Korpelainen, 2011; Samaradiwakara & Gunawardena, 2014). In this research, the DOI was modelled to answer the critical questions in terms of four of its constructs: relative advantage, ease of use, compatibility with existing values and practices and observability.

The integration of ICT into the ECD education teaching and learning processes by the MoPSE in Masvingo province can also be viewed as an innovation that is communicated in a social system (the primary school in this context) over a specified period. Although the MoPSE has not yet made it mandatory for ECD teachers to integrate ICT in their classes, it updated the national primary schools’ curriculum to put an emphasis on ICT integration; hence, it has become necessary for ECD teachers to engage in ICT integration activities. Attitudes and competence challenges noted by Konyana and Konyana (2013) have also been extracted from the perceptions obtained from the questionnaire and interview instruments designed for educators. The implications of these challenges have been inferred and included in chapters

presenting the findings of the study. The next section presents the UTAUT.

3.7 Unified theory of acceptance and use of technology

The beginning of the 21st century saw a longitudinal field study yielding a new model that took a unified approach towards technology acceptance by exploiting the strengths and weaknesses of eight different technology adoption models, which was reviewed by Venkatesh et al. (2003). The eight models that were empirically validated included: Theory of Reasoned Action, Theory of Planned Behaviour, Technology Acceptance Model, Combined TAM-TPB (C-TAM-TPB), Motivational Model, Innovation Diffusion Theory/Diffusion of Innovations, Social Cognitive Theory and the PC Utilisation Model to produce the UTAUT, (Attuquayefio & Addo, 2014; Kabakçi-Yurdakul, Faruk Ursavaş, & Becit İşçitürk, 2014; Samaradiwakara & Gunawardena, 2014; Venkatesh et al., 2003). The UTAUT was found to account for at least 70% of the actual usage intention (Venkatesh et al., 2003), which made it more effective when compared to its predecessors.

The UTAUT provides an explanation of a user's intentions to use ICT and predicts the ensuing user's behaviour. Figure 3.9 shows the interplay between UTAUT's constructs and moderating variables. According to Korpelainen (2011), the UTAUT "considers four key constructs as direct determinants of user acceptance and usage behaviour, which are performance expectancy, effort expectancy, social influence, and facilitating conditions", and "focuses on users who may be less willing to adopt and use new systems" based on four key moderating variables: gender, age, experience and voluntariness of use. As a result of how it was constructed, the UTAUT becomes one of the most universally strong models whenever it is chosen as a theoretical framework for any study. In the context of this study, it will be used to validate attitudes and predictors of attitudes based on its constructs and moderating variables. The UTAUT is a universally validated model that was designed to be a tool for assessing the likelihood of users of any information system rejecting it or adopting it. Govender's (2006) study utilised the UTAUT and it accounted for 83% of educators' attitudes in South Africa. Attuquayefio and Addo (2014) successfully used it to assess tertiary students' acceptance of ICT in Ghana; while the study of Kabakçi-Yurdakul et al. (2014) on Turkish preservice teachers also used the UTAUT to evaluate how culture influences technology acceptance.

The questionnaire that was used for conducting this research considered this model, and the data it collected was used to deduce the ECD teachers' attitudes. Section one of the instrument (questionnaire) used in phase one of the study captured data on the moderating variables in form of demographic data, which includes age, gender, voluntariness and teaching experience. Section one was used to inform and explain the constructs and findings of section two of the questionnaire, which has in-depth educators' attitudinal, competence and challenges questions. Phase two qualitatively follows up the generic findings of phase one to give a critical explanation of the study based on the constructs and moderating variables of the UTAUT theory and the constructs of its underlying IS theories.

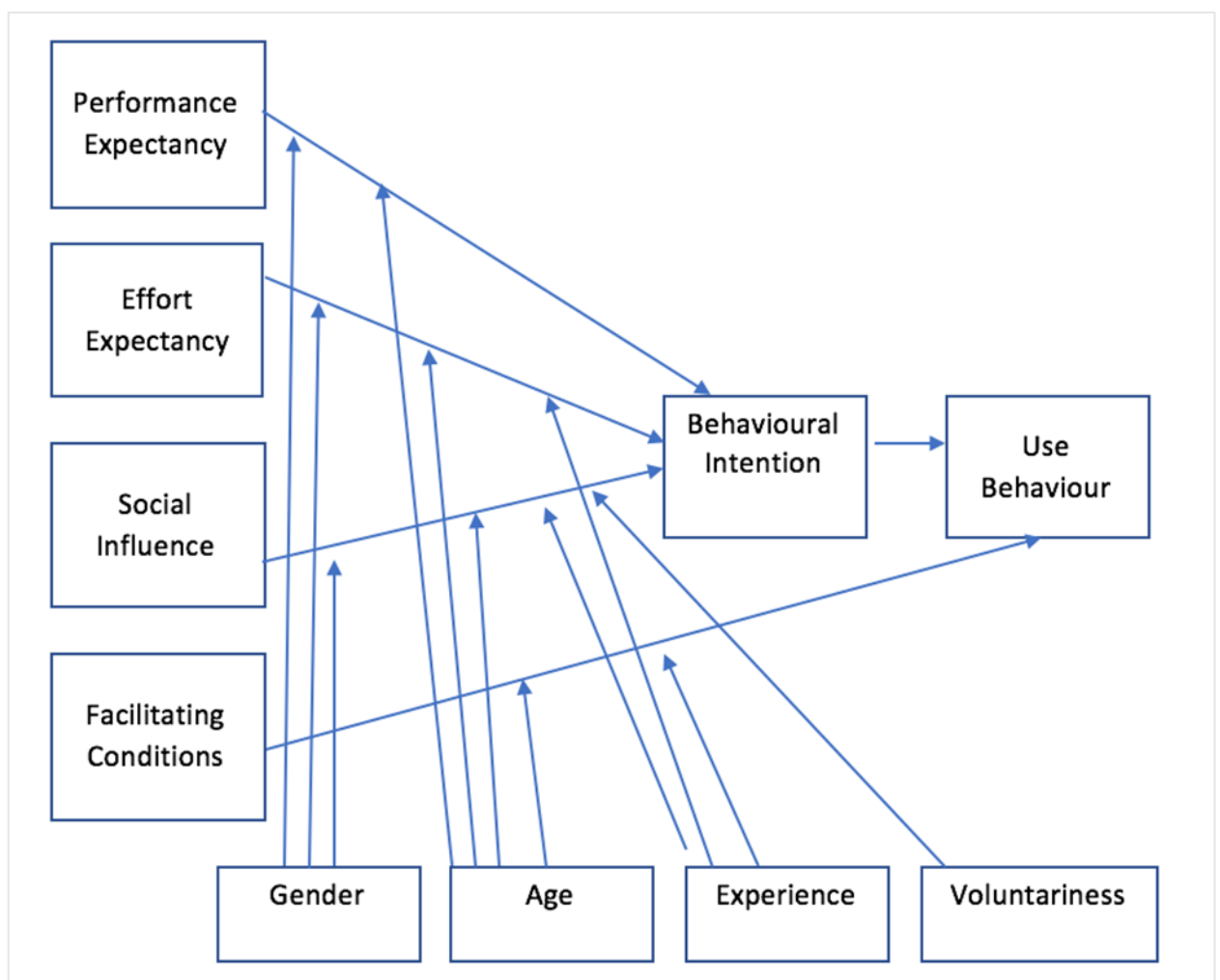


Figure 3.9: Unified theory of acceptance and use of technology (UTAUT)

(Adapted from Venkatesh et al., 2003, p. 447)

3.8 Outline of the theoretical framework employed in this study

Samaradiwakara and Gunawardena's (2014) study, which reviewed 14 theories relating to technology adoption affirms that "among the fourteen theories reviewed, UTAUT seems to be an improved theory that could provide a useful tool to assess the likelihood of success for technology acceptance studies ... the UTAUT has been playing a key role in technology acceptance research and provides a solid base to explain why users accept or reject technology in a specific perspective", and in this particular context, it is the integration of ICT in ECD education. Table 3.1 below presents a high-level illustration of the definitions for the model's different constructs discussed above (section continued on page 87).

Table 3.1: Technology adoption models/theories constructs with definitions

Theory of Reasoned Action	Core Constructs	Definitions
Is a model used to predict and understand motivational influences on behaviour that are not under the individual's volitional control (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975).	Attitude Towards Behaviour	Fishbein and Ajzen (1975, p. 216), define it as “an individual’s positive or negative feelings (evaluative effect) about performing the target behaviour”
	Subjective Norm	Fishbein and Ajzen (1975, p. 302), define it as “the person’s perception that most people who are important to him think he should or should not perform the behaviour in question”
Theory of Planned Behaviour	Core Constructs	Definitions
Is an extension of the TRA that predicts behaviours in situations where individuals have incomplete volitional control (Ajzen & Fishbein, 2005; Korpelainen, 2011; Otieno et al., 2016; Yzer, 2013). The behavioural construct is added to the TRA constructs in the TPB to address the shortcomings of the TRA.	Attitude Towards Behaviour	Adapted from the TRA
	Subjective Norm	Adapted from the TRA
	Perceived Behavioural Control	According to Ajzen (1991, p. 183), it is the “people’s perception of the ease or difficulty of performing the behaviour of interest.” “refers to the perception of control over the performance of a given

		behaviour”, (Korpelainen, 2011, p. 16)
Technology Acceptance Model, TAM2 and TAM3	Core Constructs	Definitions
<p>Based on Davis’ (1986) doctoral thesis, TAM adds two new constructs Perceived Usefulness and Perceived Ease of Use to specifically determine user acceptance of technology in ICT and IS research and possibly predict usage behaviour (Davis et al., 1989).</p> <p>TAM2 – provides a more concrete explanation of the perceived usefulness and actual system usage intentions based on the cognitive instrumental processes and social influences (Venkatesh and Davis cited in Otieno et al., 2016, p. 4).</p> <p>TAM3 – According to Venkatesh and Bala (2008), “TAM3 posits that: (i) the effect of perceived ease of use on perceived usefulness will be moderated by experience; and (ii) the determinants of perceived ease of use (i.e., computer self-efficacy,</p>	Perceived Usefulness (PU)	User’s perception that he or she uses to classify whether the system will be useful and relevant to his or her job and performance (Davis, 1989, p. 320)
	Perceived Ease of Use (PEOU)	User’s perception that he or she uses to classify whether the system will be free of effort for him or her to use (Davis, 1989, p. 320; Venkatesh & Davis, 1996). In TAM3, new determinants of perceived ease of use are considered, which include: computer self-efficacy, the perception of external control, computer anxiety, computer playfulness, perceived enjoyment and objective usability (Venkatesh & Bala, 2008)
	Subjective Norm	Adapted from the TRA and TPB. Included in TAM2 and TAM3

<p>perceptions of external control, computer anxiety, computer playfulness, perceived enjoyment, and objective usability) will not have any significant effects on perceived usefulness over and above the determinants of perceived usefulness”; and it has been able to account for variances of between 52% and 67% of perceived usefulness when it was applied to different models in varied times.</p>		
<p>TPACK</p>	<p>Core Constructs</p>	<p>Definitions</p>
<p>Based on Shulman’s (1986, 1987) PCK theory, TPACK is a theory that was developed to explain the knowledge required by teachers to teach effectively, integrate and use technology in their classrooms (Koehler & Mishra, 2009; Koehler et al., 2013, 2014).</p> <p>“addresses the problem arising from an overemphasis on technological knowledge</p>	<p>Technological Knowledge</p>	<p>“refers to teacher knowledge about traditional and new technologies that can be integrated into the curriculum”, (Koehler et al., 2014, p. 102)</p>
	<p>PK</p>	<p>“refers to teacher knowledge about a variety of instructional practices, strategies, and methods to promote students’ learning”, (Koehler et al., 2014, p. 102).</p>
	<p>Content Knowledge (CK)</p>	<p>“Content knowledge (CK) is teachers’ knowledge about the subject matter to be learnt or taught... Knowledge and the nature of inquiry differ greatly between fields, and teachers should understand the deeper knowledge fundamentals of the disciplines they teach”, (Koehler et al., 2013, p. 14)</p>
	<p>PCK</p>	<p>“covers the core business of teaching, learning, curriculum, assessment, and reporting, such as the conditions that promote learning and the links among</p>

in many ICT courses that are conducted in isolation from teachers' subject matter learning and pedagogical training", (Chai et al., 2013)		curriculum, assessment, and pedagogy", (Koehler et al., 2013, p. 15).
	Technological Pedagogical Knowledge (TPK)	"TPK is an understanding of how teaching and learning can change when particular technologies are used in particular ways...To build TPK, a deeper understanding of the constraints and affordances of technologies and the disciplinary contexts within which they function is needed... TPK becomes particularly important because most popular software programs are not designed for educational purposes", (Koehler et al., 2013, p. 16).
	Technological Content Knowledge	"refers to knowledge of the reciprocal relationship between technology and content. Disciplinary knowledge is often defined and constrained by technologies and their representational and functional capabilities", (Koehler et al., 2014, p. 102).
	TPACK	"is an emergent form of knowledge that goes beyond all three "core" components (content, pedagogy, and technology); it is an understanding that emerges from interactions among content, pedagogy, and technology knowledge...TPACK is the basis of effective teaching with technology, requiring an understanding of the representation of concepts using technologies, pedagogical techniques that use technologies in constructive ways to teach content, knowledge of what makes concepts difficult or easy to learn and how technology can help redress some of the problems that students face, knowledge of students' prior knowledge and theories of epistemology, and knowledge of how technologies can be used to build on existing knowledge to develop new epistemologies or strengthen old ones", (Koehler et al., 2013, p. 16).

Diffusion of Innovation (DOI)	Core Constructs	Definitions
<p>“is a general theory of how new ideas are spread and adopted in a community, and it seeks to explain how communication channels and opinion leaders shape adoption”, (Korpelainen, 2011, p. 16). Rogers (1995, p. 35), confirms that the four key elements “in the diffusion of new ideas are (1) an innovation, (2) which is communicated through certain channels, (3) over time, (4) among the members of a social system. An innovation is an idea, practice, or object perceived as new by an individual or another unit of adoption.”</p>	Relative Advantage	<p>“the degree to which an innovation is perceived as being better than its precursor”, (Moore & Benbasat, 1991, p. 195).</p> <p>“the degree to which an innovation is perceived as better than the idea it supersedes”, (Rogers, 1995, p. 15).</p>
	Ease of Use (also referred to as Complexity)	<p>“the degree to which an innovation is perceived as being difficult to use”, (Moore & Benbasat, 1991, p. 195).</p> <p>“the degree to which an innovation is perceived as difficult to understand and use”, (Rogers, 1995, p. 16).</p>
	Image	<p>“the degree to which use of an innovation is perceived to enhance one’s image or status in one’s social system”, (Moore & Benbasat, 1991, p. 195).</p>
	Visibility (also referred to as Observability)	<p>“the degree to which one can see others using the innovation in the organisation”, (Venkatesh et al., 2003, p. 431).</p> <p>“the degree to which the results of an innovation are visible to others”, (Rogers, 1995, p. 16).</p>
	Compatibility	<p>“the degree to which an innovation is perceived as being consistent with the existing values, needs and past experiences of the potential adopters”, (Moore & Benbasat, 1991, p. 195).</p>

		“the degree to which an innovation is perceived as being consistent with the existing values”, (Rogers, 1995, p. 15).
	Results Demonstrability (also referred to as Trialability)	“the tangibility of the results of using the innovation, including their observability and communicability”, (Moore & Benbasat, 1991, p. 203). “the degree to which an innovation may be experimented with on a limited basis”, (Rogers, 1995, p. 16).
	Voluntariness of Use	“the degree to which use of the innovation is perceived as being voluntary, or of free will”, (Moore & Benbasat, 1991, p. 195).
UTAUT	Core Constructs	Definitions
According to Venkatesh et al. (2003), integrates the above theories to measure the user intention and usage of technology	PE	“the degree to which an individual believes that using the system will help him or her to attain gains in job performance”, (Attuquayefio & Addo, 2014, p. 76). “is defined as the degree of expectancy regarding an increase in the job performance of individuals who are using the system”, (Kabakçi-Yurdakul et al., 2014, p. 24).
	Effort Expectancy (EE)	“the degree of ease associated with the use of the system”, (Attuquayefio & Addo, 2014, p. 76). “is defined as the degree of facilities brought by the use of the system”, (Kabakçi-Yurdakul et al., 2014, p. 24).

	Social Influence	<p>“the degree to which an individual perceives that important others believe he or she should use the new systems”, (Attuquayefio & Addo, 2014, p. 77).</p> <p>“is defined as the degree of importance that other people give to use of the system”, (Kabakçi-Yurdakul et al., 2014, p. 24).</p>
	Facilitating Conditions (FC)	are the organisational or technical sub-structure supports necessary for use of the system”, (Kabakçi-Yurdakul et al., 2014, p. 24).

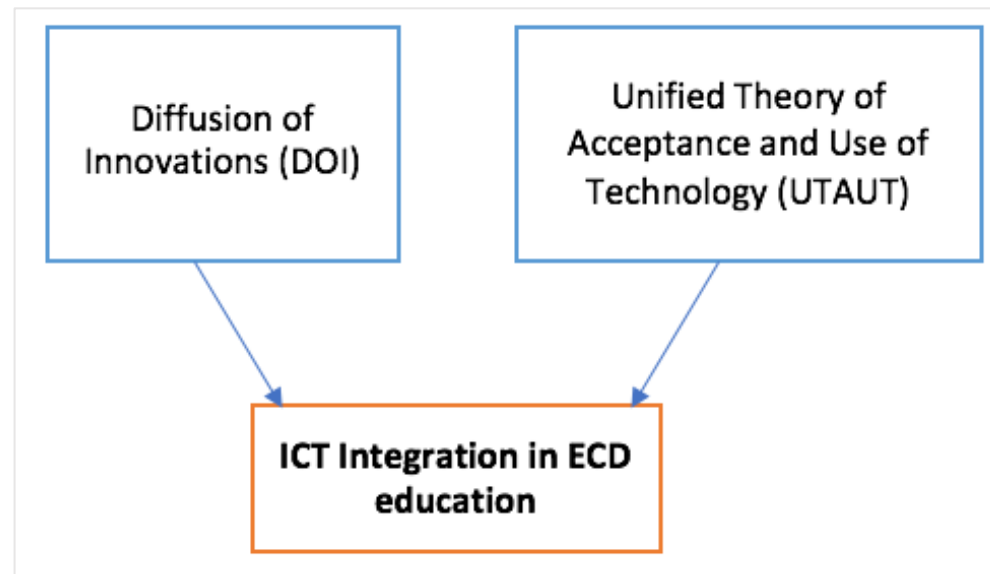


Figure 3.10: Theoretical framework employed in this study

Based on the arguments presented above, one would agree that when conducting a critical analysis benchmarking of one's study against a single theory may not be able to capture all the views of ECD teachers and complexities associated with integrating ICT into ECD education; hence, employing more than one theory becomes necessary. A detailed review of IS integration theories was presented and the DOI and the UTAUT were chosen as the key theories driving this research (refer to Figure 3.10). It illustrates how the two chosen theories constitute the theoretical framework of this study. Hence, this study will principally make use of the DOI and UTAUT theories as the basis for evaluating the critical key questions (theoretical framework) against the items found in the instruments. The next section concludes this chapter.

3.9 Conclusion

This chapter presented and reviewed a synopsis of IS theories that could be used as the basis for conducting this research. The reviewed theories include reasoned action theories (Theory of Reasoned Action and Theory of Planned Behaviour), Technology Acceptance Model, TPACK, Diffusion of Innovations and the UTAUT. The Diffusion of Innovations and UTAUT were chosen to constitute the theoretical framework which will be used as the basis of this study. IS constructs from these two were chosen to model the Masvingo province, Zimbabwean context because the available research has not been able to validate if they can be used to explain the acceptance, adoption and ultimately integration. Attitudes, which are also key to this study have been previously used with these models (Eickelmann & Vennemann, 2017; Kabakçi-Yurdakul et al., 2014; Kerckaert, Vanderlinde, & van Braak, 2015). The next chapter presents the research methodology employed.

Chapter Four – Research Design and Methodology

4.1 Introduction

The literature reviewed in Chapter Two showed how previous researchers have used educators' attitudes to understand ICT integration. The previous chapter presented technology adoption theories and described how the UTAUT and DOI theories will be used to answer the critical questions. Based on the discourses discussed in the previous chapters a mixed-methods approach was chosen to study the educators' attitudes, competencies for engaging with ICT integration, challenges faced in trying to integrate ICT into the ECD classroom and how the integration processes can be enhanced for better results. The policy position of the MoPSE and other related government bodies will be referred to constantly as educators' perspectives are drawn from the study. This chapter contains an in-depth discussion of the research methodology, research paradigm, research tools, sampling procedures, population, instruments, data collection and analysis procedures used to conduct the ICT integration study on ECD education in Masvingo province of Zimbabwe. The limitations of the study have also been presented in the last section of this chapter. Table 4.1 outlines a high-level summary of the research design and methodology adopted in this study as presented in this chapter.

Table 4.1: Overview of the research methodology

Title	ICTs integration into Early Childhood Development (ECD) education in Zimbabwe: A critical analysis
Research Approach	Mixed Methods
Research Design	Sequential Explanatory Mixed Methods

<p>General Data Collection</p>	<p>The researcher applied for the Gatekeeper’s permission to conduct research in Zimbabwean primary schools from the MoPSE Permanent Secretary. The permission was granted and the approval letter was used to apply for the UKZN ethics clearance. Upon clearance from the university’s ethics committee, the researcher sought permission to conduct research in Masvingo province primary schools from the MoPSE Provincial Education Director.</p> <p>The researcher then visited primary schools in the province where participants indicated their consent to participate in the study by signing consent forms. A total of 350 questionnaires were distributed in seven districts (50 questionnaires per district), 6 follow-up focus group discussions and 26 follow-up interviews were conducted. Data was collected, analysed separately and later merged to critically analyse the integration of ICTs in ECD education.</p>	
<p>Population</p>	<p>The population comprises a total of 940 ECD teachers and 350 were used for this study.</p>	
<p>Sampling Techniques</p>	<p>Purposive sampling was used to select the participants in both phase one and two of this study. Information-rich units occurring naturally in the population were purposively selected based on geographical location (Masvingo province), time and reach. This ensured the trustworthiness of the qualitative data since the key informants were all ECD experts qualified to teach at that educational level.</p>	
<p>Data Collection Methods</p>	<p>Quantitative</p> <p><u>Cross-sectional Survey</u></p> <p>350 Questionnaires were distributed to ECD teachers in Masvingo province. A total of 309 Questionnaires were returned.</p>	<p>Qualitative</p> <p><u>Semi-structured Interviews</u></p> <p>A total of 26 interviews were conducted with 26 teachers</p> <p><u>Focus Group Discussions</u></p> <p>A total of six focus group discussions were conducted with 46 teachers.</p>
<p>Validity and Reliability</p>	<p>The instruments used in this study were validated and moderated by peers and the supervisor. Questionnaires moderated and used in this study, had already been validated for previous ICT integration studies to ensure a high level of reliability for this particular study. Participants of the study were also allowed to verify if the information they provided is correct. The triangulation of both qualitative and quantitative data also ensured high levels of confirmability, reliability and validity.</p>	
<p>Data Analysis</p>	<p>Descriptive and Inferential Statistics</p> <p>Quantitative data from the questionnaires were reduced and analysed using descriptive and inferential statistics. The SPSS software package was utilised to compute quantitative data.</p>	<p>Thematic Content and Narrative Analysis</p> <p>Qualitative data from the interviews and focus group discussions were reduced by establishing themes, narratives and excerpts to give meaning to the data. Atlas.ti and NVivo software were used to manage qualitative data.</p>

Ethical Consideration	Official permission to conduct research was obtained from the MoPSE in Zimbabwe (refer to Appendices H - P), and ethical clearance (reference number: HSS/0581/017D) from the Humanities and Social Sciences Research Ethics Committee of the University of KwaZulu-Natal (see page iv). This study ensured informed consent, voluntary participation and the right to withdraw at any time by participants. Confidentiality was observed as the information given was used for educational purposes only and pseudonyms were used to refer to participants' names and schools (see Chapter Five).
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4.2 Methodology/research paradigm

All research has a lens through which it is viewed, which in turn determines the theories, philosophies, methodologies, beliefs and interpretations of the study based on the study's contextual setting (Creswell, 2009, 2012). Bodies of knowledge have seen research that is mostly either qualitative or quantitative in nature, based on different philosophical points of view as outlined and interpreted by the researcher. The literature review outlined a South African ICT integration study by Govender (2006) similar to this one, which used quantitative methods to evaluate educators' attitudes towards ICT integration. Gumedze (2017) critically analyses ICT integration in Swaziland schools using mixed methods. The current study principally used mixed methods, which incorporate both qualitative and quantitative methods to offset the shortcomings of using each approach by itself. Mixed methods can be defined as a pragmatic research approach, in which both quantitative and qualitative data is collected, analysed, and integrated into a study or program of inquiry to address the research's critical questions (Creswell, 2003, 2009). Methods can be mixed to better understand a problem, as the research approach allows the researcher to tap the advantages of either paradigm (quantitative and qualitative) for generalisability and transferability (Creswell, 2003). A combination of the two methods could potentially map out a study whose worldview is based on a reality that is less biased or influenced by our attitudes (Creswell, 2003, 2014).

In mixed-methods research, the researcher has the freedom to choose the techniques and procedures, thereby producing a research study that has a rich base of breadth and depth of meanings and interpretations (Creswell, 2008; Guba & Lincoln, 2005; Tashakkori & Teddlie, 2003). This research study puts particular focus on the investigation of ECD teachers' attitudes

and competencies which have been numerically reduced using a quantitative instrument for generalisation. The qualitative instruments were also used to get a deeper understanding of why ECD teachers behave in the way they behave while in their natural settings. While mixed methods seem to be advantageous for conducting this research, their disadvantage is that they produce large volumes of data to be analysed, which can be overwhelming for the researcher if not managed well (Cohen, Manion, & Morrison, 2011; Tashakkori & Teddlie, 2003; Teddlie & Yu, 2007). The data collected was reduced to leave the data that produced key themes, which helped the researcher answer the critical questions from different angles. The next sub-section particularly explains the research design used in this study.

4.3 Research design

A sequential explanatory mixed-methods approach was particularly chosen for use in this study as the research design for its ability to answer the critical questions (Creswell, 2014). The sequential explanatory mixed-methods design involved collecting quantitative data through a cross-sectional survey and qualitative data through semi-structured interviews and focus group discussions sequentially (Subedi, 2016). The data was analysed separately and then merged to critically analyse the integration of ICTs in the Zimbabwean ECD education in this particular context. This meant that the research was to be conducted in two phases; phase one mainly consisting of quantitative data collection and analysis, while phase two was concerned with qualitative data collection and analysis which was conducted upon completing phase one (refer to Figure 4.2). It illustrates the research design employed in this study. Figure 3.10 also presents a bird's eye view of how the research was conducted. ECD teachers were the key respondents and informants in this research as shown in the centre of Figure 4.2. Upon completing both phases, the results were merged and interpreted to critically analyse the findings of the study.

4.4 The context of the study

The study was conducted at selected Zimbabwean primary schools with ECD centres teaching ECD A and ECD B in Masvingo province. Teachers from all primary schools with ECD centres and enrolling learners up to eight years of age (infants) in the province were potentially eligible to participate in the study. The assumption made was that all ECD teachers may have

been equipped with the basic knowledge of delivering their lessons using ICT tools since it is catered for in the new ECD curriculum, which in turn would make it feasible to gauge their attitudes towards the integration of ICT. The participants were ECD teachers at the abovementioned primary schools. A total of 350 questionnaires were distributed. Masvingo province has seven districts and each district received the same number of questionnaires (50). Contact information for the sample participants was obtained from the district education offices through the assistance of District ECD Trainers and school heads. Interviews and focus-group discussions were set up with respondents that indicated their interest in participating in the research at their schools.

The diagram in Figure 4.1 shows two maps, the smaller one (to the left) represents Zimbabwe (the country), while the section in the smaller map (coloured purple) represents Masvingo province. Masvingo province is the area where this study was conducted. As shown in the map magnifying Masvingo province, there are seven districts (Bikita, Chiredzi, Chivi, Gutu, Masvingo, Mwenezi and Zaka). The next sub-section is an outline of the population for this study.

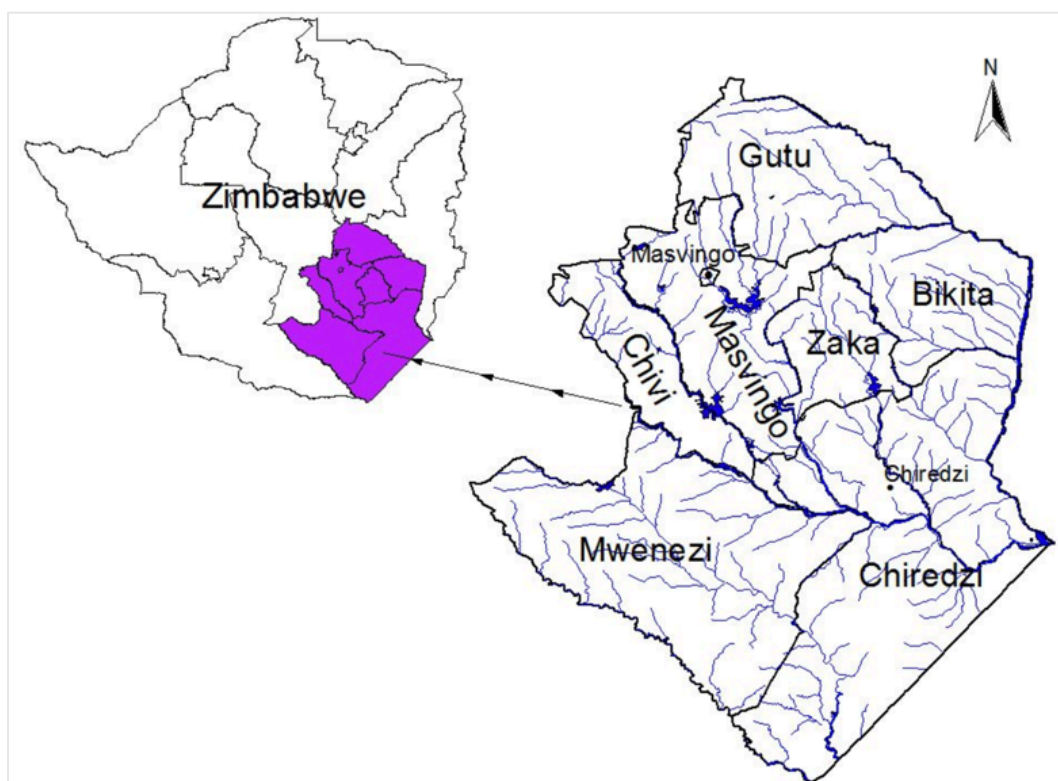


Figure 4.1: Map of Masvingo province in Zimbabwe

(Source: Chikodzi, 2013)

4.5 Population and sample

Table 4.2: Masvingo province Schools – ECD qualified teachers’ distribution table by district (as at 5 October 2016)

	DISTRICT	NUMBER OF PRIMARY SCHOOLS	NUMBER OF ECD TEACHERS	NUMBER OF FEMALE ECD TEACHERS	NUMBER OF MALE ECD TEACHERS
1	Bikita	89	118	100	18
2	Chiredzi	148	187	159	28
3	Chivi	93	74	63	11
4	Gutu	168	135	115	20
5	Masvingo	150	208	188	20
6	Mwenezi	127	90	77	13
7	Zaka	94	128	109	19
	TOTAL	869	940	811	129

Source: MoPSE Masvingo Provincial Office (PED, 2016)

4.5.1 Identification of the population

For this study, the target population consisted of primary school ECD educators (teachers) in Masvingo province. According to Creswell (2012, p. 142), “a target population is a group of individuals (or a group of organisations) with some common defining characteristic that the researcher can identify and study”. Gay and Airasian (as cited in Leedy & Omrod, 2005) have offered the following guidelines when selecting a sample size: for small populations (with fewer than 100 people), there is little point sampling, therefore, one should survey the entire population; if the population size is around 500, one should sample at least 50% of the population; if the population size is between 500 and 1,500, then one should sample at least 20% of the population; and beyond a certain point (at about 5,000 or more), one should sample at least 400 units of the population. Based on these guidelines, this study selected 350 from a total of 940 ECD teachers (PED, 2016) (see Table 4.2). The participants of the interviews and focus group discussions were drawn from the same sample. The next subsection is an outline of the sampling procedure and size of sample used for this research.

4.5.2 Sampling procedure

The research study employed a mixed-methods approach, which used both qualitative and quantitative methods, to generate a complementary database that includes information that has both depth and breadth regarding the phenomenon under study (Flick, 2014; Ritchie, Lewis, Nicholls, & Ormston, 2014; Teddlie & Yu, 2007). In the context of this study, it means that the study can make use of both non-probability-based and purposive sampling strategies. The study made use of the sequential explanatory mixed methods approach, which was implemented in two phases running one after the other: phase one – quantitative data collection and phase two – qualitative data collection as illustrated in Figure 4.2.

According to Leedy & Ormrod (2005), purposive sampling selects sample individuals, units or objects based on their ability to yield the most information about the phenomenon under investigation. Campbell (cited in Tongco, 2007, p. 152) emphasises that “both qualitative and quantitative sampling methods may be used when samples are chosen purposively”. However, Tongco (2007) asserts that the competence of the informants must be ensured to maintain the reliability of the collected data. In this study, all participants were qualified ECD teachers practising their teaching in Zimbabwean primary schools with ECD centres. Hence,

they were competent enough to be able to provide the researcher with information related to ICT integration in ECD education. Purposive sampling was chosen and utilised in both phase one and two of this study for its ability to afford the researcher an opportunity to seek information-rich participants who helped in producing the data that is more related to the critical questions (Dilshad & Latif, 2013).

This study is a critical analysis of ICTs and ECD education in Masvingo province, Zimbabwe, and a cross-sectional survey was employed in phase one to obtain quantitative data from ECD teachers. Phase one of this study used purposive sampling to select the 350 ECD teachers who received the questionnaires used to collect data. Due to the financial implications associated with conducting a nationwide survey, Masvingo province was purposively chosen to represent Zimbabwean ECD educators in this study. When the questionnaire was administered, the last question in the questionnaire (see Appendix A, p. 9) required respondents to specify whether they would be interested in participating in the interview and focus group discussion. The data collected from the last questionnaire item enabled the researcher to contact only those who had indicated their interest in participating in phase two of the study. Phase two was only conducted after phase one of the study. Twenty-six interviews and six focus group discussions with participants ranging from six to 10 ECD teachers were employed in phase two (Grønkjær, Curtis, de Crespigny, & Delmar, 2011). The next section presents an outline of how the sample size was selected.

4.5.3 Sample size

As outlined above in section 4.4.2, the target population for the ICT integration in ECD education survey was purposively chosen based on the units' ability to be easily reached, time and geographical location. The purposive sample for the quantitative data constitutes all qualified ECD teachers in Masvingo province. Table 4.2 shows some of the demographic characteristics of the population from which the participants of the study were drawn. The next sub-section outlines the research instruments used in this study.

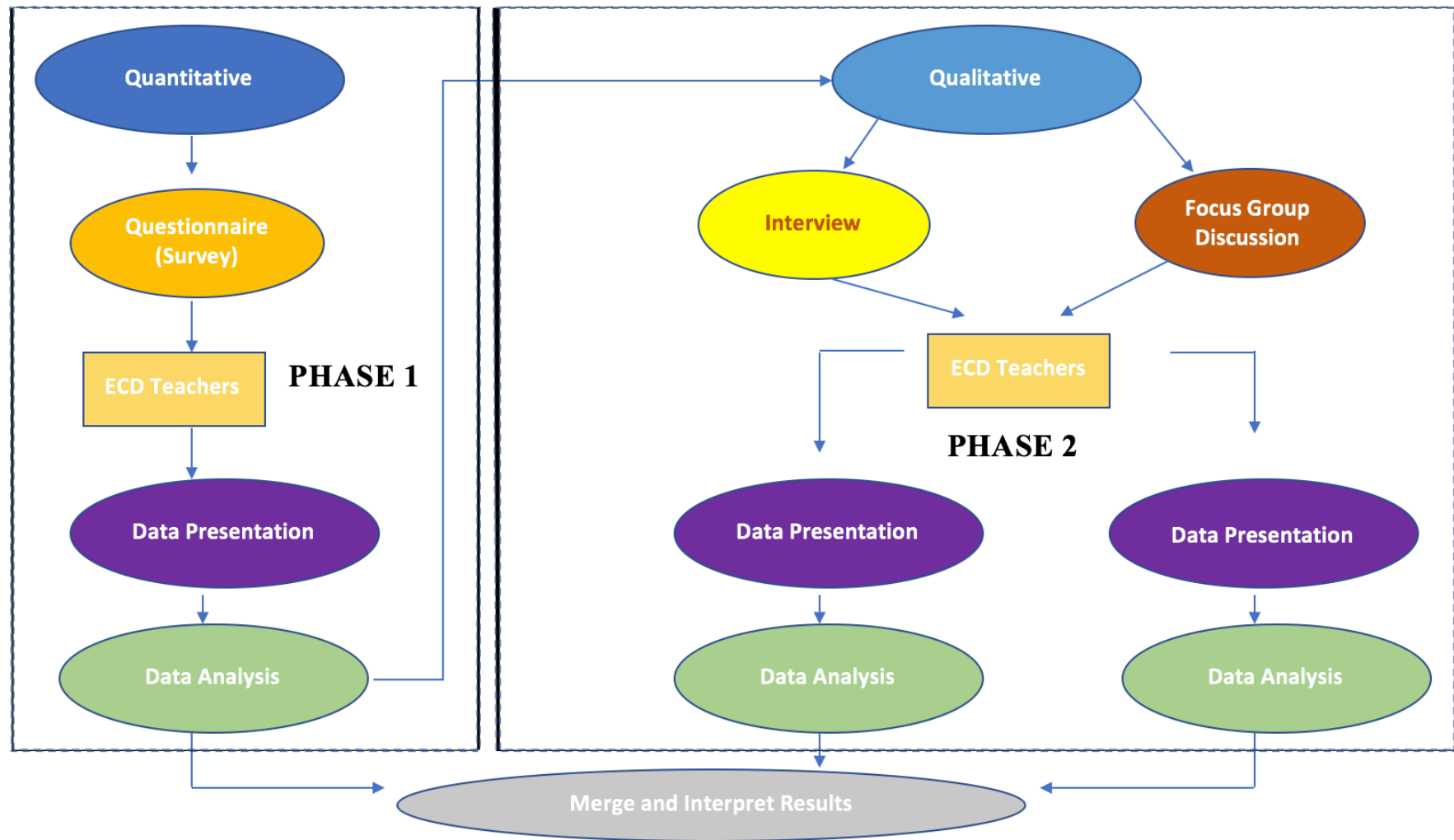


Figure 4.2: Flowchart showing a study of ICT integration in ECD education (sequential explanatory mixed methods)

4.6 Research instruments

Adopting a mixed-methods approach means that the study can benefit from the advantages of using both quantitative and qualitative data. As outlined above, data were collected to determine ECD teachers' attitudes towards and competencies in ICT integration, based on the UTAUT and DOI theories. Quantitative data was also used in the identification of the best predictor of ECD teachers' attitudes towards ICT integration in Masvingo province. It is believed that behaviour and attitude can influence the adoption of technology (Attuquayefio & Addo, 2014; Copriady, 2014; Kabakçi-Yurdakul et al., 2014; Rogers, 1983, 1995, 2003; Samaradiwakara & Gunawardena, 2014; Venkatesh et al., 2003); therefore, to critically analyse the current state of ICT integration, qualitative data was used to understand why ECD teachers possess the attitudes deduced from the data collected in form of ICT integration challenges for MoPSE and the ECD teacher. According to Creswell (2003, 2009, 2014), methods can be mixed to better understand a problem, as the research approach allows the researcher to tap from the advantages of either paradigm (quantitative and qualitative) for generalisability and transferability. It is against this background that the structured questionnaire was chosen to collect quantitative data, while semi-structured interviews and focus group discussions collected qualitative data. The research instruments are further explained in the sub-sections below.

4.6.1 Questionnaire design for attitude items

When designing question items to be used for evaluating attitudes the following has to be considered by the researcher: whether the question items will have open-ended or closed-ended formats, the number of scale points and whether a rating or a ranking will be used. When an open-ended question format is adopted the respondent is presented with a blank space to fill in his or her desired response based on what he perceives the question to be asking, as opposed to the closed-ended format, where the researcher provides the respondent with a predefined list of options that the respondent is expected to choose from (Fabrigar & Krosnick, 1995; Krosnick et al., 2005). The variety of answers and themes that might emerge from the data collected from an open-ended format question after a data analysis procedure can be overwhelming for a researcher if there are many participants.

Based attitude measurement reviews, Krosnick et al. (2005) stated that the closed-ended question format was the preferred and more widely used format compared to the open-ended, due to the complexity associated with coding the answers where an open-ended format is used, and the time and financial resources associated with administering such question items. Fabrigar and Krosnick (1995) suggested that the limit in options for the respondent in the closed-ended format was the major disadvantage of closed-ended question formats. Krosnick et al. (2005) highlighted the drawback that closed-ended question items are likely to have lower reliability and validity due to the fact that the answers are researcher-induced. However, Krosnick et al. (2005) noted that closed-ended questions worked well for respondents who had difficulties articulating their views on paper. Driven by the information required to answer the critical questions, the questionnaire designed to collect data for this study used more closed-ended questions than open-ended questions.

However, when the researcher's choice of question formats is a closed-ended one, the next step would be to choose whether the question item is to be rated or ranked. According to Fabrigar and Krosnick (1995, p. 44), the difference between a rated question item and a ranked question item is that "rating formats require respondents to report the absolute magnitude of a psychological construct along a continuum (e.g. ranging from 'like a great deal to 'dislike a great deal'). Rankings require respondents to order a set of objects according to some criterion (e.g. most preferred to least preferred)".

4.6.1.1 Questionnaires for ICT integration survey

The study collected quantitative data using a structured questionnaire. According to Kendall (cited in Harris & Brown, 2010), questionnaires are tools for providing evidence among large populations. Structured questionnaire participants answer questions by responding to multiple-choice-like responses that are sometimes configured as Likert scales (Harris & Brown, 2010). Dittrich, Francis, Hatzinger and Katzenbeisser (cited in Subedi, 2016, p. 38) claim that "Likert type data are commonly used to measure attitude providing a range of responses to a given question or statement. It is an essential tool in psychology and in social surveys, and is an ever-present method of collecting attitudinal data". Although Likert-type measurements have been useful in capturing subjective feelings and opinions such as attitudes in the context of this study, they are challenged in that these can change depending

on the time which the survey is taken (Joshi, Kale, Chandel, Pal, & Campo-Arias, 2015; Subedi, 2016).

The questionnaire instrument designed for this study consisted of 21 elements (see Appendix A), which may have five-point Likert scales rated Strongly Disagree, Disagree, Neutral, Agree and Strongly Agree and other multiple-choice-type questions to quantitatively extract demographic, attitudinal, ICT competence and challenges data. Appendix A displays the questionnaire instrument that was adapted from Govender (2006) and Raulston (2009) and designed for this study. The questionnaire used in this study has been discussed based on its two sections (see Appendix A).

4.6.1.2 Section one of the questionnaire data-collection instrument

Section one of the questionnaire, which had 12 items/questions (see Appendix A), gathered demographics and some of the ECD teachers' views about integrating ICT in ECD education. Items 1–7 required participants to specify the name of the primary school, district, age, gender, grade which they teach, teaching experience and the highest level of education. Makuvaza and Gatsi (2014) pointed out that ECD education had the highest number of unqualified teachers, while according to Dozva and Dyanda (2012, p. 57) one of ECD education's "major challenges include ... failure to attract male practitioners into ECD training". This helped the researcher gather information on the participants' educational qualifications and other demographic characteristics noted above. Item 8a asked whether the ECD teacher was using ICT in his or her classes; answering yes would require them to specify their frequency of use in item 8b. Item 9 required information on whether they had received ICT-related training to enable them to teach using ICT. Items 10 and 11 asked about the ECD teachers' views pertaining to when they last participated in ICT-related training and when next they would like to participate if they are given the chance to do so. The last item, item 12, asked them to choose from a list what they would regard as the most significant factor in preventing them from using a computer. Section two was titled "Teachers' Attitude Towards ICT Integration", and the next section presents it.

4.6.1.3 Section two of the questionnaire data collection instrument

This study utilised questionnaires in the collection of quantitative data. Based on studies by Culbertson (1968), Fabrigar and Krosnick (1995), Krosnick, Judd and Wittenbrink (2005) and Banaji and Heiphet (2010), the questionnaire instrument has been successfully used to extract and evaluate attitudes gathered from subjects. The first three items (i.e. questions 13–15 – refer to Appendix A) used in this study were Likert-scale type questions, with 20, 16 and 16 statements respectively. The participant was supposed to specify his or her view on each of the statements on a 5-point scale (starting with Strongly Disagree, Disagree, Neutral, Agree and ending on Strongly Agree as noted in the previous chapters).

Question 13 gathered key attitudinal data based on the three attitude domains (affective, cognitive and behavioural) (refer to Chapter 6 for a more detailed explanation). Question 14 extracted information on Rogers' DOI four main computer attributes that affect technology adoption and acceptance (these included relative advantage, compatibility with existing practices, complexity and observability) (Rogers, 2003). Question 15 gathered the ECD teachers' cultural perceptions in relation to ICT integration based on the UTAUT's theory constructs. The next four items (questions 16–19) were mainly concerned with the ECD teachers' computer use and proficiency.

Question 16 listed 10 computer purposes in relation to teaching and learning and then asked participants to indicate their frequency of engaging in the listed activities. The five scores that the participants chose from were "Never, Less than once a month, Once or Twice a month, Once or Twice a week and Daily". Question 17 investigated the proficiency of ECD teachers using a 4-point scale (None, Low, Moderate and High). ICT devices and services were put into three categories (common ICT devices, generic software applications and Web applications). Question 18 had six key activities that an educator could use an ICT device or service for, which included keeping track of learner grades and attendance, creating work scheme plans and sharing teaching and learning material. This question required them to specify their frequency of engaging in the listed activities based on the 5-point scale used in question 16. Question 19 had items similar to the ones found in question 17, but question 19 investigated the ECD teachers' frequency of using ICT devices and services based on the 5-point scale used

in question 16. The last two items (question 20–21) gathered information on the maintenance and repair of ICT resources found in schools.

Question 20 asked about how often the school serviced its ICT resources, while question 21 inquired about whether the school provides any ICT-related technical support. Question 20 required a participant to specify his or her school's frequency of maintaining ICT devices based on a 5-point scale (Never, when they break down, yearly, monthly and weekly). Question 21 gathered information on who gave the school ICT-related technical support.

The last section of the questionnaire was an unnumbered item requesting participants to specify whether they would be interested in participating in the interview and/or focus group discussion. This was put in to help the researcher know which of the participants would be willing to participate in the qualitative part of the research without contacting all of them. The synopsis of the questionnaire above is an outline of the questionnaire items in relation to the critical questions. The next sub-section presents semi-structured interview information.

4.6.2 Semi-structured interviews

Semi-structured interviews can be defined as qualitative tools for gathering verbal data from planned questions, where interesting and unexpected answers may be used to construct probing questions aimed at understanding people's perceptions and experiences in depth (Blandford, 2013). Flick (cited in Zohrabi, 2013, p. 255) argues that an interview's purpose "is to reveal existing knowledge in a way that can be expressed in the form of answers and so become accessible to interpretation". Although interviews have been used as standalone tools for obtaining research data in other studies, in this study they were used to complement the questionnaire and focus group discussions also used in this study. Kendall (cited in Harris & Brown, 2010, p. 1) states that "qualitative interview data often gather more in-depth insights on participant attitudes, thoughts, and actions", while Bryman (also cited in Harris & Brown, 2010, p. 2) believes that results from studies of a qualitative nature are difficult to replicate or generalise since they are conducted using small samples. All interviews were conducted face to face with the selected ECD educators.

Zwart (cited in Harris & Brown, 2010, p. 2) asserts that “participants actually respond differently to questionnaire and interview prompts, claiming that face-to-face interviews trigger strong affective responses while questionnaires permit a wide range of responses, or, perhaps, a more cognitively dispassionate nature”. According to Brown (2001), interviews are known for the following advantages: a high return rate, fewer incomplete answers and controlled answering order; by contrast, they are also said to be time-consuming, never 100% anonymous and have the potential for subconscious bias. In the context of this study, semi-structured interviews were used to affirm the findings of the questionnaire in phase two of the data collection by collecting data in verbatim. Questions found in the Interview guide that was administered are further explained in section 4.5.4. The next section presents focus group discussions, the third research instrument used in this study.

4.6.3 Focus group discussions

Focus group discussions are the third research instrument used in this study. According to Blandford (2013), the focus group discussion is an alternative to the interview and is intended for a group of participants with a common interest where the researcher can act as a facilitator and guider. The researcher is cognisant of the limitations posed by closed-ended questions in the questionnaire and therefore, captured deeper information more economically by using focus groups (Wolff, Knodel, & Sittitrai, 1993). Focus groups are not best suited where participants cannot be grouped into cohorts because their time of availability differs greatly (Creswell, 2012, 2015). Wolff, Knodel and Sittrai (1993) and Lijadi and Schalkwyk (2015) posit that focus group discussions can be used to complement quantitative tools in hard-to-reach populations. In contrast, Gibbs (cited in Dilshad & Latif, 2013, p. 197) believes that “it is considerably difficult to get the people together on time for the group session”. Dilshad and Latif (2013, p. 197) argue that very vocal participants may override non-dominant participants to the extent that they are bound by the vocal participants’ responses, even though they may not agree, if the moderator is inexperienced. Taking cognisance of the abovementioned benefits and limitations of focus group discussions, they were used to conduct ECD teacher interviews in phase two of the study and to corroborate the findings of phase one of the study (Driscoll, Appiah-Yeboah, Salib, & Rupert, 2007; Ritchie, Lewis, McNaughton Nicholls, & Ormston, 2014). The next section gives an in-depth explanation of the questions found in the interview and focus group discussions.

4.6.4 Qualitative data (interviews and focus group discussions)

The aim of this study was to critically analyse the integration of ICT in ECD education. The previous chapters noted that there are a number of studies that have critically analysed the integration of ICT in education using different methodologies (Govender, 2006; Gumedze, 2017; Kelentrić, 2013; Manaligod, 2012; Munyengabe et al., 2017; Nangue, 2011; Nordin, 2014; Phiri, 2016; Pohio, 2009). To best answer the critical questions found in this study, the researcher chose a mixed-methods approach, where qualitative data was gathered to validate or invalidate the quantitative data findings (Creswell, 2014; Subedi, 2016). As outlined above in sections 4.6.2 and 4.6.3, qualitative data was gathered through semi-structured interviews and focus group discussions. A maximum of 11 key questions and 12 key questions supported by probe questions were administered for the interviews and focus group discussions respectively. This enabled the researcher to answer the how, why and what questions that could not be readily answered through the quantitative data gathered for this research (Adams & Cox, 2008).

4.6.4.1 Interview questions with ECD teachers

This section presents the 11 questions that were on the Interview guide (see Appendix B) used in phase two of the study.

Question 1: *Please provide a brief history of your personal experiences and professional development in ICT as an ECD teacher.* This question created a platform for participants to introduce themselves and start sharing their personal experiences in relation to professional development in ICT. Their responses helped the researcher gather information on their perceptions and level of professional development about ICT integration in ECD education.

Question 2: *Do you think ICTs should be taught in ECD?* **Probe / Follow-up Question:** *Explain your answer: why do think they should or should not be taught at that educational level?* This question afforded participants an opportunity to express their views towards the use of ICT tools in the teaching of ECD learners. The probe question required the participants to further explain their views.

Question 3: *Are you using ICTs to teach in your ECD classes (e.g. computers, projectors, computer games etc.)? Probe / Follow-up Question: If yes, how are you using ICTs? If no, why are you not using them?* The question required the participants to indicate whether they were using ICT tools when teaching in their ECD classes, and the probe question needed them to specify why they answered yes or no to the first question.

Question 4: *Have you been trained to teach and use ICTs in your ECD classes? Probe / Follow-up Question: If you have, what ICT-related skills or competencies do you have? If no, do you have any intentions of getting trained?* This question required participants to indicate whether the ECD teachers had been trained to teach using ICT tools prior to attending the interview. According to Mandina (2015, p. 95), “teachers also lacked competence, in-service training and technical support, as well as Technological Pedagogical Content Knowledge on how to integrate ICTs into teaching and learning”. The probe question verified the ICT-related skills or competencies possessed by the ECD teachers, which in turn helped the researcher to answer Critical Question Two.

Question 5: *What kind of ICT devices are installed/found in your ECD classrooms (hardware and software, e.g. projectors, laptops, radios etc.)? Probe / Follow-up Question: How are learners interacting with these ICT devices? If none, how are ICT classes conducted?* The question gathered information on the types of ICT devices and services installed in the ECD classrooms. A probe question would then be asked to find out how the teacher and the ECD pupils interacted with the hardware, software and services installed (if any). As noted in the literature review, the lack of ICT resources might be one of the reasons stalling the full educational sector ICT integration (Konyana & Konyana, 2013; MICTPCS, 2016). The researcher managed to gather information on which ICT devices and services have been installed in schools.

Question 6: *Are the ICT devices (e.g. computers) in your school maintained/repared when they break down? Probe / Follow-up Question: If yes, who conducts the repairs? If no, why are your computers not regularly repaired?* This question required participants to specify how installed ICT devices were maintained or repaired in primary schools. As noted earlier in the literature review section, MoPSE (2017, p. 9) reports that the “lack of classrooms or classrooms in a poor state of repair leads to large class sizes, few or no laboratories and ICT

centres which when in place are often poorly equipped all act as a disincentive for children to enter or to attend school". Mukhari (2016, p. iv) reveals that successful ICT integration could not be achieved in South African schools due to a number of "factors, which included lack of ICT leadership, funds and technical support". The probe question required the participants to identify who conducts the ICT device maintenance and how frequently it is done.

Question 7: *What ICT-related help/assistance is made available to you by the MoPSE and the school? Probe / Follow-up Questions: Is the assistance adequate to your need for help/assistance? Has the assistance provided improved ICT-related learning activities in the ECD department?* This question directed the discussion towards the ICT-related help/support afforded to the school and ECD teachers by their authorities. Markon (2013, p. 51) believes that teachers need support from the authorities and that "without support, the staff can develop a negative attitude towards ICT and ultimately not integrate ICT into their lessons". The probe question requires participants to indicate whether the help is adequate in relation to their current set up/environment.

Question 8: *How would you describe the school's, MoPSE's and School Development Committee's support of ICT-related teaching activities in ECD? Probe / Follow-up Questions: If any, what kind of support is provided towards the ECD department? What do you think is the reason why your SDC and school administration is not supporting you to integrate ICTs into ECD education?* The question required the participants to describe how they felt about the impact of the support that they had been receiving from their authorities. The probe questions were intended for gathering information on the kind of support they were receiving (if they were receiving support) and reasons for lack of support (if they were not receiving any support).

Question 9: *What expectations, if any do you perceive the MoPSE and the school hold for you as an ECD teacher pertaining to the introduction of ICTs?* The purpose of this question was to gather information on what the ECD teachers perceived the MoPSE and the school expected from them and what they expected from the MoPSE and the school. According to Andrew and Durand (2001), Zimbabwean education ministries expect teachers to make efforts to equip themselves with ICT-related knowledge for ICT integration to be a success.

Question 10: *What are some of the challenges and issues you commonly face as an ECD teacher in teaching ICTs? Probe / Follow-up Questions: How have you been overcoming them? What do you think should be done to remove these challenges?* Based on Zimbabwean studies reviewed in the literature review section (Dozva & Dyanda, 2012; Makuvaza & Gatsi, 2014; MICTPCS, 2016; MoPSE, 2017; Pindula News, 2017b) for more detailed accounts of ICT integration challenges, there is no doubt that teachers are faced with challenges in trying to integrate ICT in their classes. This question asked for the ICT integration challenges experienced by ECD teachers. The probe question required participants to explain what they had been doing to overcome the challenges.

Question 11: *What suggestions can you give to enhance support for ICT integration in ECD?* This question allowed participants to suggest how ICT integration in ECD education could be enhanced in relation to the Masvingo province, Zimbabwean situation.

4.6.4.2 Focus group discussion questions with ECD teachers

As noted earlier all questions on interview and focus group discussion guide were follow-up questions to qualitatively confirm quantitative data findings. The focus group discussion guide had 12 questions (see Appendix C). Questions 1–6 and 8–12 for the focus group discussions were similar to questions 1–6 and 7–11 found on the interview guide respectively. However, Question 7 on the focus group discussion schedule (see Appendix C) was the only question that was not found in both the interview and focus group discussion schedules. The next section outlines the data collection procedure.

Question 7: *What ICT instructional resources (time, money, assistance, resources (hardware or software)) are made available to you by the Ministry of Primary and Secondary Education and the school? Probe / Follow-up Questions: Do you consider these resources sufficient or are there additional resources that are required?* The purpose of this question was to gather information on the instructional resources made available to the ECD teachers by the MoPSE and school. Dozva and Dyanda (2012, p. 63) identified the “inadequate supply of material resources, limited local literature and published research studies in ECD” as major challenges; Makuvaza and Gatsi (2014) highlighted the inadequacy of instructional resources in the form of textbooks and teaching guides as some of ECD education’s challenges. A probe question

was added to gather the ECD teachers' views on the adequacy of the instructional resources. The next section outlines the reliability of this study.

4.6.5 Reliability

Nuan (cited in Zohrabi, 2013, p. 259) states that “reliability deals with the consistency, dependability and replicability of “the results obtained from a piece of research”, which may require data obtained to be identical”. Data obtained may not always be the same given the diversity of the units under investigation. Cronbach’s Alpha reliability coefficient (α) is a statistical way of measuring internal consistency for evaluating the reliability of Likert-type scales items/questions on a scale ranging from 0 to 1. According to Tavakol and Dennick (2011), previous studies reported that if the value of α is between 0.70 and 0.95, the instrument is regarded as having high internal consistency. A value between 0.50 and 0.70 implies that the data is less reliable and has poor internal consistency, while a value below 0.5 has highly unreliable data and therefore unacceptable. The Cronbach’s reliability coefficients for elements 13, 14 and 17 are: computer attitude = 0.755, computer attributes = 0.745 and computer competence/proficiency = 0.952. Tavakol, Mohagheghi and Dennick (cited in Tavakol & Dennick, 2011, p. 53) argue that an instrument’s reliability is linked to its validity, but the instrument’s reliability is not dependent on its validity.

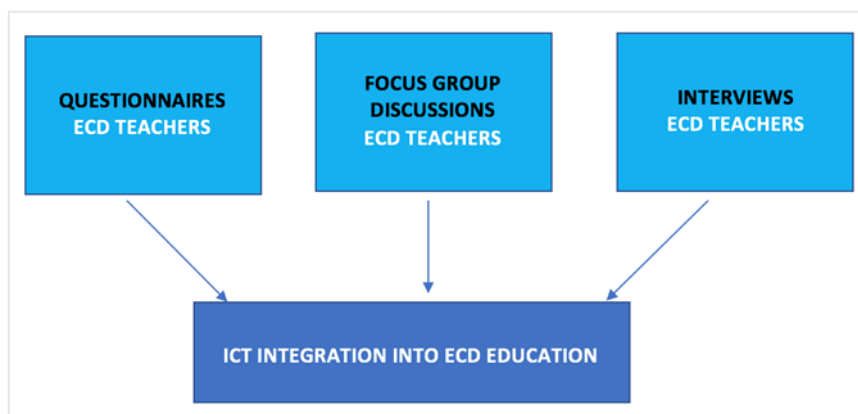


Figure 4.3: Triangulation of data sources on the ICT integration in ECD education study

(Adapted from Tarisayi, 2016, p. 99)

To ensure that the research is of a high degree of trustworthiness and dependability, the researcher triangulated data from different sources and allowed qualified peers to review it

so that findings are explicitly interpreted without bias. Figure 4.3 shows how the data sources have been triangulated in this study.

4.6.6 Validity

Burns (1999, p. 160) cited in Zohrabi (2013, p. 258), emphasises that “validity is an essential criterion for evaluating the quality and acceptability of research”. Tavakol and Dennick (2011, p. 53) assert that “validity is concerned with the extent to which an instrument measures what it is intended to measure”. The questionnaire was created based on question items validated in previous studies (refer to studies by Govender, 2006; Raulston, 2009, which had been validated based on the TAM, TPB, TRA, DOI and UTAUT). This research used data from different sources, namely questionnaires, interviews and focus group discussions, to strengthen the validity and deal with all biases associated with using one data source (see Figure 4.3). The researcher took the findings and interpretations back to the participants for checking to confirm the contents of what they provided during an interview or focus group discussion (see section 4.6.3). Five qualified peers who are PhD holders or candidates were also allowed to examine if the research findings had been interpreted well. The next section is an outline of the ethical considerations adhered to in this study.

4.7 Ethical Considerations

4.7.1 Ethics clearance and gatekeepers’ permission

According to Hammersley and Atkinson (cited in Creswell, 2012, p. 211), “a gatekeeper is an individual who has an official or unofficial role at the site, provides entrance to a site, helps researchers locate people, and assists in the identification of places to study”. Creswell (2008, p. 90) emphasises that “ethical procedures during data collection involve gaining the agreement of individuals in authority (e.g. gatekeepers) to provide access to study participants at research sites”. As outlined in Table 4.1 the researcher applied for gatekeepers’ approval to conduct research in Masvingo province primary schools from the Permanent Secretary in the MoPSE and permission was granted in form of a letter (see Appendix H). Creswell (2012, p. 210) highlights that “researchers applying for permission to study individuals in a qualitative project must go through the approval process of a campus institutional review board. These steps include seeking permission from the board,

developing a description of the project, designing an informed consent form, and having the project reviewed.” The researcher also applied for ethics clearance from the University of KwaZulu-Natal to conduct research in Masvingo province, Zimbabwe and obtained an approval letter (reference number: HSS0581/017D – see page iv). The letter from the Permanent Secretary was then used to seek permission from the Provincial Education Director (PED) for Masvingo province in the MoPSE, and an approval letter addressed to the District School Inspectors (DSIs) of the seven districts of Masvingo province was obtained (see Appendix I).

The three letters (Permanent Secretary’s letter, Ethical Clearance Approval letter and Provincial Education Director’s letter) were presented to the DSI of each district in Masvingo province. Upon receipt of the letters from the Permanent Secretary and the PED, DSIs either stamped on the PED’s letter of authority or wrote a separate letter asking for the cooperation of headmasters (see Appendices J–P for the letters obtained from the DSIs), should they be visited by the researcher. The researcher asked for permission from the DSI to address school heads at the DSI monthly school heads’ meeting, who expressed their willingness to assist the researcher should he decide to visit their schools. The District ECD Trainers for every district were very helpful in arranging a meeting with a school. Prior arrangements were then made with the headmasters for initial visits to the primary schools in Masvingo. During a visit, the researcher sought permission to conduct the study by presenting the letters authorising him to conduct research in the province and district to the headmaster of the primary school. When the researcher was granted permission, he would ask for the ECD teachers’ voluntary participation in the study. Thereafter the researcher arranged with different participants on when the data collection process would commence. The next section presents information on voluntary participation, anonymity, confidentiality and informed consent.

4.7.2 Voluntary participation, anonymity, confidentiality and informed consent

The researcher ensured that voluntary participation, anonymity, confidentiality and informed consent were observed in this study as prescribed by O’Leary (2014) and Creswell (2014). All participants in the study were volunteers who could freely withdraw from the research whenever they felt uncomfortable in any way. This was explicitly communicated to the participants verbally and on the informed consent form (see Appendix D) asking for their

voluntary participation and guaranteeing their confidentiality and anonymity. Confidentiality was observed as the information given was used for educational purposes only. Zohrabi (2013, p. 255) accentuates that “respondents’ anonymity makes them share information more easily”. Pseudonyms were used to refer to participants’ names and schools to ensure that their anonymity was preserved. The next section presents how feedback was communicated to the participants.

4.7.3 Feedback to the participants

Feedback meeting sessions were set up with ECD trainers and teachers (scheduled during the period they normally meet at the end of each month) to give them feedback from the study and they disseminated the results to their teachers. Participants have also been provided with a link to the UKZN repository where the thesis will be stored online. Copies of the thesis have been produced for the Secretary for Primary and Secondary Education and the Provincial Education Director (Masvingo province). The following section is an in-depth outline of the data collection procedures taken to ensure that the study conformed to standard research ethics.

4.8 Data collection procedure

The data for this study was collected in two phases: quantitative data in phase one, while qualitative data was collected in phase two. According to Driscoll et al. (2007, p. 21), “sequential mixed methods data collection strategies involve collecting data in an iterative process whereby the data collected in one phase contributes to the data collected in the next”. A cover letter (see Appendices A, D and H) was attached to the questionnaire with a consent form asking respondents to participate in the study. To ensure a high return rate, questionnaires were distributed by the researcher through the ECD trainers’ offices in every district, who conducted meetings with ECD teachers at least once every school term (Creswell, 2012, p. 382). The completed questionnaires were posted to the ECD trainers’ office, where the researcher would periodically go to collect the completed questionnaires over a period of eight weeks, which ensured that questionnaires posted in hard-to-reach areas were returned in time for analysis. Questionnaires were administered, collected, captured and analysed during the 2017 second school term and holiday. When the

quantitative data was collected it was then prepared for analysis by assigning codes that were also used to capture it in the Social Science Statistics Package (SPSS).

Phase two data (that is interviews and focus group discussions) collection started when the third school term of 2017 commenced in September 2017. For phase two, the interviewees and focus group discussion participants were purposively selected from the respondents who indicated their interest to participate in phase two of the study on the last section of the questionnaire. Selected participants were invited to participate in the study after the completion of quantitative data analysis (phase one). Interviews (for semi-structured interviews and focus group discussions) were recorded as well as hand-written notes taken on the conversation and body language of participants (with permission from the participants). In preparation for analyses, qualitative data was transcribed and uploaded to Atlas.ti for interviews and NVivo for focus group discussions. The two data sets (quantitative and qualitative) have been merged and presented together. However, findings have been consolidated to critically analyse the integration of ICTs into ECD education (see section two of this report).

4.9 Data analysis procedure

According to Creswell and Plano Clark (cited in Onwuegbuzie & Combs, 2011, p. 4), “data analysis in mixed methods research consists of analysing the quantitative data using quantitative methods and the qualitative data using qualitative methods”. The polarity of negative statements was reversed in the SPSS package. The Social Science Statistics Package (SPSS), was then used to aggregate, compute and reduce all the quantitative data collected and generate inferential statistics, as the volume of collected data was too large for the researcher to use manual calculations. Attitudes, ICT competencies and identification of factors that can best predict ICT integration in ECD education were all deduced from the computed data. With educators’ attitude as the dependent variable, regression analysis was computed to determine whether the variance between it and the independent variables (computer attributes and proficiency – see Chapter Nine) was statistically significant. This helped the researcher determine the best predictor of ECD teachers’ attitudes.

In the second phase of the study, qualitative data was transcribed into verbatim statements outlining the conversations that occurred between the researcher and the participants. The Atlas.ti and NVivo software packages were used to manage and analyse all the qualitative data gathered in this study (Suter, 2012). Coding the transcripts to establish themes, narratives and interview excerpts reduced the data volume by giving meaning to the collected data (Braun & Clarke, 2006; Ryan & Bernard, 2003; Taylor-Powell & Renner, 2003). This established an in-depth explanation of why the resulting educators' attitudes, ICT competencies and challenges, based on phase one's findings. In addition, data analysis commenced when the first data was collected from the participants (Burns & Grove, 2005). LeCompte (2000) reveals that qualitative data analysis begins almost as soon as the researcher enters the field until the final draft of the report is completed. Excerpts of the interviews and focus group discussions conducted in the local languages other than English were translated into English. Upon completion of the independent analysis, the findings were consolidated and interpreted to give a critical analysis of the ICT integration in ECD education based on the research questions. The following section highlights the key limitations of this study.

4.10 Limitations of the research

The period during which the study was undertaken could be considered as a possible limitation. The research was conducted at a time when the country was economically challenged and educators may have been demoralised (Moyo, 2013; Murisa, 2010; ZIMCODD, 2016), which in turn could influence their attitudes towards pro-government programmes like the integration of ICTs.

Initially, the total numbers of scheduled interviews and focus group discussions were 28 and seven respectively. The numbers of interviews and focus group discussions achieved were 26 and six respectively. For the two interviews and one focus group discussion that could not be conducted, participants failed to arrive for a booked interview or focus group discussion (Tongco, 2007). Hence, the seventh focus group discussion could not be conducted as the participants that attended could not form a quorum (Pawi, Putit, & Buncuan, 2010, p. 2). This study considered a quorum to be a group with at least five ECD teachers. The meeting would

then be postponed but when the new date arrived the participants that arrived again could not form a quorum.

According to Copriady's (2014) study on technology integration in Indonesia, "technology readiness and adaptation process are positively correlated with the type of teacher's attitude and motivation towards new technology", which can potentially impact on their willingness to participate. Cullen and Greene (2011) also support this position by asserting that, "when people have the extrinsic motivation they are still interested in performing an activity, but the focus is on the reward rather than the activity itself". The next sub-section concludes this chapter.

4.11 Conclusion

This chapter presented the research methodology used in this study. The research was conducted with 350 ECD teachers at primary schools that have ECD centres teaching ECD A and ECD B in the Masvingo province. To conduct this study the researcher employed the mixed-methods approach, which utilised both quantitative and qualitative methods of inquiry in a sequential manner. The chapter elaborately discussed how the questionnaire, interview and focus group discussion were employed as data collection methods to enhance triangulation, ensure reliability, validity and yield the best results. The chapter also explained the sampling techniques, instruments, data analysis procedures and how the study handled issues of research ethics. The next chapter presents, analyses and discusses the data collected from this study.

SECTION TWO – DISCUSSION OF RESULTS AND FINDINGS

Chapter Five – Discussion of the Data Analysis Process

5.1 Introduction

The previous chapter gave an in-depth discussion of the methodology that was employed in the collection and analysis of data. The data in this study was obtained through questionnaires, interviews and focus group discussions. A two-pronged approach enabled the researcher to tap the strengths of both the quantitative and qualitative research inquiries (O’Leary, 2014). Quantitative data were presented and discussed by using descriptive and inferential statistics, while qualitative data were presented in a narrative form as descriptive data as well as verbatim statements. Where the same information was solicited through interviews and focus group discussions the researcher analysed such data at the same time in order to come up with common trends (Flick, 2014; Lecompte, 2000; Ritchie & Lewis, 2013). The research data were analysed in relation to what was obtained on the ground. The data was presented separately and discussed following the order of the research questions (see Chapters Six to Ten). This chapter thus presents and discusses an outline of the data that will be presented in Chapters Six to Ten in the form of tables and figures.

The objectives of this study were:

1. To **examine** the attitudes of ECD teachers towards the implementation of ICT in the ECD Curriculum;
2. To **investigate** the ICT competencies possessed by ECD teachers in order to engage with ICT integration in teaching and learning;
3. To **establish** the nature of teaching and learning ICT integration challenges faced by ECD teachers;
4. To **identify** the best predictor of educators’ attitudes towards ICT integration in ECD education, and;

5. To **develop** a model based on the best predictors of teachers' attitudes which can be implemented to enhance the integration of ICT in ECD Education.

5.2 Data collected

This section presents an overview of the data collected in this study. Table 5.1 shows a detailed outline of all the participants of this study classified by phase one and two:

Table 5.1: Participants in the study

SAMPLE DETAILS	PHASE TWO (QUALITATIVE)				PHASE ONE (QUANTITATIVE)	
	Initially Proposed Interviews	Interviews Conducted	Initially Proposed Focus Group Discussions	Focus Group Discussions Conducted	Questionnaires Distributed	Returned Questionnaires
ECD teachers	28 (28 participants)	26 (26 participants)	7 (70 participants)	6 (46 participants)	350 (350 respondents)	309 (350 respondents)
Total Number of Participants	28	26 (92.9%)	70	46 (65.7%)	350	309 (88.3%)

(Field data: 2017)

As noted in Chapter Four (see section 4.5), 350 participants were sampled from the total population to participate in this study. Table 5.1 is a comparative overview of the questionnaires that were returned with the ones that were distributed, the proposed interviews and focus group discussions against the ones that were achieved in the field. Of the 350 questionnaires that were distributed, 309 were returned (achieving an 88.3% return rate). However, three of the questionnaires could not be used in the analysis stage because they had not been fully completed and signed. Phase one eventually used 306 questionnaires (about 87.4% of the distributed questionnaires) during the analysis stage.

Table 5.1 also shows that of the 28 proposed interviews, 26 were conducted (92.9% of the proposed interviews). The total number of proposed participants in the focus group discussions was initially pegged at 70; however, 46 actually attended (about 65.7%). This was partly due to the way the schools were scattered in the province, which made putting ECD teachers in the same room difficult. Some of the scheduled interviews and focus group

discussions could not proceed because of the participants’ decision to withdraw and the low number of participants who arrived for the discussions. The percentages achieved in Table 5.1 can be regarded as this study’s response rates (Carley-baxter et al., 2009).

While a number of studies tend to agree that there is no outright definition of an acceptable response rate (Carley-baxter et al., 2009; Morton, Bandara, Robinson, & Carr, 2012; Saldivar, 2012); they, however, confirm that response rates reaching percentages higher than 60% have been proven to be of a high quality and accepted by a majority of renowned journal editors (Nulty, 2008). This validates the response rates found in this research as rates worth reporting. The next section presents the demographic characteristics of this study’s participants.

5.3 Demographic characteristics

This section gives an overview of the demographic data collected from the participants in this study. The demographic data and codes used in the two phases have been separated and presented in the two sections that follow:

5.3.1 Quantitative data demographic characteristics

Table 5.2: Gender of respondents

Gender of Respondents	Frequency	Percent
Male	28	9.2
Female	278	90.8
Total	306	100

(Field data: 2017)

This section presents the demographic data of the respondents of the questionnaire instrument that was administered in phase one of the study. Table 5.2 above is a presentation of the gender of the respondents and shows that 90.8% of the respondents were female ECD teachers and only 9.2% were male. The demographic characteristics of the quantitative phase presented in Table 5.2 above suggest that Zimbabwean ECD education is dominated by female teachers. The gender composition of this study’s participants confirmed Dozva and Dyanda’s (2012) study, which cited the failure to attract males into the ECD training programmes as one of the major challenges affecting the ECD education department.

Table 5.3: Age ranges of respondents (Field data: 2017)

Age Range of Respondents	Frequency	Percent
21 years or younger	7	2.3
22-30 years	62	20.3
31 - 40 years	126	41.2
41 - 50 years	90	29.4
51 - 60 years	20	6.5
61 years or older	1	0.3
Total	306	100

Table 5.3 presents the age of the respondents in ranges. The age ranges 31-40 years and 41-50 years contributed the highest percentages (about 70.6% when combined) of the respondents in this study. While one might argue that there is no clear pattern and rule used to recruit ECD teaching practitioners, Novaković (2015), who conducted a similar study on preservice ECD teachers in Croatia, reported that teachers employed as ECD teachers had age characteristics similar to the ones found in this study. The sector is characterised by a large number of teachers who are 40 years and younger. The highest level of education of respondents is shown in Table 5.4 below.

Table 5.4: Highest level of education of respondents

Highest Level of Education	Frequency	Percent
Diploma	204	66.7
Bachelor's Degree	41	13.4
Master's Degree	5	1.6
Other	56	18.3
Total	306	100

(Field data: 2017)

The qualification that recorded the highest percentage is the diploma with 66.7%, and the one with the lowest recorded percentage is the Master's degree. Participants in Novaković's (2015) research who held ECD education and vocational studies diplomas amounted to 63.8%, a figure that is in the same range as the one found in this study. The item "other" had an open-ended portion where respondents were supposed to fill in their highest level of

education (if they ticked “other”) and the responses recorded amounted to 18.3% of the respondents. Responses recorded on the other items included “Paraprofessional” and “Post-Graduate Certificate of Education (CE)”. This confirms the findings of studies reviewed in the literature review section, which reported the existence of Paraprofessionals in ECD centres (refer to studies by Dozva & Dyanda, 2012; Makuvaza & Gatsi, 2014; MoPSE, 2017; Nhaka Foundation, 2012 for a detailed overview of Para-professional ECD teachers). These are semi-skilled community workers who were trained and awarded certificates to act as community ECD teachers and in turn, help bridge the gap created by the lack of ECD teachers who hold at least a diploma. This means that the large majority of teachers found in ECD centres are qualified to teach in ECD education. However, the question that is to be answered by this study is whether they are competent to engage with ICT in teaching and learning activities.

Table 5.5: Teaching experience of respondents

Teaching Experience	Frequency	Percent
0 - 5 years	149	48.7
6 - 10 years	95	31
11 - 15 years	26	8.5
16 - 20 years	17	5.6
21 - 25 years	6	2
26 - 30	7	2.3
Over 30 years	6	2
Total	306	100

(Field data: 2017)

Table 5.5 shows that about 48.7% of the respondents indicated that they are fall the range of 0–5 years of teaching experience. The percentages are lower for teachers with more than 20 years’ experience. This could be due to the fact that ECD education was formally introduced in the Zimbabwean education system in 2004 (Chikutuma & Mawere, 2013; Makuvaza & Gatsi, 2014; Nhaka Foundation, 2012). The next section outlines how the qualitative data has been presented in the later chapters.

5.3.2 Qualitative data demographic characteristics

Table 5.6: Interview codes and demographic data

Interview	District	Interviewee	Code	Gender	Age
1	Bikita	Interviewee Bikita District 1	IBK1	Female	48
2	Bikita	Interviewee Bikita District 2	IBK2	Female	32
3	Bikita	Interviewee Bikita District 3	IBK3	Female	43
4	Bikita	Interviewee Bikita District 4	IBK4	Female	33
5	Chivi	Interviewee Chivi District 1	ICH1	Female	34
6	Chivi	Interviewee Chivi District 2	ICH2	Female	24
7	Chivi	Interviewee Chivi District 3	ICH3	Female	27
8	Chivi	Interviewee Chivi District 4	ICH4	Female	37
9	Chiredzi	Interviewee Chiredzi District 1	ICR1	Female	39
10	Chiredzi	Interviewee Chiredzi District 2	ICR2	Female	38
11	Chiredzi	Interviewee Chiredzi District 3	ICR3	Female	36
12	Gutu	Interviewee Gutu District 1	IGT1	Female	39
13	Gutu	Interviewee Gutu District 2	IGT2	Female	36
14	Gutu	Interviewee Gutu District 3	IGT3	Female	38
15	Gutu	Interviewee Gutu District 4	IGT4	Female	44
16	Masvingo	Interviewee Masvingo District 1	IMA1	Female	56
17	Masvingo	Interviewee Masvingo District 2	IMA2	Female	44
18	Masvingo	Interviewee Masvingo District 3	IMA3	Female	40
19	Masvingo	Interviewee Masvingo District 4	IMA4	Male	34
20	Mwenezi	Interviewee Mwenezi District 1	IMW1	Female	32
21	Mwenezi	Interviewee Mwenezi District 2	IMW2	Female	35
22	Mwenezi	Interviewee Mwenezi District 3	IMW3	Male	42
23	Mwenezi	Interviewee Mwenezi District 4	IMW4	Female	31
24	Zaka	Interviewee Zaka District 1	IZK1	Female	26

(Field data: 2017)

This section presents the demographic data of the participants in the interview and focus group discussion instruments that were used in phase two of this study. As outlined in Chapter Three, qualitative data was collected from participants who were purposively selected from the questionnaire respondents' list. Table 5.6 outlines the interviews, interviewee demographic data by district and the codes that have been assigned to them for

reference in this report. Table 5.6 also shows that there were three males (about 11.5%) and 23 females (about 88.5%) who participated in the interviews. Table 5.7 gives an overview of the codes that were used to refer to the focus group discussions by the district.

Table 5.7: Outline of the codes used to identify the focus group discussions

District	Focus Group Discussion	Code
Bikita	Focus Group Discussion Bikita District	FGDBK
Chivi	Focus Group Discussion Chivi District	FGDCH
Chiredzi	Focus Group Discussion Chiredzi District	FGDCR
Gutu	Focus Group Discussion Gutu District	FGDGT
Masvingo	Focus Group Discussion Masvingo District	FGDMA
Mwenezi	Focus Group Discussion Mwenezi District	FGDMW
Zaka	Focus Group Discussion Zaka District	FGDZK

(Field Data: 2017)

Table 5.7 above provides more detail by outlining the codes of the participants of the focus group discussions that were conducted for this study. Table 5.8 also shows that there were six males (about 13%) and 40 females (about 87%) who participated in the focus group discussions. The percentages achieved in the qualitative phase are in congruence with the percentages achieved in the quantitative phase. The next section is an outline of the themes and trends that emerged from the data that will be presented in chapters 6,7,8,9 and 10.

Table 5.8: Overview of focus group discussion participants' demographic data

Participant	District	Focus Group Discussion	Code	Gender	Age
1	Chivi	FGDCH	FGDCHA	Female	34
2	Chivi	FGDCH	FGDCHB	Female	24
3	Chivi	FGDCH	FGDCHC	Male	25
4	Chivi	FGDCH	FGDCHD	Male	27
5	Chivi	FGDCH	FGDCHE	Female	21
6	Chivi	FGDCH	FGDCHF	Female	21
7	Chivi	FGDCH	FGDCHG	Female	44
8	Chivi	FGDCH	FGDCHH	Female	49

Participant	District	Focus Group Discussion	Code	Gender	Age
9	Chivi	FGDCH	FGDCHI	Female	29
10	Chivi	FGDCH	FGDCHJ	Female	36
11	Chiredzi	FGDCR	FGDCRA	Female	29
12	Chiredzi	FGDCR	FGDCRB	Female	38
13	Chiredzi	FGDCR	FGDCRC	Female	34
14	Chiredzi	FGDCR	FGDCRD	Female	37
15	Chiredzi	FGDCR	FGDCRE	Female	45
16	Chiredzi	FGDCR	FGDCRF	Female	47
17	Chiredzi	FGDCR	FGDCRG	Female	41
18	Chiredzi	FGDCR	FGDCRH	Female	40
19	Gutu	FGDGT	FGDGTA	Female	36
20	Gutu	FGDGT	FGDGTB	Female	38
21	Gutu	FGDGT	FGDGTC	Female	28
22	Gutu	FGDGT	FGDGTD	Female	31
23	Gutu	FGDGT	FGDGTE	Female	31
24	Gutu	FGDGT	FGDGTF	Female	30
25	Gutu	FGDGT	FGDGTG	Female	37
26	Gutu	FGDGT	FGDGTH	Female	35
27	Masvingo	FGDMA	FGDMAA	Female	40
28	Masvingo	FGDMA	FGDMAB	Female	41
29	Masvingo	FGDMA	FGDMAC	Female	42
30	Masvingo	FGDMA	FGDMAD	Female	37
31	Masvingo	FGDMA	FGDMAE	Female	36
32	Masvingo	FGDMA	FGDMAF	Female	38
33	Masvingo	FGDMA	FGDMAG	Female	31

Participant	District	Focus Group Discussion	Code	Gender	Age
34	Masvingo	FGDMA	FGDMAH	Female	30
35	Masvingo	FGDMA	FGDMAI	Female	46
36	Mwenezi	FGDMW	FGDMWA	Female	31
37	Mwenezi	FGDMW	FGDMWB	Male	42
38	Mwenezi	FGDMW	FGDMWC	Female	22
39	Mwenezi	FGDMW	FGDMWD	Female	42
40	Mwenezi	FGDMW	FGDMWE	Male	44
41	Zaka	FGDZK	FGDZKA	Female	23
42	Zaka	FGDZK	FGDZKB	Female	22
43	Zaka	FGDZK	FGDZKC	Female	36
44	Zaka	FGDZK	FGDZKD	Male	47
45	Zaka	FGDZK	FGDZKE	Female	33
46	Zaka	FGDZK	FGDZKF	Male	25

(Field Data: 2017)

5.4 Overview of emerging themes

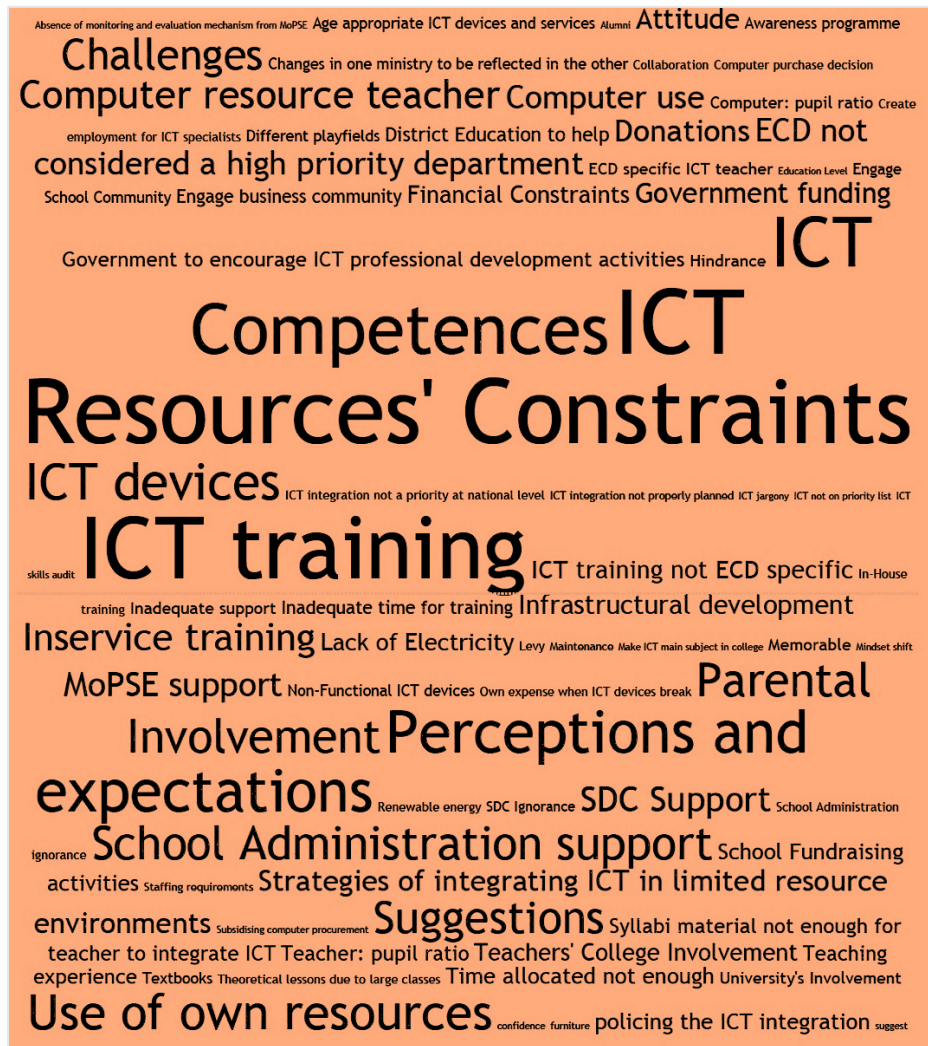


Figure 5.1: Qualitative frequently used words tag cloud for emergent themes
(Field Data: 2017)

Figure 5.1 is a frequently used Words Tag Cloud generated from the qualitative data in the Atlas.ti software package that was used to populate the codes and emerging themes in this study. According to the tag cloud in Figure 5.1, “ICT Competences”, “Resources” Constraints”, “ECD not considered a high priority” and “ICT training” were some of the trending statements in phase two of this study. Figure 5.2 provides a high-level presentation/summary of the themes that emerged from the analysis of data in this study.

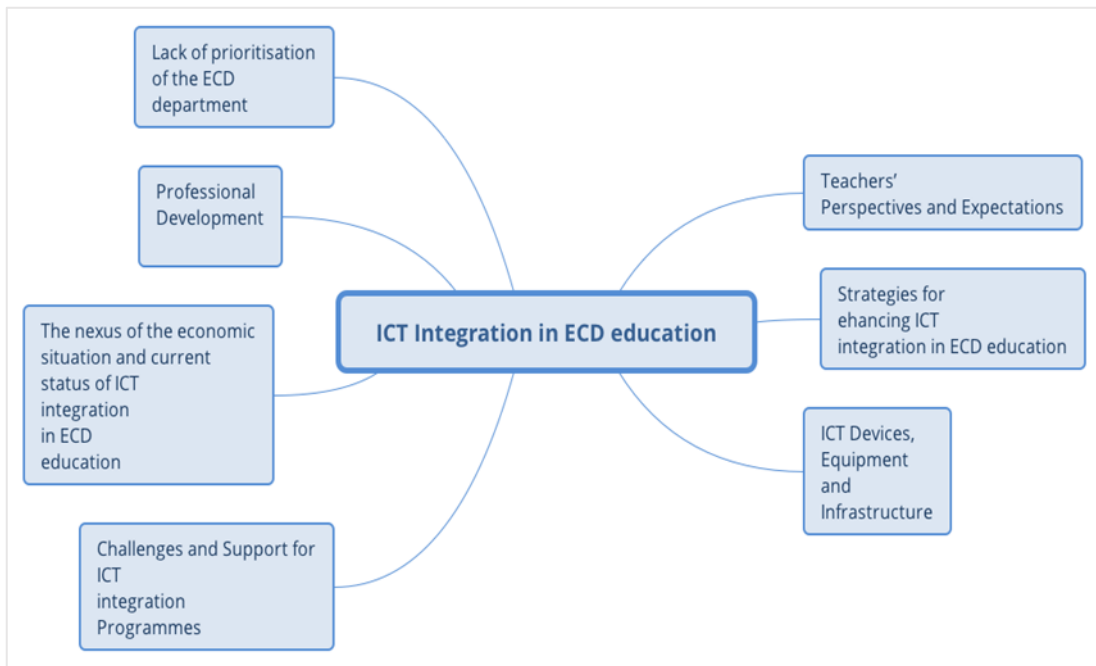


Figure 5.2: Key Themes that emerged from the qualitative data

This study's field data produced the following key themes (see Figure 5.2):

- Teachers' perspectives and expectations (see sub-section 5.3.1);
- Lack of the prioritisation of the ECD Department (see sub-section 5.3.2);
- Professional development (see sub-section 5.3.3);
- The nexus of the economic situation and current status of ICT integration in ECD education (see sub-section 5.3.4);
- Lack of ICT devices, equipment, infrastructure and instructional resources (see sub-section 5.3.5);
- Challenge and support for ICT integration programmes (see sub-section 5.3.6); and
- Strategies for enhancing ICT integration in ECD education (see sub-section 5.3.7).

The introduction of this chapter gave an outline of the key objectives in this study; the rest of the chapter follows this up by attaching each research question to the key codes and themes relating to it that emerged from this study. With the researcher as a data collection and analysis instrument in the qualitative phase, the study produced large amounts of data, which required it to be thoroughly reduced by critically analysing it. This could not be done in a short period by merely looking at the questionnaire data and interview and focus group discussion

transcripts. According to Ryan and Bernard (2003), a theme is an abstract construct linking expressions mined from data (this may be text, images, sounds or objects) by evaluating their uniqueness, relevance to the phenomenon under study and number of occurrences. SPSS software was used for aggregating and analysing the quantitative data, while Atlas.ti and NVivo software were used for identifying and managing themes and codes for the qualitative data. This analysis and presentation of data helped the researcher map the findings of this study, which can best answer the research questions systematically (Creswell, 2012). The key themes that emerged from this study (see Figure 5.2), were identified and drafted against the backdrop of previous studies associated with ICT integration in education. The themes have been briefly explained and expanded into sub-themes in the sub-sections below:

5.4.1 Teachers' perspectives and expectations

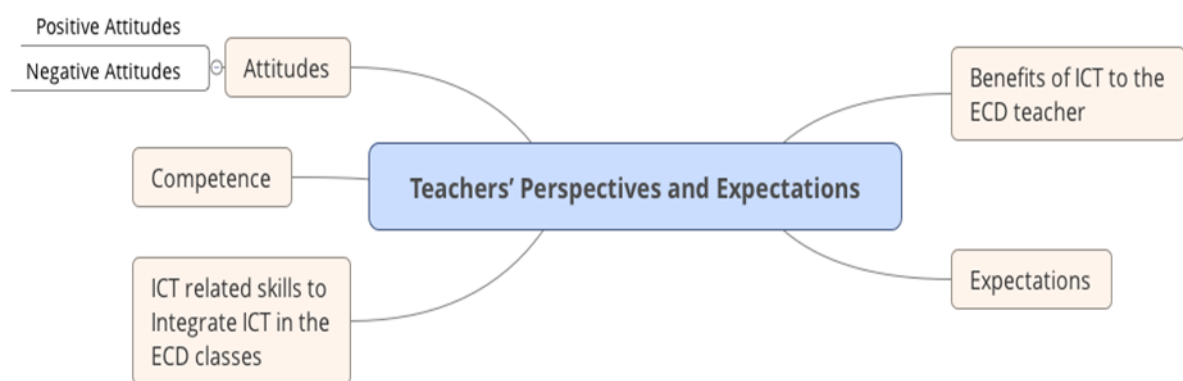


Figure 5.3: Teachers' perspectives and expectations

The first critical question investigated the ECD teachers' attitudes on ICT integration (see section 1.3.1 and Chapter Six). During the analysis of the qualitative data, it emerged that ECD teachers had both negative and positive attitudes on ICT integration in ECD education and expectations for ICT integration to become a success, as illustrated in Figure 5.3 (refer to studies by Botha, 2013; Copriady, 2014; Cullen & Greene, 2011; Govender, 2006; Kabakçı-Yurdakul et al., 2014; Raulston, 2009). The participants also indicated that they were aware of the benefits of ICT in ECD education but they were not satisfied with their level of ICT competence (this will be further discussed in Chapter Seven where the data on the ECD teachers' ICT competencies critical question has been presented and analysed). The next key theme (lack of the prioritisation of the ECD department) is presented in the next section.

5.4.2 Lack of prioritisation of the ECD department

Despite the fact that ICT in education had been tagged as a priority item in the MoPSE 2016–2020 strategic plan (MoPSE, 2017), it emerged that the participants in this study believed that the education authorities were not been giving priority to the ECD education department. This theme was further strengthened by the government’s move to suspend the recruitment of 5,907 ECD teachers who had been included in the 2018 national budget (Chinamasa, 2017; Pindula News, 2017c). The next key theme (professional development) is presented in the next section.

5.4.3 Professional development

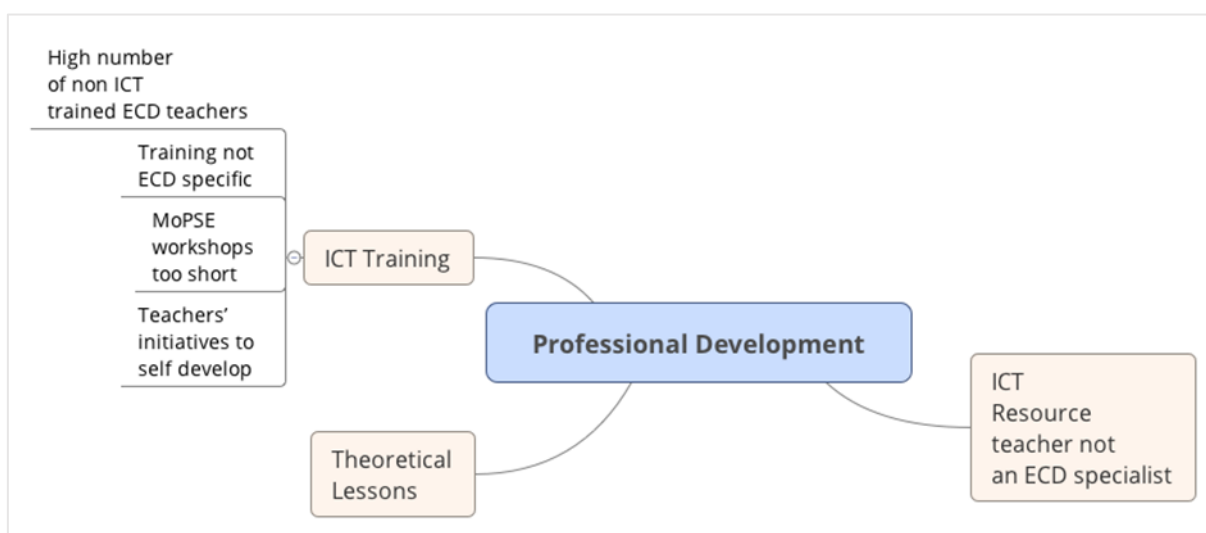


Figure 5.4: Professional development

This study’s second critical question asked for the ICT competencies possessed by ECD teachers in order to engage with ICT integration in teaching and learning. This, therefore, qualified this research to classify participants’ responses under a theme titled “professional development”. Under this theme, it emerged that there was a need to revisit the ICT-related training programmes afforded to the ECD teacher as there was a high number of non-ICT trained teachers, ICT resource teachers who do not understand ECD education and theoretical lessons resulting from the lack of ICT resources (see Figure 5.4). In spite of the number of workshops that the MoPSE has been facilitating for the participants, they expressed the feeling that the workshops were implemented as crash programmes (MoPSE, 2017), which made them fall short of what might be required to equip them with lifelong ICT

competencies. The next section presents the key theme (the nexus of the economic situation and the current status of ICT integration in ECD education).

5.4.4 The nexus of the economic situation and current status of ICT integration in ECD education

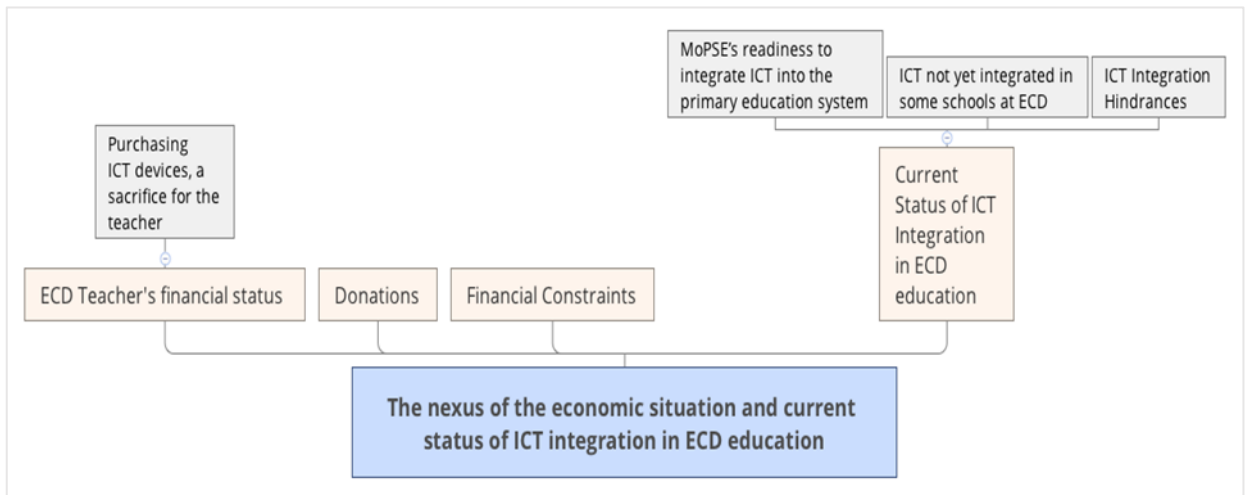


Figure 5.5: The nexus of the economic situation and current status of ICT integration in ECD education

The literature review section highlighted that Zimbabwe has been faced by an economic crisis (that is there is no cash in the banks, schools are too financially constrained to buy ICT equipment and teachers' salaries are pegged just above the poverty datum line) for some time (studies by Makochehanwa, 2009; Maposa, 2013; Mlambo, 2016; Moyo, 2013; The Zimbabwean, 2016; VVOB, 2014; ZIMCODD, 2016 further explain the Zimbabwean economic situation in relation to teachers). Participants evaluated the current status of ICT integration in ECD education and rhetorically asked if the MoPSE was ready to integrate ICT into the primary education system. Figure 5.5 is an outline of the sub-themes that emerged from the trending debate that the teachers' and school income base was limited, which poses as one of the major hindrances slowing down the ICT integration programmes in some schools. It also emerged that some of the schools that have successfully integrated ICT in their systems were excessively reliant on donations and fundraising programmes. The key theme (ICT devices, equipment, infrastructure and instructional resources) is presented in the next section.

5.4.5 ICT devices, equipment, infrastructure and instructional resources

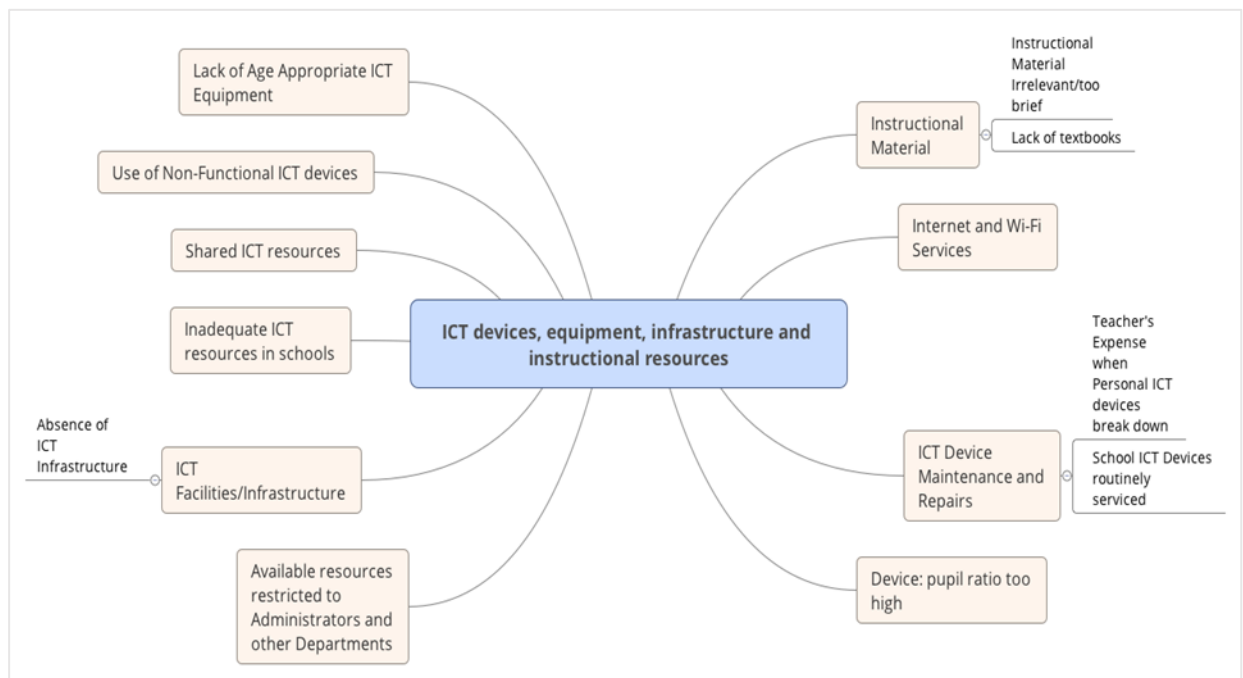


Figure 5.6: ICT devices, equipment, infrastructure and instructional resources

Participants in this study stated that the lack of ICT devices, equipment, infrastructure and instructional resources was the major challenge hindering them from integrating ICT into their teaching and learning processes. As illustrated in Figure 5.6, there was an absence of ICT infrastructure in schools, ICT and instructional resources were shared and inadequate, which resulted in very low ICT device to pupil ratio and in teachers using their personal ICT resources to conduct ICT-based teaching and learning processes. The findings classified under this theme confirmed MoPSE’s (2016c, 2017) policy statements and Konyana and Konyana’s (2013) study, which affirmed that schools in Zimbabwe were experiencing major ICT device and infrastructure challenges that have resulted in the low device to pupil ratios. The next section presents the key theme (challenges and support for ICT integration programmes).

5.4.6 Challenges and support for ICT integration programmes

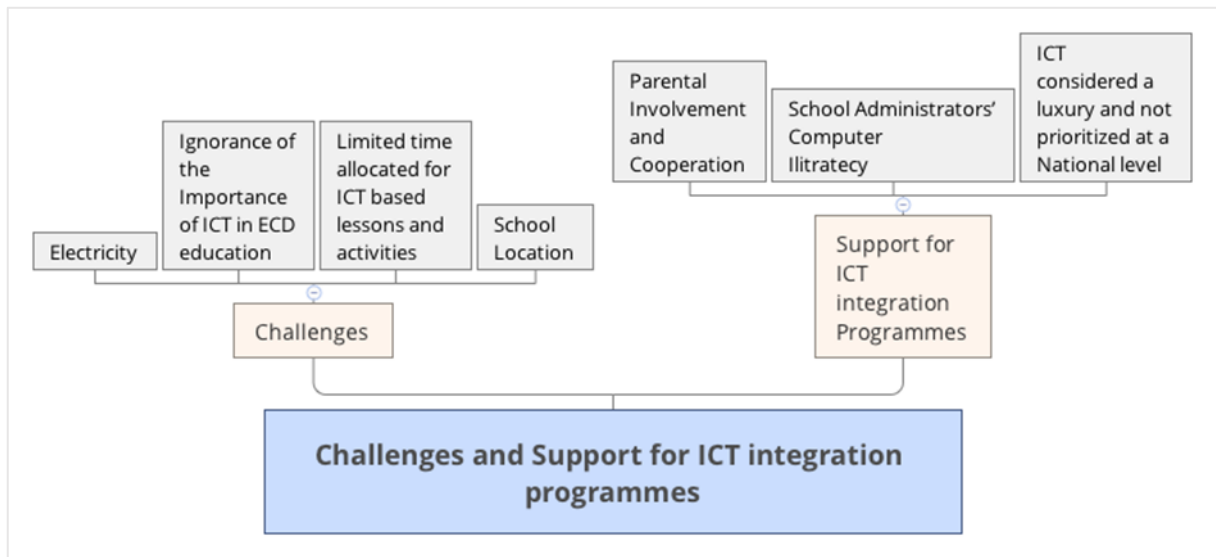


Figure 5.7: Challenges and support for ICT integration programmes

This research investigated the support for ICT integration and challenges faced by ECD teachers in trying to integrate ICT into their teaching and learning processes (see research question 3 in sub-section 1.2.1). It emerged that the lack of electricity, ignorance of the importance of ICT in ECD education, limited time allocated for ICT-based activities and the location of some schools were the key challenges of implementing ICT integration in ECD education. These findings align with what studies in the literature section found (refer to the following studies: Bukaliya & Mubika, 2012; Dozva & Dyanda, 2012; Hlupo, Kufakunesu, Denhere, Chinyoka, & Ganga, 2003; Kanyongo, 2005; Konyana & Konyana, 2013; Mndzebele, 2013a; Ngimi, 2013; VVOB, 2014, for literature on ICT integration related challenges faced by ECD teachers). As noted in the literature review, the above mentioned studies found that Zimbabwean rural areas where some of the schools were located were still technologically remote and not yet electrified.

The participants in this study conveyed that most of them were experiencing commendable parental involvement and cooperation. However, they cited the computer illiteracy of school administrators as one of the hindrances of ICT integration, which has resulted in ICT being considered a luxury at the national level. Studies by Mawere, Thomas & Nyaruwata (2015), Chindanya (2011), and Tshabalala (2013) outline how the government supports parental

involvement in education through Statutory Instrument 87 (SI87) of 1992 and Statutory Instrument 379 (SI379) of 1998. Strategies for enhancing ICT integration in ECD education is the theme presented in the next section.

5.4.7 Strategies for enhancing ICT integration in ECD education

Qualitative data collection instruments (see Appendices B and C for the interview and focus group discussion question guides) collected data on the challenges, how they were being overcome and possible suggestions for the enhancement of ICT integration in ECD education (as illustrated in Figure 5.8 below). Participants indicated that they have been making use of their personal ICT resources, donations and fundraising activities to integrate ICT into their teaching and learning processes. Based on the fifth research question (see critical question 5), the participants also suggested that the MoPSE should spearhead ICT integration programmes by policing ICT integration in ECD education, involve teachers' training colleges, electrify rural schools, resource the ECD teacher and provide schools with subsidies when they want to procure ICT-related equipment and construct infrastructure. The next section is a discussion of the findings presented in this chapter.

5.5 Discussion

An overview of the demographic data showed that there were fewer males (9.2%) than females (90.2%) participating in the study. The gender disparity in this study's participants could be explained by Nyoni and Nyoni (2012) who conducted a study on gender stereotyping and found that the community seemed to have a negative attitude towards male ECD teachers. They also found that the community in Zimbabwe had the perception that teaching in ECD was a preserve for females. Based on their findings this could have a categorical effect on the ECD teacher education programme, which is seen to be generally enrolling a very small number of males. According to Eurostat (2017), "there was a large gender imbalance among teachers at these educational levels: men accounted for just 4.6% of all pre-primary school teachers in the EU and for 15.3% of primary school teachers". This confirmed that the challenge was also a reality in the European zone. Therefore, this study established a feminisation of the ECD teaching profession.

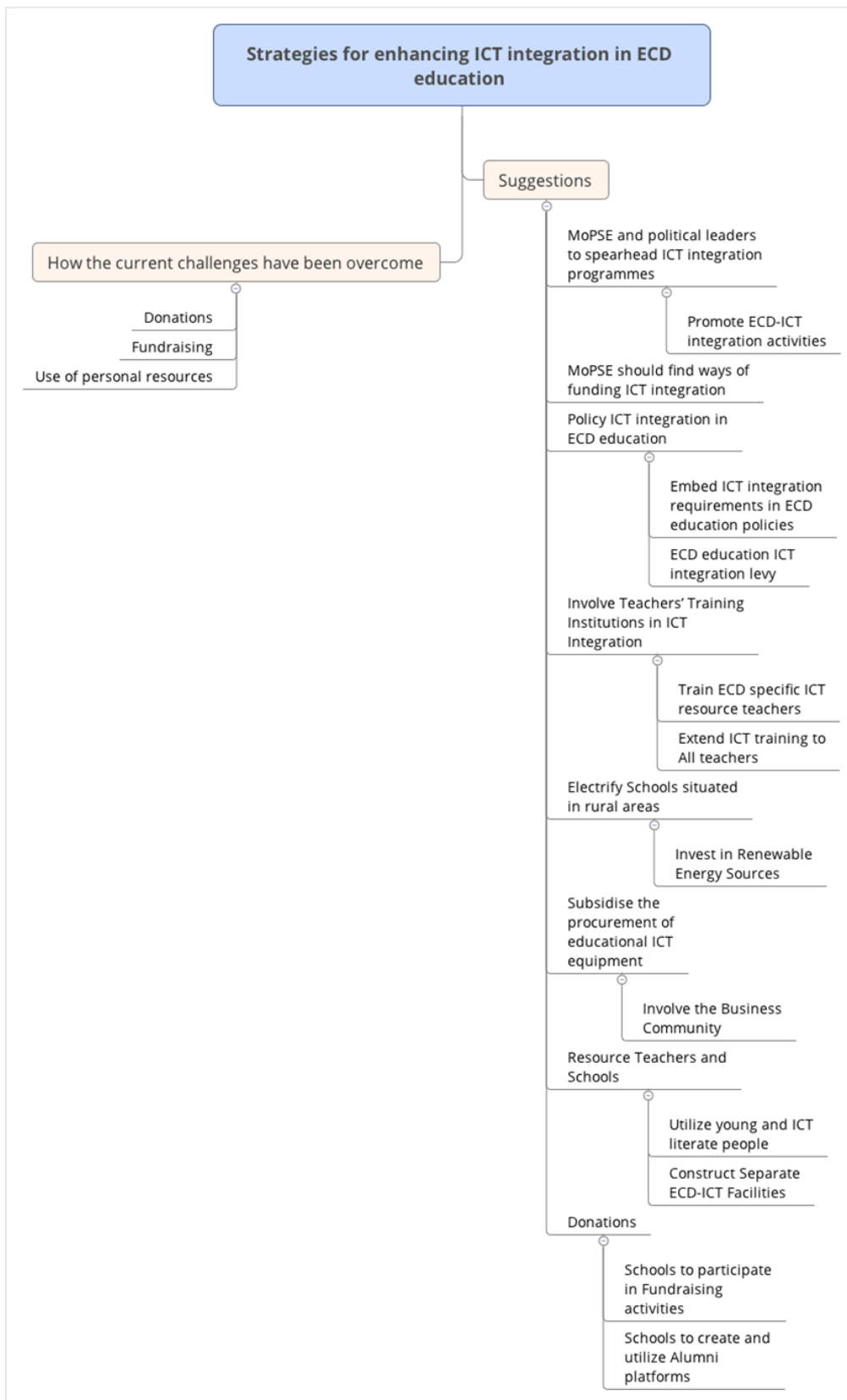


Figure 5.8: Strategies for enhancing ICT integration in ECD education

The data on age groups that participated in this study showed that when plotted, the graph would be a normal curve as most of the participants were middle-aged (41.2% was in the range 31-40 years, while 29.4% is in the range 41-50 years) (see Table 5.2). The highest qualification possessed by the majority of the ECD teachers in this study was the diploma with 66.7% (see Table 5.3), which may be attributed to the fact that it is the teachers' colleges that first offered the course at diploma level before the other tertiary institutions like universities (Munjanganja & Machawira, 2015). Hence, it can be argued that the ECD teachers who participated in this study were qualified and in a position to contribute to the integration of ICT in Zimbabwean ECD education. However, there was also a very high number of teachers with low teaching experience (about 48.7% in the 0-5 years) as training was only started in 2004 (see Table 5.4 and Table 5.5), which confirms MoPSE's (2017) and Munjanganja and Machawira's (2015) findings.

According to Ryan and Benard (2003), there is no hard-written technique of classifying codes, themes and sub-themes. The emergent trends and themes outlined in Figure 5.2 confirm the findings of the previous studies discussed in the literature review chapter. The themes were further expanded into sub-themes as illustrated by Figure 5.3–Figure 5.7. The thematic analysis of the data collected in this study implied that ECD teachers who participated in this study generally had positive attitudes and low to moderate ICT competencies. However, in spite of the participants' attitudes being most positive, there was a high number of non-ICT trained teachers and major ICT resources' challenges being experienced in schools (this will be further explained in Chapters Six to Ten). The next section concludes this chapter.

5.6 Conclusion

This chapter presented a high-level presentation of the demographic data, codes and the emergent themes that are later explained and used in chapters 6,7,8,9 and 10 to answer the critical research questions in this study. Inferences were drawn from similarities and differences to answer the research question, "***What are the attitudes of ECD teachers in Masvingo towards the implementation of ICT as tools in the ECD curriculum?***" in the next chapter.

Chapter Six – Attitudes and Perceptions of ECD Educators

We have to know what change looks like from the point of view of the individual teacher, student, parent, and administrator if we are to understand the actions and reactions of each; and if we are to comprehend the big picture, we must combine the aggregate knowledge of these individual situations with an understanding of organisational and inter-organisational factors which influence the process of change as government departments, intermediate agencies, universities, teacher federations and school systems interact (Fullan, 2001b, p. xi).

6.1 Introduction

The literature review and theoretical framework sections outlined how the Rodgers' DOI model was used in previous studies to evaluate attitudinal studies which related to technology adoption. Based on the literature's position that attitudes can be divided into three categories that include the affective, cognitive and behavioural domain (Banaji & Heiphetz, 2010; Cohen, Lawrence, Keith, Manion, & Morrison, 2004; Eaton & Visser, 2008); this study will also analyse ECD teachers' attitudes on ICT integration according to those domains. Studies of ICT integration into education have shown that for a proper analysis of ICT integration in education it is key to evaluate the individual attitudes of the people participating in the integration processes (Copriady, 2014; Cullen & Greene, 2011; Govender, 2006; Masango, 2014; Özdemir, 2017; Pohio, 2009; Trafimow, 2009). This chapter intends to answer the critical question, **“What are the attitudes of ECD teachers in Masvingo towards the implementation of ICT in the ECD Curriculum?”** by presenting and discussing the key findings in this study.

6.2 Research question one: What are the attitudes of ECD teachers in Masvingo towards the implementation of ICT in the ECD Curriculum?

This section presents an assessment of the attitudes of the ECD teachers participating in this study. The sections below are a presentation and brief analysis of the collected data relating to attitudes in a bid to answer Critical Question One.

6.3 Presentation of quantitative data

This section separately presents themes related to the ECD teachers' attitudes towards ICT integration that emerged from the quantitative data.

6.3.1 ECD teachers' attitudes

The questionnaire instrument contained 20 Likert-type statements that were designed to assess the ECD teachers' attitudes in this study (see Appendix A, No. 13). Statement items 1–6 measured the affective domain, while items 7–15 measured the cognitive domain and items 16–20 measured the behavioural domain. All statements were calibrated with 5-point scores ranging from 5 (strongly agree as the maximum value) to 1 (strongly disagree as the minimum value) and 3 being the neutral value. To ensure that correct and evocative scores were achieved for all statements, the polarity of negative statements was reversed in SPSS.

Table 6.1: ECD educators' attitudes towards ICT integration in ECD education

	Affective	Cognitive	Behavioural	Average Score
Mean	4.284	4.295	4.364	4.309
Median	4.410	4.415	4.490	4.454
Mode	4.000	5.000	5.000	
Standard Deviation	0.616	0.663	0.540	0.707

(Field data: 2017)

The standard deviation (overall average score = 0.707) was low (average difference of each respondent's rating from the mean per rating), meaning that there were a few respondents that rated their attitudes outside of what most teachers rated. I have segmented the teachers' attitudes into the three categories (see Table 6.1 above), affective (mean score = 4.284), cognitive (mean score = 4.295) and behavioural (mean score = 4.364). Every respondent was almost averagely positive/had a positive attitude (overall mean score = 4.309) towards the integration of ICT as evidenced in Table 6.1. This means that ECD teachers had highly positive attitudes towards ICT integration. These findings confirmed Govender's (2006) study whose findings recorded that the majority of South African educators who participated generally had high positive attitudes towards ICT integration. Positive attitudes have also been identified and modelled as enablers capable of motivating teachers to rigorously use ICT in their

teaching and learning activities (Mafang’ha, 2016; Markon, 2013; Nangue, 2011). These conclusions were also used to validate this study’s findings.

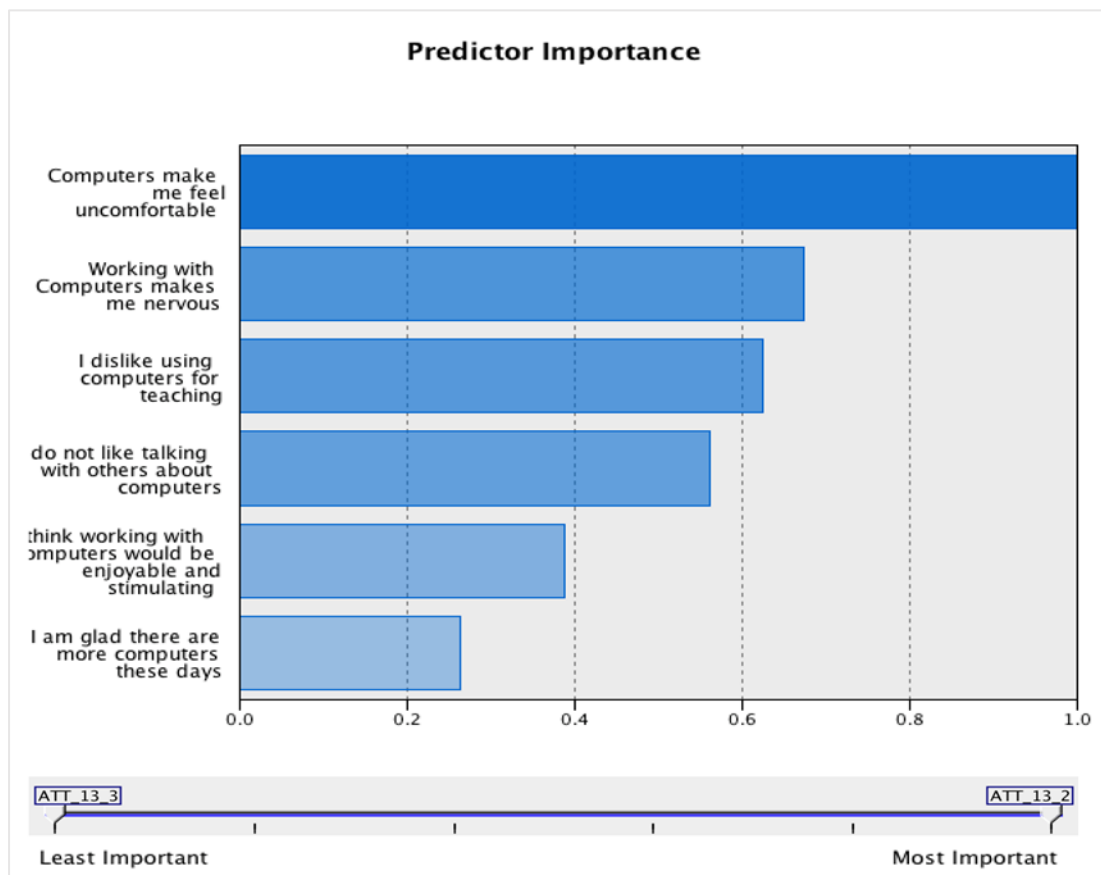


Figure 6.1: Importance ranking of affective domain statement items on the Questionnaire
(Field data: 2017)

Table 6.2: Affective domain average weighting based on the mean

Affective domain statements	N	Mean	Rank based on Importance	Aggregate scale value	Rating
Computers make me feel uncomfortable	306	4.34	1	4	Disagree
Working with computers makes me nervous	306	4.18	2	4	Disagree
I dislike using computers for teaching	306	4.35	3	4	Disagree
I do not like talking with others about computers	306	4.29	4	4	Disagree
I think working with computers would be enjoyable and stimulating	306	4.44	5	4	Agree

Affective domain statements	N	Mean	Rank based on Importance	Aggregate scale value	Rating
I am glad there are more computers these days	306	4.09	6	4	Agree

(Field data: 2017)

6.3.1.1 Affective domain

The two-stepwise algorithm (cluster analysis) was used to derive the importance rankings for each statement per domain. Affective domain items represented the teachers' emotional responses towards ICT integration (Eaton & Visser, 2008; Maio & Augoustinos, 2005). Figure 6.1 and Table 6.2 above show the statements relating to the affective domain ranked based on the answering patterns of the respondents in this study. The two show the statements' importance ranking based on the responses obtained in this study. In spite of the highly positive attitudes possessed by ECD teachers in this study, the findings showed that the statement "computers make me feel uncomfortable" was the highest predictor of ECD teachers' affective attitude, while the statement "I am glad there are more computers these days" was found to be the least predictor of affective attitude based on the importance ranking.

As indicated above negative statement scores were reversed in SPSS; therefore, the majority of the respondents disagreed that computers neither make them uncomfortable nor nervous (see Table 6.2). What made ECD teachers in this study comfortable with computers might be their level of education and ICT use that was high (see sub-sections 7.2.2 and 8.2.1). This finding acknowledges the value of computers in their line of work and the discharge of modern education duties. ICT use ultimately culminates in an increase in their exposure to ICTs. Figure 6.2 and Table 6.3 below show the statements relating to the cognitive domain ranked based on the answering patterns of the respondents in this study.

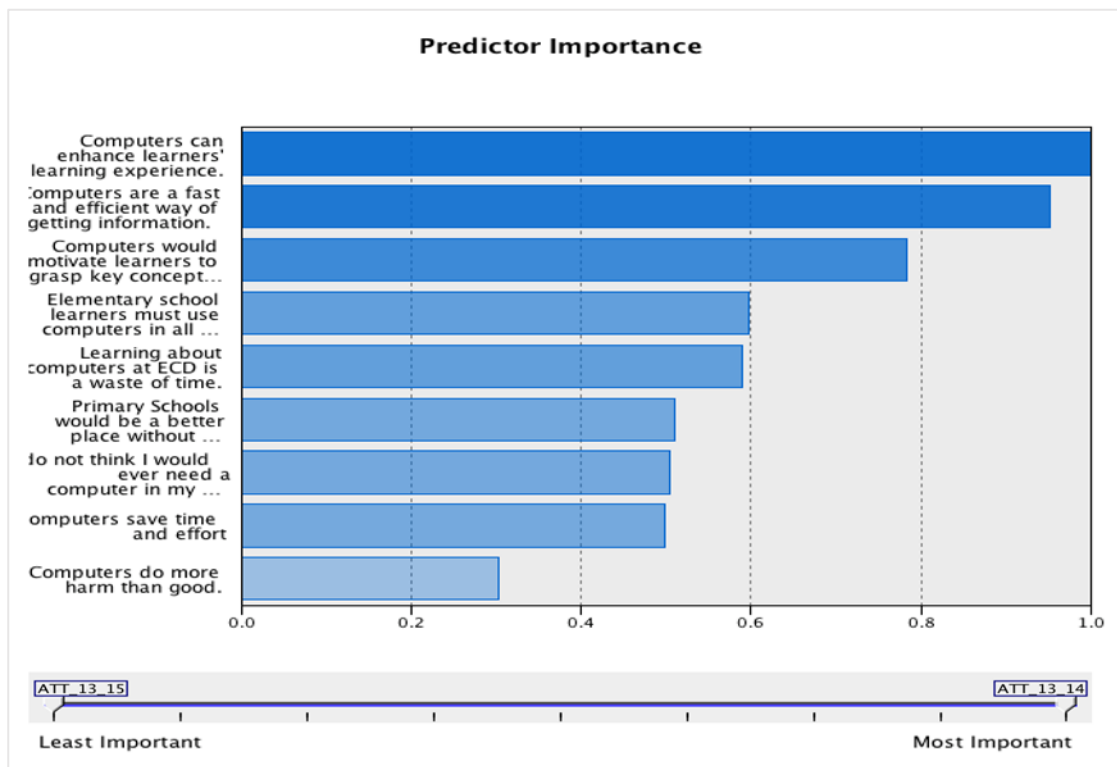


Figure 6.2: Importance ranking of cognitive domain statement items on the Questionnaire

(Field data: 2017)

Table 6.3: Cognitive domain average weighting based on mean scores

Cognitive domain statement	N	Mean	Rank based on Importance	Aggregate scale value	Rating
Computers can enhance learners' learning experience.	306	4.2	1	4	Agree
Computers are a fast and efficient way of getting information.	306	4.46	2	4	Agree
Computers would motivate learners to grasp key concepts and do more study.	306	4.35	3	4	Agree
Elementary school learners must use computers in all learning areas.	306	3.8	4	4	Agree
Learning about computers at ECD is a waste of time.	306	4.52	5	5	Strongly Disagree
Primary Schools would be a better place without computers.	306	4.33	6	4	Disagree

Cognitive domain statement	N	Mean	Rank based on Importance	Aggregate scale value	Rating
I do not think I would ever need a computer in my classroom.	306	4.44	7	4	Disagree
Computers save time and effort.	306	4.41	8	4	Agree
Computers do more harm than good.	306	4.15	9	4	Disagree

(Field data: 2017)

6.3.1.2 Cognitive domain

Cognitive domain items are concerned with ECD teachers' knowledge about ICT (computers in this particular study, where their attitudes towards them are at times influenced by their beliefs) (Eaton & Visser, 2008; Maio & Augoustinos, 2005). Figure 6.3 and shows the statements' importance ranking based on the responses obtained in this study. The findings show that the statement "computers can enhance learners' learning experience" was the highest predictor of ECD teachers' cognitive attitude, whilst the statement "Computers do more harm than good" was found to be the least predictor of cognitive attitude based on the importance ranking (see Figure 6.2 and Table 6.3 above). Therefore, the majority of the ECD teachers who were respondents in this study do know something about computers to the extent that they believed that computers had a positive effect on their teaching and learning processes. However, "Computers save time and effort" was one of the statement items to note that was ranked low in the cognitive domain items. Figure 6.3 and show the statements relating to the behavioural domain that were ranked based on the answering patterns of the respondents in this study.

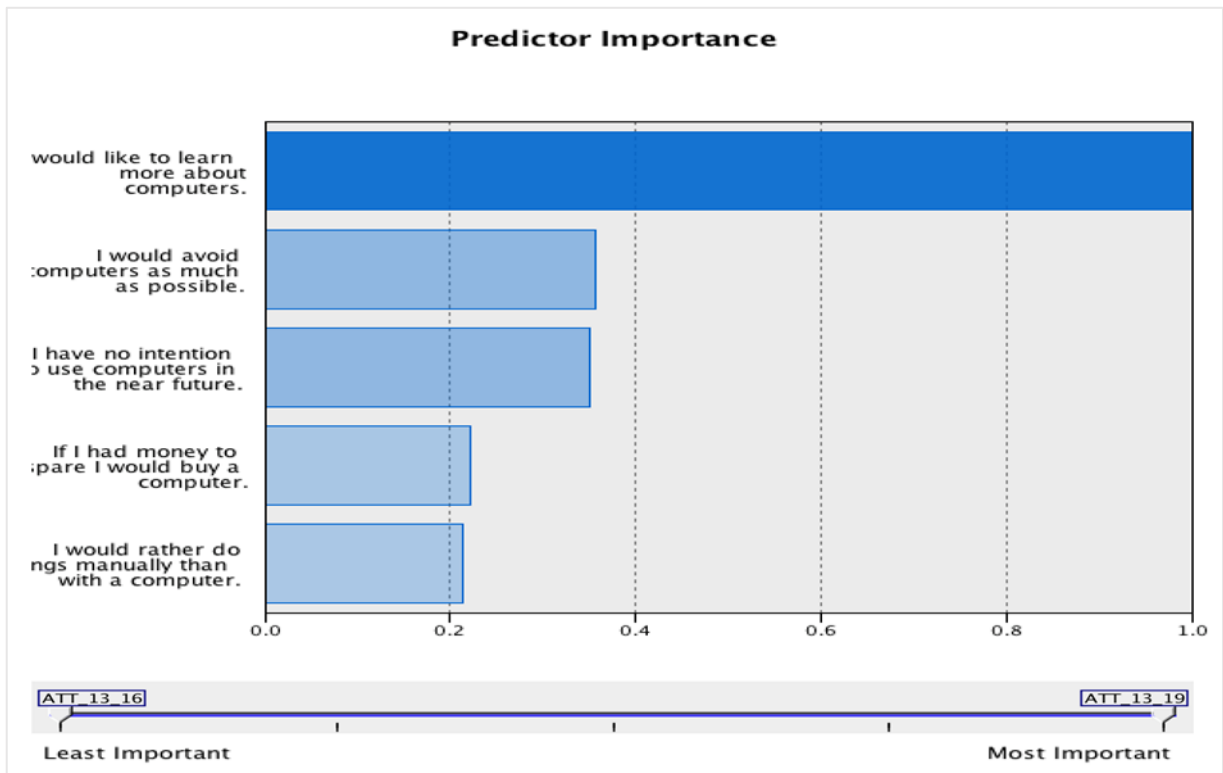


Figure 6.3: Importance ranking of behavioural domain statement items on the Questionnaire
(Field data: 2017)

Table 6.4: Behavioural domain average weighting based on mean scores

Behavioural domain statements	N	Mean	Rank based on Importance	Aggregate scale value	Rating
I would like to learn more about computers.	306	4.52	1	5	Strongly Agree
I would avoid computers as much as possible.	306	4.43	2	4	Disagree
I have no intention to use computers in the near future.	306	4.49	3	4	Disagree
If I had money to spare I would buy a computer.	306	4.34	4	4	Agree
I would rather do things manually than with a computer.	306	4.04	5	4	Disagree

(Field data: 2017)

6.3.1.3 Behavioural domain

The behavioural domain items were mainly concerned with how the ECD teachers in this study behaved towards ICT integration (Culbertson, 1968; Eaton & Visser, 2008; Maio & Augoustinos, 2005). The findings showed that the statement “I would like to learn more about computers” was the highest predictor of ECD teachers’ behavioural attitude, while the statement “I would rather do things manually than with a computer”, was found to be the least predictor of behavioural attitude based on the importance ranking (see Table 6.4 and Figure 6.3 above). These responses revealed that the respondents do put some importance on ICT, were willing to engage in ICT-related learning and would not favour an educational environment without ICT over one where ICT automates teaching and learning processes for the ECD teachers and their learners.

Figure 6.4 shows a histogram that indicates the ECD teachers’ ICT-related training intentions. The bars indicate that 71.6% of the ECD teachers were interested in participating and furthering their ICT-related training in the next two years, while 6.5% were not interested (“never”). However, 17% of the respondents were not sure and only 4.9% were most likely interested in getting training in the next five years. This was a positive trend showing that the majority of the respondents were willing to participate in ICT-related training, which was in congruence with the findings that a high number of ECD teachers have positive attitudes towards ICT integration (see Table 6.4 above) (the studies by Adams, 2016; Gumedze, 2017; Manaligod, 2012; Mukhari, 2016 reached similar conclusions).

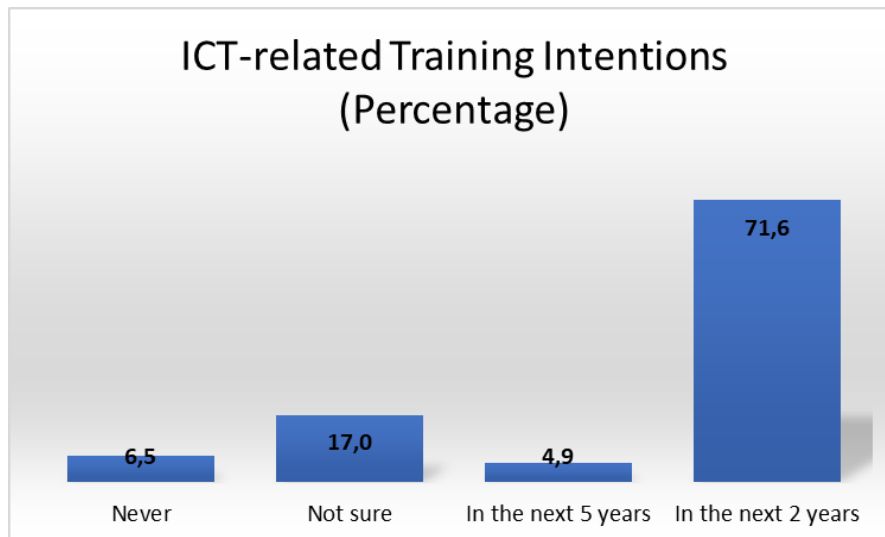


Figure 6.4: ECD teachers' ICT-related training intentions

(Field data: 2017)

“If I had money to spare I would buy a computer” was also a low predictor statement in the behavioural domain (see Figure 6.3 and Table 6.4 above). Despite the ECD teachers’ indication that they would like to learn more about computers, the majority of them were not likely to use their surplus money to buy a computer. A number of things could have caused this, which included that they might have beliefs that the MoPSE needed to ensure that they had the right ICT integration resources and the economic crisis currently being experienced in Zimbabwe (this is further explained when the qualitative data is presented) (Chagonda, 2010b; Kanyenze, 2016; Mlambo, 2016; ZIMCODD, 2016). According to Chagonda (2010b), the economic crisis has not spared the teachers who earn salaries that are just above the poverty datum line. Hence, a computer may not be a priority acquisition unless it has the potential of changing the teachers’ basic conditions of living.

Table 6.5: Pearson correlation of statement items that could influence each other (relative advantage)

	Correlations	Computer technology cannot improve the quality of a learner's learning.	Computers have no place in schools.	Computer use fits well into my curriculum goals.	I have never seen computers at work.	I have never seen computers used as an educational tool.
Computer technology cannot improve the quality of a learner's learning.	Pearson Correlation	1	0.285	0.246	0.146	0.071
	Sig. (1-tailed)		0	0	0.005	0.219
	N	306	306	306	306	306
Computers have no place in schools.	Pearson Correlation	0.285	1	0.303	0.223	0.066
	Sig. (1-tailed)	0.000		0.000	0.000	0.126
	N	306	306	306	306	306
Computer use fits well into my curriculum goals.	Pearson Correlation	0.246	0.303	1	0.165	0.219
	Sig. (1-tailed)	0.000	0.000		0.002	0.000
	N	306	306	306	306	306
I have never seen computers at work.	Pearson Correlation	0.146	0.223	0.165	1	0.184
	Sig. (1-tailed)	0.005	0.000	0.002		0.001
	N	306	306	306	306	306
I have never seen computers used as an educational tool.	Pearson Correlation	0.071	0.066	0.219	0.184	1
	Sig. (1-tailed)	0.109	0.126	0.000	0.001	
	N	306	306	306	306	306

(Field data: 2017)

Questionnaire items in the attitudes section relating to the relative advantage of using computers were correlated against each other, and those that significantly correlated have been displayed in Table 6.5 above. Generally, Table 6.5 shows that the ECD teachers' attitudes were positive as evidenced in the correlation computations. As an example, based on the

correlation computation of the statements above that can influence one another the statements “I have never seen computers used as educational tools” and “computer use fits well into my curriculum goals” correlated with a value of 0.219 and a p-value ($p < 0.05$) of 0.000. The association shown by the computations in Table 6.5 showed that an ECD teacher who rated positively on the statement “computer use fits well into my curriculum goals” is more likely to have seen computers being used as an educational tool. However, despite most of the statements being correlated, some of the correlations were significantly weak as shown by their r and p values respectively. For example, the correlation between the statement “I have never seen computers used as educational tools” and “computer technology cannot improve the quality of a learner’s learning”, whose r-value was recorded as 0.219. In other words, the measures revealed that exposure to computers had a weak positive effect on the ECD teachers’ ICT integration attitudes. The result was different in Govender’s (2006) study, where the majority of the educators echoed that they had never seen a computer being used as an educational tool. The next sub-section quantitatively presents the ECD teachers’ demographic data in relation to their attitudes towards ICT integration.

6.3.2 Gender and age as attitude moderators/ predictors

This section discusses the gender and age of respondents who participated in this study in relation to their attitudes towards ICT integration. Cross-tabulations of the collected data had to be computed to produce Table 6.6 and Table 6.7. As noted in subsection 6.1.1 the ECD teachers’ attitudes were mostly positive.

Table 6.6: Gender of respondent * attitude – cross-tabulation

		Overall Attitude (%)					Total%
		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	
Gender of respondent	Male	0	0	0	4.2	4.9	9.2
	Female	0	0	1.3	62.1	27.5	90.8
Total		0	0	1.3	66.3	32.4	100

(Field data: 2017)

According to Nosek, Banaji and Greenwald (cited in Morris, Venkatesh, & Ackerman, 2005, p. 69), “gender and age are among the most fundamental groups to which individuals can

belong and membership in such groups is likely to have a profound influence on individual perceptions, attitudes, and performance”. Table 6.6, which displays the cross-tabulation of the respondents’ gender against their attitudes indicates that there were no male respondents in the neutral ranking. On the contrary, it was found that both females and males had highly positive attitudes.

In spite of the fact that there was a noticeably low number of male ECD teachers – as outlined in the literature review by Dozva and Dyanda (2012, p. 57) – this study recorded their attitude towards ICT integration to be somewhat in the same range (most positive) as that recorded for the female ECD teachers. Morris, Venkatesh and Ackerman’s (2005, p. 82) study where the participants were found to conform to a stereotype that classified technology as a domain designed for males only, may not apply in this context. Hence, it can be concluded that in this study, the gender of the respondents had no significant effect on their attitude, therefore, gender cannot be used to moderate or/and predict their attitude.

Table 6.7: Age of respondent* attitude - cross-tabulation

		Overall Attitude (%)					Total%
		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	
Age of respondent	21 years or younger	0	0	0	1.6	0.7	2.3
	22-30 years	0	0	0.7	14.1	5.6	20.3
	31-40 years	0	0	0.3	25.8	15.0	41.2
	41-50 years	0	0	0.3	19.9	9.2	29.4
	51-60 years	0	0	0	4.6	2.0	6.5
	61 years or older	0	0	0	0.3	0	0.3
Total		0	0	1.3	66.3	32.4	100

(Field data: 2017)

The cross-tabulation of the age against the attitude presented in Table 6.7 outlines that respondents in the age ranges 31–40 years and 41–50 years had high percentages, which

accounted for 41.2% and 29.4% respectively. The younger (that is 21 years and younger and 22–30 years) and older (51–60 years and 61 years and over) participants had noticeably lower percentages when compared to the 31–50 years age range. What caused these high percentages cannot be directly deduced from the quantitative demographic data without considering other moderating factors like the gender, teaching experience and educational level. But it can be established that the highest frequencies on the age range demographic categories with high positive attitudes were for middle-aged people (31–50 years).

A European study of the age structure of the workforce and the adoption of new technologies estimated that employees younger than 30 years were more likely to accept new technologies should they be introduced to them in their work area (Meyer, 2008). This study could not establish a distinctive pattern based on the age because the attitude was generally high for all respondents and the 31–50 year age range was also the age range with the highest number of respondents (see Table 5.3). The next sub-section quantitatively presents the ECD teachers' perceptions of computer attributes in relation to their attitudes towards ICT integration.

6.3.3 Perceptions of ECD teachers

A number of researchers (Moore & Benbasat, 1991; Rogers, 2003; Venkatesh & Bala, 2008) agree that technology acceptance and adoption occur in stages. Rogers (1983, 1995, 2003) further explains that one of the stages is diffusion, which is concerned with technology's use spreading over time, based on the perception of technology users. Rogers' (1995) DOI theory explains how the technology users' decision on whether to accept or adopt a technology system (in this particular context ICTs as teaching and learning tools for ECD teachers) can be benchmarked on his or her perceived technological system characteristics/computer attributes, which include complexity, observability, compatibility, trialability and relative advantage. This section attempts to ascertain to what extent the ECD teachers' perceptions of the computer attributes affect their attitudes towards ICT integration.

6.3.3.1 ECD teachers' perceptions of computer attributes (based on Rogers' DOI)

This section evaluates ECD teachers' responses on the computer attributes in relation to their attitudes (see Chapter Three for a more detailed outline of Rogers' DOI computer attributes). The questionnaire instrument contained 16 Likert-type statements that were designed to

assess the ECD teachers' perceptions of Rogers' computer attributes in this study (see Appendix A, No. 14). Table 6.8 below shows the questionnaire items addressing the DOI's computer attributes.

Table 6.8: Rogers' DOI computer attributes

Computer Attribute	Definition	Questionnaire Item
Relative Advantage	"the degree to which an innovation is perceived as better than the idea it supersedes", (Rogers, 1995, p. 15).	Computers will improve ECD education. (Q14:1) Teaching with computers offers real advantages over traditional methods of instruction. (Q14:2) Computer technology cannot improve the quality of a learner's learning. (Q14:3) Using computer technology in the classroom will make the subject matter more interesting. (Q14:4)
Compatibility with existing practices	"the degree to which an innovation is perceived as being consistent with the existing values, needs and past experiences of the potential adopters", (Moore & Benbasat, 1991, p. 195).	Computers have no place in schools. (Q14:5) Computer use fits well into my curriculum goals. (Q14:6) Class time is too limited for computer use. (Q14:7) Computer use suits my learner's learning preferences and their level of computer knowledge. (Q14:8) I would rather do things by hand than with a computer. (Q14:16)
Complexity	"the degree to which an innovation is perceived as being difficult to use", (Moore & Benbasat, 1991, p. 195).	It would be difficult for me to learn to use the computer in teaching. (Q14:9) I have no difficulty in understanding the basic functions of computers. (Q14:10) Computers complicate my tasks in the classroom. (Q14:11) Everyone can easily learn to operate a computer. (Q14:12) I would rather do things by hand than with a computer. (Q14:16)
Observability	"the degree to which one can see others using the innovation in the organisation", (Venkatesh et al., 2003, p. 431).	I have never seen computers at work. (Q14:13) Computers have proved to be effective learning tools worldwide. (Q14:14) I have never seen computers used as an education tool. (Q14:15)

(Field data: 2017)

A variable was computed for each of the computer attributes. Statement items 1–4 measured the relative advantage of using computers in teaching and learning processes, while items 5–8 and 16 measured whether the use of ICT tools is compatible with the ECD teachers’ existing practices; items 9–12 and 16 measured the level of complexity of introducing computers in aiding the ECD teacher and items 13–15 measured the observability (see Table 6.8 above). All statements were calibrated with 5-point scores ranging from 5 (strongly agree as the maximum value) to 1 (strongly disagree as the minimum value) and 3 being the neutral value. To ensure that correct and evocative scores were achieved for all statements, the polarity of negative statements was reversed in the SPSS software.

Table 6.9: ECD teachers' perceptions in terms of factors related to attitudes towards ICT

	Relative Advantage	Compatibility	Complexity	Observability	Averages
Mean	4.25	3.95	3.94	4.20	4.08
Median	4.29	4.09	4.01	4.31	4.22
Mode	4.00	4.00	4.00	4.00	
Standard Deviation	0.46	0.74	0.60	0.62	0.78

(Field data: 2017)

Table 6.9 above outlines means, medians and standard deviations of the abovementioned Rogers’ computer attributes as they relate to the ECD teachers’ attitudes towards ICT integration. The computations indicated that the perceptions were generally most positive (overall mean = 4.08 and standard deviation = 0.78). Rogers (1995), concluded that a technological innovation had a higher chance of being diffused if the participants had positive perceptions towards it. The respondents’ perceptions about Rogers’ DOI computer attributes were most positive for the relative advantage of computers (mean = 4.25 and standard deviation = 0.46) and less positive for the complexity (mean = 3.94 and standard deviation = 0.60) (see Table 6.9 above).

Participants in this study seemed to understand the benefits of ICT in their school environments as ECD teachers. The majority rated their scores well above neutral, which therefore meant that they had seen computers being used as educational tools prior to the time this research was conducted in 2017 (observability mean = 4.20 and standard deviation

= 0.62). They also believed that the introduction of ICT would be compatible with their traditional teaching and learning methods, which may not include ICT as tools (compatibility mean = 3.95 and standard deviation 0.74; (also see the correlations in Table 6.5 above). The results were different for the South African context where most educators were unsure about the benefits of ICT in their teaching and learning processes (Govender, 2006). According to Gumedze (2017, p. 142), in Swaziland “teachers are influenced by computer attributes to decide whether they can integrate ICT into their teaching and learning” processes.

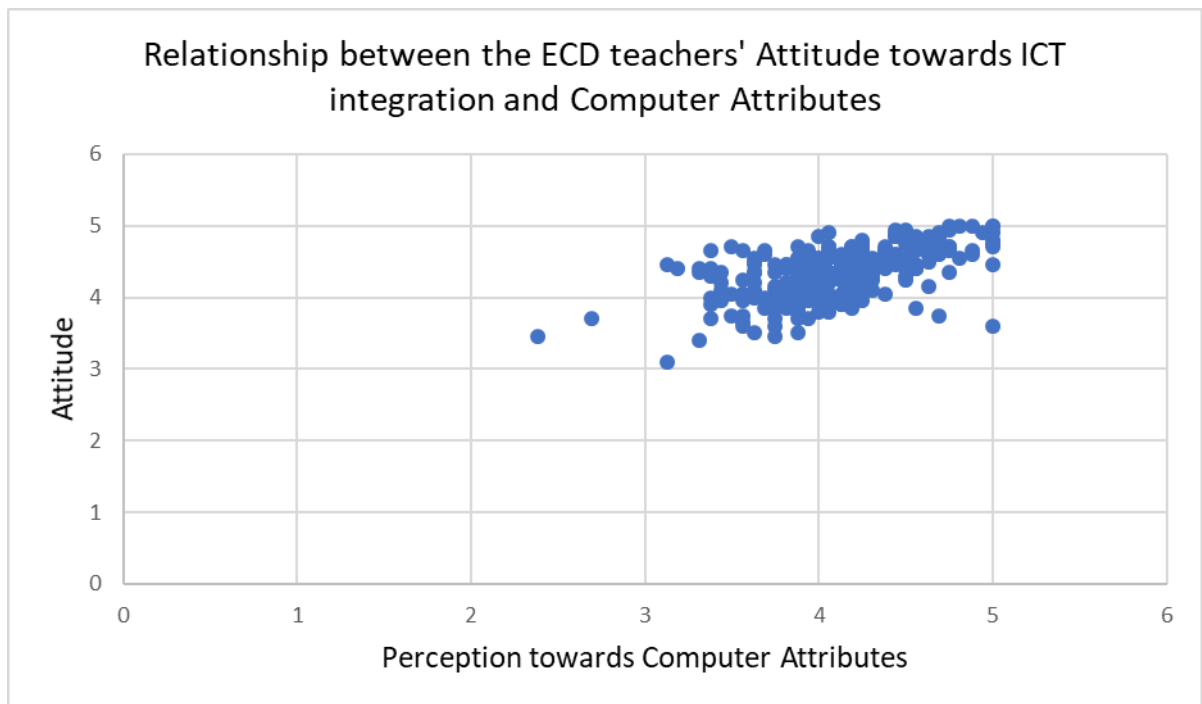


Figure 6.5: Relationship between attitude and computer attributes' perception scatter plot
(Field data: 2017)

Table 6.10: Pearson correlation of the attitude and computer attributes

	Correlations	Attitude	Computer Attributes
Attitude	Pearson Correlation	1	0.572
	Sig. (1-tailed)		0.000
	N	306	306
Computer Attributes	Pearson Correlation	0.572	1
	Sig. (1-tailed)	0.000	
	N	306	306

(Field data: 2017)

Figure 6.5 above displays the scatter plot of the relationship between attitude and the DOI's computer attributes. The scatterplot shows that on average, the perception of the computer attributes towards ICT integration drove the respondents' attitude. As we can see most data points were in the top right quadrant of the graph suggesting that most respondents had a generally high positive perception towards ICT and high attitude (*most positive in this case*) towards ICT. The Pearson correlation coefficient of 0.572 ($p < 0.05$) shown in Table 6.10 is above average and significant at the 0.05 level, therefore, if a respondent had a high perception there is about 60% chance that his or her attitude would be equally high. The next sub-section presents the qualitative data.

6.4 Presentation of qualitative data

Teachers who participated in this study had positive attitudes towards ICT integration as evidenced by the questionnaire results presented in section 6.3.1. The quantitative data analysis found that ECD teachers had attitudes that are most positive in all the three attitudes' domains (affective, cognitive and behavioural). Section 6.4.1 also highlighted that the level of exposure can potentially be used to determine an ECD teacher's attitude towards ICT integration. Key points in the extracted interview excerpts have been underlined to direct the reader. This section presents findings from the qualitative data that either confirm or negate findings from the quantitative data analysis.

6.4.1 Positive Attitudes

The qualitative data analysis presented in this section confirmed that this study's participants had positive attitudes by the responses that were generally positive. Their responses are given below:

"As an ECD teacher, I have got little knowledge about ICT. I got trained here at school but I don't have a certificate. I was trained with basic ICT skills just enough to help the learners. So, I am looking forward to continuing training so that I can get a certificate." (Focus Group Discussion Participant FGDMAA, 14 September 2017)

“I don’t have much Information about ICT and I am also willing to learn more about it if the government and school provide me with enough funds and equipment.” (Focus Group Discussion Participant FGDMAG, 14 September 2017)

“I have little knowledge of computers. I would like to study further on ICT.” (Focus Group Discussion Participant FGDMAD, 14 September 2017)

The excerpts extracted from the transcripts displayed above show that teachers had accepted that ICT integration was vital in ECD education and therefore looked forward to furthering their ICT skills (Murisa, 2010; Nangue, 2011; Syed, 2016). Focus group participants FGDMAA, FGDMAG and FGDMAD indicated that they were willing to participate in ICT-related training in the near future. As noted in the behavioural attitude domain cluster analysis above, the statement “I would like to learn more about computers” was found to be the highest predictor of ECD teachers’ behavioural attitude towards ICT integration. The teachers’ willingness to participate in ICT integration professional development activities is one of the indications of positive attitudes and that they would most likely integrate ICT into their teaching and learning processes (Al-Sulaiman, 2010; Birch, 2009; Botha, 2013; Molope, 2006). Hence, it can be concluded that the qualitative data collected in this study confirms that ECD teachers have attitudes that are most positive towards the integration of ICT in ECD education.

6.4.2 Negative attitudes

However, this study also noted that in spite of the statements affirming positive attitudes above, there were also statements that had negative perceptions towards ICT integration. The statements also highlighted the factors causing this from the data recorded in the qualitative phase. These statements are given below:

“ICT is a challenging area, especially to rural and farm schools. Previously, I was teaching at a farm school here in Chiredzi district and teaching using ICT is pointless in those schools because there are no devices even to conduct demonstrations with. Commitment is another factor, even if the school administration organises a training programme for the teachers during the

holiday, they would rather spend the day in the bank queue than to attend the training because it seems like it has no immediate benefits for them. (Focus Group Discussion Participant FGDCRA, 18 September 2017)

“At our school, computer-related training was extended to all teachers, but because no one believed it was important to participate in the training, the computer resource teacher, waited and waited but no one visited the computer laboratory during the designated times.” (Focus Group Discussion Participant FGDCRH, 18 September 2017)

“We were doing computers but we were not taking them seriously because we just thought that it was something that is going to end in the college class. However, when we came into the ECD classroom, we were required to teach ICT.” (Focus Group Discussion Participant FGDGTH, 21 September 2017)

Focus group discussion participants FGDCRA, FGDCRH and FGDGTH admitted that some ECD teachers did not take ICT seriously even though an environment to improve their ICT skills through training had been created for them at their schools. FGDCRA further emphasised that some ECD teachers held the perception that improving their ICT skills was not a critical issue when compared to visiting the bank to queue for cash; while FGDCRH remarked that ECD teachers did not engage in ICT integration because they believed it was not important. The literature review reported the cash shortage, which is currently being faced by the country (Mlambo, 2016; Moyo, 2013; The Zimbabwean, 2016; ZIMCODD, 2016).

Therefore, using Rogers' (2003) DOI theoretical framework, the teachers who participated in this study can be categorised in the knowledge level where they are starting to realise the existence and benefits of ICT in ECD education and would need more refined information and beliefs to go beyond that level so that they can eventually fully adopt it in their teaching and learning processes. The extracts recorded above highlighted and confirmed that the economic situation in the country was one of the factors influencing the ECD teachers' attitudes and perceptions about ICT integration. Based on the excerpts shown below, the participants also reported that the economic situation in the country might be one of the ICT integration's hindrances.

“I can safely say that it is not adequate because looking at our economy, the school may not be able to secure all the equipment that I need to help me achieve maximum ICT integration in my ECD classes.” (Interview Participant IMA4, 14 September 2017)

“Right now, the situation in Zimbabwe is such that finances are a problem. It is a strain for the schools, everyone is trying to do what they can and if that is not a priority (it is not that they don’t want to do it) they don’t do it... Yes, funding. Right now, the main problem everywhere in Zimbabwe is just funding related. It is not like we are in a society where people are saying, ‘No, we don’t want our children to learn about ICT’, it is the funding that limits and makes it difficult to get what the children need. In the individual homes, some parents can’t afford these things, which is most of them.” (Interview Participant IMA3, 14 September 2017)

“Besides the financial constraints that everyone is experiencing in Zimbabwe, there is a lot of resistance because they don’t view it as an important initiative for the education of the children.” (Interview Participant ICR2, 18 September 2017)

Interview excerpts for conversations with participants IMA4, IMA3 and ICR2 shown above made it clear that the economic woes being experienced by the Zimbabwean general populace might also be affecting ECD teachers and their schools. Describing the school’s support towards ECD teachers, interview participant IMA4 made reference to the condition of the economy. IMA3 explained how the situation had resulted in a lack of funding, which in turn limits the ICT integration processes for most schools. ICR2 further explained how the Zimbabwean economic experience might have brooded resistance to ICT integration in ECD education among the stakeholders. Rogers (1995) believed that resistors (champions of resistance to change – also known and referred to as laggards in sub-section 3.6) belonged to a small group of the organisation, which is normally the last to adopt a technological innovation. According to Fullan (2001a, p. 41), it is the resistant voices that may offer the most critical ideas that may have been missed when the problem was being solved. Fullan (2001b, 2001a) also believes that the resistance that they display usually occurs when key

stakeholders (ECD teachers in this particular instance) are not involved in the decision-making processes leading to the introduction of an innovation and if they lack the necessary skills, knowledge and technical support. Fullan encourages leaders of such organisations to address resistors' concerns early.

Nisbet and Collins (1978, p. 14) stated that “disputes over educational objectives, inappropriate motivation, too narrow definitions of innovation, lack of planning for consequences outside the target system, lack of knowledge about the dynamics of change, characteristics of innovations which hinder adoption, characteristics of school systems which are not receptive to change and the characteristics of persons associated with the innovation”, as barriers that could fuel resistance to change and potentially hinder the success of an innovation. According to Rogers (2003) and Fullan (2001b), change happens in stages and it first occurs in individuals before it can be realised throughout the organisation or system.

Hence, it was key to understand the ECD teachers' attitudes and how their resistance to change could affect ICT integration in ECD education. Drysdale and Gurr (2017) prescribe that if school leaders are key participants in the creation of the best educational environment for the community, students and teachers, issues associated with resistance to change might be easily dealt with. This can only be done if the school leaders set the direction and advocate for programmes that improve ICT-related teaching and learning processes by reviewing what their teachers expect from them. Reviewing the ECD teachers' expectations of what they perceived/though should be done to achieve full ICT integration in ECD education helped the researcher understand why their attitudes were mostly positive. The next sub-section reports the ECD teachers' expectations.

6.4.3 Expectations

The participants had varied expectations for/from their authorities (see Appendices B and C, No. 9, which made enquiries about what they perceived the authorities expected from them and what they expected from the authorities). Excerpts highlighting the trending expectations have been extracted from the transcripts and displayed below:

“Well, I expect them to really equip the department adequately with ICT tools, books and training. The ICT block for the ECD department should be separate from the junior department’s ICT block and within that ICT block there should be a computer laboratory and besides the ECD teachers being trained they should have a highly qualified ECD specific ICT teacher like the one they have for the junior pupils that will be manning the ICT classes with the ECD teacher.” (Interview Participant IBK1, 25 September 2017)

“I am expecting the Ministry to provide me with more ICT-related training. I expect the school to buy me educational ICT resources to help me teach ICT in my classes and to also provide electricity for me because we are disadvantaging the children.” (Interview Participant IGT3, 21 September 2017)

“We were expecting the Ministry to train us before they introduce this new curriculum, which demands more of ICT.” (Focus Group Discussion Participant FGDMAF, 14 September 2017)

According to participants IBK1, IGT3 and FGDMAF above, ICT integration can be improved if the authorities resource schools with more ICT materials and infrastructure that is specific to the ECD department. IBK1, IGT3 and FGDMAF all expected to receive ICT-related training from the MoPSE; while FGDMAF felt that the training should have been conducted prior to the introduction of ICT in ECD education. IBK1 believed that training and introducing ECD specialist ICT teachers could help close the gap of lack of ICT skills in ECD education. Participant IGT3 also expected the authorities to resource schools with electricity.

The expectations of the ECD teachers who participated in this study confirmed the ICT integration challenges relative to the Zimbabwean situation found in previous studies. ICT resources, infrastructure and electricity are challenges whose existence the Zimbabwean government acknowledges (Konyana & Konyana, 2013; MoPSE, 2016c, 2017). In spite of the challenges noted some of the participants believed that full ICT integration could be achieved, which may be the reason for the high positive attitudes recorded in this study. On the contrary, it seems like a paradox that the collected data leaves the question “whose responsibility is it to resource schools?” unanswered. Based on the collected data, the ECD

teachers who participated in this study expected the government and the MoPSE to resource them with ICT and instructional equipment, resources and infrastructure. The next section is a brief discussion of the findings of research question one discussed in this chapter.

6.5 Discussion of the results above

This study was conducted in Masvingo province (one of the seven provinces in Zimbabwe) at primary schools that have ECD centres. The findings of this study suggested that the ECD teachers in Masvingo province had highly positive attitudes in all the three attitude domains (affective, cognitive and behavioural – please see Table 6.2 and Figure 6.1, Figure 6.2 and Figure 6.3). The ECD teachers that participated in this study were aware of the benefits and capabilities that ICTs possess when used as educational tools in the ECD classroom. However, the findings also indicated that the ECD teachers believed that their ICT-related skills were still very low, resulting in them being uncomfortable using ICTs in their teaching and learning processes in some cases. The respondents highlighted their interest in participating in ICT-related training should such training be extended to them in the near future (see Figure 6.4).

This study also found that the majority of the ECD teachers that participated had seen computers being used as educational tools prior to participating in this research (that is about 78%). The age group range of 31 – 50 years recorded the highest frequencies (about 70.6%) and positive attitudes. Results for the ECD teachers' perception towards the Rogers' (1983, 1995, 2003) DOI computer attributes in relation to their attitude showed that their attitude was positively driven by their perception towards the computer attributes (please see the scatterplot and correlation between the two in Figure 6.5 and Table 6.10). One's decision to either adopt or accept ICT as a teaching and learning tool in the ECD class can be determined by one's attitude towards the ICT integration process (as espoused by Ajzen & Fishbein, 1980, 2005; Rogers, 2003). The qualitative data indicated that the majority of the ECD teachers may be categorised in the knowledge level of Rogers' (2003) classification even though the quantitative data implied that they may have gone past the persuasion level. Fullan (2001b, p. xi) states that:

We have to know what change looks like from the point of view of the individual teacher, student, parent, and administrator if we are to understand the actions and

reactions of each; and if we are to comprehend the big picture, we must combine the aggregate knowledge of these individual situations with an understanding of organisational and inter-organisational factors which influence the process of change as government departments, intermediate agencies, universities, teacher federations and school systems interact.

In spite of the most positive attitudes recorded in the quantitative data analysis, the ECD teachers emphasised that the lack of proper training, ICT skills, instructional materials, ICT resources and infrastructure afforded to them and the Zimbabwean economic crisis may be hindering them from fully integrating ICT in ECD education. These findings affirmed the literature's position on challenges and factors affecting teachers' attitudes (Dozva & Dyanda, 2012; Konyana & Konyana, 2013; Makuvaza & Gatsi, 2014; Mandina, 2015; MICTPCS, 2016; Mlambo, 2016; Mndzebele, 2013a; Murisa, 2010; Shizha & Kariwo, 2011; ZIMCODD, 2016). Therefore, despite the challenges that ECD teachers are faced with, based on the quantitative data, their attitudes towards ICT integration remain positive. This may be a result of the teachers' level of education (refer to Table 5.4, which indicates that 66.7% and 13.4% of the respondents were diploma and bachelor's degree holders respectively). Brennan et al. (2015) and Mata, Lazar and Lazar (2016) concur that there is a difference in attitude levels for people as the level of education changes. They agree that the higher the level of education the more positive the attitude becomes. The next sub-section concludes this chapter.

6.6 Conclusion

The discourses discussed in this chapter explicitly showed that the findings of this study were a confirmation of the attitudes and ICT integration challenges recorded in previous studies conducted in the Southern African region (Botha, 2013; Govender, 2006; Gumedze, 2017; Mashile, 2016; Mbatha, 2015; Simelane, 2013). Some of the challenges noted from this study included: lack of proper training, ICT skills, instructional materials, ICT resources and infrastructure and the Zimbabwean economic crisis (these are further discussed in Chapter Eight). The quantitative section found that the attitudes (affective, cognitive and behavioural) of the ECD teachers that participated in this study were most positive, their gender and age had no significant effect on their attitude, their exposure to computers had a positive effect on their attitude and that their perception of the computer attributes positively drives their attitude.

The qualitative section strengthened the findings of the quantitative section by outlining the excerpts that had statements indicating positive attitudes. The section also reviewed statements which highlighted that some ECD teachers had negative perceptions towards ICT integration in ECD education. A review of the teachers' expectations showed that there is a need for education administrators to understand what teachers expect from them for successful ICT integration at this educational level. The participants indicated that they expected their authorities to have equipped them with instructional materials, ICT resources and infrastructure and to have received ICT-related training prior to the introduction of ICT integration programmes. Teachers' positive attitudes can be used to foretell the future of ICT integration in education and motivate teachers to engage with it and use it in their teaching and learning processes (Mafang'ha, 2016; Markon, 2013; Nangue, 2011). The next chapter attempts to answer Critical Question Two, "What ICT competence do ECD teachers in Masvingo have in order to engage with ICT integration in teaching and learning?".

Chapter Seven – ICT Competencies of ECD Educators

In one sense people are the organisation, especially in intensive human capital organisation such as schools. Policymakers all over the world are focused on attracting, developing and retaining quality teachers and ensuring there is quality teaching. Two key capabilities that are required in uncertain times are talent management and capacity building” (Drysdale & Gurr, 2017, p. 144).

7.1 Introduction

The previous chapter presented and discussed findings related to the ECD teachers’ attitudes towards ICT integration. The findings recorded that the ECD teachers who participated in this study possessed attitudes towards ICT integration in ECD education that were most positive in all the attitude domains (affective, cognitive and behavioural). The discussion of the findings implied that ECD teachers may be faced with ICT competence and training challenges as noted in the literature review section (refer to studies by Afunde, 2015; Fu, 2013; ITU, 2016b; Mafang’ha, 2016; Markon, 2013; Pohio, 2009; UNESCO, 2011; UNESCO et al., 2001 for a detailed synopsis). Mandina (2015, p. 95), revealed that in Zimbabwe “teachers also lacked competence, in-service training and technical support, as well as Technological Pedagogical Content Knowledge on how to integrate ICTs into teaching and learning”. This chapter attempts to answer the critical question, **“What ICT competence do ECD teachers in Masvingo have in order to engage with ICT integration in teaching and learning?”** by presenting and discussing the key findings in this study. In this chapter quantitative and qualitative data will be concurrently presented where necessary.

7.2 Research question two: What ICT competence do ECD teachers in Masvingo have in order to engage with ICT integration in teaching and learning?

The European Commission (cited in Svensson & Baelo, 2015, p. 1527) “defines competence as the combination of knowledge, skills and attitudes that a person must have to successfully develop and participate in the knowledge society”. Based on the European Commission’s definition and the literature reviewed in Chapter Two, this section attempts to answer

research question two by assessing ICT-related competencies possessed by ECD teachers who participated in this study. Plate 7.1 below shows an ECD teacher from Masvingo District conducting a lesson with ECD pupils using laptops. The ECD pupils in the image attentively followed the instructions of the teacher who was teaching them how to play a word-colour matching game that used a wireless mouse to direct the cursor on the laptop. The sections below are a presentation and a critical analysis of the collected data relating to whether ECD teachers possess ICT-related competencies similar to the ones being used by the teacher in Plate 7.1 or not.



Plate 7.1: Participant IMA3 conducting an ECD lesson with laptops

(Field Data: 2017)

7.3 Presentation of data

7.3.1 ECD teachers' ICT competencies

The questionnaire instrument contained 20 Likert-type statements that were designed to assess the ECD teachers' ICT-related competencies in this study (see Appendix A, No. 17). Statement items (1-6) measured ICT competencies on common ICT devices, while items 7-13 measured ICT competencies on generic software applications and items 14-20 measured ICT competencies on Web applications. All statements were calibrated using a 4-point scale ranging from 4 to 1, (4 – high proficiency, 3 – moderate proficiency, 2 – low proficiency and 1 – no proficiency). The overall ICT competence score for Masvingo province ECD teachers was computed using all the 20 items used to collect ICT competence data. Four items represented the basic ICT skills that an ECD teacher could possess to be considered ICT competent: the computer, word processing, email and internet were used to compute the core proficiency of the ECD teachers based on Govender's (2006) and Gumedze's (2017) studies. Govender (2006, p. 105) believed that the "use of the computer for word processing, email and the internet by educators is seen as core to facilitating the integration of ICT into the school curriculum. Without these basic skills, it is unlikely that an educator will be able to start to integrate ICT successfully into the school curriculum".

Despite the rate at which technology is changing for teacher education in the 21st century (Boholano, 2017), the researcher believes that the above-mentioned ICT competencies are still the most basic ones required for a teacher to engage with ICT integration in teaching and learning processes. While competence seems to be more concerned with the pedagogical and content aspects possessed by ECD teachers, proficiency is the level of skill that one has to achieve these competencies. Table 7.1 and Table 7.2 below display the distribution of the standard deviation, mode, median and mean of the computed proficiency scores obtained for the ECD teachers (produced in SPSS).

Table 7.1: Mean proficiency

Statistical Analyses	Common ICT Devices	Generic Software Applications	Web Applications	Average Score
Mean	2.394	2.410	2.049	2.279
Median	2.260	2.425	1.964	2.237
Mode	1.000	1.000	1.000	
Standard Deviation	0.862	0.599	0.726	0.831

(Field data: 2017)

Table 7.2: Overall and core proficiency

Statistical Analyses	Overall Proficiency	Core Proficiency
Mean	2.279	2.576
Median	2.237	2.564
Standard Deviation	0.831	0.618

(Field data: 2017)

The two tables presented above show that the proficiency scores for both the overall and core proficiency ranged between low and moderate (for overall proficiency, mean = 2.279 and standard deviation = 0.831; for core, proficiency mean 2.576 and standard deviation = 0.618 – see Table 7.2). Table 7.1 indicates that the highest scores were recorded for generic software applications (mean = 2.410 and standard deviation = 0.599), while the lowest scores were recorded for Web applications (mean = 2.049 and standard deviation = 0.726). Respondents with no (30.1%) and moderate (29.7%) ICT proficiency constituted the majority of ECD teachers who participated in this study (see Figure 7.1). Percentages for high (14.7%) and low (25.5%) proficiency were lower when compared to those for no and moderate ICT proficiency. This meant that the ECD teachers possessed low to moderate ICT proficiencies.

These findings confirmed the results found in a study done by Angeli (cited in Govender, 2006, p. 106).

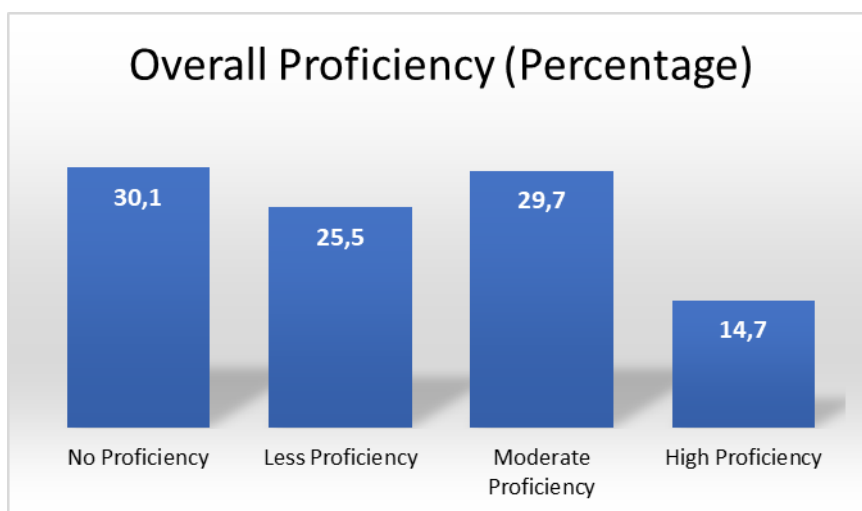


Figure 7.1: Overall proficiency by percentage

(Field data: 2017)

Table 7.3 – Table 7.5 display how the ECD teachers perceived their level of ICT proficiency by district. The quantitative data in Table 7.3 below shows that Masvingo (26.5%) and Zaka (25%) district had the highest number of respondents, indicating that they had high levels of ICT proficiency in using common ICT devices; while Chivi (34.7%), Masvingo (34.7%) and Gutu (35.6%) district recorded high numbers in the moderate category and Bikita (22.5%), Chiredzi (24.1%) and Mwenezi (28%) had high numbers in the low and none category.

Table 7.3: Proficiency of common ICT devices by district

District where questionnaire was administered	None	Low	Moderate	High	Total
Bikita	22.5%	37.5%	22.5%	17.5%	100%
Chiredzi	24.1%	41.4%	31%	3.4%	100%
Chivi	22.4%	28.6	34.7%	14.3%	100%
Gutu	22.2%	31.1%	35.6%	11.1%	100%
Masvingo	16.3%	22.4%	34.7%	26.5%	100%
Mwenezi	28%	38%	22%	12%	100%
Zaka	11.4%	34.1%	29.5%	25%	100%
Total	20.9%	32.7%	30.1%	16.3%	100%

(Field data: 2017)

Masvingo District houses the capital of the province and one of the oldest cities in Zimbabwe, Masvingo City (Muzvidziwa, 1997, p. 97). Masvingo is among the districts with a large pool of urban and peri-urban primary schools since it is the capital of Masvingo province. The city is currently set up in such a way that all the other smaller districts look up to it for key services (Munzwa & Wellington, 2010; Wekwete, 1988). Hence, this may explain the evident high proliferation of common ICT devices used in teaching and learning processes in and around the Masvingo city area.

Table 7.4: Proficiency of generic software applications by district

District where Questionnaire was administered	None	Low	Moderate	High	Total
Bikita	30%	30%	25%	15%	100%
Chiredzi	34.5%	20.7%	31%	13.8%	100%
Chivi	12.2%	28.6%	36.7%	22.4%	100%
Gutu	37.8%	15.6%	26.7%	20%	100%
Masvingo	20.4%	22.4%	24.5%	32.7%	100%
Mwenezi	44%	20%	28%	8%	100%
Zaka	22.7%	15.9%	27.3%	34.1%	100%
Total	28.4%	21.9%	28.4%	21.2%	100%

(Field data: 2017)

Table 7.4 presents very high numbers of ECD teachers with no proficiency in generic software applications for Chiredzi (34.5%), Gutu (37.8%) and Mwenezi (44%) Districts. Masvingo (32.7%) and Zaka (34.1%) are still on top of the list for generic software applications. The high competence in software applications may be due to the ECD teachers' exposure to generic communication applications that include WhatsApp and Facebook due to the high proliferation of ICT devices and social media use in teaching and learning (Kau, Shri, & Mital, 2015; Tarisayi & Manhibi, 2017c). However, their high competence does not mean that they are utilising them in their ECD classes for teaching and learning purposes even though the possibility is high.

Table 7.5: Proficiency in Web applications by district

District where Questionnaire was administered	None	Low	Moderate	High	Count
Bikita	62.5%	17.5%	15%	5%	100%
Chiredzi	58.6%	17.2%	17.2%	6.9%	100%
Chivi	42.9%	22.4%	18.4%	16.3%	100%
Gutu	53.3%	2.2%	35.6%	8.9%	100%
Masvingo	36.7%	24.5%	20.4%	18.4%	100%
Mwenezi	56%	18%	20%	6%	100%
Zaka	36.4%	20.5%	27.3%	15.9%	100%
Total	48.7%	17.6%	22.2%	11.4%	100%

(Field data: 2017)

Table 7.5 indicates that there were low numbers for ECD teachers with high ICT proficiency in Web applications and generally high numbers for ECD teachers with no ICT proficiency at all in the area. Bikita (62.5%), Chiredzi (58.6%), Mwenezi (56%) and Gutu (53.3%) all have figures above 50% for no ICT proficiency in Web applications. The low competence in Web applications for this study’s participants may be explained by the low penetration of the Internet and poor telecommunications infrastructure in some parts of the country.

Whilst MICTPCS (2016, p. 14) acknowledges the non-existence of telecommunications infrastructure to support the provision of Internet-related services in most rural areas, MoPSE (2017) identifies the lack of funding and ICT equipment as the key barriers slowing down ICT integration and internet penetration in these areas. Therefore, this study concurs with Hasan et al.’s (cited in Halili & Sulaiman, 2018, p. 2) finding that “almost all rural communities in the world have a problem with technology facilities and have not been able to obtain any benefit from the advantages of using ICT”. The next sub-section presents the ECD teachers’ use of ICT in teaching and learning processes.

7.3.2 ECD teachers' ICT use

Table 7.6: Use of ICT as teaching and learning tools in ECD classes

Using ICTs to teach in ECD classes	Frequency	Percentage
No	86	28.1
Yes	220	71.9
Total	306	100.0

(Field data: 2017)

Table 7.6 presents the ECD teachers' general ICT usage responses (see Appendix A, No. 8a and sub-section 8.2.1). Over 70% of the respondents indicated that they are currently using ICTs as teaching and learning tools in their ECD classes despite a corpus of them giving responses that implied that their ICT competencies were generally low and moderate in the previous sub-section. According to Ghavifekr et al. (2013) and Ghavifekr, Kunjappan, Ramasamy, and Anthony (2016), ICT use has the potential of enhancing educators' competencies as it increases their exposure to it. In this study, computer use was regarded as the ECD teachers' use of the computer (desktop or laptop) for teaching tasks that include keeping track of learners' grades and attendance; creation of work schemes and syllabi guides; sharing instructional material and creation of Web-based groups that guide learners (see Appendix A, No. 18 items 1–6).

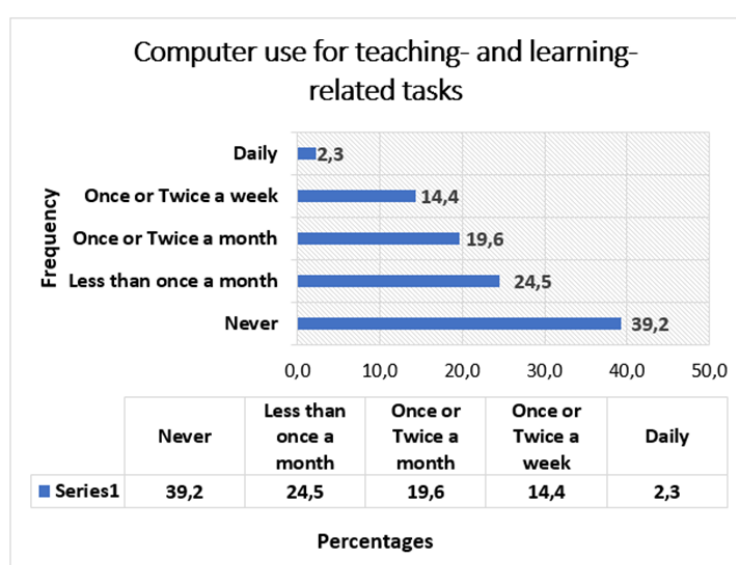


Figure 7.2: General computer use

(Field Data: 2017)

Figure 7.2 is a clustered bar graph showing the general computer use of ECD teachers who participated in this study. The highest number of responses was recorded for respondents who “never” (39.2%) use a computer for any tasks at all, while the lowest number was recorded for those who use it on a “daily” (2.3%) basis. These findings were similar to Govender’s (2006, p. 135) findings that the minority of the educators (about 9%) were using computers in their teaching and learning processes, while the majority (about 47%) were not using them. Palak and Walls (cited in Fu, 2013, p. 118) found “that the strongest predictor of future ICT use were teachers’ attitudes towards it”. The cross-tabulation between computer use and the ECD teachers’ attitude towards ICT integration (see sub-section 9.1.1) indicates that in spite of the high number of respondents indicating non-recurrent computer use “never”, their attitude was very positive. Therefore, if attitudes were to be considered in the determination of ICT use for ECD teachers, there might be hope for an increase in the uptake of ICT in ECD education.

The statistics of teachers not frequently using a computer for teaching and learning processes noted above were backed by statistics of their perceptions towards proficiency, which were also high for no ICT-related proficiency (about 30.1% – see Figure 7.2 above). This means that some of the respondents who indicated that they were using ICTs to teach (see Table 7.6) might not be using computers for their general teaching and learning activities. Despite the disparities noted between the ECD teachers’ general computer use and their attitude towards ICT integration, Fu (2013) asserts that the culture and confidence level for technology adoption can also directly affect their computer use. The cause of these disparities was established from the qualitative data as presented below. Statements from participants indicating how they use ICT in teaching and learning processes are presented below:

“I personally use it for scheming and conducting some internet-based research. I can prepare power point presentations and I also type and balance the attendance register using Microsoft Excel.” (Focus Group Discussion Participant FGDGTG, 21 September 2017)

“I can type my work scheme plan in preparation for my lessons using a word processor.” (Interview Participant ICR1, 20 September 2017)

“I collect and download educational games and videos for use in my lessons and I can also play these games and videos to introduce a certain concept. I can play audio files that I use when I do demonstrations on animal sounds.” (Interview Participant ICH4, 20 September 2017)

The excerpts presented above show that some of the ECD teachers understand the importance of ICTs in education and are using it in teaching and learning activities. Participant ICR1 makes use of the word processor, while participants ICH4 and FGDGTG prepare lessons using information found through an internet search and slideshows using PowerPoint. Özdemir (2017, p. 507), asserts that “one of the competencies that an individual must possess in the 21st century is technology literacy”. On the contrary, some participants revealed that they lack the ICT skills required for them to integrate ICT into ECD education. Extracts from their statements have been presented as follows:

“I am not ICT literate and this bothers me because I have challenges teaching the ICT learning area.” (Interview Participant IMW2, 19 September 2017)

“In our case, we as ECD teachers don’t have a clue of what and how we are supposed to do it.” (Focus Group Discussion Participant FGDCRF, 18 September 2017)

“Computers are not understood by most teachers, and this makes them not use them to teach and teach them in their classes.” (Focus Group Discussion Participant FGDCRA, 18 September 2017)

Participant IMW2 acknowledged not being ICT literate, which concerned him (or her), while FGDCRF displayed ignorance of what he or she should use ICTs for in ECD education. It should also be noted from statements by participant IMW2 and FGDCRA that the ECD teachers’ ICT use may be slowed down by their lack of confidence due to their perception that they are not competent enough to use them (Ertmer & Ottenbreit-Leftwich, 2010). Hence, they would prefer not to adopt them to avoid embarrassing themselves in front of an audience such as their ECD learners. The other participants believed that the school administrators’ computer illiteracy could be negatively affecting ICT use as the administrators did less to promote ICT use and integration activities. Statements in support of this are presented below:

“In our school system, even headmasters are computer illiterate and in such a situation. How can he possibly fully support ICT programmes for the ECD department?” (Focus Group Discussion Participant FGDCRB, 18 September 2017)

“They can never understand the importance of being computer literate when they are seen using phones that are not even Internet and WhatsApp capable. This gap is what’s stopping the school heads from being on the forefront of integrating ICT in some schools.” (Focus Group Discussion Participant FGDCRH, 18 September 2017)

“I believe a workshop targeted at school administrators to raise their awareness on this issue should be conducted as a matter of urgency. If the training and workshops are always for the teachers it won’t change anything because we are not administrators. Administrators will be the ones who will be responsible for the procurement and distribution of ICT resources. Lastly, when the ministry calls for a workshop all the administrators should also attend because this can help raise their awareness levels.” (Focus Group Discussion Participant FGDZKF, 26 September 2017)

Participant FGDCRH figuratively described the school administrators’ ignorance of ICT by highlighting that some of them were still using older communication devices (“feature” rather than “smart” phones), which were not WhatsApp capable. The statements displayed above suggest that there is a need to raise the school administrators’ awareness and computer literacy levels to improve the ECD teachers’ ICT use in primary schools. According to Munyengabe et al. (2017, p. 7194), ICT use in Rwandan schools was also affected by the geographical location of the school, the dearth of infrastructure supporting electricity, and lack of funds to procure ICT equipment. Based on Munyengabe et al.’s study, the above-mentioned issues may not be the only barriers to ICT use in primary education (see Chapter Eight for a detailed review of barriers to ECD teacher’ ICT use).

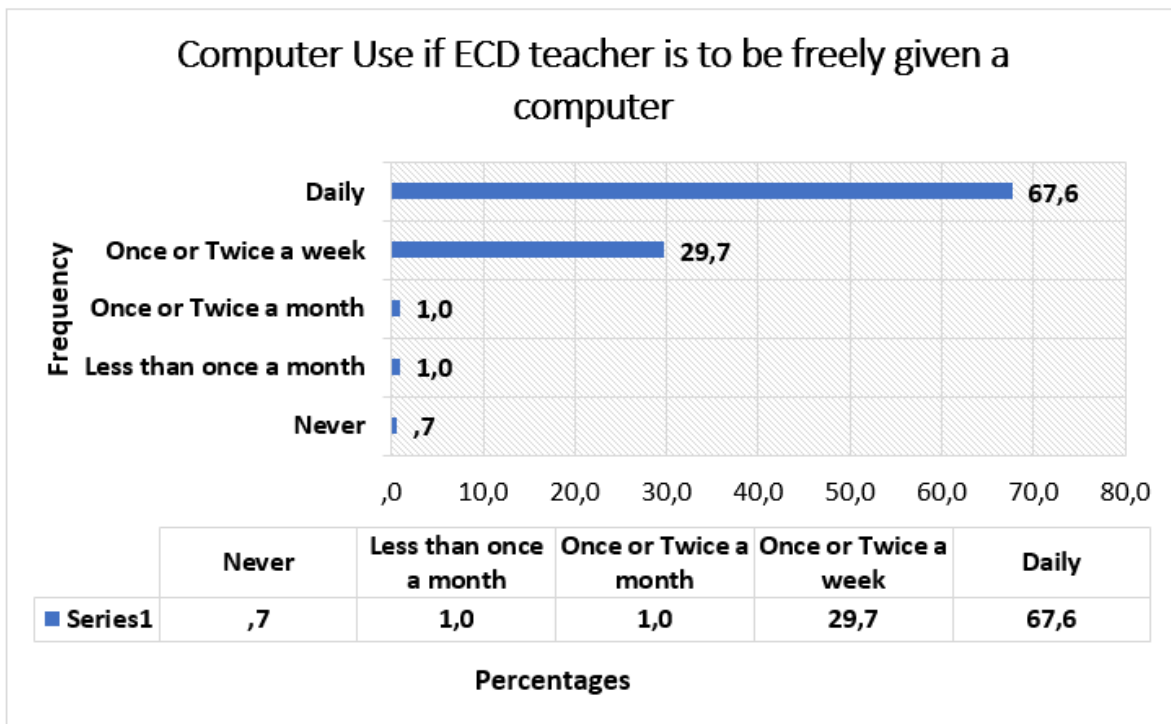


Figure 7.3: Computer use for teaching purposes if the computer is freely available

(Field data: 2017)

After evaluating the general computer use for teaching and learning activities, it became necessary to make an inquiry into how many ECD teachers would be willing to use a computer for teaching purposes if it was to be freely made available to them (see Appendix A, No. 16, item 1). Figure 7.3 presents the statistics for computer use in the event that a computer is freely available. About 67.6% indicated that they would be willing to use computers for teaching on a “daily” basis and 29.7% on a weekly basis. These high percentages further confirmed the positive attitudes reported in Chapter Six. In spite of them indicating very low ICT proficiencies, the findings showed that they were willing to accept and adopt computers for teaching purposes. Positive attitudes, ICT skills and abilities were identified as key determinant factors for teachers before they can willingly try to use ICT in the classroom (Alrasheedi, 2009; Wozney et al. cited in Cullen & Greene, 2011).

In this context, based on the findings discussed above, ECD teachers may not have confidence in their ability to use ICT. However, they showed a willingness to adopt ICT and to participate in ICT-related training (see Figure 6.4 in Chapter Six, which presents the ECD teachers’ intentions pertaining to ICT-related training). Copriady’s (2014, p. 121) study “demonstrated

that teachers’ motivation is a mediator of their willingness to apply ICT in their teaching and learning”. Henoch (2015, p. 22), studied how more exposure to ICT for teachers, could influence their use of it in teaching and found that “teachers specified that lack of ICT awareness and skills by learners hindered their willingness to use ICTs during lessons, as they believed that it would distract learners’ attention during lessons”, (2015, p. 54). The studies cited above accentuate the need to consider the teachers’ beliefs, attitude, motivation and skill levels in the prediction of their technology acceptance and adoption traits. The next sub-section presents the current status of access to ICTs and technical support for ECD teachers.

7.3.3 Access to ICTs and technical support

To understand why the majority of ECD teachers perceived that they had low to moderate ICT competencies and a low general computer use, it also became necessary to analyse their access to ICTs and the technical support that they have been receiving. The findings are presented in the sections below:

7.3.3.1 Access to ICTs for teaching and learning activities

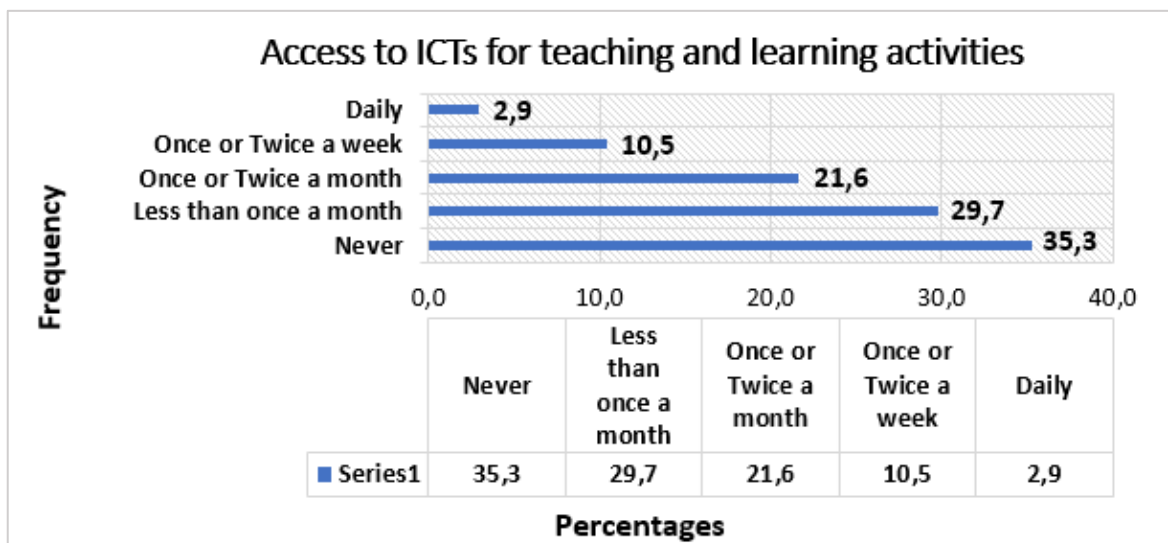


Figure 7.4: General access to ICTs for teaching and learning activities

(Field data: 2017)

The questionnaire instrument collected data on the frequency of accessing ICT tools (see Appendix A, No. 19). Statements were calibrated using a 5-point scale ranging from 5 to 1, (5 – daily, 4 – once or twice a week, 3 – once or twice a month, 2 – less than once a month) and 1 – never). The results have been presented in Figure 7.4 above. They indicate that 35.3% “never” had access to ICTs for teaching and learning, while 29.7% had access to ICTs for

teaching and learning less than once a month. The minority had access “once or twice a month” (21.6%), “once or twice a week” (10.5%) and “daily” (2.9%). These figures were aligned with the general computer use percentages presented in Figure 7.4 above (the daily frequency in particular, which was 2.3% for the general computer use). Therefore, based on these statistics, it was concluded that the majority of the ECD teachers in this study had a general lack of access to ICT for teaching and learning activities.

The qualitative data also recorded that ECD teachers may be using their personal functional resources and non-functional ICT resources to integrate ICT into ECD education. According to them, these are some of the ways that they have been using to improve access to ICTs for teaching and learning activities. Statements highlighting the use of personal resources to integrate ICT are presented below:

“We try to improvise ways of making ICT education happen by bringing those things into the classroom, for example, I am using my personal computer and smartphone and everything else that I use is my own because the school doesn’t have anything of its own.” (Interview Participant IBK4, 25 September 2017)

“I am using my own laptop to prepare for the instructional material... We have 5 ECD classes and the other 3 teachers (me included) don’t have school laptops.” (Interview Participant IMA4, 14 September 2017)

“We have to use our personal ICT resources at times to complement the school owned resources.” (Interview Participant ICH3, 20 September 2017)

The finding that ECD teachers used their personal ICT resources to prepare instructional material (participant IMA4) and support learning activities in their classes (participants IBK4 and ICH3) meant that they had a degree of understanding of its importance in ECD education. Previous studies suggest that when users push initiatives that promote technology access they can be seen as having accepted it and their adoption patterns would be positive and notable (Al-Majeeni, 2004; Ertmer, 2005; Ngonile, 2014).

The ECD teachers’ key role is to teach. They can either use ICTs to aid them in the preparation of instructional material or in the ICT learning area lessons. The lack of ICT resources (see sub-

sections 8.2.1 and 10.2.16 for more detailed reviews) in primary schools limits access for both them and the ECD learners. To enable them to continue teaching ICT, they indicated that in some cases they have had to use non-functional ICT resources in their classes. Statements in support of this sub-theme are presented below:

“We also don’t have computers, the only gadgets that we can gather and use are those that have been disposed of because they are no longer functioning properly. We use these gadgets for demonstration purposes only.” (Interview Participant IBK4, 25 September 2017)

“There are some non-functional devices that include television sets and DVD players that are just for display and demonstration purposes.” (Interview Participant IMW3, 19 September 2017)

“ICT corners were populated using non-functional ICT devices that many have no use for anymore. This enables us to teach our learners by practically demonstrating what the ICT parts look like, for example, a keyboard, a mouse and a monitor.” (Focus Group Discussion Participant FGDCHE, 20 September 2017)

Based on the excerpts presented above, it can be noted that some ICT lessons were conducted in the absence of functional ICT resources. This would ultimately mean that the learners in such environments were unable to interact with functional ICT devices. The next sub-section describes the type of technical support that the ECD teachers have been receiving in primary schools.

7.3.3.2 Technical support

The Becta survey (cited in Ghavifekr et al., 2016, p. 42), researching educators’ ICT usage in educational activities highlights that “technical faults might discourage them from using ICT in their teaching because of the fear of equipment breaking down during a lesson”. Al-Majeeni (2004, p. 279), found that the lack of technology support structures was the main reason for its under-use in basic education. In Chitanana’s (2009, p. 333) study, the participants expressed frustration over the lack of technical support despite having indicated

positive attitudes towards the introduction of computers. The questionnaire asked the ECD teachers whether they were receiving technical support for using ICT equipment or not and in the event that the equipment breaks down (see Appendix A, No. 21). Figure 7.5 presents the results.

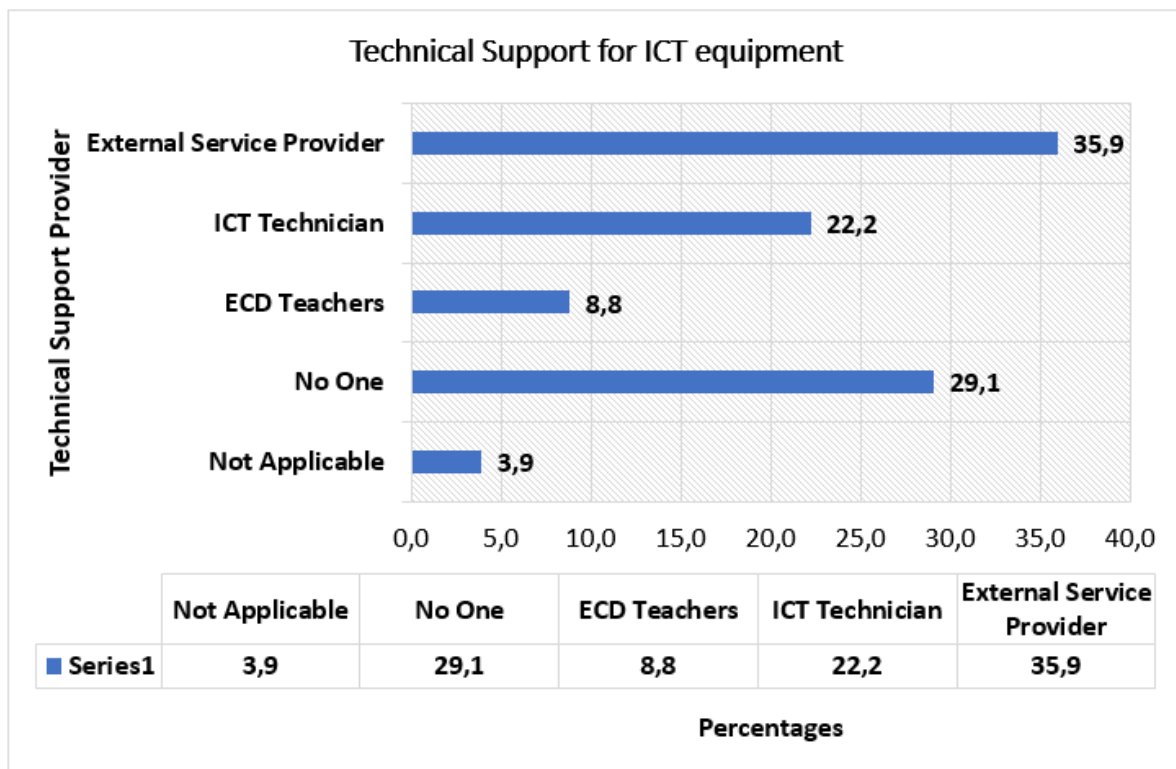


Figure 7.5: Technical support providers in primary schools

(Field data: 2017)

About 35.9% of the respondents indicated that their schools were outsourcing technical support from an “external service provider”, while 22.2% indicated that their schools hired an “ICT technician” (see Figure 7.6) to provide technical support. Another 29.1% indicated that they were not receiving technical support for their ICT-related equipment at all. Only 3.9% left the questionnaire item unanswered. This could mean that their schools do not have ICT equipment installed. A mere 8.8% of the respondents indicated that they were providing technical support themselves (i.e. the ECD teachers). This raise the question whether the ECD teachers were competent enough to provide the technical support for themselves, when the majority of them indicated that they were not ICT competent and have never received ICT-related training. However, based on the results presented in Figure 7.6, over 50% of the respondents were receiving technical support for their ICT-related equipment.

The ECD teachers were also asked how often their ICT equipment was maintained (see Appendix A, No. 20). Figure 7.6 presents the results in a clustered bar graph.

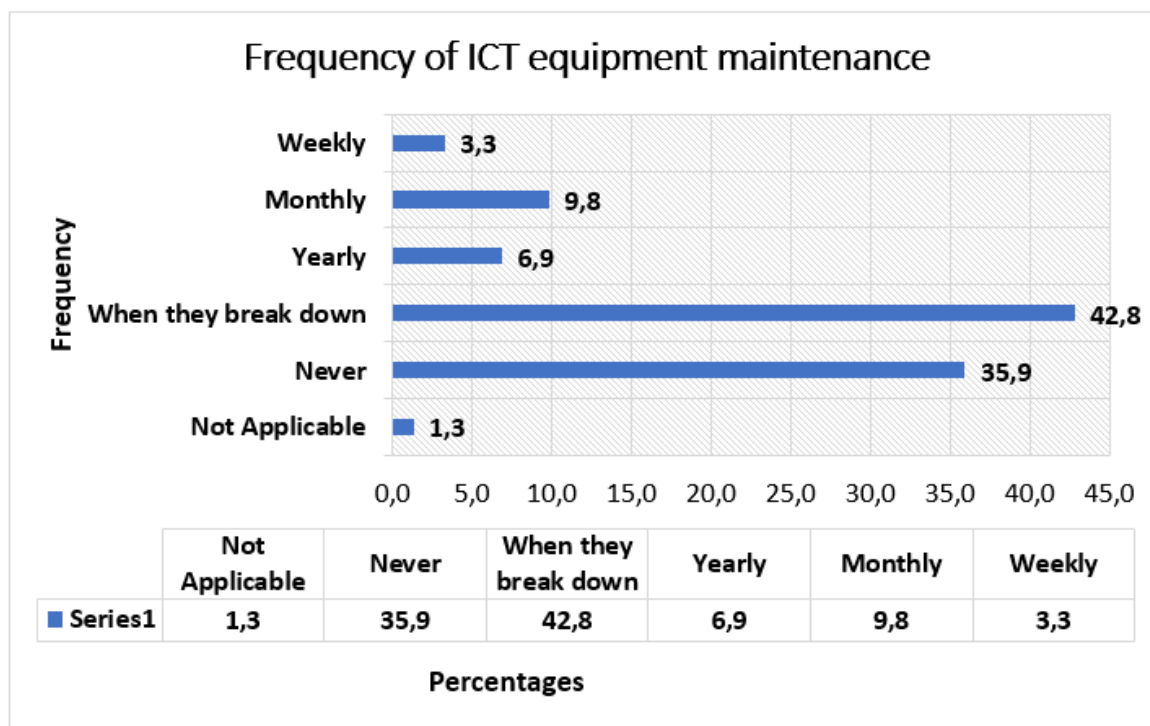


Figure 7.6: ICT equipment maintenance frequency in primary schools

(Field data: 2017)

Respondents who indicated that their schools-maintained ICT equipment on a “weekly” (3.3%), “monthly” (9.8%) and on a “yearly” (6.9%) basis were few (see Figure 7.6). High numbers were recorded for respondents deployed to schools which “never” (35.9%) serviced ICT equipment and those that only serviced “when they break down” (42.9%). When these two categories are combined, they amount to 78.7% of the respondents. The qualitative data also supported the findings discussed above. Statements in support of this have been presented below:

“They are only serviced when they break down, by very professional degreed external service providers. The last time I went there they were down and within two days they were all functional after the provider had been called.” (Focus Group Discussion Participant FGDCRB, 18 September 2017)

“There is a routine of regularly maintaining them, we have got 2 people that include our computer teacher and another technician in town who do that. They

are always in perfect condition; we have never gone there to find any of them down unless if it is a power problem.” (Interview Participant IMA2, 14 September 2017)

“We have got some attaches from local universities and polytechnic colleges who are attached to the computer laboratory to regularly maintain our ICT devices. Where there is a need they hire outside for bigger problems.” (Interview Participant IMA4, 14 September 2017)

The statements presented above are in support of the statistics in Figure 7.5 and Figure 7.6. Participant FGDCRB above revealed that ICT equipment is only serviced when it breaks down. Thus, it can be concluded that some primary schools do not prioritise the maintenance of ICT equipment. The reasons for this lack of priority are not known at this point. However, the educators’ and administrators’ ignorance of the importance of ICT in education can be cited as one of the reasons for this behaviour (see sub-section 8.2.9 for a detailed review). It should also be noted that since ICT equipment mainly comprises electronic devices, in a place like Zimbabwe where random power cuts (also called load shedding) are frequently experienced, it is common for ICT equipment to break down due to unstable power sources. Pita (2010, p. 98), reports that power failure was also the main reason for ICT device breakdowns in Solomon Islands’ schools. The qualitative data also confirmed that ICT was considered a luxury and not prioritised at a national level. Statements in support of this sub-theme have been presented below:

“Already for some schools, ICT is considered a luxury. It is a necessity but for some schools, they don’t even get the bond paper, you know I have to fight to get A3 paper for the kids’ artwork It is like me driving a small Volkswagen (those small VWs), there is no use me trying to get a Mercedes Benz when I know I can’t afford it.” (Interview Participant IMA3, 14 September 2017)

“I don’t think as a nation we are serious about this ICT advancement. I will give you an example, you go to Makombe national government building complex in Harare there are no computers there. There are just old dusty files in the building and you expect to hear those old men talking about computers, “the

ICT.” I just think we should shift from having these old guys in the strategic positions because they don’t advocate for the advancements in ICT.” (Focus Group Discussion Participant FGD MAG, 14 September 2017)

“I also think that they don’t even know or understand what ICT is. When they hear about ICT maybe they just think of computers but they don’t know that there is a lot in the world of ICT that can be done by ECD pupils.” (Focus Group Discussion Participant FGDZKF, 26 September 2017)

Participant IMA3 above explained why some schools considered ICT a luxury, while participant FGD MAG narrated why he or she thinks ICT is not prioritised nationally. FGD MAG described the items found in the national government offices. In the description, there is mention of dusty files, which may not be supported by ICT devices normally used for administrative purposes like computers. Participant FGDZKF highlights the existence of ignorance about the importance of ICT in ECD education. These statements show that some teachers are of the opinion that the government (government officials expected to spearhead ICT integration issues) may be part of barriers to ICT integration. The next sub-section is a discussion of the ICT-related training programmes that have been extended to the ECD teachers.

7.3.4 ICT-related training for ECD teachers

This study assessed the way ICT-related training programmes were rolled out upon establishing that the ECD teachers had low to moderate ICT competencies. The next sub-section discusses the sub-theme confirming the existence of training challenges for ICT-related programmes.

7.3.4.1 Training programmes and associated challenges

There was a consensus among the participants that teacher training programmes did not adequately address ICT integration in ECD education. Statements supporting this sub-theme are quoted below:

“From the knowledge that we got in college, we may have benefited a little while we were still in college being able to type assignments. However, we have

difficulty teaching ICT even though we received training because we were only taught how to use it for our benefit and not how to teach it. It is a fairly complex area in that it introduces too many big words to the ECD learner whom we are trying to teach basic language concepts with the proper pronunciation.” (Focus Group Discussion Participant FGDMAE, 14 September 2017)

“The same challenge that she just outlined is the same challenge that I would say even those who went to university faced. During our training, I still remember that we were taught about computer networking topologies and I questioned the lecturer. I asked him whether this concept was going to fit well in the ECD class. The training that we receive in colleges is the training for me such that when I arrive at a learning centre, and I am given access to computers I can personally understand what kind of computer networking topologies are used at the centre. The training is not ECD learner specific, which makes it difficult for ECD teachers to grasp; even those that claim that they have received training to understand what is really the best content for the ECD department.” (Focus Group Discussion Participant FGDMAE, 14 September 2017)

Thus, it can be noted from the participants in the focus group discussions (*see participants FGDMAE and FGDMAE above*) that ICT integration is being curtailed by inadequacies in the teacher training programme. Quantitative data revealed that 71.9% of the teachers who participated in this study were using ICT to teach in their ECD classes (*see Table 7.6 in subsection 7.3.2 above*).

Table 7.7: Trained to use ICTs in ECD classes

Trained to use ICTs to teach in ECD classes	Frequency	Percentage
No	195	63.7
Yes	111	36.3
Total	306	100.0

(Field data: 2017)

However, Table 7.7 above indicates that about 63.7% of the respondents had never been trained to use ICTs in their ECD classes. Excerpts in support of the quantitative analysis findings are presented below:

“I have to be honest that I don’t have any training and what I have is pretty basic. I haven’t received any training ... to be able to teach I don’t think I would be the right person because I would need training” (Interview Participant IMA3, 14 September 2017)

“I have never had any ICT-related training in my life and I am not using ICT in my ECD classes. I rely on the computer resource teacher for ICT.” (Focus Group Discussion Participant FGDCRC, 18 September 2017)

“When we were at the recent ICT workshop in May 2017, we were a group of qualified teachers and about 75% of the people who attended the workshop reported that they had never been behind a computer. Most of the ECD teachers in this district have very little or no knowledge in ICT.” (Focus Group Discussion Participant FGDCRB, 18 September 2017)

The statements above showed that there were mixed perspectives. Participants IMA3 and FGDCRC expressed that they had never received any ICT-related training before, while participant FGDCRB narrated his or her experience at a training workshop. The ICT-related training intentions data (see Figure 6.4 in sub-section 6.2.1.3 above) indicated that about 72.5% of the respondents had intentions to participate in ICT-related training programmes in the next two years. These results showed that despite the high number of teachers who had never received ICT-related training, the majority was willing to participate should they be afforded the opportunity.

Therefore, it can be argued that some ECD teachers in Zimbabwe participated in ICT training even though a corpus of them (63.7% – see Table 7.7 above) indicated that they had never been trained to use ICT in their classes. However, the challenges associated with ICT teacher training programmes established by this study can also be reasoned to be general and not ECD specific. Moreover, as noted by participant FGDMAE above the ICT teacher training

programme equips teachers with ICT skills to use computers and not to teach ICT in ECD classes. Participant FGDMWD concurred that:

“In actual fact, we had more of theoretical lectures and less practical lectures because there were too many of us in our classes at college.” (Focus Group Discussion Participant FGDMWD, 19 September 2017)

The ECD teachers revealed that the training they received at college had more theoretical lectures than practical lectures. Therefore, it can also be concluded that the training may not be helping them much to teach using ICT or teach ICT as it negated the most important component of practical training. Hence, it can now be argued that the teacher training programme did not adequately equip teachers in the area of ICT. This was further confirmed by FGDMWC who stated,

“120 students would be expected to use 20 computers in the same lecture. It was very difficult to learn and grasp practical ICT skills under those circumstances.” (Focus Group Discussion Participant FGDMWC, 19 September 2017)

This further revealed that ECD teachers’ computer proficiency is constrained by theoretical knowledge, which was obtained under a resource-constrained teacher training programme (refer to a study by Musingarabwi, 2017 for a detailed review). It can further be argued that the ICT proficiency of ECD teachers in the integration of ICT in ECD is adversely affected by the teacher training programme that they received. Hence, these findings were further supported by the informing demographic data which revealed that 66.7% of the participants in this study were non-bachelor degree graduates (their highest education level is the diploma – see Table 5.4 in sub-section 5.2.1). This confirmed Bukaliya and Mubika’s (2011, p. 421) study that recorded the majority of participants citing the lack of teachers adequately equipped with ICT competencies. Musarurwa (2011b) and Musingarabwi (2017) acknowledged the dearth of education-specific ICT skills among lecturers and ICT resources in colleges. This shortage may be the reason for the lack of sound ICT competencies among ECD teachers who may have been trained at the same colleges. Therefore, it can be concluded

that the ICT training challenge emanating from teachers' training institutions has been leading to an ICT-illiterate ECD teacher as the end product.

It was also noted that prior to the introduction of ICT in the Zimbabwean primary education system, MoPSE organised training programmes that were conducted in all districts. The conversations with the ECD teachers revealed the following:

"The training was extended to a select few and it was conducted during 2016. The only problem was that we were unable to give a detailed feedback report to the teachers that were not selected to participate. The funds seemed very limited such that the programme ended at the workshop. Nothing tangible could be set up on the ground. I believe that there was a lack of resources and no clear monitoring and evaluation mechanisms to help the Ministry understand the situation on the ground." (Focus Group Discussion Participant FGDMAG, 14 September 2017)

"Only a few of us were trained at the workshops because when a call is made, a few teachers are selected to attend with the view that they will come to teach the others. Those who attend the workshops come back and show us that they were half-baked at the workshop and this does not help us as ECD teachers. I think the training programmes should be extended to all teachers." (Focus Group Discussion Participant FGDCRG, 18 September 2017)

"We have approached and reported some of these challenges to the Teacher in Charge, especially on workshops. How can the ministry consider training only one teacher when it expects the ICT integration programme to be implemented successfully in the schools? The challenge is extending the training to a select few who have to go back to the school to teach the others in the absence of ICT resources for teaching and learning." (Interview Participant IGT1, 21 September 2017)

The ECD teachers' excerpts presented above suggest that the workshops organised by the MoPSE were attended by a select few (see participants FGDMAG and FGDCRG above). The ECD teachers who attended the workshops were expected to impart the ICT-related skills that

they would have acquired to their peers. This may not be the case as some participants expressed their frustration over the government's strategy to "train the trainer" (see participant IGT1 above).

While it may be a good initiative to facilitate technology diffusion through training a select few so that their peers would, in turn, benefit from them, it may not always be the most effective strategy to achieve full ICT integration (Fullan, 2001a; Rogers, 1995). If the vessels of change (in this context the ECD teachers who attended the training programmes) experience challenges in the adoption process, this may negatively affect the teachers who were not part of the training programme (Rogers, 2003). The ECD teachers expected the MoPSE to extend the training to all teachers.

In spite of the government's efforts to provide the barest minimum of training to some ECD teachers so that they would teach their peers, the peer teachers who received training from the trained teachers who attended the workshops believed that they were "half-baked" (refer to participant IGT1 below). Their statements in support of this finding are presented below:

"The other challenge comes from the teachers that went for reskilling. I think the time that they spent on the training was too short and they seem to be half-baked when handling ECD children. If they have challenges in generic ECD related matters, in ICT it could be worse." (Interview Participant IGT1, 21 September 2017)

"The training that is conducted does not consider what is required for the ECD department, for example in the recently introduced curriculum we are supposed to teach our pupils to draw, scribble and paint using the computer. Based on the training I got, there is nothing that is ECD specific, they are just basic ICT skills." (Focus Group Discussion Participant FGDCRA, 18 September 2017)

"At the training programmes, they teach us Microsoft Excel that is generic to our need for ICT skills, where you are taught how to compute class marks. This is not what I need ICT for in my ECD class, I need to colour, scribble and paint using a computer with my pupils as stipulated in the new curriculum. I don't

compute marks at this level.” (Focus Group Discussion Participant FGDCRC, 18 September 2017)

The excerpts presented above imply that the training workshops fall short of the ECD teachers’ expectations as they are not addressing the pedagogical aspect for the ECD learner. Hammed (2014) found that the lack of ICT training focused on the pedagogical aspect of early education is the knowledge gap in the practice of ICT integration. However, it is refreshing to note that some of the ECD teachers acknowledge that the training programmes helped them to learn how to use ICT for instructional purposes. Their statements also imply that the training programmes were too short for them to grasp the basic proficiencies required for the use and teaching of ICT in ECD education. This sub-theme is supported by the statements presented below:

“During the implementation of the newly introduced curriculum we were staff developed with workshops, but then the courses took a very short time. The training was too basic with very little information to help me teach ICT and use it to teach my lessons. I think they should have given us a longer period to familiarise with the computers and to be able to implement computer education since our exposure to computers was very limited.” (Interview Participant ICR1, 18 September 2017)

“The workshops tackling ICT-related issues are not fully addressing the matter at hand because they are too short. If they continue to do a crash programme on this issue where they compact all the ICT-related teaching areas in one week, progress will always be slow.” (Focus Group Discussion Participant FGDCRG, 18 September 2017)

“The Ministry’s staff development programmes could help if they have more content and can be done over longer periods like holidays if they don’t want to disrupt the school activities during the school term.” (Interview Participant IMA1, 18 September 2017)

The participants felt that the training programmes set up by MoPSE to prepare them for the integration of ICT were too “compact” and “short” (see participants ICR1, FGDCRG and IMA1

above). They suggested that training programmes be conducted over longer periods such as school holidays to enable them to include more content. Another trending sub-theme related to this finding concerned the briefness and relevance of ICT-related instructional material. The participants said the following:

“We got syllabi material from the ministry, which guides us during work scheme plans in preparation for our lessons ... the syllabi are too brief such that we have difficulties creating a scheme plan that covers the entire year without repeating topics. More flesh on the syllabi guides could help inform the teacher better.”
(Focus Group Discussion Participant FGDCHG, 20 September 2017)

“The guides are quite shallow because the guides are too high-level that only outline the topical issues that you are supposed to use to teach. Since ICT is a new area at this level, more detailed guides could help us to better understand how we are supposed to use it in our classes.” (Focus Group Discussion Participant FGDGTH, 21 September 2017)

The statements above described the instructional material (teacher resource guides and textbooks) as too brief and high level for the ECD teacher who has never before received ICT-related training to understand. This may be one of the reasons for their low-to-moderate ICT competencies. A different view is that the instructional material is too generic. As participant FGDGTI narrates:

“From my experience, the guides classify us according to what we have. The first section addresses those in urban areas where the assumption is that they have access to ICT resources, while the other section addresses us who are situated in the rural areas who teach with more limited resources. I think this should not be the case because our playgrounds are now different, there is no guarantee that my learners will pass if they are subjected to the same exam that is similar to the one that will be written by learners who learnt in a resourceful environment.” (Focus Group Discussion Participant FGDGTI, 21 September 2017)

According to the statement above, the guides are able to address learners operating in different environments (resourced and under-resourced). However, the problem arises when the learners write the same exam when they were subject to different educational ICT environments. The finding implies that the examinations are not being packaged in a standard way that caters for the varied educational ICT environments in primary schools. This challenge can be partly dealt with by ensuring that all primary schools are properly resourced with basic educational ICT tools and standardising examinations. The next sub-section discusses what the ECD teachers and schools have been doing to close the lack of ICT competencies gap.

7.3.4.2 School-based peer coaching ICT training

The study revealed that there are schools that have realised the importance of ICT in ECD education to the extent that they have set up environments enabling ECD teachers to receive training from their peer computer resource teacher. Statements in support of this are presented below:

“As a school, we are also conducting ICT staff development meetings, where we teach each other.” (Interview Participant IBK4, 25 September 2017)

“They have also asked the computer teacher to give us teachers who are not well-versed free lessons during the afternoons when we are free.” (Interview Participant IZK2, 26 September 2017)

“No, that one I haven’t yet done like going to a college but I have done with our ICT teacher here. I started when we were asked to go to him to teach us how to do it.” (Interview Participant IMA2, 14 September 2017)

Based on these statements, it was noted that schools with resident/permanent computer resource teachers encouraged their ECD teachers to receive training from him or her. Fullan and Langworthy (2014, p. 27) report on how peer coaching catalyses change in an educational environment. The initiative by the schools can be viewed as instrumental in improving the teachers’ ICT literacy levels. However, it can only happen if the school administrators understand the benefits of ICT in education enough to put a priority tag on it. It is also dependent on the willingness of the teachers (which in this context is true) and the availability

of a resourced ICT facility. The participants also indicated that they have been embarking on personally initiated efforts to receive ICT-related training. Statements in support of this finding are presented below:

“Using ICT is out of my interest to keep up with the times. I have been using my own resources to do further reading and some of the ICT knowledge and the skills I have I acquired them before I even started training to become a teacher.... I have been using my own resources and I have also been developing myself with ICT-related training programmes.” (Interview Participant IMA4, 14 September 2017)

“The training was my own personal thing; I just went to a college in town to learn how to use a computer for myself. It was not related to ECD or teaching ICT in the school.” (Interview Participant IBK1, 25 September 2017)

“Usually, the school allows the teacher to go for those ICT-related training activities but in terms of finances, they say you are going to get a certificate so you have to sponsor yourself. It is like the school tries to separate itself from the knowledge that you are going to get.” (Interview Participant IBK4, 25 September 2017)

The participants indicated that they had been participating in ICT-related training using personal resources (see participants IMA4 and IBK1). One of the participants expressed that his or her interest in ICT sparked the personally initiated efforts. On the other hand, participant IBK4 revealed that his or her school separates itself from such an initiative despite allowing him or her to enrol for the training. This explains the variation in ICT integration levels noted for all schools. The next section is a brief discussion of the results presented above.

7.4 Discussion of results

The findings established that the majority of ECD teachers participating in this study possessed ICT competencies that were found in the low (30.1%) to moderate (29.7%) categories (see Figure 7.1 and Table 7.3 – Table 7.5 in subsection 7.2.1 above). Masvingo

district, which is also the capital city of the province (Muzvidziwa, 1997, p. 97), recorded respondents with the highest ICT competencies. The majority of the respondents (about 72% – see Table 7.6 in subsection 7.2 above) indicated that they were using ICTs in teaching and learning activities. However, their general computer use statistics showed that about 63% of them were not regularly using ICTs for basic teaching and learning activities (see Figure 7.3 in subsection 7.2.2 above). A review of the qualitative data unveiled the mixed perspectives about the ECD teachers' perceptions of their ICT competencies. The majority acknowledged that they were computer illiterate (even though they can use other ICT devices like the smartphone and tablet), whilst the rest of the participants indicated that they possessed key competencies. Based on these findings, it can be concluded that this study confirmed Bukaliya and Mubika's (2011, p. 414) study whose

results reveal that the majority of the teachers were computer illiterate because they were not exposed to ICT training or the practical hands-on experience. A significant number had no formal ICT qualifications... Further indications are that teachers lack the necessary skills and knowledge of computers. In terms of applicability of the packages teachers' weak knowledge levels show that their competence in ICTs for classroom use still lags behind.

About 65% of the respondents revealed that they had no access (35.3%) or access that was quantified as less than once a month (29.7%) to ICT used for teaching and learning activities. Based on these findings, it can be concluded that the majority of ECD teachers in this study were experiencing challenges accessing ICTs used for teaching and learning activities.

Modelling the UTAUT's facilitating conditions construct in this context (Venkatesh et al., 2003), the lack of access to ICT can be viewed as an extrinsic limitation that exists in the ECD teachers' educational environment. An increase in the access to ICT in the classroom could potentially increase the chances of ECD teachers embracing ICT in their classes (Blackwell, Lauricella, Wartella, Robb, & Schomburg, 2013, p. 311). This is a cause of concern as the lack of access to ICT-related teaching and learning tools has been recorded as a major barrier in previous studies (Blackwell et al., 2013; Ertmer & Ottenbreit-Leftwich, 2010; Ghavifekr et al., 2016; Michaelides, 2011; Mndzebele, 2013b; Özdemir, 2017). As long as the teachers have limited access to ICTs in the classroom, successful ICT integration in ECD education may be a pipedream for policymakers. The lack of ICT access also negatively affects the development

of ICT competencies for teachers as they could have no platform to experience and learn how to use ICT by themselves.

It was also noted from the qualitative data that some ECD teachers were using their personal resources to subserviently conform to their employer's (MoPSE) ICT integration requirements for the teaching of ICT in ECD education. These findings are a confirmation of the trade unions' claim that the teachers are using their personal resources to implement the new curriculum (Pindula News, 2017b). This initiative directly improves access to ICTs for the ECD teachers using their personal ICT resources.

The majority of the participants (58.1%) revealed that their schools either hired an ICT technician (22.2%) or outsourced an external service provider (35.9%) to provide technical support for their ICT equipment. The study found that the majority of the ICT equipment is only serviced when they break down. This indicated that the existing technical support provided at most schools was available on a need basis and not a standby/regular basis. Morris and Venkatesh (2000, p. 384) assert that "prior research has suggested that support staff is one of the most crucial elements in alleviating constraints to technology usage", while Hall and Mansfield (cited in Morris & Venkatesh, 2000, p. 384), "suggest that older workers place greater importance upon receiving help and assistance on the job". In the context of this research, this could not be established as the age showed no significant effect on the teachers' attitudes and competencies (see Chapter Six). Al-Majeeni (2004, p. 281), emphasises the need for readily available technical support staff in primary schools to encourage teachers to seamlessly integrate ICT in teaching and learning activities. There is an exigent need for MoPSE to consider deploying technical ICT support at schools with fully fledged ICT facilities.

The qualitative data suggested that the non-existence of ICT technical support staff in primary schools resulted from the lack of prioritisation for ICT. The participants narrated how government officials sat in offices that were not backed by ICT devices normally used for administrative purposes. According to Drysdale & Gurr (2017, p. 144):

In one sense people are the organisation, especially in an intensive human capital organisation such as schools. Policymakers all over the world are focused on

attracting, developing and retaining quality teachers and ensuring there is quality teaching.

Policymakers normally dictate the pace at which change occurs. If those at the operational level (the ECD teachers) perceive that the change they are supposed to enact is not fully supported by the policy maker, the rate at which they enact the change is also bound to be negatively affected (Rogers, 1995). In other words, the ECD teacher can only prioritise what he or she feels the authorities prioritise. Hence, it may also be key for the MoPSE to review the personnel it employs to administer ICT integration. This can indirectly contribute to improving the teachers' competencies.

The majority of the respondents (63.7%) indicated that they had never received ICT-related training before. The qualitative data supported these statistics by revealing that ICT integration activity is curtailed by inadequacies in the teacher training programmes. This further confirmed what Musingarabwi (2017) found. According to Gray (2011, p. 307), lack of access to ICT resources and proper training leads to a lack of competence and confidence in using ICT for teaching and learning activities. The study also noted that schools with ICT facilities and computer resource teachers have been creating learning platforms for ECD teachers where they are peer coached. Based on their statements, this has been improving their ICT related competencies.

The next section concludes this chapter.

7.5 Conclusion

This chapter presented findings related to ICT competencies possessed by ECD teachers. The study found that the majority of ECD teachers have low to moderate ICT competencies, despite the most positive attitudes recorded for them in Chapter Six. According to Jegede et al. (2007), the attitude of a technology user has a significant effect on the prediction of competencies. The study also revealed that the majority of the ECD teachers participating in this study have challenges accessing ICTs used for teaching and learning activities. It was concluded that there are inadequacies in the teacher education training programme, which may be slowing down ICT integration as ICT illiterate ECD teachers are being produced from the institutions. The study also noted that there are poor or no technical ICT support

structures in primary schools. A recommendation to deploy ICT support staff where there are functional ICT facilities was made. The next chapter is an attempt to answer the research question, **“What are the challenges faced by ECD teachers when trying to integrate ICTs in teaching and learning processes?”**

Chapter Eight – ICT Integration Challenges Faced by ECD Educators

8.1 Introduction

Chapters Six and Seven presented the data relating to the ECD teachers' attitudes, perceptions and ICT competencies. Chapter Six reported that the attitudes and perceptions of ECD teachers who participated in this research were mostly positive; while Chapter Seven analysed ECD teachers' competencies in this study, which validated the literature review's position that teachers lacked ICT competencies to engage with ICT integration (Abraham & Wadhvani, 2013; Ghavifekr et al., 2013; Kim & Jang, 2015; Mandina, 2015). As noted in the literature review, some schools have not been able to integrate ICT into their teaching and learning processes as a result of teacher-centric/related challenges associated with the integration process (refer to studies by Abongdia, Adu, & Fonicha, 2015; Bukaliya & Mubika, 2012; Hamed, 2014; Hlupo et al., 2003; Hutchison, 2009; Kanyongo, 2005; Karsenti, Collin, & Harper-Merrett, 2012; Kramarenko et al., 2010; Majoni & Nyaruwata, 2015; Mlambo, 2016; Mndzebele, 2013a; Munyengabe et al., 2017; Murava, 2017; VVOB, 2014 that give a more detailed synopsis of ICT integration challenges in education).

ECD teachers who participated in this study highlighted the challenges that have been documented in this chapter. This chapter sets out to answer the critical question, "**What are the challenges faced by ECD teachers when trying to integrate ICTs in teaching and learning processes?**", by presenting and discussing the key findings related to it in this study. The findings from both phases of the study (quantitative and qualitative) will be concurrently presented in this chapter. This chapter will also report key challenges that have not been mentioned explicitly in the preceding chapters answering the critical questions.

8.2 Research question three: What are the challenges faced by ECD teachers when trying to integrate ICTs in teaching and learning processes?

This section attempts to answer research question three by establishing the ICT integration-related challenges faced by ECD teachers who participated in this study. The sections below

are a presentation and brief analysis of the collected data relating to ICT integration challenges faced by ECD teachers.

8.3 Presentation of results

Participants in this study were asked to identify the challenges that they were commonly faced with in trying to integrate ICT into their classrooms in both data collection phases (see the interview and focus group discussion guide - Appendix B, No. 10; and Appendix C, No. 11 respectively); their views are presented and analysed in this section. One of the main challenges which emerged from this study pertains to resource constraints.

8.3.1 ICT resources, instructional material and services' constraints

One of the participants in this study revealed that:

“When you introduce an ICT based concept to the learner, it is a bit challenging and it is like you first drive the learner into town and then you bring him or her back; but he or she is still in the same classroom where he or she has to face the reality of his or her environment, no ICT resources.” (Interview Participant IBK4, 25 September 2017)

The resource constraint theme was further revealed by other participants who confirmed it as follows:

“They don’t have computers and the ones who have might be having just one computer to be shared among say maybe 20 or 40 kids and it is not easy to teach all those kids using one computer. There is one place that I actually visited where a friend of mine teaches and I asked, how do you do it? And then she said “it is not easy”, at the end of the day they just play games where she will be more of the one playing the games as she demonstrates and the learners watch.” (Interview Participant IMA2, 14 September 2017)

“ECD learners learn through interacting with the environment and demonstrating to them using non-existent ICT media and devices, has been proven to be ineffective. They need real resources to be available to them. We

need our classes to be installed with ICT devices.” (Focus Group Discussion Participant FGDGTB, 21 September 2017)

Based on the comments displayed above, it can be argued that the participants in this study suggested that their ICT-related teaching and learning processes in ECD were constrained by severe ICT device shortages. Participant FGDGTB highlighted that there was a gap created by the lack of ICT devices and services, which need to be installed to ensure that ICT is successfully integrated by ECD teachers. Therefore, this finding is consistent with findings established by studies carried out by a number of scholars (Chikutuma & Mawere, 2013; Chiparange, 2016; Chitanana, 2009; Dozva & Dyanda, 2012; Konyana & Konyana, 2013; Makuvaza & Gatsi, 2014; Manaligod, 2012; Mashile, 2016; and Pohio, 2009).

In spite of the fact that some schools benefited from the presidential donation of computer equipment between 2003 and 2008, Chitanana (2009) established that there were resource constraints in the teaching of ICT in Zimbabwean schools. According to Kim (2017, p. 8), “access to ICT in learning spaces and environments”, is one of the targets set for achieving SDG 4 under the Education 2030 UN Agenda. The findings of this research show that a lot of work is required to make this a reality since there is a need to resource schools for successful ICT integration in ECD education. The lack of access to ICT resources in the classroom is an ICT integration barrier that could potentially limit ICT acceptance, adoption and use in Zimbabwean ECD centres (Gumedze, 2017; Mashile, 2016; Zaitz, 2016).

This study adds to and widens the resource constraints discourse to the teaching of ICT in ECD education. If ECD teachers continue to face challenges accessing ICT-related resources, the diffusion of this technological innovation will be slow and chances are high that they may end up not adopting or integrating ICT in their teaching and learning processes at a speedy rate (Rogers, 1995, 2003). Therefore, it can be concluded from this study that the teaching of ICT in ECD is also being curtailed by resource constraints. Gomba (2016, p. 108), prescribed that “the solution to the computer shortage may be solved by having donors and government help in the acquisition of more computers”. In addition, another variant perspective to the ICT resource constraints in the ECD class is centred on the lack of ICT textbooks. Participants stated:

“There is a limitation on the ICT-related texts at our schools because our schools have financial challenges preventing them from buying more textbooks.”
(Interview Participant ICH1, 20 September 2017)

“I think that is another challenge because the entire school has got one ECD ICT resource book.” (Interview Participant ICH3, 20 September 2017)

“We don’t have ICT textbooks. In ECD, we haven’t been getting the instructional materials like the books.” (Interview Participant IGT1, 21 September 2017)

The ECD teachers (see interview participants ICH1, ICH3 and IGT1 above) indicated that there was a challenge of the lack of ICT-related textbooks in ECD education departments across the province. The challenge was more pronounced for participant IGT1 who reported that there were no ICT textbooks at all at his or her school. Participant ICH1 believed that the challenge existed due to the financial constraints that the schools were faced with.

The Zimbabwean economic crisis has not spared schools, which have to procure ICT devices and instructional resources to enable ECD teachers to integrate ICT (refer to studies by Chagonda, 2010a; Makochekanwa, 2009; Mhlanga, 2016; Mlambo, 2016; Moyo, 2013; Shizha & Kariwo, 2011; The Zimbabwean, 2016; ZIMCODD, 2016 for a more detailed review). The Minister of Finance (cited in FMSI, 2011), reported that in 2010, “the textbook to pupil ratio was pegged at 1:15”, a very low ratio. According to EuropeAid (2012), over 15 million textbooks were donated and delivered to Zimbabwean primary schools between 2009 and 2011.

However, ICT was not among the learning areas selected for the donation. The literature review highlighted one of the Presidential Commission of Inquiry’s findings, which states that “there is a tendency to introduce new subject areas without the requisite textbooks, equipment and expertise”, (Nziramasinga, 1999, p. 243). Almost two decades later, based on the qualitative findings of this research, this study confirmed the abovementioned literature position that there has been a tendency of introducing new learning areas and subjects in the Zimbabwean education system without the requisite textbooks, equipment and expertise, as evidenced for ICT at the ECD educational level. Some participants expressed their views

towards the availability of internet connectivity and wireless fidelity (WiFi) services at their primary schools. The views in support of this sub-theme are presented below:

“We have the internet here at our school but it covers only a small area, when you are down there at the ECD department there is no internet connectivity. My plea is that the school makes efforts to extend WiFi internet coverage to other parts of the school like the ECD department.” (Interview Participant IMA4, 14 September 2017)

“... of course, as a teacher at some point, you would definitely need to access the internet because that is the platform that you can use to conduct searches of information that is not found in ordinary textbooks. The internet can produce more current information and information sources. At our school, it is not accessible for the ECD department.” (Focus Group Discussion Participant FGDGTB, 21 September 2017)

“In some schools, access to the Internet-enabled WiFi connection is for the administrative officers, the headmaster and his family only and not for teachers and pupils. If ICT resources like computers and the internet are extended to the teachers in such instances, a different story can be told.” (Focus Group Discussion Participant FGDCRG, 18 September 2017)

All the participants (see IMA4, FGDGTB and FGDCRG above) motivating this sub-theme indicated that teachers in the ECD department were having challenges accessing internet services at their schools. The participants are from three districts (Masvingo, Gutu and Chiredzi). Therefore, this means the internet challenge could be a province-wide challenge if it has been raised in three out of seven districts. On the contrary, participant FGDGTB’s sentiments, “that is the platform that you can use to conduct searches of information that is not found in ordinary textbooks”, show that the teachers understand the benefits of having internet services installed at their schools. Despite the high number of participants who indicated that ICT resource and service constraints may be hindering them from successfully integrating ICT, Table 7.6 in sub-section 7.2 indicates that about 72% of the participants were already using ICTs in their ECD lessons, while only 28% was not using them. The qualitative

data discussed above, shows that for the Masvingo province context, ICT resource constraints have a very little effect on ECD teachers' ICT use, as the usage is still high in spite of the resource constraints recorded in this study. The next sub-section reports the ICT device: pupil and teacher: pupil ratios in primary schools, which were qualitatively recorded as too low.

8.3.2 Low ICT device to pupil and teacher to pupil ratios in primary schools

The study further established that due to ICT resource constraints there are low ICT device to pupil ratios in primary schools, which limits the teaching of ICT in ECD education.

"the computer : learner ratio is 0:35 because there are no computers."

(Interview Participant IGT4, 21 September 2017)

"We only have 10 computers, and most of the time only six will be working. If your class has 37 ECD learners, working with six computers translates to a computer being shared by six learners. When they are all functional, we could speak of about four learners per computer." (Interview Participant ICR2, 18 September 2017)

"There is one laptop for the teachers and two for the pupils. We have about 30 students and there are about five classes, that is an estimate of 150 students using the two laptops." (Interview Participant ICH1, 20 September 2017)

"Most of the time, many of them would have broken down when we visit the computer lab. Most of the time, the device: learner ratio would be 1: 6." (Interview Participant IMA1, 14 September 2017)

"It is just one computer and it can take the whole day if it is about 40 children. If we can have more computers in ECD departments." (Interview Participant IMA2, 14 September 2017)

"I think the teacher: pupil and computer: learner ratios are too low. In our case, the teacher is the only one that has access to a laptop. When I use my phone with the six groups that I normally create in my class, the other challenge will be the inadequacy of the time allocated as the timetable is ideal for people who

have ICT resources.” (Focus Group Discussion Participant FGDGTB, 21 September 2017)

According to participant IGT4, ICR2, ICH1 and IMA1 above, the ICT device to pupil ratios at their schools are 0:35, 1:6, 1:75 and 1:6 respectively. The qualitative data shows that ECD teachers were subjected to very low ICT device to pupil ratios resulting from the ICT resource constraints reported in sub-section 8.2.1 above. The findings classified under this sub-theme confirmed MoPSE’s (2016c, 2017) policy statements and Konyana and Konyana’s (2013) study, which affirmed that schools in Zimbabwe were experiencing major ICT device and infrastructure challenges that have resulted in the low device to pupil ratios. According to MoPSE (2016c, p. 4),

the national ratio of functional computers per learner was 1:167 for primary schools and 1:40 in secondary schools while 11.02% of primary schools and 29.58% of secondary schools had internet connections with 303 primary schools and 347 secondary schools having integrated e-learning programmes into day to day teaching and learning, but with great variations between urban and rural as well as government and non-government schools.

If a school has few ICT resources, the teacher can use the available resources for demonstration purposes only, which can be considered the first step towards integrating ICT in Zimbabwean primary schools.

However, when the school has no devices (as in the case of participant IGT4 above) or few devices available to the pupils, it may be a very difficult task for the ECD teacher to manage. Other issues come into play that include limited time to complete ICT-related tasks, a scramble for the available resources and non-dominant pupils not being able to fully participate in ICT learning activities. Participant FGDGTB has been putting ECD pupils in groups where they had to share the available resources as he or she teaches using ICT tools. During the discussion of ICT device to pupil ratios, the participants also reported that the requirements of the teacher to pupil ratio were not being met in primary schools. This has been further highlighted by the excerpts below:

“The teacher: pupil ratio is a challenge. They are not meeting the requirements of the policy that stipulated that it should not exceed 1: 20, for example in my

class I have got 44 learners. If you are teaching such a large group of ECD learners, there is no guarantee that you will be able to cater for individual differences and needs. (Interview Participant IGT1, 21 September 2017)

"I think the other thing is the teacher: pupil ratio, which is too low, the kids are too many. In ECD there are over 35 ECD learners to one teacher. It has been quite difficult to teach ICT and use ICT to teach because the number of students that I have in my class is just too high." (Interview Participant IGT4, 21 September 2017)

"I think it is because the catchment area is too big. They should recruit more ECD teachers but there are other things that come into play like the infrastructure required to support many ECD classes are also not there. ICT seems like a practical subject and reducing the teacher: pupil ratio could help the teacher in a very big way." (Focus Group Discussion Participant FGDMAB, 14 September 2017)

Participants IGT1 and IGT4 above revealed that the teacher to pupil ratios based on their classes were 1:44 and 1:35 respectively. According to Guta (2017, paras. 1–2),

the teacher to pupil ratio in most primary and secondary schools in Zimbabwe currently stands at 1: 50 and in some extreme cases one teacher to 80 learners, a scenario which definitely compromises the quality of the end result. Just imagine how parents are traumatised and tormented by just one or two kids of ECD level at home, what about the teacher who is expected to take good care of 80 such notorious kids.

Guta (2017), also reported that there were some primary schools that had resorted to engaging qualified unemployed teachers as a way of reducing the teacher to pupil ratio in ECD education. This move was later approved by the government during the presentation of the 2018 national budget, where the Ministry of Finance refused the request to recruit 5,907 new ECD teachers to increase the teacher to pupil ratio, leaving the responsibility of recruiting new ECD teachers to the community and school development committees (Chinamasa, 2017, pp. 13–14).

The literature emphasised the existence of the teacher to pupil ratio challenge in ECD education by highlighting the Nhaka Foundation's (2012) website and the MoPSE (2017) strategic plan statements (listed below) that implied that the dearth of trained and qualified teachers existed and may be the cause of the low ratio.

Most schools have no classrooms for the ECD children. Moreover, the number of children in each class was too large failing to meet the required teacher-pupils' ratio of 1: 20. Our experiences in some of the schools show that some of the teachers in ECD have as many as 40 children! In most provinces of the country, a critical deficit of trained teachers with ECD qualifications has been discovered. Overall, the ECD A and B classes have been manned by untrained staff (paraprofessionals) and this practice militates against attainment of quality education. We are then involved together with the Ministry of education in the training of these paraprofessionals so that they provide quality care and education to the children (Nhaka Foundation, 2012, para. 4).

As noted in the literature review, according to MoPSE (2017, p. 45), by the end of 2015 there was

a disparity of enrolment and teacher to pupil ratio by district and province, raising issues of equity that need to be resolved. There has been a steady increase in the number of ECD teachers since 2012 with 12,124 qualified ECD teachers in 2014. However, 49% of the teachers remain as paraprofessionals, who are untrained teachers almost invariably women, most of whom teach in school-based centres (ECD A and B) but who have not undergone any formal training in ECD and who are supported by community-based funds. The poor uptake of qualified teachers to the public sector, often due to the remoteness of ECD centres and the attraction of the private sector for qualified teachers is a challenge for MoPSE. Private provision is important and MoPSE will focus on strategies to relieve the pressure on rural areas. In the meantime, some 9,954 paraprofessionals have been trained by MoPSE and will remain an interim support to the system while qualified teachers are trained and recruited.

Munjanganja and Machawira (2015) reported how the Zimbabwean education system has been coping with human resources' challenges in ECD education through the use of paraprofessionals who started off as volunteer community daycare ECD helpers. An extract from their article states:

These para-professionals have their origin at a time when ECD was almost exclusively a community-based affair. However, seeing the critical role that the paraprofessionals were playing, UNICEF assisted with funds for their training. The training is carried out at individual teacher training colleges. The paraprofessionals receive a certificate of attendance issued by each individual college.... In the absence of a full complement of qualified ECD teachers, the paraprofessionals are filling a yawning gap and providing a vital service in ECD delivery. It is unfortunate that because of the economic difficulties that the country is going through the government is unable to pay them any allowances (Munjanganja & Machawira, 2015, p. 18).

A review of the literature and an analysis of the data collected in the qualitative phase of this research shows that schools have a massive teacher to pupil ratio challenge. However, the situation may now be different since there are qualified and unemployed ECD teachers and the government publicly declaring that they are not able to finance the formal recruitment of new ECD teachers. Transferring the burden back to the individual schools and parents may not solve the problem in some areas where schools and parents are experiencing bigger financial constraints. As prescribed by participant FGDMAB above, there is a need to resource schools with more ECD teachers who may reduce the burden on the existing teachers. The next sub-section reports on the sub-theme highlighting the lack of age-appropriate ICT equipment in schools.

8.3.3 Lack of age-appropriate ICT equipment and furniture

For schools where there are ICT resources, some of the participants expressed their concern over the lack of age-appropriate ICT equipment among the resources provided to them. Excerpts related to this are presented below:

“The desktop computers are not child-sized; they are not meant for kids and we requested for the school to buy us computers that are child-sized in future. Even the desks are higher than our pupils, the furniture used in the computer laboratory is meant for junior pupils, not for ECD pupils.” (Interview Participant ICR1, 18 September 2017)

“This is evidenced by the type of computers that they have put in the computer laboratory, they are not developmentally appropriate for ECD learners.”
(Interview Participant ICR2, 18 September 2017)

“Construct a developmentally appropriate computer laboratory that can accommodate ECD learners. Developmentally appropriate in this context refers to a structure that conforms to the requirements of ECD learners in terms of the height of the furniture (they should be able to comfortably sit on the furniture found in the computer laboratory).” (Focus Group Discussion Participant FGDCRG, 18 September 2017)

The ECD teachers revealed that ICT equipment allocated to the ECD department was not age and developmentally appropriate for learners ranging from four to six years of age (see participants ICR1, ICR2 and FGDCRG above). They also believed that ICT could be best integrated into learning processes at ECD if the ICT equipment suppliers/sponsors were to take into consideration the age of the learners that it is meant for. Participant FGDCRG further proposed that computer laboratories accommodative of ECD learners should be constructed at ECD centres to solve this problem.

Chepkonga (2017, p. 15), found that in Kenya, “there was a significant relationship ($p < 0.01$) between learning facilities and provision of quality” in elementary education; the lack of adequate and appropriate learning facilities in ECD education negatively influence the quality of the education at that level. Kalaš (2010), reported on the Developmentally Appropriate Technology in Early Childhood (DATEC), a framework for identifying the appropriateness of ICT tools (hardware and software) that has been used since 2003 under the UNESCO information technology early childhood projects. ICT equipment and service suppliers could benchmark what they provide to schools against such frameworks to achieve ICT environments that accommodate ECD learners. The next sub-section reports on the sub-theme, “available resources restricted to administrators and other departments”.

8.3.4 Available resources restricted to administrators and other departments

The discussion above clearly shows that the availability of ICT resources has an effect on the ICT integration processes in ECD education. Some participants indicated that they had the

required ICT resources at their schools; however, their access to these ICT resources was limited as some of the resources were restricted to upper grades and administrators at the schools. Participants in support of this sub-theme said:

“We only have one for the administrators that we can book for use in our lessons.” (Interview Participant ICH4, 20 September 2017)

“We as ECD teachers were not allowed to use them and our children were also not allowed to participate in ICT-related education activities because of the limitation of ICT resources. The shortage of resources resulted in the computer use timetable being allocated to the upper grades only since ECD conducted its lessons from morning up to mid-morning only.” (Interview Participant IMW2, 19 September 2017)

“In some schools, access to the Internet-enabled Wi-Fi connection is for the administrative officers, the headmaster and his family only and not for teachers and pupils. If ICT resources like computers and the internet are extended to the teachers in such instances, a different story can be told.” (Focus Group Discussion Participant FGDCRG, 18 September 2017)

The ECD teachers narrated their experiences of not being able to access available ICT resources due to shortages and restrictions set on them (see participants ICH4, IMW2 and FGDCRG above). At participant ICH4’s school, ICT resources were mainly used for administrative purposes and ECD teachers booked the resources for use when the administrators were not using them. ICT resources were only used by teachers and learners in upper grades at participant IMW2’s school. Focus group participant FGDCRG’s school internet-enabled WiFi connection was only being used by the administration staff (the headmaster and his assistants). Putting limitations on available ICT resources directly restricts access for the ECD teachers. Govender (2006, p. 176), suggested that educators may first need to be comfortable using technology for simple administrative purposes before they can use it for teaching and learning processes, which can help them realise the key benefits of using ICT in ECD education.

The ECD teachers that participated in this study believed that if the available ICT resources were to be shared they would be in a better position as far as ICT integration in ECD education is concerned. On the contrary, the position that those in the administration are the only ones privileged to use the available ICT resources, may also negatively influence the ECD teachers' attitude towards ICT integration. The next sub-section discusses the "lack of electricity" as one of the key challenges of ICT integration emerging from the study.

8.3.5 Lack of electricity

The literature review section noted that 67% of the population in Zimbabwe is situated in the rural areas where there are electricity challenges (ZimStat, 2013). The education ministries acknowledge the existence of this challenge, indicating that is a need to electrify these areas for successful ICT integration in education (Konyana & Konyana, 2013; MoPSE, 2016c, 2017). The ECD teachers also highlighted the existence of this challenge in their school environments as evidenced in the statements below:

"Remember, we are in the rural areas and there is no electricity, and ICT resources are inadequate." (Interview Participant ICH4, 20 September 2017)

"We have been facing the challenges of not having electricity and computers to teach at the school." (Interview Participant IGT3, 21 September 2017)

"The other problem would be electricity to power the ICT resources in such a community." (Focus Group Discussion Participant FGDCRC, 18 September 2017)

The lack of electricity has been cited as one of the major challenges faced by schools situated in rural communities (see participants ICH4, IGT3 and FGDCRC above). As noted in Chapter One, ICT resources are dependent on the existence of a power source, which can be in the form of a generator, a renewable source (like solar energy), batteries or electricity from the national grid.

Table 8.1: Most significant factor that might prevent computer use

Response	Frequency	Percent	Cumulative Percent
Other	9	2.9	2.9
Not interested	3	1	3.9
No time	4	1.3	5.2
No electricity	45	14.7	19.9
No computer skills	82	26.8	46.7
No computer	93	30.4	77.1
I use a computer	70	22.9	100
Total	306	100	

(Field data: 2017)

According to MoPSE (2016c, p. 4),

in terms of ICT-related infrastructure, as at June 2015, about 47% of schools in Zimbabwe had electricity from the national grid with an additional 10% accessing power from alternative sources such as solar and generators.

This challenge is more pronounced for ECD teachers deployed in areas where development has been slow, like the Zimbabwean rural areas. However, in spite of the existence of the electricity challenge, only 14.7% indicated that the lack of electricity may hinder them from using a computer (see Table 8.1 above). The next sub-section reports on the economic situation in the country as a sub-theme that emerged from the qualitative data collection.

8.3.6 Economic situation and financial constraints in the country

As noted in the literature, Zimbabwe has been experiencing economic challenges, which have negatively affected the education sector (Chagonda, 2010a; Mhlanga, 2016; Shizha & Kariwo, 2011; Tarisayi & Manhivi, 2017b). Participants highlighting the effects of the economy on the integration of ICT in ECD education said:

“I can safely say that it is not adequate because looking at our economy, the school may not be able to secure all the equipment that I need to help me achieve maximum ICT integration in my ECD classes.” (Interview Participant IMA4, 14 September 2017)

“Right now, the situation in Zimbabwe is such that finances are a problem. It is a strain for the schools, everyone is trying to do what they can and if that is not a priority (it is not that they don’t want to do it) they don’t do it... Yes, funding. Right now, the main problem everywhere in Zimbabwe is just funding related. It is not like we are in a society where people are saying, “No, we don’t want our children to learn about ICT”, it is the funding that limits and makes it difficult to get what the children need. In the individual homes, some parents can’t afford these things, which is most of them.” (Interview Participant IMA3, 14 September 2017)

“Besides the financial constraints that everyone is experiencing in Zimbabwe, there is a lot of resistance because they don’t view it as an important initiative for the education of their children.” (Interview Participant ICR2, 18 September 2017)

The ECD teachers blamed the economy for their schools’ failure to procure ICT-related equipment. Participant IMA3 and ICR2 above believed that the lack of funds was a common problem for the Zimbabwean general populace. According to Mapolisa and Tshabalala (2013, p. 2264),

inadequate and operational deficiencies point to one conspicuous causal factor: lack of resources as a result of the collapse of the economy ... Many teachers left the education system to work outside the country and those who remained joined better-paying sectors within the country.

Chapters Five and Six reported on the ECD teachers’ attitudes and discovered that the teacher’s salaries were pegged just above the poverty datum line (see sections 5.3.4 and 6.1.1.1), which may negatively contribute to their intrinsic and extrinsic motivation to integrate ICT into their teaching and learning processes. According to Ertmer (cited in Haelermans, 2017), challenges can be classified into two categories (first and second order). Ertmer defined first-order challenges as those that are extrinsic to the teacher (i.e. ICT resources, services, training and support) and second order challenges as those that are intrinsic to the teacher and more cognitive.

However, based on the views discussed above the status of the economy might have a negative effect on the integration of ICT since it affects the procurement of ICT resources, services and training. The Zimbabwean economy has been experiencing challenges that have resulted in cash shortages and lack of funding for schools trying to integrate ICT into their teaching and learning processes as pointed out by participant IMA3 and ICR2 (Chagonda, 2010b; Makochekanwa, 2009; Moyo, 2013; Shizha & Kariwo, 2011; ZIMCODD, 2016). Rogers (2003), explained how external factors can motivate one's decision to either adopt or accept a technological innovation. The excerpts below highlight the existence of financial constraints in the country affecting both ECD teachers and schools:

"I think the school is financially crippled, the fees are very little. Parents cannot afford higher fees because it is a rural school. Plus, we don't have any other project to support such activities, we only rely on fees." (Interview Participant IGT4, 21 September 2017)

"Since most of the challenges are due to financial constraints, I think it may be very difficult if there is no funding availed for this purpose. We could also mobilise resources from parents and other stakeholders." (Interview Participant ICH4, 20 September 2017)

"As it stands like now, I don't see it being fully implemented in rural areas because in rural areas they have bigger financial constraints." (Interview Participant ICR1, 18 September 2017)

There were varied perspectives about the existence of financial constraints as evidenced in the excerpts above. Participants IGT4 and ICR1 emphasized that their schools had financial constraints resulting from the fact that they were located in rural areas. The ECD teachers also indicated that financial constraints were a force to reckon with, which could hinder the integration of ICT in both urban and rural areas. The data that has been reviewed thus far, implies that the authorities have challenges resourcing schools with ICT resources and services such that teachers have had to use their own ICT devices to make teaching and learning possible. This has, however, resulted in the ECD teachers using their own money to repair ICT equipment, which may break down during the lesson times. The next sub-section

discusses the sub-theme “*use of personal ICT devices at own expense when personal ICT devices break down*”.

8.3.7 Use of personal ICT devices and own expense when school equipment breaks down

Some participants further revealed that they were integrating ICT in their teaching and learning processes using their personal ICT resources because their schools were unable to provide them with the required devices and services (this sub-theme was also reported in Chapter Seven). Statements highlighting this sub-theme are:

“We have been using our own devices like in my case I use my smartphone to demonstrate what a smartphone looks like and to play stories for my ECD class. This is a disadvantage for the ECD children because they never get to interact with the ICT devices.” (Interview Participant IMW2, 19 September 2017)

“There is a time that I have used my own personal laptop. There is a limited amount of activities that you can do with one personal laptop when you have 20 pupils and because it is a personal laptop you cannot allow each child to handle it as there is no guarantee that if anything happens to my laptop I will be reimbursed.” (Interview Participant IBK1, 25 September 2017)

“I am using my personal computer and smartphone and everything else that I use is my own because the school doesn’t have anything of its own.” (Interview Participant IBK4, 25 September 2017)

The excerpts (see participants IMW2, IBK1 and IBK4 above) implied that some of the ECD teachers that participated in this study may have gone past the persuasion decision-making level of the diffusion of innovations theory (Rogers, 1995, 2003). The participants understood the benefits that come with using ICTs in education because they had resorted to using their personal ICT resources to help their schools, which did not have enough ICT resources. However, the challenge comes when there is a need for young learners to interrogate the ICT resources (see participants IMW2 and IBK1). They expressed that it may not be a tenable arrangement for them to allow the ECD pupils to interact with their personal ICT devices as

the schools had in some occasions made them pay for the repairs of their personal ICT resources when they broke down. This also emerged from the statements noted below:

“The other challenge is that even if I look for a laptop to use in the class if it breaks down the expense is always pinned on me. It is because of these risks and shortcomings that most teachers fail to improvise.” (Focus Group Discussion Participant FGDGTC, 21 September 2017)

“Most of the working ICT devices that I use in my classes are personal and I have to maintain and get my ICT devices repaired when they break down because the school does not cater for that.” (Interview Participant ICH1, 20 September 2017)

“It becomes very difficult for me to hand over the gadget to the learners because if it breaks down, the expense is on me for trying to impress the learner whose school is not able to procure ICT devices.” (Focus Group Discussion Participant FGDGTA, 21 September 2017)

If the participants (ECD teachers) were expected to finance some of the activities and repairs associated with the integration of ICTs in ECD (as in the cases of participants FGDGTC, ICH1 and FGDGTA above), some of them may have found it difficult to integrate them into their teaching and learning processes. This confirmed the teachers’ trade unions’ claim that the ministry rushed the implementation of ICT and other learning areas without considering the issue of resources (as reported by Pindula News, 2017a). Pindula News (2017b) also reported that the trade unions strengthened their claim by highlighting that the implementation of the new curriculum was forcing teachers to use their own funds due to a lack of resources. Leaving the challenges noted in the sub-themes reported in this sub-section unaddressed could slow down ICT integration in ECD education. The next sub-section reports on the sub-theme *“absence of ICT infrastructure in primary schools”*.

8.3.8 The absence of ICT infrastructure in primary schools

The literature noted the absence of ICT-related infrastructure in primary schools as one of the major barriers to ICT integration in education (see studies by Bahati, 2010; Farmery, 2014; Gumedze, 2017; Kanyongo, 2005; Kelentrić, 2013; Konyana & Konyana, 2013; Markon, 2013;

Masango, 2014; MICTPCS, 2016; Munyengabe et al., 2017; Ramakrishna, 2013; Raulston, 2009; WOZA, 2009 for a detailed review of discourses on Infrastructure for ICT education). This study also confirmed that there was a perceptible absence of ICT infrastructure in the primary schools where the participants were deployed with the following statements:

“The parents have challenges to buy even one computer for the school. That is the computers and the infrastructure for the computer laboratories where these computers will be stationed because if there is inadequate infrastructure those computers won’t be safe and secure.” (Interview Participant ICR1, 18 September 2017)

“In schools where there is no ICT infrastructure, teaching ICT is like a white elephant because the government cannot expect the teacher to always take from his or her pocket filled with meagre resources.” (Focus Group Discussion Participant FGDGTB, 21 September 2017)

“We really don’t know what they expect us to do under such circumstances. How can they introduce something when schools don’t have the necessary infrastructure?” (Interview Participant IBK2, 25 September 2017)

The statements presented above clearly outlined that the lack of infrastructure to support ICT activities in the form of facilities like computer laboratories and media centres for the ECD department was a common problem in primary schools. In Saudi Arabia, Al-Sulaiman (2010, p. 111) identified lack of infrastructure for ICT as one of the main barriers to ICT integration in education cited by participants in his study. If there are no physical structures in the form of buildings constructed to securely keep ICT equipment and provide an environment conducive for teaching ICT in the primary schools, chances are high that it may never be formally adopted in those areas until the challenge has been addressed. Participant IBK2 above, rhetorically asked what the authorities (government) expected them to do when they failed to provide them with the necessary ICT infrastructure at the primary schools; while focus group participant FGDGTB believed that “teaching ICT is like a white elephant” in areas where there was no infrastructure constructed for ICT teaching and learning processes.

According to Chung (1990, p. 191), “since 1980 primary school buildings are constructed by local authorities and parents using their own resources. Secondary schools are constructed by government”; a situation which the ECD teachers in this study clearly wanted a change in. The ZIMASSET economic blueprint also spelt out how it intended to make the nation, “computer literate by lifting all district education and ICT infrastructure by 2018” (Government of Zimbabwe, 2013). However, this may be a pipe dream since 2018 has passed and this study’s participants confirmed that their schools had not yet received the ICT-related infrastructure spelt out in the ZIMASSET national agenda that spanned from 2013 to 2018. As noted in the literature review, AfDB (2013), asserts that the World Bank, the AfDB and the ITU have been sponsoring projects aimed at closing ICT infrastructure gaps across the African continent. The Zimbabwe ECD education could also benefit from such initiatives if projects of this nature were to be steered from a national level. The next sub-section discusses the sub-theme “*ignorance of the importance of ICT in ECD education*”.

8.3.9 Ignorance of the importance of ICT in ECD education

When the participants were asked what they thought could be making the parents, school development committee and school heads provide limited support towards ICT integration programmes at their schools, some of the participants expressed that they believed that the non-support of ICT programmes was due to ignorance and resistance to change resulting from lack of education about the benefits of ICT in ECD education. The participants’ remarks related to this sub-theme are presented below:

“I think it is because of ignorance and lack of education. They need to be schooled on the importance of ICT in the education of their children. If they knew, I believe that they could sacrifice something for the education of their children.” (Focus Group Discussion Participant FGDGTI, 21 September 2017)

“I think it is because of ignorance and resistance to change. I believe most of them don’t even know what ICT is.” (Interview Participant IGT4, 21 September 2017)

“I also think it is an issue of ignorance because, to be honest almost all working members of this community have migrated to the neighbouring countries to

seek employment. At times, they leave their children behind with the grandparents who may not be in a position to advise the parents accordingly when they come back to Zimbabwe. When the parents send them money, they would always prioritise buying food because they don't know the value of education.” (Focus Group Discussion Participant FGDGTH, 21 September 2017)

Participants FGDGTH and FGDGTI above emphasised that the parents' ignorance of ICT-related programmes was a case of misaligned priorities. The economic situation in the country discussed in Chapters Two and Six above has also been negatively affecting the parents, who may in some cases have to choose between supporting their children's school activities over using the funds they get to buy food items for survival (as indicated by participant FGDGTH above). In some cases, the guardians would be grandparents who would have been left with the responsibility of supporting the young learner whose parents would have migrated to a neighbouring country to look for employment opportunities. This means that in such situations, expecting the guardian, parent or community to foot the ICT integration bill could remain a wish that is difficult to fulfil. In such cases, authorities (governing bodies like the MoPSE) may need to find ways to help marginalised communities integrate ICT into ECD education. According to Rogers (1983, p. 92):

The pro-innovation bias is the implication of most diffusion research that an innovation should be diffused and adopted by all members of a social system, that it should be diffused more rapidly, and that the innovation should be neither re-invented nor rejected ... This lack of recognition of the pro-innovation bias makes it especially troublesome and potentially dangerous in an intellectual sense. The bias leads diffusion researchers to ignore the study of ignorance about innovations and to underemphasize the rejection or discontinuance of innovations.

Ignorance is cyclic and will keep on resurfacing if it is not broken by replacing it with the proper education on the technological innovation (ICT integration in ECD education), and “the most cost-effective strategy to achieve this would be to target the IT capabilities of teacher educators” (Underwood, 1997, p. 156). When such programmes are rolled out, there is an imperative need to pre-educate all stakeholders on the technological innovation being introduced and highlighting their role in making it a success – what they are expected to do.

The next sub-section is a discussion of a sub-theme highlighting that the ignorance of all stakeholders results in them not prioritising the ECD education department in the country.

8.3.10 Prioritisation of the ECD department

The ECD teachers emphasised that they believed the ECD department is at times given the lowest priority in Zimbabwean primary schools (see section 6.3.3 reporting on perceptions and statements from the researcher's conversation with participant FGDCRE, IMW1, FGDCRC, FGDCRA and FGDZKF below). In support of this they said:

*"We have submitted our concerns on the inadequacy of ICT resources to the departmental key teacher, and up to now two years later we haven't got a satisfying response. They always put the lowest priority to the ECD department. The departmental key teacher sits on the procurement committee and the message she brings back is **"Teacher weECD zvionere"** (text in the Shona native language - meaning you are on your own as an ECD teacher, therefore you must find ways to get it done), the resources are unavailable you can find or use your own. In some instances, you will be the one to demonstrate the dancing that can be better demonstrated through the use of ICT in educational videos."* (Focus Group Discussion Participant FGDCRE, 18 September 2017)

"There is a need to prioritise the ECD department as most people (even the administrators) think that the department is for playing and not learning thereby making the other teachers and departments view it as a less important department. Hence, when resources are limited, the department is at times not even considered for the resources." (Interview Participant IMW1, 19 September 2017)

"Taking an example of me as an ECD teacher, if an event or something happens at school and a teacher is needed, they first come to the ECD class. They come to take the ECD teacher to attend to the issues because they think your work is just playing with the kids. "ECD teacher come and label these chairs", at the expense of the kids. So, they don't even value these kids, they think the teacher is being wasted and he or she is being paid for nothing because there is nothing

he or she is doing in the ECD classroom with the three-year old kid.” (Focus Group Discussion Participant FGDZKF, 26 September 2017)

The participants narrated how the administrators at their schools put the lowest priority on ECD-related activities based on their perception of ECD education. Participants IMW1 and FGDZKF expressed that their school authorities thought that ECD education is all about playing games and therefore, no ICT-based learning should take place at that level yet. Participant FGDZKF further reported how he or she was made to do menial tasks like labelling chairs because the administrators regarded him as a teacher being wasted on young learners and paid for playing games with the pupils. Despite the fact that the teacher/administrator in charge of the ECD department sat on the procurement board (as reported by FGDCRE above), it is alarming that some schools left the responsibility of ICT resourcing with the ECD teachers. The existence of this challenge may be the reason why some teachers had negative attitudes that were reported in sub-section 6.3.2.

Failure to deal with this challenge early means that teachers in the ECD department, who in this context felt and believed that their department was being treated as an inferior department when compared to the other educational departments in primary schools, may always be the reason for the slow adoption of any technological innovation to be introduced in the future. This study established that whenever the resources were few the ECD education department got the lowest number of resources, which would eventually result in them sharing the available ICT resources to enable them to teach and create a learning environment through using ICTs. Richter (2016), reported that economies prioritising ECD have been steadily growing when compared to those that have not put a priority tag on ECD. She believes that breaking the poverty cycle by ensuring that ECD children and services are well financed can potentially foster development, which can be realised in the future of ECD children at least 10 years later. Realising that this helps, the World Bank has also been investing in ECD and encouraging developing nations to do the same (Bernard van Leer Foundation, 2015; Sayre, Devercelli, Neuman, & Wodon, 2015).

If ECD-related investments have been helping to grow some developing countries' economies, the Zimbabwean government must have picked it up when it formally introduced ECD education in 2005 (as noted in the literature review, see sub-section 1.1.3 and 2.3.1).

However, the lack of prioritisation of ECD education at all levels revealed by the participants in this study should be an area of concern for the education ministries going forward. The next sub-section is a discussion of the limited time allocated for ICT based lessons and activities due to the sharing of available ICT resources.

8.3.11 Limited time allocated for ICT-based lessons and activities

Some of the challenges discussed above (like low computer to pupil ratio and teacher to pupil ratio, inadequate ICT resources and services, the absence of ICT infrastructure in primary schools and the existence of shared resources) affect how ICT will be used for teaching and learning processes. Statements supporting the inadequacy of time allocated for ICT-based activities from participants of this study have been noted below:

“We share resources and our time is taken when the learners move from the classroom to the computer laboratory. I think it could help if we had the computers in our classrooms, and the time allocated for the subject was increased as we are supposed to integrate it with other subjects as well.”
(Interview Participant IZK2, 26 September 2017)

“I think 20 minutes is not enough for a lesson to be conducted with 51 ECD learners in an environment with shared resources. To solve this problem, I think lesson time for ICT should be doubled per day so that there is one block lesson and the number of days is reduced for a stipulated time until all schools have [been] fully resourced and integrated.” (Interview Participant IGT4, 21 September 2017)

“Our lessons are 20 minutes long and with the ECD learners, 20 minutes in a laboratory is something else. We end up using only 10 minutes because the other 10 minutes will be spent walking to and settling into the new environment.” (Interview Participant IMA4, 14 September 2017)

ICT facilities for the participants’ schools (see IZK2 and IMA4 presented above) were shared and located away from the ECD classrooms, which made it difficult for them to use all the time allocated for ICT-based activities as some time was spent walking to the ICT laboratory

before the lesson could start. The ECD teachers described the nature of the learners as one of the factors that limited time in an ICT resource-shared environment (see participant IMA4). Based on their scenarios, the ECD teacher may need to get them settled and focused before he or she can delve into the main part of the ICT based lesson. Gumedze (2017), also confirmed that lack of time to learn, use and access ICTs in the teaching and learning space were disenablers of ICT integration in Swaziland.

His findings were consistent with this study's findings that there are inadequate time allocations for ICT teaching and learning processes, which may be a result of the time allocators not considering the resource constraints that exist in their environments. Some of the ECD teachers (see participants IZK2 and IGT4 above) who participated in this study suggested that increasing the ICT lesson time by consolidating all the ICT time slots into one block period could potentially solve the problem in environments where resources are shared. A variant perspective highlighting that the location of a school poses a challenge for the integration of ICT in ECD education also emerged. Therefore, there is a need to consider constructing ICT facilities near ECD classrooms in under-resourced environments. The next sub-section gives an account of the participants' perceptions of where their schools are geographically located in the country as an ICT integration challenge.

8.3.12 The rate at which ICT is integrated affected by school location

ECD teachers deployed to schools that are situated in the rural areas, which included Gutu, Mwenzezi and Zaka district were of the view that their learners were at a disadvantage when compared to the ones found in a district that had more urban and peri-urban areas like Masvingo. Key statements with views that trended discussions throughout the qualitative data review are presented below:

“The fact that our children are situated in the rural areas automatically makes them disadvantaged because on top of the general challenges that are common to everyone, like lack of ICT resources they don't have electricity, which makes it even more difficult to teach ICT.” (Interview Participant IGT3, 21 September 2017)

“The School Development Committee (SDC) and the school administration are willing and in support of such activities because they talk to the parents about these issues but the school is situated in a rural area and raising funds for buying ICT resources can be a mammoth task. (Focus Group Discussion Participant FGDMWD, 19 September 2017)

“Learner experiences are definitely different because the rural pupil will be experiencing ICT from a picture while the urban pupil will be experiencing it from a resourced classroom. At this stage, learners learn through manipulation and the rural learner will always be at a disadvantage if this is not addressed.”
(Focus Group Discussion Participant FGDGTB, 21 September 2017)

ECD teachers located in rural areas felt that their ICT educational experience was not fair for them and their pupils because their communities were underdeveloped when compared to the urban areas. They cited lack of electricity, financial constraints and use of personal resources (these problems have already been discussed in the sub-sections above) as the key barriers to ICT integration haunting schools located in the rural areas (this is consistent with what was found by Chikutuma & Mawere, 2013; Gomba, 2016; Konyana & Konyana, 2013; MICTPCS, 2015; MoPSE, 2016c; and Tongkaw, 2011). One of the participants from Masvingo District (FGDMAG) confirming that the ECD pupils found in urban areas may actually be more exposed to ICT when compared to the teachers said:

“My view is that our geographical location is such that the catchment area is highly populated and urbanish. The ECD learners might actually know more than what the teacher knows in terms of ICT.” (Focus Group Discussion Participant FGDMAG, 14 September 2017)

The participants also revealed that the terminology used in ICT also poses a challenge for them and their ECD pupils who may at times be taught in the local languages. This sub-theme is discussed in the next sub-section.

8.3.13 Terminology too complex for learners to articulate

This study also noted that some ECD teachers may be having challenges teaching ICT as a learning area in the ECD department due to the terminology used. Excerpts in support of this sub-theme have been displayed below:

"I think another challenge is the terminology that we are to use when teaching the little children. ICT has big words and to break them down for the kids to understand is also quite a challenge to us as ECD teachers because when we are trained we are trained using the big words." (Interview Participant ICH3, 20 September 2017)

"This is evidenced in some of the words or terms to describe ICTs that we learnt. The words seem to be very big words at this level, my experience has been that the ECD pupils have difficulty comprehending these words and I end up using abbreviations like CPU." (Focus Group Discussion Participant FGDCHG, 20 September 2017)

"It is a fairly complex area in that it introduces too many big words to the ECD learner whom we are trying to teach basic language concepts with the proper pronunciation." (Focus Group Discussion Participant FGDMAE, 14 September 2017)

The policy in Zimbabwe was

amended in 2006 to enable the mother tongue to be the language of education up to the end of primary school (Education Act, 1987b). Section 55 of Part X1 (revised 1990 and 1994) of The Education Act (1987a) stipulated that children in Grade 1 up to Grade 3 should be taught in the mother tongue in all subjects and that English becomes one of the subjects (Ndamba, van Wyk, & Sithole, 2017, p. 1).

This stipulates that infant children (ECD included) should be taught in their local language, a position which the ECD teachers in this study are having challenges with when it comes to teaching ICT. Ndamba (2010) and Ndamba, Wyk and Sithole (2017) found that their participants (who were infant level teachers) preferred English as the language of instruction if they were to be given a chance to choose between the local languages (Shona and Ndebele)

and the English language. ECD teachers who participated in this study revealed that the words for describing ICT resources and services may be considered to be “big words”, which in turn makes the area fairly complex for them to teach and for the young learner who will still be learning basic language formation like pronunciation. Participant ICH3 above confirmed that their training may have introduced the “big words” to them but they, however, find it difficult to break them down for the ECD learners; while participant FGDCHG reports that he or she ends up using abbreviations like CPU to refer to ICT equipment.

“An initial step in studying specific matters concerning the use of ICT in school education is addressing the issue of terminology and language”, (Fluck, 2003, p. 10). Ndamba, Wyk and Sithole (2017, p. 1) found “that participants strongly believed that the English language offers socioeconomic opportunities, a factor which may negatively influence teachers in the implementation of the mother tongue-based policy”. However, in the context of this study, to address the terminology problem there is a need to translate commonly used ICT terms to vernacular languages found in Zimbabwe to simplify ICT words for ECD teachers and learners who are currently having lessons in the local languages. The next sub-section is a discussion of the above results.

8.4 Discussion of above results

The findings show that ICT resources, services and instructional material constraints were the most prevalent challenges indicated by ECD teachers in this study (see Figure 5.1 in Chapter Five, which shows the most frequently used words tag cloud). ECD teachers who participated in this study indicated that there are serious ICT resource constraints, which are also their largest barrier when it comes to ICT integration in teaching and learning processes. This is consistent with the findings discussed in the literature review (refer to studies by Chikutuma & Mawere, 2013; Chiparange, 2016; Chitanana, 2009; Dozva & Dyanda, 2012; Konyana & Konyana, 2013; Makuvaza & Gatsi, 2014; Manaligod, 2012; Mashile, 2016; Pohio, 2009; and Zaitz, 2016).

In addition to the ICT resource challenges, this study also confirmed that ICT integration programmes were introduced without making sure that there are requisite textbooks and instructional materials in primary schools. These findings affirm the 1999 Presidential

Commission of Inquiry's findings that "there is a tendency to introduce new subject areas without the requisite textbooks, equipment and expertise" (Nziramasanga, 1999, p. 243). In spite of the dearth of ICT resources, services, textbooks and other instructional materials, the large majority (about 72% – see Table 7.6 in Chapter Seven) of the ECD teachers indicated that they were already using ICTs in teaching and learning processes. This chapter's findings are consistent with the ECD teachers' attitudes that are mostly positive (see Table 6.1 in Chapter Six on attitudes).

Qualitative data also revealed that there were low ICT device to pupil and teacher to pupil ratios, which in some instances were as low as 1:75 and 1:44 respectively. The low ICT device to pupil ratios in primary schools are a result of the ICT device shortages that exist in primary schools. According to ECD education policies, the teacher to pupil ratio should not exceed 1:20 to ensure that quality is maintained (Guta, 2017; Makuvaza & Gatsi, 2014; MoPSE, 2016c, 2017; Nhaka Foundation, 2012). However, it seems the requirements of this policy are not being met as ECD teachers have classes that have more than 20 pupils (Chikutuma, 2013; Chikutuma & Mawere, 2013; Dozva & Dyanda, 2012). In the context of this research, this not only affects the quality of education but it also negatively affects the rate at which ICT is integrated into ECD education. The participants reported that it is a mammoth task to teach such big classes when they are also faced with ICT resource constraints.

In primary schools where there are ICT resources and services, it emerged that there is a lack of age-appropriate ICT equipment and the available resources may be restricted to administrators and other departments. The participants who are also child specialists expressed their views towards the ICT equipment that was allocated to the ECD department. They were advocating for developmentally appropriate equipment and infrastructure, which can accommodate the young learner with ease. Kalaš (2010), reports that Developmentally Appropriate Technology in Early Childhood (DATEC), a framework for identifying the appropriateness of ICT tools (hardware and software) could be used to design and procure ICT tools for educational environments similar to the ones found in Zimbabwean ECD centres.

In some primary schools, ICT infrastructure, resources and services exist. However, ECD teachers have no access to it because it may have been restricted to or reserved for administrators, the school head and his family. Even though, Govender (2006, p. 176),

suggested that educators may first need to be comfortable using technology for simple administrative purposes before they can use it in teaching and learning processes, the fact that the ECD teachers do not have access to the available resources slows down the process of ICT integration in these schools because they may never get a chance to use the available resources until more resources have been procured.

The lack of electricity at schools situated in rural areas was another trending sub-theme. The literature noted that about 67% are situated in the rural areas, while only 47% of the schools in Zimbabwe are connected to the national electricity grid (MICTPCS, 2016; MoPSE, 2016c, p. 4; ZimStat, 2014). ICTs are reliant on energy sources that include grid electricity, solar power and generators for optimal performance. The challenges of poor and no infrastructure for electricity and other energy sources may prevent ECD teachers deployed in rural areas from leveraging on the power of ICTs in their teaching and learning processes.

The economic situation and financial constraints in the country were used to explain the negative attitudes of the participants of this study (see sub-sections 6.4.2 and 8.3.6). In this chapter, the duo was discussed as potentially the key barriers slowing down the integration of ICTs in Zimbabwean ECD education. The country has been financially constrained for a very long time to the extent that almost 98% of MoPSE's national budget allocation has been allocated to educators' salaries (UNICEF, 2015, p. 1). Recently, there has been a cash crisis negatively affecting everyone in the country, where all imports and cash withdrawals go through a vetting process that can leave one without the permission to withdraw if the request has been deemed a low priority (Mlambo, 2016; The Zimbabwean, 2016; ZIMCODD, 2016). The participants who were at times blaming the government for their schools' failure to procure ICT resources, revealed that they were not spared by the economic crisis as schools are no longer able to raise funds required to procure ICT equipment (Chagonda, 2010b; Gukurume, 2010; Makochekanwa, 2009; Moyo, 2013).

It also emerged that ECD teachers are using their personal ICT devices and monetary resources to integrate ICT into their lessons. This is consistent with the literature, which reported that the lack of resources has led to teachers being forced to use their personal resources to enable teaching and learning to take place in some primary schools (Pindula News, 2017a, 2017b). ECD teachers in this study perceived that the introduction of ICT as a

learning area, and teaching and learning tool is a move that has been imposed on them without considering the issue of ICT resources and infrastructure, which is key to the success of ICT integration in ECD education.

Revealing that ECD education in Zimbabwe is characterised by an absence of ICT infrastructure in primary schools, participant FGDGTB (see sub-section 8.2.8) said, “teaching ICT is like a white elephant”, referring to its poor implementation in some primary schools due to the lack of ICT resources and infrastructure. It was noted from the analysis that at times schools may be in a position to procure ICT equipment, but the non-existence of infrastructure and lack of funds to construct ICT facilities puts no guarantee on the security of the equipment should it be procured. This finding confirmed those from previous studies (see studies by Bahati, 2010; Farmery, 2014; Gumedze, 2017; Kanyongo, 2005; Kelentrić, 2013; Konyana & Konyana, 2013; Markon, 2013; Masango, 2014; MICTPCS, 2016; Munyengabe et al., 2017; Ramakrishna, 2013; Raulston, 2009; WOZA, 2009 for a detailed review of discourses on Infrastructure for ICT education).

The other challenge noted is the parents’, the school development committees’ and school heads’ ignorance of the importance of ICT in ECD education and resistance to change resulting from their lack of education about the benefits of ICT in ECD education. Rogers (1983, p. 92) reports that there is a pro-innovation bias that misleads some researchers and system implementers into thinking that a technological innovation should be “diffused rapidly and adopted by all members of the social system”. However, this may not always be the case as evidenced by the existence of some members resisting the change in this study because they did not receive sufficient education about technological innovation, hence their ignorance. The ignorance displayed by the parents, school development committees and school administrators negatively affects the ECD teacher who is expected to steer the ICT integration programme in ECD education. Based on the participants’ remarks it also emerged that this challenge has led to the lack of prioritisation of the ECD department in primary education.

The participants narrated how their administrators are failing to prioritise the ECD department in some primary schools. It was noted that some ECD teachers were made to do menial activities at the expense of the ECD pupils because the school administrators perceived them as “play” teachers being wasted on the young learner. This is also evidenced

by the lack of ICT resources and infrastructure for the ECD department in some primary schools. Despite the MoPSE making notable efforts (which include publicly promoting ECD education) (Tshuma, 2017), the finance ministry validated the ECD teachers' "lack of prioritisation" claims when they refused the recruitment of 5,907 new ECD teachers, a move that would have improved the teacher to pupil ratios (Chinamasa, 2017, pp. 13–14). On the contrary, international bodies, including the World Bank and the UN, have been making efforts to make sure that ECD education is adopted in policy and well-resourced for the future (refer to studies by Bernard van Leer Foundation, 2015; Kim, 2016; Nziramasanga, 1999; Richter, 2016; Sayre et al., 2015; and UNICEF, 2015). Full ICT integration may be a difficult target to reach if ECD education is not prioritised from the lowest level.

The ICT resource constraints discussed above have also led to the limitation of time allocated for ICT-based lessons and activities as it is very difficult for some schools to implement teaching ICT as a learning area. The ECD teachers who participated in this study revealed that some of the lesson time is taken by the time they take to walk to the ICT facilities, which may not be located in the same building and getting the young learners settled. Some participants suggested that there is a need to consolidate ICT time into block/double periods to cater for the resource constraints that exist in some schools. They also believe that their administrators who draft the timetables ignore the existence of this challenge, even though it negatively impacts on their ability to integrate ICT into their teaching and learning processes.

Another variant sub-theme emerged when participants deployed in rural area primary schools reported that they believed that their pupils and they themselves may be at a disadvantage when compared to their colleagues deployed in urban and peri-urban primary schools. They cited lack of electricity, financial constraints and use of personal resources (these problems have been discussed in the sub-sections above) as the key barriers to ICT integration not common to schools located in the urban areas (this is consistent with what Chikutuma & Mawere, 2013; Gomba, 2016; Konyana & Konyana, 2013; MICTPCS, 2015; MoPSE, 2016c; and Tongkaw, 2011 found).

Lastly, it emerged that the "terminology used when referring to ICT-related issues may be too complex for learners at ECD to articulate". It was also noted that ECD teachers are allowed and expected to teach in the local languages found in Zimbabwe, as the English language is

hardly spoken when the ECD learners are at home (Ndamba et al., 2017), which makes it very difficult for them to translate some of the ICT terms native to the ICT learning area. Fluck (2003, p. 10) highlighted that “an initial step in studying specific matters concerning the use of ICT in school education is addressing the issue of terminology and language”. Therefore, there is an urgent need for the encouragement of the writing and publication of ICT education textbooks in the local languages to permanently address this challenge. The next sub-section concludes this chapter.

8.5 Conclusion

This chapter presented findings related to challenges faced by ECD teachers in trying to integrate ICTs in teaching and learning processes. Challenges noted include: ICT resources, services and instructional material constraints; low ICT device: pupil and teacher to pupil ratios; the non-existence of age-appropriate ICT equipment in ECD centres; available resources being restricted to administrators and other departments; lack of electricity for schools situated in rural areas; the economic situation and financial constraints currently being experienced in the country; use of personal ICT devices by ECD teachers who are expected to pay for the expenses associated with repairs when they break down; the absence of ICT infrastructure in primary schools to support ICT-related activities; ignorance of the importance of ICT in ECD education; the lack of prioritisation of the ECD department in primary schools; limited time allocated for ICT based lessons and activities; and ICT terminology too complex for learners to articulate. The next chapter is an attempt to answer the research question, ***“What is the best predictor of educators’ attitudes towards ICT integration in ECD education?”***

Chapter Nine – Best Predictor of ECD Teachers’ Attitudes

9.1 Introduction

The previous chapters identified ECD teachers’ attitudes towards ICT integration, ICT competencies and the challenges they are faced with in trying to integrate ICT into their ECD classes. While educators’ attitudes have been identified as strong predictors of ICT use (Attuquayefio & Addo, 2014; Banaji & Heiphetz, 2010; Samaradiwakara & Gunawardena, 2014), they can also be used to predict and explain users’ behaviour towards technology adoption (Ajzen & Fishbein, 2005; Copriady, 2014; Culbertson, 1968; Kabakçi-Yurdakul et al., 2014).

It is against this background that this study attempts to identify the best predictor of ECD teachers’ attitudes towards ICT integration based on the data collected from them. To determine the best attitude predictor, simple correlations were considered to identify independent variables and then multiple regressions were applied to the quantitative data. Multiple linear regression is a statistical technique employed to show the effect that two or more independent variables have on a dependent variable (Nathans, Oswald, & Nimon, 2012). The ECD teachers’ attitude towards ICT integration was the dependent variable and the independent variables were cultural perception and computer attributes in the first regression; the individual computer attributes (relative advantage, compatibility, complexity and observability) in the second regression; and IS constructs from other models, which are related to the UTAUT in the third regression. This chapter is set to answer the critical question, *“What is the best predictor of educators’ attitudes towards ICT integration in ECD education?”* by presenting and discussing the key findings in this study.

9.2 Research question four: What is the best predictor of educators’ attitudes towards ICT integration in ECD education?

After identifying the ECD teachers’ attitudes, assessing their ICT competence levels, computer use and the challenges they encounter when they try to integrate ICT into their teaching and learning processes, it became critical to further identify the best predictor of their attitudes towards ICT integration in education based on theoretical models previously used. This

section attempts to answer research question four by identifying the best predictor of ECD teachers' attitudes towards ICT integration in ECD education. The Diamantopoulos and Schlegelmilch's (2000) recommendations were employed to determine the independent variables that correlate with the attitudes towards ICT integration (dependent variable). Computations of cross-tabulations and Spearman correlations were obtained from SPSS. All cross-tabulations of constructs selected to be independent variables against the dependent variable were based on a 95% confidence interval. The sections below are a presentation and critical analysis of the computed data relating to the best predictor of attitudes.

9.2.1 Regression one – ECD teachers' attitudes as a function of computer attributes and cultural perception

Figure 6.5 and Table 6.1 presented in Chapter Six outlined the relationship between attitude and computer attributes. The duo indicated that the two variables were positively correlated. This proved the qualification of computer attributes in the modelling of the ECD teachers' attitudes towards ICT integration. Thus, the ECD teachers' perception towards the computer attributes was used as one of the independent variables in the first regression.

Aldosari (2007), Govender (2006), Gumedze (2017) and Thomas (1987) evaluated the educators' technology adoption perceptions of culture. According to Watson and Harper (cited in Albirini, 2006, p. 49), "in the field of education, it has been noticed that teachers' reactions to technological innovations are mediated by their cultural perceptions". Albrini (2006), highlights how most ICT innovation researchers have not been considering cultural perceptions in the evaluation of technology adoption. Based on these arguments, it became critical to explore how the ECD teachers perceived the impact and relevance of ICT in relation to their existing cultures and norms. This study quantitatively evaluated their cultural perceptions through the analysis of questionnaire items (see Appendix A, No. 15).

Table 9.1: Computer attitude*cultural perceptions - cross tabulation

Attitude	Cultural Perceptions					Total
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	
Strongly Negative	0	0	0	0	0	0
Negative	0	0	0	0	0	0
Neutral	0	0	3	0	1	4
Positive	0	4	134	65	0	203
Strongly Positive	0	1	54	41	3	99
Total	0	5	191	106	4	306

(Field data: 2017)

Table 9.1 illustrates the relationship between the teachers' computer attitudes and their cultural perceptions towards ICT. It was established in Chapter Six that the large majority of the respondents had generally positive to strongly positive attitudes towards ICT integration in ECD education. A total of 134 respondents with positive attitudes towards ICT integration had neutral cultural perceptions (see Table 9.1 above); while 65 indicated that they agreed about the effect of their cultural perceptions towards ICT integration. Only 54 respondents with strongly positive attitudes revealed that they had a neutral view of cultural perceptions and 41 expressed that they agreed to the effect of cultural perceptions towards ICT integration.

The minority of the respondents, that is three respondents, had a neutral view of both attitude and cultural perception; and one respondent with a neutral attitude score strongly agreed to the effects of cultural perception on the integration of ICT. Only three respondents with a strongly positive attitude strongly agreed that there was a significant effect of cultural perception on their uptake of ICT in ECD education. Noteworthy were four respondents and one respondent with positive and strongly positive attitudes respectively, who strongly disagreed with the effect of cultural perceptions on their ICT integration patterns. Based on the cross-tabulation presented in Table 9.1 above, the pattern of the points produced a linear

relationship between the ECD teachers' attitudes and their cultural perceptions towards the integration of ICT in ECD education.

Table 9.2: Symmetric measures for computer attitude^acultural perceptions

	Value	Asymptotic Std. Error ^a	Approx. T ^b	Approx. Sig.
Ordinal by Ordinal: Spearman Correlation	0.128	0.059	2.254	0.025 ^c
Number of Valid Cases	306			

(a) Not assuming the null hypothesis

(b) Using the asymptotic standard error assuming the null hypothesis

(c) Based on normal approximation

(Field data: 2017)

Table 9.2 above indicates a calculated Spearman rank-order coefficient of 0.128, with a standard error estimate value of 0.059. The corresponding T-value was 2.254, with a significant value of $p = 0.025$. The observed correlation was highly unlikely to have come about if there was no relationship between the two variables. Therefore, the null hypothesis was rejected and the study concluded that there was a relationship between the respondents' attitudes towards ICT integration and their cultural perceptions. The two variables were thus found to be positively correlated as noted in Table 9.2. However, the strength of the relationship was very weak as indicated by the magnitude of the Spearman rank-order correlation coefficient in the table.

The cross-tabulation and correlation computations presented above indicated that computer attributes and cultural perceptions qualified to be used as independent variables. Based on the computations made above, the study then used the independent variables to determine the best predictor of ECD teachers' attitude towards ICT integration in education. Multiple linear regression was performed using the SPSS to further qualify and rank the variables according to their order of influence on the ECD teachers' attitudes.

Table 9.3: Regression one analysis model summary ^b

R	R Square	Adjusted R Square	Std. Error of the Estimate	Sum of Squares	Df	Mean Square	F	Sig.
0.573 ^a	0.328	0.324	0.28192	11.765	2	5.883	74.016	^b

(a) **Predictors:** Computer Attributes and Cultural perception

(b) **Dependent Variable:** Attitude

(Field data: 2017)

Table 9.4: Coefficients^a for regression analysis one

Independent Variables	Unstandardised Coefficients		Standardised Coefficients	T	Sig.
	B	Std. Error			
Constant	2.297	0.192		11.976	0.000
Computer Attributes	0.479	0.040	0.571	12.102	0.000
Cultural Perception	0.017	0.035	0.023	0.483	0.629

(a) **Dependent variable:** Attitude

(Field data: 2017)

The results of the first regression analysis presented in Table 9.3 and Table 9.4 above reflected that only one variable influenced the ECD teachers' attitudes towards ICT integration at the 0.05 level of significance. It was evident that the ECD teachers' cultural perceptions did not make any significant contribution to the prediction of the dependent variable (ECD teachers' attitude towards ICT integration) since the significance value attained was greater than 0.05 and the T-value (0.483) was very low (it was closer to zero). The standardised estimates of the variable (computer attributes) that influenced the ECD teachers' attitudes were: (B = 0.441, T = 10.881, p < 0.05). The analysis of the first computed regression suggested that the greatest amount of variance in attitude among the ECD teachers could be explained by the computer attributes independent variable.

This finding implied that ECD teachers' attitudes and decisions of whether to adopt or not to adopt ICT were significantly influenced by their perceptions towards the Rogers (1995)

computer attributes. Previous studies have also concluded that the computer attributes were key in accounting for the variance when dealing with technology adoption in educational contexts (Cossa & Cronjé, 2004; Govender, 2006; Gumedze, 2017; Moore & Benbasat, 1991). Conducting regression computations on the same variables, Govender (2006) and Gumedze (2017) found that the educators’ cultural perceptions significantly influenced their attitude towards ICT integration. On the contrary, Govender (2006) found computer/ICT competence (referred to as proficiency in his study) to have a significant effect on the educators’ attitudes towards ICT integration. Based on Gumedze’s (2017, p. 142) study, the effect of the computer attributes (relative advantage, complexity, compatibility and observability) on the ECD teachers’ attitude towards ICT integration was further analysed separately. Therefore, the study performed a second regression analysis of the effects of the computer attributes on the ECD teachers’ attitudes towards ICT integration.

9.2.2 Regression two – ECD teachers’ attitudes as a function of computer attributes

Table 9.5 – Table 9.6 below summarise data using cross-tabulations and correlations between the ECD teachers’ attitude towards ICT integration and their perception towards the computer attributes (relative advantage, compatibility, complexity and observability) produced in SPSS based on a 5% significance level. The four attributes depicted a moderate degree of correlation with attitude, as indicated in Figure 6.5 and Table 6.1 in Chapter Six. Hence, the researcher also performed cross-tabulations for each individual attribute.

Table 9.5: Computer attitude* relative advantage - cross tabulation

Attitude	Relative Advantage					Total
	Strongly Negative	Negative	Neutral	Positive	Strongly Positive	
Strongly Negative	0	0	0	0	0	0
Negative	0	0	0	0	0	0
Neutral	0	0	2	2	0	4
Positive	0	0	9	140	54	203
Strongly Positive	0	0	4	32	63	99
Total	0	0	15	174	117	306

(Field data: 2017)

Table 9.5 above indicates that the highest numbers were recorded for respondents who positively rated their responses for the relative advantage of computers when their attitude was also highly positive. The majority of the respondents (140) with a positive attitude towards ICT integration had positive perceptions towards the relative advantage of ICT (see Table 9.5); while 54 respondents with positive attitudes maintained that they had strongly positive views towards the relative advantage of ICT in ECD education. Another 63 respondents possessing strongly positive attitudes expressed that they also strongly agreed that ICTs had significant relative advantages; the last 32 respondents had strongly positive attitudes towards the impact of ICT on the relative advantage.

Low numbers were recorded for respondents with neutral views of relative advantage (see Table 9.5). There were three and nine respondents with neutral views on both the attitude and the relative advantage of ICT and a positive attitude and a neutral perception of the relative advantage of ICT respectively. Only four respondents had a strongly positive attitude and a neutral view of the relative advantage of ICT in ECD education. The reasons for their attitude towards ICT integration and the computer attribute relative advantage were almost similar (4.3 and 4.25 respectively – see Table 6.1 and Table 6.9 respectively, found in Chapter Six), which gave the impression that generally there were high positive ratings of the respondents’ relative advantage to computers and attitude towards ICT integration. The cross-tabulation presented in Table 36, demonstrates a linear pattern of the points. However, the points seemed to be more skewed towards the positive and strongly positive categories. According to the results displayed above (see Table 36 above), when the attitude was highly positive, the perception of relative advantage of ICT in ECD education was also high.

Table 9.6: Symmetric measures for computer attitude*relative advantage

Statistical Analyses	Value	Asymptotic Std. Error ^a	Approx. T^b	Approx. Sig.
Ordinal by Ordinal: Spearman Correlation	0.354	0.056	6.603	0.000 ^c
Number of Valid Cases	306			

(a) Not assuming the null hypothesis

(b) Using the asymptotic standard error assuming the null hypothesis

(c) Based on normal approximation

(Field data: 2017)

The Spearman’s rank-order coefficient was found to be 0.354, with a standard error estimate of 0.056 (see Table 9.6). The corresponding T-value was 6.603, which was highly significant ($p < 0.05$). According to the findings, the two variables were positively related although the strength of the relationship was a weak positive one (since the Spearman rank-order coefficient is less than 0.5). Thus, the relative advantage had a weak positive bearing on the ECD teachers’ attitudes towards ICT integration. Therefore, it was rational to reject the null hypothesis and conclude that there was a relationship between the respondents’ attitudes towards ICT integration and their responses to the relative advantages of computers in education as a computer attribute.

Table 9.7: Computer attitude*compatibility - cross tabulation

Attitude	Compatibility					Total
	Strongly Negative	Negative	Neutral	Positive	Strongly Positive	
Strongly Negative	0	0	0	0	0	0
Negative	0	0	0	0	0	0
Neutral	0	0	3	1	0	4
Positive	0	3	23	150	27	203
Strongly Positive	0	0	5	60	34	99
Total	0	3	31	211	61	306

(Field data: 2017)

Table 9.7 above indicates that the respondents whose attitude ratings were positive mostly rated highly positive responses towards compatibility. A total of 150 respondents with a positive attitude towards ICT integration had positive perceptions towards the relative advantage of ICT (see Table 9.7), and 60 respondents had strongly positive attitudes towards the compatibility of ICT in ECD education. Another 34 respondents who had strong positive attitudes revealed that they strongly agreed that ICTs were compatible with their existing norms and practices in ECD education. The other 27 respondents who had positive attitudes strongly believed that ICT was compatible with existing ECD educational values. Only three respondents with positive attitude disagreed with the notion that there was compatibility of ICT in ECD education. Only three respondents and one respondent with a neutral attitude

possessed neutral and positive perceptions (*respectively*) of the compatibility of ICT. The last 23 respondents with positive attitudes and five respondents with strongly positive attitudes possessed a neutral view of the compatibility of ICT. The results above therefore demonstrated a linear relationship between attitude and compatibility that was skewed towards the high values of both variables.

Table 9.8: Symmetric measures for computer attitude*compatibility

Statistical Analyses	Value	Asymptotic Std. Error ^a	Approx. T ^b	Approx. Sig.
Ordinal by Ordinal: Spearman Correlation	0.281	0.055	5.100	0.000 ^c
Number of Valid Cases	306			

(a) Not assuming the null hypothesis

(b) Using the asymptotic standard error assuming the null hypothesis

(c) Based on normal approximation

(Field data: 2017)

The study obtained a Spearman rank-order coefficient of 0.281, with a standard error estimate of 0.055 (see Table 9.8). The corresponding T-value came out to be 5.1, which was highly significant ($p = 0.000$). The respondents' attitude towards ICT integration was positively correlated to the computer attribute 'compatibility'. However, the association between the variables was a weak positive one as represented by the Spearman rank-order coefficient value < 0.5 (see Table 9.8). Based on this computation, the null hypothesis was rejected and it was concluded that the respondents' attitude towards ICT integration and their perception towards compatibility as a computer attribute were related.

Table 9.9: Computer attitude* complexity – cross-tabulation

Attitude	Complexity					Total
	Strongly Negative	Negative	Neutral	Positive	Strongly Positive	
Strongly Negative	0	0	0	0	0	0
Negative	0	0	0	0	0	0
Neutral	0	1	2	1	0	4
Positive	0	4	30	147	22	203
Strongly Positive	0	0	10	43	46	99
Total	0	5	42	191	68	306

(Field data: 2017)

Table 9.9 illustrates a pattern similar to the ones presented for the association between the relative advantage and compatibility computer attributes above (see Table 9.5 and Table 9.7). The majority of the respondents (147) had a positive attitude towards ICT integration and positive perceptions towards the non-complexity of ICT (see Table 9.9). Another 46 respondents had strongly positive attitudes and strongly positive perceptions of the non-complexity of ICT in ECD education. Only 43 respondents had strongly positive attitudes towards a positive view of the non-complexity of ICT in ECD education. The other 30 respondents had positive attitudes but were not sure of their positions towards the non-complexity of ICT. Only four respondents with a positive attitude indicated that they believed that ICT was too complex to be integrated into ECD education. There was only one respondent with a negative perception of non-complexity, two with a with a neutral position and one with a positive view of the non-complexity of ICT in ECD education. Based on the cross-tabulation presented in Table 9.9, it was realised that there was a linear relationship between attitude and complexity that is also skewed towards the high values of both variables.

Table 9.10: Symmetric measures for computer attitude* complexity

	Value	Asymptotic Std. Error ^a	Approx. T ^b	Approx. Sig.
Ordinal by Ordinal: Spearman Correlation	0.361	0.057	6.742	0.000 ^c
Number of Valid Cases	306			

(a) Not assuming the null hypothesis

(b) Using the asymptotic standard error assuming the null hypothesis

(c) Based on normal approximation

(Field data: 2017)

The Spearman rank-order coefficient was found to be 0.361, with a standard error estimate of 0.057 for a computation between the ECD teachers' attitude and complexity (see Table 9.10). The computation found a corresponding T-value of 6.742, which was highly significant ($p < 0.05$). These findings postulated that the two variables had a weak correlation (as indicated by the magnitude of the coefficients).

Table 9.11: Computer attitude* observability – cross-tabulation

Attitude	Observability					Total
	Strongly Negative	Negative	Neutral	Positive	Strongly Positive	
Strongly Negative	0	0	0	0	0	0
Negative	0	0	0	0	0	0
Neutral	0	1	1	2	0	4
Positive	0	3	16	122	62	203
Strongly Positive	0	0	2	34	63	99
Total	0	4	19	158	125	306

(Field data: 2017)

A pattern of a generic linear relationship between attitude and the computer attributes employed in this study was established from the collected data (as evidenced in the cross tabulations presented – see Table 9.5, Table 9.7, Table 9.9 and Table 9.11 above). Table 9.11 presents 122 respondents with positive ratings for both attitude and observability towards

ICT integration. On the other hand, 63 respondents had strongly positive ratings for both the attitude and the observability computer attribute. Only one respondent had a neutral perception of both attitude and observability. Another 34 respondents held strong positive attitudes for a positive perception of observability, and 16 respondents had positive attitudes but were not sure of their position towards the observability computer attribute. Only one respondent and three respondents possessed a neutral and positive perception respectively of attitudes and believed that observability had no significant effect on the integration of ICT in ECD education. Another two respondents had a neutral attitude towards ICT and a positive view of observability. The last two respondents held strongly positive attitudes and were unsure of their perception towards observability. A linear relationship skewed toward the high values of both variables was also observed for attitude and observability

Table 9.12: Symmetric measures for computer attitude*observability

	Value	Asymptotic Std. Error ^a	Approx. T^b	Approx. Sig.
Ordinal by Ordinal: Spearman Correlation	0.342	0.052	6.348	0.000 ^c
Number of Valid Cases	306			

(a) Not assuming the null hypothesis

(b) Using the asymptotic standard error assuming the null hypothesis

(c) Based on normal approximation

(Field data: 2017)

Table 9.12 presents a calculated Spearman rank-order coefficient of 0.342, with a standard error estimate value of 0.052 between the ECD teachers' attitude towards ICT integration and the computer attribute observability. A highly significant ($p < 0.05$) corresponding T-value of 6.348 was attained. This meant that the computed Spearman rank-order coefficient between attitude and observability represented a weak positive correlation between the two variables. Therefore, the study rejected the null hypothesis and concluded that there was a relationship between the ECD teachers' attitude towards ICT integration and the observability computer attribute.

The cross tabulations and correlation computations presented above exhibited that all four constructs of computer attributes selected for use in this study were significant in modelling attitude. Therefore, the independent variables were important in modelling the attitude of ECD teachers towards the integration of ICT. Since the four attributes depicted some degree of correlation with ECD teachers' attitude as presented in this subsection, they were used as independent variables to corroborate the best predictor of ECD teachers' attitude towards ICT integration in ECD education results in regression one, which found the DOI's computer attributes to significantly influence their attitude. Multiple linear regression was performed using the SPSS to rank the variables according to their order of influence towards the teachers' attitude. Table 9.13 and Table 9.14 below present the results:

Table 9.13: Regression two analysis model summary ^b

R	R Square	Adjusted R Square	Std. Error of the Estimate	Sum of Squares	Df	Mean Square	F	Sig.
0.584 ^a	0.341	0.333	0.28006	12.240	4	3.060	39.014	0.000 ^b

(a) **Predictors:** Observability, Compatibility, Complexity, Relative Advantage

(b) **Dependent Variable:** Attitude

(Field data: 2017)

Table 9.14: Coefficients ^a for regression analysis two

Independent Variables	Unstandardised Coefficients		Standardised Coefficients	T	Sig.
	B	Std. Error			
Constant	2.304	0.164		14.087	0.000
Relative Advantage	0.184	0.037	0.272	4.911	0.000
Compatibility	0.063	0.033	0.102	1.908	0.057
Complexity	0.091	0.028	0.166	3.217	0.001
Observability	0.147	0.029	0.264	5.087	0.000

(a) **Dependent variable:** Attitude

(Field data: 2017)

The results of the second regression analysis in Table 9.13 and Table 9.14 above show that three variables from the Rogers' computer attributes influenced the ECD teachers' attitude towards ICT integration at the 0.05 level of significance. The standardised estimates of the computer attribute variables that influenced the ECD teachers' attitude (from largest to smallest - according to the B values) were: relative advantage (B = 0.184, T = 4.911, p = 0.000 (i.e. p < 0.05)), observability (B = 0.147, T = 5.087, p = 0.000 (i.e. p < 0.05) and complexity (B = 0.091, T = 3.217, p = 0.001 (i.e. p < 0.05)). The computer attribute "compatibility" did not have any significant effect on the ECD teachers' attitude (see Table 9.14). The results were different in Gumedze's (2017, p. 143) study, which established that of the four computer attributes (relative advantage, complexity, compatibility and observability), observability did not have any significant effect on the prediction of educators' attitude towards ICT integration, while the other three could be used to predict their attitudes.

Therefore, the ECD teachers' attitudes towards ICT cannot be determined by their perceptions of it being consistent with existing values and norms in ECD education (*i.e. compatibility*). Thus, it was concluded that the computer attributes utilised in this study accounted for 33.3% of the variance. Based on the second regression analysis, the variable compatibility was not considered in the third regression, which was computed from the UTAUT's constructs and is presented in the next sub-section.

The low variance percentage of 33.3% could have been caused by other factors influencing the teachers' perception of the computer attributes not statistically evaluated in this study. The preceding chapters noted that in spite of the ECD teachers' highly positive attitudes, they had limited access to ICT for teaching and learning processes and they were not spared the economic woes currently being faced by the country. This study also established that the ECD teachers possessed low to moderate ICT competencies and were subjected to policies lacking functional implementation and accountability frameworks. These were some of the key factors that could not be statistically measured to find out if they had significant influence over the respondents' view of the computer attributes included in this multiple linear regression computation.

9.2.3 Regression three – ECD teachers’ attitudes as a function of IS theory constructs

As noted in Chapter Three outlining the theoretical framework, the UTAUT is a theory that resulted from a longitudinal study reviewing the constructs of eight different technology acceptance and adoption theories (Attuquayefio & Addo, 2014; Samaradiwakara & Gunawardena, 2014; Venkatesh et al., 2003). Based on Gumedze’s (2017) approach to extract the various IS theory constructs relating to the UTAUT to analyse educator attitudes, this study adopted the same approach. From the seven constructs that were common to the key technology acceptance theories reviewed to formulate the UTAUT, Venkatesh et al. (2003) found only four of them to be direct determinants of technology users’ usage behaviour and acceptance. These four constructs were effort expectancy, performance expectancy, social influence and facilitating conditions (see Chapter Three for a detailed review of IS theories that were key to this study). The UTAUT’s relationships with other IS theories used to model technology adoption are presented below:

- **Effort Expectancy** is defined as “the degree of ease associated with the use of the system”, (Attuquayefio & Addo, 2014, p. 76). IS constructs pertaining to effort expectancy in other theories are perceived ease of use (found in TAM/TAM2/TAM3 – see chapter 3) and complexity (found in the DOI – also see Chapter Three).
- **Performance Expectancy** “the degree to which an individual believes that using the system will help him or her to attain gains in job performance”, (Attuquayefio & Addo, 2014, p. 76). IS constructs pertaining to performance expectancy in other theories are perceived usefulness (found in TAM/TAM2 and TAM3 – see chapter 3), the relative advantage (found in the DOI – also see Chapter Three) and extrinsic motivation (Davis et al., 1989).
- **Social Influence** “is defined as the degree of importance that other people give to use of the system” (Kabakçi-Yurdakul et al., 2014, p. 24). IS constructs pertaining to social influence as a direct determinant of social influence in other theories are the subjective norm (found in TRA, TPB, TAM/TAM2/TAM3 – see chapter 3) and image (found in DOI – also see Chapter Three).
- **Facilitating Conditions** refer to the “organisational or technical sub-structure supports necessary for use of the system” (Kabakçi-Yurdakul et al., 2014, p. 24). IS constructs pertaining to facilitating conditions in other theories are perceived behavioural

control (found in the TPB – see chapter 3), compatibility and facilitating conditions (found in the DOI – also see Chapter Three).

Table 9.15 shows how these constructs were computed using items from the questionnaire (see Appendix A for the questionnaire).

Table 9.15: IS constructs in UTAUT employed in this study

Construct	Definition	Questionnaire Item
Perceived Usefulness (PU)	User’s perception that he or she uses to classify whether the system will be useful and relevant to his or her job and performance (Davis, 1989, p. 320).	<p>Computers save time and effort. (Q13:7)</p> <p>Primary Schools will be a better place without computers. (Q13:8)</p> <p>Elementary school learners must use computers in all learning areas. (Q13:9)</p> <p>Learning about computers at ECD is a waste of time. (Q13:10)</p> <p>Computers would motivate learners to grasp key concepts and do more study. (Q13:11)</p> <p>Computers are a fast and efficient way of getting information. (Q13:12)</p> <p>Computers can enhance a learner’s learning experience. (Q13:14)</p>
Relative Advantage	“the degree to which an innovation is perceived as better than the idea it supersedes”, (Rogers, 1995, p. 15).	<p>Computers will improve ECD education. (Q14:1)</p> <p>Teaching with computers offers real advantages over traditional methods of instruction. (Q14:2)</p> <p>Computer technology cannot improve the quality of a learner’s learning. (Q14:3)</p> <p>Using computer technology in the classroom will make the subject matter more interesting. (Q14:4)</p>
Extrinsic Motivation	The perception that a user participates in an activity because it is perceived to have valued outcomes which motivate the user to perform better, (Davis et al., 1989)	<p>Based on some of the items in Perceived Usefulness in TAM,</p> <p>I would avoid computers as much as possible. (Q13:18)</p> <p>I would like to learn more about computers. (Q13:19)</p> <p>I have no intention to use computers in the future. (Q13:20)</p>

Construct	Definition	Questionnaire Item
Perceived Ease of Use (PEOU)	User's perception that he or she uses to classify whether the system will be free of effort for him or her to use (Davis, 1989, p. 320; Venkatesh & Davis, 1996).	<p>It would be difficult for me to learn to use the computer in teaching. (Q14:9)</p> <p>I have no difficulty in understanding the basic functions of computers. (Q14:10)</p> <p>Computers complicate my tasks in the classroom. (Q14:11)</p> <p>Everyone can easily learn to operate a computer. (Q14:12)</p>
Complexity (CX)	<p>"The degree to which a system is perceived as relatively difficult to understand and use."</p> <p>Thomson et al. (cited in Govender, 2006, p. 110)</p>	<p>Primary Schools will be a better place without computers. (Q13:8)</p> <p>Computers do more harm than good. (Q13:15)</p> <p>Computers complicate my tasks in the classroom. (Q14:11)</p> <p>I would rather do things by hand than with a computer. (Q14:16)</p>
Subjective Norm	Fishbein and Ajzen (1975, p. 302), define it as "the person's perception that most people who are important to him think he should or should not perform the behaviour in question."	<p>Learners need to learn how to use computers for their future jobs. (Q15:2)</p> <p>Learners prefer to learn from teachers rather than the computer. (Q15:3)</p> <p>Working with computers does not diminish peoples' relationships with one another. (Q15:14)</p> <p>Computers should be a priority in education. (Q15:16)</p>
Perceived Behavioural Control	According to Ajzen (1991, p. 183), it is the "people's perception of the ease or difficulty of performing the behaviour of interest."	<p>Working with Computers makes me nervous. (Q13:1)</p> <p>Computers make me feel uncomfortable. (Q13:2)</p> <p>I have no difficulty in understanding the basic functions of computers. (Q14:10)</p>
Facilitating Conditions (FC)	"are the organisational or technical sub-structure supports necessary for use of the system", (Kabakçi-Yurdakul et al., 2014, p. 24).	<p>I have never seen computers at work. (Q14:13)</p> <p>Computers have proved to be effective learning tools worldwide. (Q14:14)</p> <p>I have never seen computers used as education tools. (Q14:15)</p> <p>There are other social issues that need to be addressed before implementing computers in ECD education. (Q15:11)</p>

Construct	Definition	Questionnaire Item
Observability (O)	“the degree to which one can see others using the innovation in the organisation”, (Venkatesh et al., 2003, p. 431).	I have never seen computers at work. (Q14:13) Computers have proved to be effective learning tools worldwide. (Q14:14) I have never seen computers used as education tools. (Q14:15)
Perceived Ease of Use (PEOU)	User’s perception that he or she uses to classify whether the system will be free of effort for him or her to use (Davis, 1989, p. 320; Venkatesh & Davis, 1996)	It would be difficult for me to learn to use the computer in teaching. (Q14:9) I have no difficulty in understanding the basic functions of computers. (Q14:10) Computers complicate my tasks in the classroom. (Q14:11) Everyone can easily learn to operate a computer. (Q14:12)

Table 9.16: ECD teachers' perceptions of IS theories/models constructs

Statistical Analyses	Perceived Usefulness	Relative Advantage	Extrinsic Motivation	Complexity	Perceived Ease of Use
Mean	4.30	4.25	4.48	4.18	3.94
Median	4.29	4.25	4.67	4.25	4.00
Mode	4.00	4.00	5.00	4.00	4.00
Standard Deviation	0.43	0.51	0.60	0.55	0.62

(Field data: 2017)

Table 9.17: ECD teachers' perceptions of IS theories/models constructs (cont'd)

Statistical Analyses	Subjective Norm	Perceived Behavioural Control	Facilitating Conditions	Observability
Mean	3.99	4.10	4.24	4.20
Median	4.00	4.00	4.50	4.25
Mode	4.00	4.00	4.00	4.00
Standard Deviation	0.53	0.62	0.70	0.62

The means of the IS constructs found in the UTAUT were higher than the means computed for the DOI computer attributes (particularly for the perceived usefulness and extrinsic motivation – see Table 9.16 and Table 9.17 above). However, it should be noted that the three attributes that accounted for the variance in regression two (i.e. relative advantage, complexity and observability) were also found in the UTAUT when it was broken down into the IS constructs. Table 9.18 presents the Pearson product moment correlation computations between the ECD teachers' attitude towards ICT integration and the IS constructs defined in Table 9.15 above.

Pearson product moment correlation computations between the IS constructs' variables and the ECD teachers' attitude revealed that they were positively correlated significantly (at $p < 0.05$). The column and row in bold direct the reader to the correlation computations being referred to in Table 9.18. The Pearson product moment correlation coefficients obtained from the majority of the computations between the IS constructs and attitude revealed a weak to moderate positive correlation as the majority of the values were slightly below 0.5 (see Table 9.18). High correlation computation values were obtained for three IS constructs, which are namely: Perceived Usefulness (0.80, $p = 0.000$), Extrinsic Motivation (0.67, $p = 0.000$) and Complexity 0.61, $p = 0.000$). Thus, we reject the null hypothesis and conclude that there were positive significant relationships between the ECD teachers' attitudes towards ICT integration and the UTAUT's IS constructs.

Based on the computations explained above, the IS constructs that constitute the UTAUT model were then used as independent variables to determine the best predictor of ECD teachers' attitude towards ICT integration in education. A multiple linear regression model was also performed using the SPSS to rank the variables according to their order of influence towards the ECD teachers' attitude.

Table 9.18: Pearson correlation between attitude and the IS constructs in UTAUT

Construct	Correlations	Perceived Ease of Use	Extrinsic Motivation	Perceived Usefulness	Perceived Behavioural Control	Subjective Norm	Facilitating Conditions	Complexity	Observability	Relative Advantage	Overall Attitude
Perceived Ease of Use (PEOU)	Pearson Correlation	1	0.201	0.300	0.586	0.279	0.296	0.431	0.328	0.321	0.371
	Sig. (1-tailed)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N	306	306	306	306	306	306	306	306	306	306
Extrinsic Motivation (EM)	Pearson Correlation	0.201	1	0.395	0.228	0.345	0.283	0.301	0.371	0.329	0.670
	Sig. (1-tailed)	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N	306	306	306	306	306	306	306	306	306	306
Perceived Usefulness	Pearson Correlation	0.300	0.395	1	0.201	0.298	0.278	0.508	0.424	0.478	0.800
	Sig. (1-tailed)	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N	306	306	306	306	306	306	306	306	306	306
Perceived Behavioural Control	Pearson Correlation	0.586	0.228	0.201	1	0.283	0.176	0.333	0.224	0.133	0.464
	Sig. (1-tailed)	0.000	0.000	0.000		0.000	0.001	0.000	0.000	0.010	0.000
	N	306	306	306	306	306	306	306	306	306	306

Construct	Correlations	Perceived Ease of Use	Extrinsic Motivation	Perceived Usefulness	Perceived Behavioural Control	Subjective Norm	Facilitating Conditions	Complexity	Observability	Relative Advantage	Overall Attitude
Subjective Norm	Pearson Correlation	0.279	0.345	0.298	0.283	1	0.204	0.265	0.304	0.361	0.351
	Sig. (1-tailed)	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
	N	306	306	306	306	306	306	306	306	306	306
Facilitating Conditions (FC)	Pearson Correlation	0.296	0.283	0.278	0.176	0.204	1	0.328	0.797	0.303	0.309
	Sig. (1-tailed)	0.000	0.000	0.000	0.001	0.000		0.000	0.000	0.000	0.000
	N	306	306	306	306	306	306	306	306	306	306
Complexity (CX)	Pearson Correlation	0.431	0.301	0.508	0.333	0.265	0.328	1	0.529	0.363	0.611
	Sig. (1-tailed)	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000
	N	306	306	306	306	306	306	306	306	306	306
Observability (O)	Pearson Correlation	0.328	0.371	0.424	0.224	0.304	0.797	0.529	1	0.366	0.445
	Sig. (1-tailed)	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000
	N	306	306	306	306	306	306	306	306	306	306
	Pearson Correlation	0.321	0.329	0.478	0.133	0.361	0.303	0.363	0.366	1	0.468

Construct	Correlations	Perceived Ease of Use	Extrinsic Motivation	Perceived Usefulness	Perceived Behavioural Control	Subjective Norm	Facilitating Conditions	Complexity	Observability	Relative Advantage	Overall Attitude
Relative Advantage	Sig. (1-tailed)	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000
	N	306	306	306	306	306	306	306	306	306	306
Attitude	Pearson Correlation	0.371	0.670	0.800	0.464	0.351	0.309	0.611	0.445	0.468	1
	Sig. (1-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
	N	306	306	306	306	306	306	306	306	306	306

(Field data: 2017)

The results of the third regression computation are presented as follows:

Table 9.19: Regression three analysis model summary^b

R	R Square	Adjusted R Square	Std. Error of the Estimate	Sum of Squares	Df	Mean Square	F	Sig.
0.938 ^a	0.879	0.876	0.12088	31.523	9	3.503	239.723	0.000 ^b

(a) **Predictors:** Facilitating Conditions, Perceived Behavioural Control, Relative Advantage, Extrinsic Motivation, Subjective Norm, Complexity, Perceived Usefulness, Perceived Ease of Use, Observability

(b) **Dependent Variable:** Attitude

(Field data: 2017)

Table 9.20: Coefficients^a for regression analysis three

Independent Variables	Unstandardised Coefficients		Standardised Coefficients	T	Sig.
	B	Std. Error	Beta		
Constant	0.648	0.086		7.513	0.000
Perceived Usefulness	0.434	0.021	0.543	20.830	0.000
Extrinsic Motivation	0.215	0.013	0.375	15.972	0.000
Perceived Behavioural Control	0.157	0.014	0.282	10.937	0.000
Complexity	0.128	0.17	0.205	7.528	0.000
Perceived Ease of Use	-0.057	0.015	-0.104	-3.809	0.000
Subjective Norm	-0.026	0.015	-0.041	-1.749	0.081
Observability	-0.052	0.022	-0.094	-2.420	0.016
Relative Advantage	0.030	0.017	0.045	1.816	0.070
Facilitating Conditions	0.017	0.017	0.035	1.016	0.311

a) **Dependent variable:** Attitude

(Field data: 2017)

The results of the third regression analysis in Table 9.19 and Table 9.20 above showed that six variables (Perceived Usefulness, Extrinsic Motivation, Perceived Behavioural Control, Complexity, Perceived Ease of Use and Observability) influence the ECD teachers' attitude towards ICT integration at the 0.05 level of significance. T-tests are utilised in comparisons of means of two or more groups. Although some statisticians have modelled negative t-values in depicting a relationship in the opposite direction for regression analyses utilising one-sided T-tests, they acknowledge that the absolute values are key when considering predictors (Azevedo, 2011; McCluskey & Lalkhen, 2007). Therefore, this study also considered all statistically significant (i.e. $p < 0.05$) variables with t-values < -2 based on their absolute values in regression three. The t-values of the three variables Subjective Norm, Relative Advantage and facilitating conditions) that had an insignificant effect (i.e. $p > 0.05$) on the prediction of ECD teachers' attitudes towards ICT integration were closer to zero (i.e. falling in the region of -2 up to 2).

The standardised estimates of the variables that influenced the ECD teachers' attitude from largest to smallest were: Perceived Usefulness ($B = 0.434$, $T = 20.830$, $p < 0.05$), Extrinsic Motivation ($B = 0.215$, $T = 15.972$, $p < 0.05$), Perceived Behavioural Control ($B = 0.157$, $T = 10.937$, $p < 0.05$), Complexity ($B = 0.128$, $T = 7.528$, $p < 0.05$), Observability ($B = -0.052$, $T = -2.420$, $p < 0.05$) and Perceived Ease of Use ($B = -0.057$, $T = -3.809$, $p < 0.05$). This analysis suggested that the greatest amount of variance in attitude among the ECD teachers could be explained from largest to smallest by the following independent variables: Perceived Usefulness, Extrinsic Motivation, Perceived Behavioural Control, Complexity, Observability and Perceived Ease of Use. The third regression presented in this sub-section accounted for 87.6% of the variance. A high percentage like this ultimately means that the IS constructs in the UTAUT can be used to safely predict the ECD teachers' attitudes with nominal influence from other factors, which was not the case for the second regression that utilised the computer attributes. According to Venkatesh et al. (2003), the UTAUT managed to account for 69% of the variance. The next section is an outline of the model for ICT integration in ECD education that resulted from this study.

9.3 Model for ICT integration in ECD education

The sub-sections above presented multiple linear regression analyses in order to statistically identify the best predictors of Masvingo province, Zimbabwean ECD teachers' attitudes. Regression one examined computer attributes (which were evaluated for technology acceptance and adoption in the following studies: Afunde, 2015; Aldosari, 2007; Cossa & Cronjé, 2004; Govender, 2006; Gumedze, 2017); and cultural perceptions (which were evaluated for technology acceptance and adoption in the following studies: Aldosari, 2007; Govender, 2006; Gumedze, 2017; Lee, Choi, Kim, & Hong, 2014; Lekhanya, 2013; Merchant, 2007; Perez-alvarez, 2012; Thomas, 1987). The study found that the ECD teachers' cultural perceptions insignificantly influenced their attitude towards ICT integration. Hence, they were not considered in the final model diagrammatically illustrated below (see Figure 9.1).

Table 9.21: Weighting for ICT integration in ECD education model

Model Construct	B	Weight
Perceived Usefulness	0.434	0.526
Extrinsic Motivation	0.215	0.261
Perceived Behavioural Control	0.157	0.190
Complexity	0.128	0.155
Observability	-0.052	-0.063
Perceived Ease of Use	-0.057	-0.069
Total	0.825	1

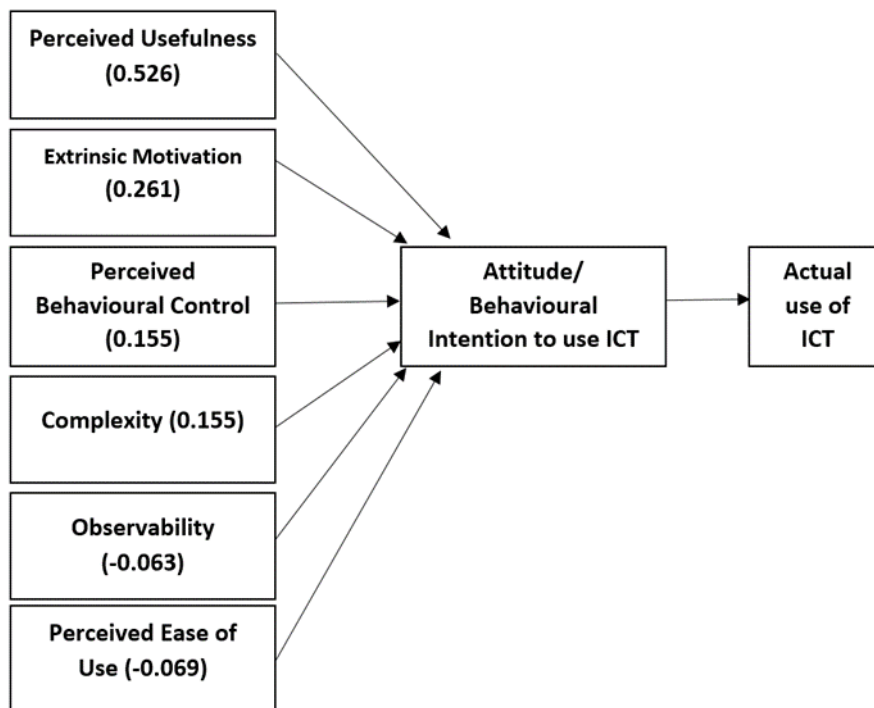


Figure 9.1: Research model: ECD teachers' ICT adoption model

(Adapted from Govender, 2006, p. 136)

This finding motivated the use of the individual computer attributes used in this study as independent variables in regression two. Regression two confirmed that the computer attributes did influence the ECD teachers' attitudes towards ICT integration as the individual computer attributes accounted for 33.3% of the variance. However, the variance value meant that the ECD teachers' attitudes were influenced by other external factors not considered in the regression computation. Constructs from different IS theories related to the UTAUT model (including the DOI computer attributes in regression two that were also used to explain technology acceptance and adoption chapter 6) were then used as independent variables in the third regression (see sub-section 9.1.3). The results of the analysis were that the variables explained 87.6% of the dependent variable. The difference in the variance indicated that the independent variables might not be the only factors that influenced the teachers' attitude towards ICT integration in ECD education. Based on the third multiple linear regression computations performed in sub-section 9.1.3, the study produced a model that could be used in the prediction of ECD teachers' attitudes towards ICT integration (see Figure 9.1). Table 9.21 presented above presents the weight values for the individual model constructs computed from the B values of the regression analysis. All the weighted values added up to

one when combined, which also represented their extent/degree of influence on the teachers' attitude/behavioural intention towards the actual use of ICT in ECD education for the individual constructs.

Conducting the study at this point in time revealed that the ECD teachers' attitudes towards ICT integration were most influenced by Perceived Usefulness, Extrinsic Motivation and Perceived Behavioural Control. The qualitative data presented in Chapters Six, Seven and Eight implied that the ECD teachers have low to moderate ICT competencies and may also be negatively affected by the economic situation currently being experienced in the country (Chagonda, 2010a; Mlambo, 2016; Moyo, 2013; ZIMCODD, 2016). One might argue that the high weighting values in the perceived usefulness and extrinsic motivation as attitude determinants/predictors could be credited to the low morale due to economic hardships expressed by the ECD teachers during the data collection (see sub-sections 6.3.2 and 8.2.6 outlining that they may prioritise queuing for cash over improving their ICT skills). However, that cannot be statistically proved.

According to Ryan and Deci (cited in Cullen & Greene, 2011, p. 33), "when people have the extrinsic motivation they are still interested in performing an activity, but the focus is on the reward rather than the activity itself ... Although promoting intrinsic motivation was always preferred in learning settings, the reality was that many would be extrinsically motivated for most activities in their different learning settings". The motivation theory explicitly outlines how extrinsic and intrinsic motivation could determine a person's decision to accept a technological innovation (Davis, Bagozzi, & Warshaw, 1992). Depending on the teaching and learning environment created for the ECD teachers at a school, they would need to be extrinsically motivated first before they are intrinsically motivated to teach using ICTs. The model was a confirmation of the qualitative finding that the ECD teachers understood the benefits of ICT in education as Perceived Usefulness was ranked at the top. The findings that led to the model could imply that the ECD teachers' ICT competencies would also need to be improved through training and their extrinsic motivation through the provision of ICT resources, furniture and infrastructure in primary schools to enable full ICT integration in ECD education. This warrants the MoPSE urgently looking into revamping the professional

development in the teaching and learning of ICT for ECD education as it could have a bearing on the success of the model presented above.

The remaining three constructs, Complexity, Observability and Perceived Ease of Use were direct determinants of the ECD teachers' attitudes, which had the lowest weighting rankings in the model when compared to the first three constructs discussed above. According to the results of this study, it is highly unlikely that the ECD teachers could choose to adopt/not to adopt ICT in their classes due to their misunderstanding of it or due to their perception of others important to them requiring them to use it. If the model for ICT integration in ECD education outlined above was to be employed in a similar environment, forcing the ECD teachers to accept and adopt ICT in their classes might not be an effective way to expeditiously diffuse it (Fullan, 2011; Rogers, 1995). Raising their awareness and knowledge levels through intensive ICT-related training and making their teaching environments conducive for ICT integration (which could, in turn, increase their extrinsic motivation) could potentially help policymakers achieve full ICT integration in ECD education.

The findings that the Extrinsic Motivation and Perceived Usefulness were the best predictors of educators' attitudes confirmed Govender's (2006) findings. Kalaš asserts that "teachers mostly understand that professional development is essential for them, and so is their motivation – such development cannot be successful without a great deal of intrinsic enthusiasm", (2010, p. 83); and that "in any professional development framework, the most important is a proper intrinsic motivation and extrinsic support: each teacher must feel he or she is a part of the learning community thus never being alone with his or her professional problems" (2010, p. 111). Over and above the creation of an ICT teaching-friendly environment for the ECD teacher there is a need for an appropriate technical support system to continually aid the teacher. Complexity, which ranked slightly below the middle of the constructs in this study was slightly higher in Govender's (2006) study and the best predictor in Al-Ghaith, Sanzogni and Sandhu's study (cited in Lekhanya, 2013, p. 1565). The drafting and conclusion of an ICT integration in ECD education model emanating from this study was a great achievement for this research. However, what is unknown is whether this holds true for an environment whose participants'/respondents' attitudes would be mostly negative or

neutral, as this scenario had mostly positive attitudes. The next section concludes this chapter.

9.4 Conclusion

This chapter was focused on identifying the best predictors of ECD teachers' attitudes towards ICT integration in ECD education. The first regression was performed with Rogers' computer attributes and cultural perceptions as independent variables in modelling ECD teachers' attitude towards ICT integration. The computation found that only the computer attributes variable could account for the variance (32.4%) in the determination of attitude. This motivated for regression two, which modelled the individual attributes (Relative Advantage, Complexity, Observability and Compatibility) as a function the ECD teachers' attitude towards ICT integration. The second regression computation found the computer attributes Relative Advantage, Complexity and Observability accounting for only 33.3% of the variance. Venkatesh et al. (2003) empirically found the different IS constructs of technology adoption theories to account for 69% of the variance when modelled with users' attitudes. The DOI computer attributes (Rogers, 1995), which accounted for 32.4% and 33.3% of the variance in regression one and two respectively were also part of the IS constructs evaluated for the UTAUT in regression three.

The best predictors of ECD teachers' attitudes towards ICT integration based on the IS constructs of the UTAUT model as independent variables were (from largest to smallest): Perceived Usefulness, Extrinsic Motivation, Perceived Behavioural Control, Complexity, Observability and Perceived Ease of Use. The ECD teachers' ICT illiteracy is not likely to hinder them from accepting and adopting ICT in ECD education. This is further confirmed by their willingness to participate in ICT-related training programmes (see sub-section 6.2.13). However, the creation of an ICT teaching and learning friendly environment conducive to increasing the teacher's extrinsic motivation is key at this point, whereas, based on the model, forcing the teachers to accept and adopt ICT in their classes might not be an effective way to swiftly diffuse ICT in ECD education. The research model that resulted from the empirical evidence found in this study was the product of the UTAUT (see Figure 9.1). A variance of 87.6% in ECD teacher attitudes could be accounted for by the model. This value was higher than the variance found for the UTAUT and it is hoped that the ICT integration in ECD

education model constructs presented in this chapter could be used in future predictions of ECD teachers' attitudes.

Chapter Ten – How ICT Integration in ECD Education Can Be Enhanced

10.1 Introduction

Chapters Six to Nine in this section discussed ECD teachers' attitudes and perceptions towards ICT integration, ICT competencies, related challenges and the best predictor of their attitudes in detail. The literature review's position was constantly referred to against the theoretical framework's (DOI and UTAUT) constructs. The data collected in this study showed that the teachers had the most positive attitudes towards ICT integration, low ICT competencies and a myriad of challenges as evidenced by the analyses in the previous chapters. The best predictors of ECD teachers' attitudes were identified and a model to statistically determine the behavioural intention was drafted.

A corpus of scholars prescribing solutions and ways of enhancing ICT integration in ECD education, was presented in the literature review section (refer to studies by Abraham & Wadhvani, 2013; Al-Sulaiman, 2010; Alev, 2003; Buabeng-Andoh, 2012; Fluck, 2003; Govender, 2006; Gumedze, 2017; Kelentrić, 2013; Lobo, 2016; Manaligod, 2012; Mbatha, 2015; Munyengabe et al., 2017; Nangue, 2011; Nordin, 2014; Özdemir, 2017; Shimasaki, 2015; and Tongkaw, 2011 for a more detailed review). The most common solution (*topping the list*) in the above-referred studies is properly resourcing schools and teachers with ICT equipment, services, instructional material and infrastructure. This section of the report is key in that it reports how ICT integration can be improved with reference to the ECD teachers' perceptions and the model that emerged from this study. This chapter is set to answer the critical question, "***How can the integration of ICT in ECD education be enhanced?***" by presenting possible solutions to some of the key challenges noted for the integration of ICT into ECD education in this study.

10.2 Can the integration of ICT in ECD education be enhanced?

A few years ago, I travelled to a foreign country and boarded a train. As I was travelling, I noticed that there was someone who was in crutches standing in the train and offered him my seat as no one close to him had offered one. He then listened to the conversations I was

having with someone on the train and noted that I was a foreigner. After some time travelling in the seat I had offered him, he leaned towards me and said, "up to this day, I have had this inborn anger and hatred for foreigners because I thought they had bad morals and lacked Ubuntu* but what you did for me today has changed my perception towards foreigners". The small gesture of allowing the man in crutches to take my seat in the train resulted in a change of his mindset towards foreigners. Change had occurred in the situation I just narrated and this made me realise that change can only occur if something in the environment is repositioned. There are gaps in our society and these gaps are filled if one or more entities or actors key to the particular environment changes the course of his or her behaviour. The absence of knowledge increases risks and fear in any system. The acceptance and adoption of a technological innovation require higher levels of knowledge among all stakeholders involved for faster diffusion (Rogers, 1995). In many educational communities similar to the ones found in Zimbabwe, the transfer of this knowledge by trained teachers cannot always be guaranteed under any circumstances.

With particular reference to the findings presented in the preceding chapters, the ECD teachers had highly positive attitudes and low to moderate ICT competencies, which made some of them nervous and less confident to use ICT in their ECD classes. In the context of this study, a change resulting in the adoption and acceptance of ICT in ECD education has been occurring piecemeal due to a number of factors repositioning the ECD teachers' environment. These factors include: ICT-related training workshops conducted by MoPSE and the business community; the formal inclusion of ICT as a learning area in the national ECD curriculum; the existence of some ICT trained ECD teachers in primary schools; administrators promoting ICT integration and schools already integrating ICT in ECD education; the use of personal resources (i.e. money, laptops, bandwidth, software and hardware etc.); and infrastructure to support ICT education by some ECD teachers after realising that their schools lacked. As noted earlier, some schools peer coached their teachers to integrate ICT into teaching and

* "Ubuntu is a complex word from the Nguni language with several definitions, all of them difficult to translate into English. At the heart of each definition, though, is the connectedness that exists or should exist between people. Ubuntu is best known outside of Africa as a humanist philosophy associated with Nelson Mandela and Archbishop Desmond Tutu." (<https://www.thoughtco.com/the-meaning-of-ubuntu-43307>)

learning spaces to enable them to teach ICT in the ECD classes (see section 7.2.4.2 for a more detailed account of the school-based peer coaching programmes).

Rogers (1995) and Fullan (2001a, 2007), believed that for an innovation to be accepted and eventually adopted into a system, there is a need for one or more opinion leaders to influence the rest of the population to engage with the innovation. This study established that the administrators, schools and teachers equipped with the ICT-related skills (which we can see as knowledge about ICT and its benefits if it were to be integrated into the ECD classroom) in the ECD education system were responsible for the current state of ICT integration. If the MoPSE were to take a bird’s eye view of what needs to be done to improve ICT integration into ECD education that would have to be their starting point. So, indeed, the integration of ICT into ECD education can be enhanced. The sections below are a presentation of proposed improvements and solutions based on critical analyses of the collected data presented in the preceding chapters.

10.3 Overview of key challenges and possible implications

Table 10.1: Possible implications for ECD teachers and schools

Key Challenges of ICT integration in ECD education	For the ECD teacher	For MoPSE, parents and the School
Lack of Access to ICT resources	Utilising available ICT resources by improvising sharing mechanisms and the need for the authorities to complement their efforts of using personal ICT resources	Providing the required ICT resources (in form of hardware, software and instructional material required for ECD education)
Lack of ECD specific ICT infrastructure, hardware, software and furniture	Advocate for the construction of ICT facilities and enabling the procurement of ICT resources by highlighting its benefits in ECD education to the other stakeholders	Find ways of funding the construction of ICT infrastructure and procuring ECD specific hardware, software and furniture
Lack of ICT Competences, ICT training and professional development	Acquire ICT skills through peer coaching, collaboration and taking up all ICT-related training opportunities offered	Urgently providing more comprehensive professional development in ICT for ECD education and engaging Instructional designers to revamp the training system

Key Challenges of ICT integration in ECD education	For the ECD teacher	For MoPSE, parents and the School
Low ICT device: pupil and teacher: pupil ratios	Teachers to continue improvising ways to salvage the situation until more teachers are recruited	Quality of education in ECD compromised by the low ratios. Therefore, recruit more ECD teachers
Lack of Electricity in rural and farm schools	Utilising alternative and cheaper energy sources	Electrifying schools in rural and farming areas
Economic situation and Financial constraints	Continue to participate in fundraising activities	Encourage and support fundraising activities in schools by partnering with the business and donor community for more viable solutions (i.e. NGOs, church and the community)
Ignorance of the importance of ICT in ECD education	Raise awareness of the importance of ICT in ECD education	Need for programmes highlighting the importance of ICT in ECD education to school administrators, parents and MoPSE officials
Limited lesson time for ICT-related activities	Work out timetables that accommodate ICT integration activities in ECD education	Facilitate the design of timetables that accommodate teachers and learners in ICT resource-shared environments
Terminology and Language used to teach ICT	Acquire local language skills to explain ICT-related terminology. Engage parents to help	Develop ICT instructional material in form of guides and textbooks in local languages

(Field data: 2017) (adapted from Gray, 2011, p. 295)

Table 10.1 presents the key challenges noted in this study and their implications for the ECD teachers, school administrators, parents and MoPSE. The sections below further explain how finding permanent solutions for the challenges would enhance ICT integration into ECD education for the teachers. In this section of the report, participants' statements will be more concise to allow them to establish the problems whose solutions will be suggested in the next sections.

10.3.1 Lack of ICT resources, infrastructure, electricity and training

10.3.1.1 *The absence of ICT resources, instructional material furniture and infrastructure*

The absence of ICT resources, instructional material, furniture and infrastructure were some of the key barriers to ICT integration into the Masvingo province, Zimbabwean ECD education system as revealed by the participants' statements presented below:

"There is a shortage of ICT devices that include computers and projectors which can make life easier for the teacher ..." (Interview Participant ICR3, 18 September 2017)

"There is a limitation on the ICT-related texts at our schools ..." (Interview Participant ICH1, 20 September 2017)

"...schools don't have the necessary infrastructure..." (Interview Participant IBK2, 25 September 2017)

"...the classrooms are not enough and the furniture too..." (Focus Group Discussion Participant FGDMWA, 19 September 2017)

The excerpts above highlighted how primary schools have been unable to provide environments enabling ICT integration in ECD education. The non-existence of materials, furniture and buildings limited the teaching, learning and educational development in the area of ICT in Masvingo province ECD education. This study further established that these disparities have resulted in very low ICT device: pupil ratios, which made it even more difficult for the teachers to teach ICT when the available resources were shared (see section 8.2.2 for a detailed review of this challenge). This challenge was confirmed by the excerpt below:

"... the computer: learner ratios are too low..." (Focus Group Discussion Participant FGDGTB, 21 September 2017)

On the contrary, the challenge noted above led to some teachers subserviently integrate ICT into their teaching and learning processes using their personal resources (see section 8.2.7 for a detailed review of this challenge). This was revealed in this statement:

“I am using my personal computer and smartphone and everything else that I use is my own because the school doesn’t have anything of its own ...” (Interview Participant IBK4, 25 September 2017)

Chapter Six concluded that the large majority of ECD teachers had attitudes which were mostly positive and this was used to explain the behaviour of the ECD teachers using their personal resources to integrate ICT in this study. This showed that the power of ICT had been felt in teacher education to the extent that this study’s ECD teachers were improvising to help themselves and their learners experience this as well. It should be noted that previously, funding was provided for by local authorities and parents in primary school education (Chung, 1990, p. 191). Based on the absence of systems and materials for supporting ICT in ECD education, it would be rational to call for a review of this position because the stakeholders (like parents, churches and local authorities) initially tasked with the responsibility seem to be failing to mobilise resources towards the ICT programmes. The next sub-section outlines the implied risk associated with depending on donations as the key ICT resources’ mobilisation mechanism.

10.3.1.2 Donations: Future risk

This study found that donations were among the key sources of funding and ICT resources sustaining ICT integration in primary schools. In acknowledging the gap closed by accepting donations of ICT resources in primary schools one of the participants said:

“Although we are excited that from the donations and fundraising we now have the TV and the DVD player but it is not enough ...” (Interview Participant IMA3, 14 September 2017)

This study discovered that donations were problematic in that some of the time the consignments of donated materials dispatched to schools contained mostly non-functional devices. Expressing that they believed that donors thought the schools were dumping grounds for non-functional devices one of the participants said:

“The problem came after the computer sets were offloaded and left in the rooms where they were supposed to be set up. We ended up thinking that the donor

wanted to dump his non-working devices at the school for our children to play with the devices...” (Focus Group Discussion Participant FGDCHF, 20 September 2017)

When one is given a donation, there might be very little room for one to dictate one’s specific requirements as evidenced by participant FGDCHF’s school donation. Therefore, it can be concluded that donations have really helped schools to bridge the gap created by the introduction of ICT in education. However, they were unable to fully solve the ICT resource constraints in ECD education as the quality of the equipment donated could not be guaranteed. This suggested that MoPSE could run the risk of slow ICT integration if primary schools are left to overly depend on donations.

10.3.1.3 Lack of electricity

The study confirmed that the lack of electricity is a key ICT integration challenge for schools situated in farm and rural areas where there is poor commercial electricity infrastructure (Konyana & Konyana, 2013; MICTPCS, 2015; MoPSE, 2017). One of the participants alluded to this as follows:

“The other problem would be electricity to power the ICT resources ...” (Focus Group Discussion Participant FGDCRC, 18 September 2017)

It is true that for urban areas, energy to power up ICTs is not a very big challenge since almost every urban building has been electrified in Zimbabwe (MICTPCS, 2016). But for ECD teachers who have been deployed in areas where there is poor electricity infrastructure the electricity challenge really limits their engagement with ICT. In addition to the electricity challenge recorded in this study, some participants expressed that they had never received ICT-related training.

10.3.1.4 Lack of adequate ICT-related training and ignorance of stakeholders

There was an inconclusive debate over whether the teachers had received adequate training to engage with ICT integration or not. Participants who had received ICT training expressed that even though they had received the training they were experiencing difficulties teaching

the learning area in the ECD classes. Statements highlighting the different views possessed by the ECD teachers are presented below:

“I haven’t received any training ...” (Interview Participant IMA3, 14 September 2017)

“However, we have difficulty in teaching ICT even though we received training...” (Focus Group Discussion Participant FGDMAE, 14 September 2017)

The challenge inferred from the statements above was a confirmation of the quantitative data that there were some teachers (amounting to 63.7% – see section 7.2.4.1 for a detailed account) who had not yet received ICT-related training. According to Musingarabwi (2017), the majority of lecturers in teachers’ training colleges lacked ICT competencies and access to ICTs for implementing their curriculum.

However, some participants indicated that teachers’ training institutions believed that they were adequately equipping teachers with the requisite ICT-related skills despite the challenges highlighted in the literature (refer to studies by Musarurwa, 2011a; Musingarabwi, 2017). Some of the participants further revealed that due to the ICT resources’ constraints in training colleges, ICT practical lectures were delivered in a mass theoretical style (as the resources were limited), which left some student teachers still baffled about what was happening, and hence not adequately benefitting.

The teachers’ training institutions could first acknowledge the gaps that exist in their ICT education programmes as highlighted in the context of this study. Their acknowledgement should then come with addressing these anomalies with guidelines setting the standards for quality ICT training in teacher education as prescribed by this study’s participants (Bukaliya & Mubika, 2011). The participants also highlighted that on top of the lack of ICT training for ECD teachers, the slow diffusion of ICT integration was also caused by the ignorance of the other stakeholders (parents and the community) as revealed in the statement below:

“I think it is because of ignorance and lack of education ...” (Focus Group Discussion Participant FGDGTI, 21 September 2017)

The ECD teachers' sentiments on this challenge suggested that the community and parents should have been the first to be taught on the importance of ICT since they were sometimes asked to provide the funds required for the ICT integration activities.

Reviewing technology acceptance theories, Samaradiwakara and Gunawardena (2014, p. 21) concluded that "awareness of technology is important in today's fast-changing networked society". All documents produced by the MoPSE indicated that when educational programmes were rolled out all stakeholders (including parents and the community who are some of the key stakeholders in primary education) were consulted and educated about the programmes (MoPSE, 2016b, 2016a, 2017). However, the participants implied that this might not be the case, hence the call for awareness programmes aimed at raising their awareness so that their attitudes and level of support are raised (see section 8.2.9 for a detailed account). It may be difficult to mobilise more support through parental involvement if the ignorance and lack of education challenges are not resolved.

10.3.2 ICT competencies, access and use

Another challenge recorded in this study was the ICT illiteracy of ECD teachers and their administrators. The quantitative data recorded that the ECD teachers possessed low (30.1%) to moderate (29.7%) ICT competencies. Participants confirming this challenge said:

"I am not ICT literate and this bothers me ..." (Interview Participant IMW2, 19 September 2017)

"... even headmasters are computer illiterate ..." (Focus Group Discussion Participant FGDCRB, 18 September 2017)

The ECD teachers acknowledging their illiteracy in ICT also revealed that educational administrators expected to spearhead ICT integration campaigns were technophobic since their offices were still filled with dusty files and no sign of an ICT device (see section 7.2.3). However, could the absence of ICT devices normally used for administrative purposes in the administrators' offices be a result of MoPSE's failure to also provide the offices with ICT resources? Or could it be the lack of ICT competencies among the officers? The reason could not be established from the participants' views. However, their views implied that the lack of

competencies was caused by the lack of access to ICT challenge, also noted in the sub-section above (see sub-section 10.2.1.1) and in participant IBK4's statement below:

"We also don't have computers, the only gadgets that we can gather and use are those that have been disposed of because they are no longer functioning properly ..." (Interview Participant IBK4, 25 September 2017)

Access to ICT has been labelled as one of the barriers to ICT integration that reduces ICT use in teacher education (Al-Majeeni, 2004; Mbatha, 2015; Ngonile, 2014; Pita, 2010; Unluer, 2011). The fact that teachers were using their personal ICT resources in teaching and learning processes could be the reason why ICT use was high in spite of the ICT resource constraints noted in sub-section 8.2.1. Hitherto, ICT competencies have been varied because the ECD teachers' interactions with ICT for teaching and learning were dependent on their access to ICTs. Hence, there is an urgent need for the MoPSE to further complement the teachers' efforts of using their personal resources to integrate ICT into the ECD education curriculum by resourcing them.

The next sub-section is an examination of policies concerned with ICT integration and ECD education against the current practice.

10.3.3 ICT integration: Policies and practice

The study also noted that the ECD teachers believed that the terminology and language used to teach ICT was too complex for the ECD learners. The challenge is summed up in the statement below:

"ICT has big words and to break them down for the kids to understand is also quite a challenge to us as ECD teachers ..." (Interview Participant ICH3, 20 September 2017)

The Education Act of 1987 (amended in 2006) stipulates that ECD pupils should be taught in their mother tongue (Ndamba et al., 2017, p. 1), a position that teachers and learners were having difficulties with when they tried to translate English ICT terms to vernacular. This problem was a result of the absence of ICT textbooks for ECD education taking this into consideration.

The study further discovered that schools and the MoPSE were currently unable to adhere to the 1:20 teacher to pupil ratio set in the ECD education policies (Guta, 2017; Makuvaza & Gatsi, 2014; MoPSE, 2017; Nhaka Foundation, 2012). This problem affects teachers deployed to schools with very large catchment areas, lack of ICT resources and infrastructure. One of the participants confirming the challenge said:

“The teacher : pupil ratio is a challenge. They are not meeting the requirements of the policy that stipulated that it should not exceed 1:20 ...” (Interview Participant IGT1, 21 September 2017)

On the contrary, sharing available resources is a massive task for ECD teachers responsible for many pupils (over 20). The literature noted that ECD teacher posts were frozen and excluded from the 2018 national budget, which implied that there were qualified teachers who could not be utilised due to financial constraints (Chinamasa, 2017; Pindula News, 2017c). Failure to address this challenge has a direct bearing on the quality of education offered in ECD. A breach of the above-mentioned policy position pertaining to the teacher: pupil ratio also negatively impacts on the time allocated for ICT-related activities. One of the participants highlighting the existence of the timetable challenge said:

“I think 20 minutes is not enough for a lesson to be conducted with 51 ECD learners in an environment with shared resources ...” (Interview Participant IGT4, 21 September 2017)

As a result of the practices narrated in this section, ICT integration has been slow. The quantitative data leading to the model empirically accounting for 87.6% of the variance in section 9.2 suggested that the Extrinsic Motivation and Perceived Usefulness variables were the largest predictors of ECD teachers’ attitudes, while Complexity and Observability were the lowest predictors. Low teacher to pupil ratios can potentially lower the ECD teachers’ morale about their teaching and learning environment, which directly contributes to their extrinsic motivation. Despite the complexity of ICT being a low predictor of the participants’ attitudes, their acknowledgement of language and terminology being too complex for them and their ECD learners makes it an equally formidable challenge that cannot be ignored.

10.3.4 The economic crisis

The literature review noted that Zimbabwe has been experiencing an economic crisis that has resulted in cash shortages and in the general populace failing to access some services considered basic (Chagonda, 2010b; Makochekanwa, 2009; Mlambo, 2016; ZIMCODD, 2016). This study also confirmed that the integration of ICT into ECD education was also negatively affected by the effects of the economic crisis. One of the participants stated that:

“Right now, the main problem everywhere in Zimbabwe is just funding related because the economy has not been performing ...” (Interview Participant IMA3, 14 September 2017)

There is no doubt that the ECD teachers who have proven to be the key players in the integration of ICT in ECD education as reported in this study also need to be intrinsically motivated. Motivation can be achieved through the provision of a teaching and learning environment that is properly resourced and better salaries for the teachers. There is a need for proper funding and strong partnerships with the business community to make this happen. The economic crisis challenges currently being experienced across the country has been more of a constricting factor disabling the creation of such an environment.

10.4 Integrating ICT into the Masvingo province ECD education

This study managed to draft a weighted statistical model, which was not being focused on by most of the previous studies (Chang, 2012). According to the statistical model drafted, the Perceived Usefulness, Extrinsic Motivation and Perceived Behavioural Control variables contributed about 52%, 26% and 19% respectively of the ECD teachers' attitude prediction weights (see section 9.2). A variance value of 87.6% validates these high values in depicting their importance in the evaluation of ICT integration into ECD education. This means that how the ECD teachers view ICT and their motivation towards ICT are instrumental in determining how ICT integration can be enhanced for and through them.

For the department of ECD education to experience full ICT integration, the change agents have to persuade a wide audience of stakeholders (ECD teachers, parents, sponsors and administrators). In this context, the attitudes of the ECD teachers were uniformly most

positive in spite of their ICT competencies being varied. The study further concluded that the attitudes could not be used to predict the teachers' competencies nor can the competencies be used to predict their attitudes. On that note, the ECD teachers' perceptions of ICT integration strongly suggested that the ECD education system is heterophilous[†] (Rogers, 1983, 1995). This was evidenced when the MoPSE tried to encourage the integration of ICT in the department through the training of a select few who were supposed to impart the skills they acquired to their peers. Therefore, the Masvingo province ECD education system can further be enhanced through the implementation of the steps reported in the sections below. It is against this background that the model and findings of this study were used to suggest the solutions for alleviating the abovementioned key challenges that have been presented in the sections below.

10.4.1 Lack of ICT resources, instructional material and infrastructure

This study established that the dearth of ICT resources, instructional material and infrastructure limits the use of and access to ICTs in ECD education. The ECD teachers' use of personal ICT resources, fundraising initiatives and donations might have salvaged the situation, for now. However, this research has proven them to be non-viable solutions for achieving full ICT integration in ECD education. There is an urgent need for more rigorous government support towards providing schools with necessary resources. The support can be provided in many ways, which include subsidies for schools procuring ICT resources, relaxation of tax for ICT equipment procured for educational purposes, provision of grants aimed at resourcing schools situated in marginalised communities and setting up an ICT integration revolving fund that can be accessed by primary schools. This support can potentially have a positive impact on the ICT device to pupil ratio that is currently too low.

It was confirmed that ICT resource constraints were among the key barriers to the implementation of ICT integration in ECD education. Hence, some schools might have inadequate ICT resources and no capacity to fully integrate them into the ECD classes. Such

[†] "Heterophily is the degree to which pairs of individuals who interact are different in certain attributes, such as beliefs, education, social status, and the like ... Therefore, the heterophily that is often present in the diffusion of innovations leads to special problems in securing effective communication" (Rogers, 1983, p. 36).

schools would be faced with limited class time for ICT-related activities since available resources were shared. Therefore, schools need to draft timetables that accommodate ICT resource sharing. This can be done by combining the ICT lessons (creating block periods that consolidate two or more ICT lessons) so that one lesson can help the teacher to accommodate all pupils thereby affording them an opportunity to interact with the ICT devices. Schools also need to actively find ways of funding ICT integration by utilising their community and alumni for the support of fundraising activities.

10.4.2 Lack of ICT competence and training among ECD teachers

It seems rather awkward that the ECD teachers' competencies that were recorded as moderate and mostly low have little effect on their attitudes towards ICT integration. On the contrary, their indication of high ICT use in teaching and learning processes has not been translated into high proficiency. The participants utilising ICT must continue to use it in their classes to develop confidence in use and encourage those who have not yet managed to get the necessary training to improve their competencies.

It was noted that some teachers have been peer coaching each other and those deployed in schools with a resident ICT resource teacher have been benefiting from his or her skillset despite them complaining that the resource teacher was not an ECD education expert. This calls for teachers' training institutions to be more involved in a quest to improve professional development in ICT and also consider training ICT resource teachers to understand the appropriate ECD education teaching methods. It is also prudent that all schools encourage peer coaching, recruit ICT resource teachers to help bridge the gap created by the low skills and create an environment that encourages the ECD teachers with low ICT skills to learn without prejudice.

10.4.3 Incentivise ICT training and ICT use for ECD teachers to enhance ICT integration

The ECD teachers participating in this study conveyed that they might also need to be intrinsically and extrinsically motivated as some of them were unable to procure personal ICT resources. Their salaries in the current economically constrained Zimbabwe were just above the poverty datum line, so that many of them indicated that they would not make a decision to buy a computer using their surplus money. Despite the teachers' indication of

understanding the benefits of using ICTs in teaching and learning processes, they still need to be motivated for faster diffusion of ICT in ECD education (Rogers, 1995). OECD (2010, p. 27), suggests that “incorporating ICT training/e-skills targets in civil servants’ performance evaluations could help incentivise the take-up of ICTs. For educators, for instance, this could include ICT training for teachers’ university curricula and incorporating ICT-related tasks in student and teachers’ examinations and increasing permanent training”. Valbonesi and Biagi (2016) also found that ICT innovation vouchers awarded to small and medium-sized enterprises for developing and adopting ICTs improved competencies among their personnel, thereby increasing competitiveness and business growth.

Financial incentives have been proved to be effective management tools for fostering change and adoption of ICT in the Italian healthcare system (De Rosis & Vainieri, 2017). The MoPSE should consider partnering with the business community to incentivise ICT integration activities to catalyse its adoption in ECD education. ECD teachers who get trained and satisfy benchmarks set could receive incentives in form of performance-based allowances, ICT devices for educational use (laptops, tablets, iPads and palmtops) and funding for further training.

10.4.4 Provision of electrical power for ICT facilities in primary schools

While ECD teachers deployed in schools situated in areas that have poor and inadequate commercial electricity expressed their expectation of the government to one day set up the infrastructure; an analysis of the underlying causes makes what they expect seem like a pipe dream. The economic crisis that resulted in the government having financial constraints, thereby limiting developmental activity in these areas, is one of the major underlying causes (Chagonda, 2010b; Mhlanga, 2016; Murisa, 2010).

ICT devices are reliant on electrical power to function. There is a vital need to consider the procurement and use of renewable sources of energy that produce the electrical power required to operate ICTs in rural and farm schools where electricity problems exist. The literature revealed that corporate institutions and NGOs that include SNV, OXFAM, UNICEF and UNESCO have been helping to electrify schools in some other parts of Africa (Avila, Carvallo, Shaw, & Kammen, 2017; eTransform Africa, 2012; Kalaš, 2010). It is against this

background that I urge the government to partner with these organisations to help electrify schools through the sponsorship of wind and solar power installations and more commercial electricity base stations.

10.4.5 Lack of parental Involvement

The literature review and the findings presented in this study suggested that recent years have seen a decline in parental involvement in school activities (Mawere et al., 2015; Tshuma & Ncube, 2016). This has had an effect on the type of support they have been extending to programmes requiring their funding and input like the ICT integration programme in ECD education. Moving forward, there is a need for schools and the education ministries to encourage their involvement. It was noted that the parents' non-participation in school activities was more prevalent in rural, farm and public schools (Mawere et al., 2015; Muchuchuti, 2014; Tshuma & Ncube, 2016).

The spirit of Ubuntu, which encourages everyone to be involved in activities that benefit the community as a whole, still exists in some African communities (Broodryk, 2002; Gwaravanda, 2011; Mawere & van Stam, 2016). Clinton (2006) wrote magnifying the African proverb: "it takes an entire village to raise and educate a child" as she shared how that experience has benefited her. Reminding the parents of such norms, which appeal to their African culture, could help to steer support for the ICT integration programmes in ECD education.

Activities to encourage more parental support include conducting workshops and campaigns to raise awareness of everyone involved in ECD education (parents, ECD teachers, school heads, MoPSE officials). Given the fact that parents have been citing financial constraints due to the economic crisis (Tshabalala, 2013), it may be a difficult task for schools to restore their involvement without the help of their teachers, MoPSE administrators and political leadership. Hence, MoPSE being the highest authority in the ECD education structures could take a leading role in such a restoration programme.

10.4.6 Representation of ECD education at higher levels in MoPSE

The participants felt that ECD education-related issues were not receiving the attention that other educational departments like the junior- and secondary-level departments were getting at the highest MoPSE levels. If ECD education was to be represented by MoPSE officials at the

Schools Inspector level, PED level, National Education Director in the office of the Permanent Secretary level and in the Office of the President – similar to the Disability issues portfolio which has a special advisor to the president – see Disabled Persons Act of 1992 (amended as 22/2001) (Government of Zimbabwe, 2001) – some the problems would not exist. Based on this study's findings, the researcher hereby recommends the government to strategically position ECD education in the education administration structures.

10.4.7 ICT policy on ECD education

The ECD teachers hailed MoPSE's move to intensively infuse ICT into the national primary education curriculum teaching and learning processes. However, this study found that there is an ICT policy on education that has been in draft form since 2016, which does not explicitly spell out how ECD education ICT-related matters would be handled; hence, the call for a standalone ICT policy on ECD education that clearly sets the direction for ICT integration in ECD education. As prescribed by Nangue (2011, p. 117), there is a need for an ICT audit in primary schools to inform policymakers on the current status of ICT in ECD education. The framework document for this policy needs to clearly define the implementation strategies, targets and requirements, taking note of the other variables discussed in this report: ICT resources, training, infrastructure, current ICT device to pupil ratio, and financial constraints being experienced as a result of the country's economic situation.

10.4.8 ICT integration levy

The enforcement of the abovementioned ICT policy on education needs to be properly funded to ensure full ICT integration is achieved. As suggested by the ECD teachers, over and above the existence of an ICT policy on ECD education, there is a need for a funding model that is independent of fundraising initiatives and donations normally conducted or collected by schools and their local communities. There was a consensus from this study that MoPSE and the other government ministries (MICTPCS and MHTESTD) concerned with ICT need to consider gazetting an ICT integration levy collected for the purposes of improving ICT integration in education in general and then allocating ECD education a quota from the collected funds. The implementation matrix of this levy can only be dictated once it has been adopted and a consolidated position of all stakeholders has been reached.

10.4.9 Employment of ICT-literate staff in MoPSE administration structures

This study revealed that there were old and ICT-illiterate professionals employed in MoPSE administrative positions resisting the advent of ICT in education. The ECD teachers described their offices as rooms filled with dust-ridden files and no sign of ICT devices normally used for administrative purposes. This can be rectified if MoPSE actively takes a stance to train them, raise their awareness of the importance of ICT in education and explicitly require their administration officials to have a certain level of ICT literacy upon recruitment. The unemployment levels in the country have created a ready pool of ICT-literate college graduates should the MoPSE consider relieving the above-mentioned officials of their duties (Bhebhe, Sulochana, Muranda, Sifile, & Chavunduka, 2015).

10.4.10 Business community / corporate world

Some of the ways used by ECD teachers in this study to deal with the challenges they reported were fundraising initiatives and donations from the corporate world. The corporate world has also been demonstrating empathy in the form of special discounted pricing towards educational institutions' internet bandwidth and software procurement. Some telecommunications companies have gone a step further to "zero-rate" some of their products (Kabweza, 2017). This is where they charge no fees for certain services when they are accessed for educational purposes. These services may include downloads from/access to educational websites. If all corporates contribute something towards the cause, ICT integration could be greatly improved.

There is no doubt that ICT, which is still in its evolutionary stages in the Zimbabwean education system (as evidenced by the findings of this study), is one of the ripple effects of echoes of the future for the sector. Hence, the need for everyone (including the business community) to actively participate in making ICT integration in education a success. Therefore, I urge the corporate world to continue supporting the education sector with the special pricing. I further encourage the business community to help educationists in devising resourcing models that are affordable enough to incorporate all schools regardless of their location and catchment area.

10.4.11 Research and education network for basic education

There is a need for the government to exploit the power of the platforms created by research and education networks (Foley, 2016; Taylor & Abbott, 2015). The literature notes that the Zimbabwe Academic and Research Network (ZARNet), which was formed in 1997, was the first National Research and Education Network (NREN) (ZARNet, 2017). The purpose of an NREN is to broker deals and negotiate on behalf of the educational institutions it represents. These deals can be, for example, software licenses, telecommunications infrastructure, bandwidth pricing and electronic learning (e-learning) infrastructure. ZARNet has had this mandate since 1997 (more than two decades ago). However, this study's findings confirmed that it may have encountered challenges in fulfilling its mandate (Ndebele, 2015).

The final recommendation is for the government to actively understand the challenges that it encountered, which have resulted in so many unresolved problems for the education sector. Once that has been done a standalone NREN for basic education (primary and secondary education), which may be affiliated to ZARNet or reporting to the MoPSE (depending on how the education stakeholders decide) can be set up. The establishment of an NREN could help primary schools deal with ICT issues by interfacing with most service providers through the platform.

10.5 Concluding remarks

This chapter concluded that the integration of ICT in ECD education can be enhanced by establishing and resolving the key challenges found in this study. The chapter further suggested solutions for the challenges noted. The uncertainty of the availability of funds to implement the solutions suggested is feared to be the biggest barrier limiting ICT integration in ECD education. The next chapter is a summary of the findings, recommendations and suggestions for future research.

SECTION THREE – CONCLUSION

Chapter Eleven – Summary of Findings, Recommendations and Conclusions

11.1 Introduction

The aim of this research was to investigate the use of ICT for teaching and learning at the ECD educational level from the ECD teachers' perspective. The ECD teachers' attitudes and perceptions towards ICT integration, ICT competencies, the best predictor of their attitudes and associated challenges were investigated in this study. The participants also suggested ways to enhance the integration of ICT in ECD education. The study was conducted in primary schools situated in the seven districts of Masvingo province in Zimbabwe. Mixed methods employing a cross-sectional survey, interviews and focus group discussions were utilised. Data were collected sequentially in two phases; phase 1 administered the questionnaire; while phase 2 concurrently administered interviews and focus group discussions based on the outcomes of phase 1. Thus, phase 2 allowed the researcher to confirm phase 1 findings in order to critically analyse the data that had been collected. This resulted in large volumes of data; hence, SPSS was used to analyse quantitative data, while Atlas.ti and NVivo software were used to analyse the qualitative data.

The critical questions for this study were:

1. What are the attitudes of ECD teachers in Masvingo towards the implementation of ICT in the ECD Curriculum?
2. What ICT competence do ECD teachers in Masvingo have in order to engage with ICT integration in teaching and learning?
3. What are the challenges faced by ECD teachers when trying to integrate ICTs in teaching and learning processes?
4. What is the best predictor of educators' attitudes towards ICT integration in ECD education?
5. How can the integration of ICT in ECD education be enhanced?

11.2 Summary / interpretation of findings

Chapter Two of this study confirmed the literature's position that the educators' attitudes towards ICT integration could be used to explain their ICT competencies and use for teaching and learning purposes. The sections below are an overview of the key findings in this study.

11.2.1 Demographic data

- There was an apparent skew of the participants' gender towards the female gender (90.8% of the respondents), which confirmed previous studies' findings that ECD education is generally viewed as a feminine teaching field (Dozva & Dyanda, 2012; Eurostat, 2017; Nyoni & Nyoni, 2012). Therefore, this study established a feminisation of the Zimbabwean ECD teaching profession.
- About 66.7% was recorded for teachers in possession of a diploma in teacher education, and 18.3% for paraprofessionals (semi-skilled teachers), which meant that the large majority of the respondents were qualified to teach in ECD education.
- The highest percentage was recorded for teachers with 0-5 and 6-10 teaching years' experience, who accounted for 48.7% and 31% respectively. Based on these figures this study concluded that the formal introduction of ECD education in the Zimbabwean education system in 2004 could be the reason for the low teaching experience years possessed by teachers in that educational level (Chikutuma & Mawere, 2013; Makuvaza & Gatsi, 2014; Nhaka Foundation, 2012).

11.2.2 Research question one

The first critical question required the researcher to identify the ECD teachers' attitudes towards ICT integration. The study established the findings presented below:

- The ECD teachers had highly positive attitudes towards ICT integration in all the three attitude domains (affective, cognitive and behavioural). The positive attitude was attributed to their willingness to receive ICT-related training and their use of ICT in teaching and learning that was high.
- Responding to the questionnaire items evaluating affective attitudes the ECD teachers indicated that ICT neither made them uncomfortable nor nervous. ECD teachers in this study who were comfortable with computers had a high level of education and ICT use.

- The study found that the majority of the ECD teachers believed that computers had a positive effect on their teaching and learning processes.
- The ECD teachers' responses to the behavioural domain questionnaire items revealed that they put some importance on ICT, were willing to engage in ICT-related learning and would not favour an educational environment without ICT over one where ICT automates teaching and learning processes for the ECD teachers and their learners. This positive trend of the respondents' willingness to participate in further ICT-related training was in congruence with previous studies' conclusions (Adams, 2016; Gumedze, 2017; Manaligod, 2012; Mukhari, 2016).
- In spite of the ECD teachers' high willingness to learn more about computers, the large majority indicated that they were not likely to use their surplus money to buy a computer. This study further established that the participants possessed a belief that MoPSE needed to ensure that they were properly resourced with ICT materials, and the economic crisis currently being experienced in Zimbabwe had a negative effect towards the ECD teachers (Chagonda, 2010b; Mlambo, 2016; ZIMCODD, 2016). Hence, a computer would not be a priority device for the majority of the ECD teachers due to the resource constraints and economic crisis.
- This study found that the majority of the ECD teachers had seen computers being used as educational tools prior to participating in this research (about 78%). However, a closer analysis of the collected data discovered that exposure to computers had a weak positive effect on the ECD teachers' ICT integration attitudes.
- The study also established that the highest percentage of ECD teachers with highly positive attitudes consisted of teachers aged between 31 and 50, which accounted for 70.6% of the respondents. However, a distinctive pattern could not be established based on the age because the attitude was generally high for all respondents and the 31–50-year age range was also the age range with the highest number of respondents. It was therefore concluded that in this study, the demographic data (their gender and age) of the respondents had no significant effect on their attitude; therefore, gender could not be used to predict their attitude.
- However, their exposure to computers and perception of the Rogers' (1995) computer attributes had a positive effect on their attitude.

- The study also discovered that the ECD teachers held the perception that improving their ICT skills was not a priority when compared to visiting the bank to queue for cash.
- The study confirmed that the lack of proper training, ICT skills, instructional materials, ICT resources, infrastructure afforded to the schools and teachers and the Zimbabwean economic crisis were hindering them from fully integrating ICT into ECD education (Bukaliya & Mubika, 2012; Correa & Pavez, 2016; Konyana & Konyana, 2013; MoPSE, 2017). However, despite the challenges that the ECD teachers faced their attitudes towards ICT integration remained positive.
- The absence of and low computer proficiencies found in this study confirmed that low technology skills can potentially brood negative attitudes resulting in resistance to change (Fullan, 2006, 2011). The study also established that the ECD teachers expected to receive instructional materials, ICT resources, infrastructure and to have received ICT-related training from the government authorities prior to engaging with ICTs in ECD education.

11.2.3 Research question two

The second critical question investigated the ICT competencies possessed by ECD teachers. The findings are presented below:

- The quantitative data recorded that the majority of the ECD teachers participating in this study possessed ICT competencies, which were in the low (30.1%) to moderate (29.7%) categories. The inadequacies exposed for the teacher education training programmes were attributed to the lack of ICT competencies among ECD teachers.
- Masvingo district, which is also the capital city of the province (Muzvidziwa, 1997, p. 97), recorded respondents with the highest ICT competencies. Masvingo, being the capital of the province, is also regarded as an urban district. Thus, this revealed that there is a relationship between proximity to the city and ICT competencies.
- The majority of the respondents (about 72%) indicated that they were using ICTs in teaching and learning activities. However, their general computer use statistics showed that about 63% of them were not regularly using ICTs for basic teaching and learning activities.
- A review of the qualitative data unveiled the ECD teachers' mixed perceptions of their ICT competencies. The majority qualitatively acknowledged that they were computer

illiterate (even though they had also indicated they could use other ICT devices like the smartphone and tablet), whilst the rest of the participants indicated that they possessed key competencies.

- About 65% of the respondents revealed that they had no access (35.3%) or access that was quantified as less than once a month (29.7%) to ICT used for teaching and learning activities. Based on these findings, it was concluded that the majority of the ECD teachers in this study were experiencing challenges accessing ICTs used for teaching and learning activities.
- On the contrary, it was also noted from the qualitative data that some ECD teachers were using their personal resources to subserviently conform to their employer's (MoPSE's) ICT integration requirements for the teaching of ICT in ECD education. This finding was a confirmation of the trade unions' claim that the teachers were using their personal resources to implement the new curriculum (Pindula News, 2017b).
- The majority of the participants (about 58.1%) revealed that their schools either hired an ICT technician (22.2%) or outsourced an external service provider (35.9%) to provide technical support for their ICT equipment.
- The study recorded that the majority of the ICT equipment was only serviced when it broke down. This indicated that the existing technical support provided at most schools was available on a need basis and not a standby/regular basis.
- The study also noted that there were poor or no technical ICT support structures in primary schools. The qualitative data suggested that the non-existence of ICT technical support staff in primary schools resulted from the lack of prioritisation for ICT.
- The majority of the respondents (63.7%) indicated that they had never received ICT-related training. The qualitative data supported these statistics by revealing that ICT-integration activity was curtailed by inadequacies in the teacher training programmes. This further confirmed the notion that a lack of access to ICT resources and proper training leads to a lack of competence and confidence in using ICT for teaching and learning activities (Gray, 2011; Musingarabwi, 2017).
- The study also noted that schools with ICT facilities and computer resource teachers were creating learning platforms for peer coaching ECD teachers. Based on their statements, this has been improving their ICT-related competencies.

- The ECD teachers' statements suggested that there was a need to raise the school administrators' awareness and computer literacy levels to improve the ECD teachers' ICT use in primary schools.
- It was noted that some ICT lessons were conducted in the absence of functional ICT resources. This ultimately meant that the learners in such environments were unable to interact with functional ICT devices.
- The challenges associated with ICT teacher training programmes established by this study were also found to be general and not ECD specific. The participants further revealed that the training programme equipped them with ICT skills to use computers and not to help them teach ICT in ECD classes.
- The ECD teachers expressed that the training they received at teachers' training institutions (universities and colleges) had more theoretical lectures than practical lectures. This led to the study concluding that the training may not be helping them much to teach using ICT or teach ICT as it neglected the most important component of practical training. Hence, it was concluded that the teacher training programme did not adequately equip teachers in the area of ICT.
- This study further revealed that ECD teachers' computer proficiency was constricted by theoretical knowledge, which was obtained under a resource-constrained teacher training programme (refer to a study by Musingarabwi, 2017 for a detailed review). This shortage may be the reason for the non-existence of sound ICT competencies among ECD teachers who may have been trained at the same institutions. Therefore, it can also be concluded that the ICT training challenge emanating from teachers' training institutions has been culminating in an ICT-illiterate ECD teacher as the end product.
- The ECD teachers explicitly expressed that the training programmes provided to them by the MoPSE were too brief and fell short of their expectations. They suggested that the training be conducted over longer periods such as school holidays to enable MoPSE to include more content.

11.2.4 Research question three

The third critical question tried to establish the ICT integration challenges faced by ECD teachers. The key challenges found in this study are presented below:

- This study established that the teaching of ICT in ECD education was being curtailed by resource constraints. The ECD teachers indicated that there were severe ICT resource constraints, which were also their largest barrier when it came to ICT integration into teaching and learning processes.
- The qualitative data revealed that teachers in the ECD department were having challenges accessing internet services at their schools. This challenge existed for both ECD departments in resourced and under-resourced primary schools.
- This study also established that whenever the resources were few the ECD education department got the lowest priority in accessing available resources, which would eventually result in them sharing the available ICT resources to enable them to teach and create a learning environment through using ICTs.
- In addition to the ICT resource challenges, this study also confirmed that ICT integration programmes were introduced without making sure that there were requisite textbooks and instructional materials in primary schools. This confirmed the 1999 Presidential Commission of Inquiry's finding that "there is a tendency to introduce new subject areas without the requisite textbooks, equipment and expertise" (Nziramasanga, 1999, p. 243).
- In some primary schools where there were ICT resources installed and services offered, it emerged that there was a lack of developmentally appropriate and age-appropriate (for learners between four and six years of age) ICT equipment.
- Some participants indicated that access to the available ICT resources was only limited and restricted to upper grades and administrators at the primary schools.
- ECD teachers deployed to schools in areas where development has been slow, like the Zimbabwean rural areas (Konyana & Konyana, 2013), cited the non-existence of electricity as one of the major challenges limiting ICT integration for rural primary schools.
- Despite the existence of the electricity challenge reported above, only 14.7% recorded that the lack of electricity would hinder them from using a computer for teaching and learning purposes.
- The study also revealed that the ECD teachers were not spared by the economic crisis, as most schools were no longer able to raise funds. Their statements further indicated that financial constraints caused by the economic crisis had a negative effect towards the

integration of ICT, which could hinder the integration of ICT in both urban and rural areas since it affected the procurement of ICT resources, services and training.

- A corpus of the participants expressed that not all stakeholders were sensitised on the ICT innovation being introduced into ECD education. This finding corroborated the existence of ignorance of the importance of ICT in ECD education among the parents, administrators and low-level MoPSE officials.
- The ECD teachers further suggested that the ignorance displayed by the parents, school development committees and school administrators negatively affected the ECD teacher who was expected to steer the ICT integration programme in ECD education.
- A variant perspective highlighted that the non-existence of infrastructure and lack of funds to construct ICT facilities in most primary schools put no guarantee on the safety of the equipment should it be procured.
- It was also noted that some ECD teachers were made to do menial activities at the expense of the ECD pupils because their school administrators perceived them as “play” teachers being wasted on the young learners.
- This study discovered that the “terminology used when referring to ICT-related issues was too complex for learners at ECD to articulate”, as they were mostly taught in vernacular.
- The ICT resource constraints discussed above led to the limitation of time allocated for ICT-based lessons and activities, which made it very difficult for some schools and teachers to implement teaching ICT as a learning area. The participants also revealed that some of the lesson time was taken by getting the young learners settled and the time they took to walk to the ICT facilities, which were not located in the same building area as their classes.

11.2.5 Research question four

The fourth critical question was identifying the best predictors of the ECD teachers’ attitudes. Statistical techniques (correlation and multiple linear regression) were used to determine the best predictors of ECD teachers’ attitudes towards ICT integration. The key findings are presented below:

- In the first regression, the ECD teachers’ cultural perception variable was found to be an insignificant contribution to the prediction of the dependent variable (ECD teachers’

attitude towards ICT integration). The standardised estimates of the variable (computer attributes) that influenced the ECD teachers' attitude were: $B = 0.441$, $T = 10.881$, $p < 0.05$. The computation accounted for 32.4% of the ECD teachers' attitude. An analysis of the first computed regression suggested that the greatest amount of variance in attitude among the ECD teachers could be explained by the Rogers (1995) computer attributes independent variable.

- The study established that when the ECD teachers' attitude was highly positive, their perception of the relative advantage of ICT in ECD education was also high.
- The study obtained a Spearman rank-order coefficient of 0.281, with a standard error estimate of 0.055 and a corresponding T-value of 5.1, which was highly significant ($p = 0.000$) between the respondents' attitude towards ICT integration and the computer attribute "compatibility". Based on this result, it was concluded that the association between the variables was a weak positive one.
- The Spearman rank-order coefficient was found to be 0.361, with a standard error estimate of 0.057 and a T-value of 6.742 ($p < 0.05$) for a computation between the ECD teachers' attitude and the computer attribute 'complexity'. This finding postulated that the two variables had a weak correlation.
- A Spearman rank-order coefficient of 0.342, with a standard error estimate value of 0.052 and a corresponding T-value of 6.348 ($p < 0.05$) was found for a computation between the ECD teachers' attitudes towards ICT integration and the computer attribute "observability". Therefore, the study rejected the null hypothesis and concluded that there was a weak positive relationship between the two variables.
- All the computer attributes (Relative Advantage, Compatibility, Complexity and Observability) selected for use in this study were found to be significant in modelling attitude and were used in the second regression.
- In the second regression computation between the computer attribute variables and the ECD teachers' attitude, the standardised estimates (from largest to smallest – according to the B values) were: relative advantage $B = 0.184$, $T = 4.911$, $p = 0.000$ (i.e. $p < 0.05$), observability, $B = 0.147$, $T = 5.087$, $p = 0.000$ (i.e. $p < 0.05$) and complexity, $B = 0.091$, $T = 3.217$, $p = 0.001$ (i.e. $p < 0.05$).

- The results of the regression computation further revealed that the computer attribute “Compatibility”, $B = 0.063$, $T = 1.908$, $p = 0.057$ (i.e. $p > 0.05$), had an insignificant effect on the ECD teachers’ attitudes. Therefore, it was concluded that the ECD teachers’ attitudes could not be determined by their perception of it being consistent with existing values and norms in ECD education (i.e. Compatibility). The regression computation accounted for 33.3% of the variance. This low percentage implied that there were other variables capable of influencing the ECD teachers’ attitude not considered in the regression computation (the economic crisis; lack of ICT equipment, infrastructure and instructional material; lack of ICT training competencies; poor MoPSE support; limited parental involvement; and financial constraints).
- The Pearson product moment correlation coefficients obtained from the majority of the computations between the UTAUT’s IS constructs and attitudes revealed a weak to moderate positive association: facilitating conditions (0.309), Subjective Norm (0.351), Perceived Ease of Use (0.371, $p < 0.05$), Observability (0.445, $p < 0.05$), Perceived Behavioural Control (0.464, $p < 0.05$) and Relative Advantage (0.468, $p < 0.05$). High correlation values were obtained for three IS constructs, which were: Complexity (0.611, $p < 0.05$), Extrinsic Motivation (0.670, $p < 0.05$) and Perceived Usefulness (0.800, $p < 0.05$). Thus, the study rejected the null hypothesis and concluded that there were significant positive relationships between the ECD teachers’ attitude towards ICT integration and the UTAUT’s IS constructs selected for use in this study.
- The results of the third regression analysis showed that six variables (Perceived Usefulness, Extrinsic Motivation, Perceived Behavioural Control, Complexity, Perceived Ease of Use and Observability) influenced the ECD teachers’ attitude towards ICT integration at the 0.05 level of significance. The study also found that the variables Subjective Norm ($B = -0.026$, $T = -1.749$), Relative Advantage ($B = 0.030$, $T = 1.816$) and facilitating conditions ($B = 0.017$, $T = 1.016$) had an insignificant effect ($p > 0.05$) on the prediction of ECD teachers’ attitudes towards ICT integration as their t-values were closer to zero.
- The standardised estimates of the variables that influenced the ECD teachers’ attitude from largest to smallest were: Perceived Usefulness ($B = 0.434$, $T = 20.830$, $p < 0.05$), Extrinsic Motivation ($B = 0.215$, $T = 15.972$, $p < 0.05$), Perceived Behavioural Control ($B =$

0.157, $T = 10.937$, $p < 0.05$), Complexity ($B = 0.128$, $T = 7.528$, $p < 0.05$), Observability ($B = -0.052$, $T = -2.420$, $p < 0.05$) and Perceived Ease of Use ($B = -0.057$, $T = -3.809$, $p < 0.05$). This analysis suggested that the greatest amount of variance in attitude among the ECD teachers could be explained from largest to smallest by the following independent variables: Perceived Usefulness, Extrinsic Motivation, Perceived Behavioural Control, Complexity, Observability and Perceived Ease of Use. The third regression accounted for 87.6% of the variance. The high percentage meant that the IS constructs in the UTAUT could safely predict the ECD teachers' attitudes with minimal influence from other factors.

- A research model resulted from the best predictors of attitude found in this study. The model assumed that the ECD teachers understood the benefits of ICT in education. Therefore, the ICT adoption model based on the Zimbabwean ECD education context can be summarised according to weight values computed from the B values of the third regression (from largest to smallest – all weight values add up to 1) as follows: Perceived Usefulness (0.526), Extrinsic Motivation (0.261), Perceived Behavioural Control (0.190), Complexity (0.155), Observability (-0.063) and Perceived Ease of Use (-0.069).

11.2.6 Research question five

The fifth critical question was concerned with establishing how the integration of ICT into ECD education can be enhanced. Based on research question three's findings in Chapter Eight, the key suggestions are presented below:

- The teachers' training institutions should acknowledge and rectify the gaps that exist in their ICT education programmes as highlighted in the context of this study. Their acknowledgement and resolutions to the ICT training challenges noted could improve the quality of the ICT competencies acquired in teacher education (Bukaliya & Mubika, 2011).
- The study concluded that the community and parents should also be regularly and explicitly sensitised on the importance of ICT in ECD education since they are expected to provide funds required for ICT integration activities.
- In addition, it was noted that some school administrators and MoPSE officials were highly ICT illiterate. The study suggested that MoPSE should actively take a stance to train them,

raise their awareness of the importance of ICT in education and unequivocally require the administration officials to have a certain level of ICT literacy upon recruitment.

- The urgent need for the MoPSE to further complement the teachers' efforts of using their personal resources to integrate ICT into the ECD education curriculum by resourcing them was highlighted in this study.
- The results pointed to the urgent need to improve the ECD teachers' intrinsic and extrinsic motivation for ECD teachers. For this to happen, the study suggested improving their standard of living through ICT integration allowances and providing them with more ICT resources in their teaching environments.
- The study also suggested more rigorous government support towards resourcing schools with ICT equipment and funds for infrastructural development. Key steps to be taken by government are providing subsidies and grants for schools procuring ICT resources and lowering the tax rates for ICT equipment procured for educational purposes.
- The study also advocated for the engagement of corporates in the promotion of zero rating and special pricing for services used for educational purposes, which include bandwidth, educational websites, hardware and software, so that ICT education can be ubiquitous.
- It emerged that primary schools with shared resources needed to draft timetables that accommodated the ICT resource sharing to afford every ECD learner an opportunity to interact with the available resources.
- Financial constraints limited most schools' ICT integration activities and this study urged them to partner with their communities and alumni for the support of fundraising activities.
- The study proposed the provision of performance-based incentives, which may be in form of monetary allowances or educational ICT devices and funding for further training, given to teachers integrating ICT into their classes. This move has previously been used to foster change and catalyse adoption of ICT in the Italian healthcare system (De Rosis & Vainieri, 2017).
- The study also suggested that schools ought to create an environment that encourages ECD teachers with low ICT skills to learn without prejudice. This can be done through the

peer coaching and recruitment of more ICT resource teachers to close the gap created by the low skills possessed by most teachers.

- ECD teachers integrating ICT in Masvingo province must continue to use it in their classes to develop confidence in use and encourage those who have not yet managed to get the necessary training to improve their competencies. Previous studies noted that this has increased the diffusion of technological innovations and eventually their use in most educational cases (Ertmer & Ottenbreit-Leftwich, 2010; Fu, 2013; Hudson, 2010).
- This study also discovered that schools and ECD teachers with a resident ICT resource teacher have benefited immensely from his or her skillset. However, the participants expressed their frustration over the ICT resource teachers' failure to handle ECD pupils. Based on this finding, it was suggested that teachers' training institutions need to consider training ECD-specific ICT resource teachers who understand the appropriate ECD education teaching methods.
- It was concluded that there is a vital need to consider the procurement and use of renewable sources of electrical power required to operate ICTs in rural and farm schools where electricity problems were noted. The government was, therefore, urged to seek partnership with Inter-Governmental organisations capable of electrifying primary schools through the sponsorship of wind and solar power installations and more commercial electricity base stations (Avila et al., 2017).
- The study further proposed that MoPSE should encourage more parental involvement in ICT integration activities by conducting workshops and campaigns to raise the parents' ICT awareness.
- The qualitative phase of this study revealed that the ECD teachers believed that the ECD department was viewed as an inferior department, which resulted from its lack of representation in the strategic MoPSE structures. For the enhancement of ICT integration into ECD education, it was therefore recommended that MoPSE repositions ECD education in its administrative and organisational structures.
- It also emerged that it would be an essential step to conduct an ICT audit in primary schools to inform policymakers on the current status of ICT in ECD education.
- There was a consensus from this study's participants that MoPSE and the other government ministries, Ministry of Information Communication Technology Postal and

Courier Services (MICTPCS) and Ministry of Higher and Tertiary Education, Science and Technology Development (MHTESTD), concerned with ICT need to consider gazetting an ICT integration levy collected for the purposes of improving ICT integration in education in general and then allocating ECD education a quota from the collected funds, as this has helped in other sectors of the economy (Bhat et al., 2016).

- Lastly, the study highlighted the need for the government to exploit the power of the platforms created by research and education networks (Foley, 2016; Taylor & Abbott, 2015).

11.3 Implications of the findings

The results from this study highlighted the gaps between policy and practice in the integration of ICT in ECD education, noted benefits and shortcomings of how primary schools are currently integrating ICT and proposed solutions to help them enhance ICT integration. The study established that there are implications for the professional development of ECD teachers in the area of ICT and how to effectively equip under-resourced primary schools.

In order to integrate ICT into ECD education, government needs to recruit and deploy sufficient ECD teachers with adequate ICT competencies on how to use technology in teaching. An improvement on the ECD teachers' access to ICT resources for teaching and learning activities is urgently required. The practice of relying on donations does not necessarily assure schools that ICT will be integrated at the expected pace as the recipients cannot always dictate their specific requirements to the donor. This means that government, schools, teachers and parents need to work together to find more viable solutions for resourcing primary schools. In the short term, MoPSE-initiated ICT training workshops need to be extended to all teachers and conducted during longer periods like the school holidays, which are normally at least a month, so that more content can be included. The inadequacies noted for teachers' training institutions implied that they should strongly consider reviewing their ICT-related training programmes and also consider training ICT teachers with a specialisation in ECD education.

Schools situated in rural and farm areas need to be equipped with better telecommunications and electricity infrastructure so that ICT can be integrated into their educational activities. A

countrywide ICT audit would be the best way to find out from all the stakeholders whether gazetting an ICT integration levy for education can solve the financial constraints currently associated with the programmes. However, questions arise as to whether the government would be able to steer the recommendations presented in this report forward, as the much-awaited ICT policy on education has taken a very long period to get approval and the economic crisis has persisted.

While this study noted with great concern the ignorance and ICT illiteracy of school administrators and MoPSE officials cited by a number of the participants, it remains the government's responsibility to make sure that their officials receive adequate training and appreciate ICT initiatives in the ministry. It also seems to be the right time to create innovation hubs hosting activities that further promote ICT in ECD education, which include awareness campaigns and hackathons. However, their impact may not be strong if the lack of resources and proper training have not been addressed. The gap between practice and policy established in this study, where the policies required the education system to have certain standards and the standards were not adhered to at the expense of the ECD teachers, suggests that the MoPSE needs to review their monitoring and evaluation mechanisms. Examples of such cases include the failure to adhere to the 1:20 teacher to pupil ratio; school administrators' failure to schedule timetables that accommodate the ICT resource sharing practices in their primary schools and failure to address the challenges associated with using vernacular languages to teach ICT in ECD education.

The model drafted from the findings of this study suggested that the ECD teachers' perceived use of ICT and extrinsic motivation were the most key predictors of their attitudes. This study further discovered that forcing the ECD teachers to integrate ICT may not be the most effective way to catalyse the diffusion and adoption of ICT in ECD education. In spite of the high ICT use resulting from the decision by some of the ECD teachers to use their personal resources to integrate ICT, the government still needs to motivate them. Motivation may be delivered by attaching ICT integration to either incentives or allowances for participating, which all require money and resources. Making school environments conducive to ICT-based learning by complementing the efforts already done enables ECD teachers who were at the epicentre of this research to integrate ICT.

11.4 Contributions to new knowledge

A gap existed in research published on ICT integration into ECD education in Zimbabwe from the perspective of the teacher. The most recent previous research has been mostly focused on ICT integration in other parts of Africa and the various facets of education, higher, secondary and tertiary (refer to studies by Gumedze, 2017; Mbatha, 2015; Musingarabwi, 2017; Nangue, 2011; Seegobin, 2012; Tondeur et al., 2018). This thesis reports a mixed-methods research, which was conducted in one of the provinces (Masvingo province) and was aimed at bridging this gap. It identifies the ECD teachers' attitudes towards ICT in an economically challenged Zimbabwe. An examination of the ECD teachers' ICT competencies and challenges established that there were gaps between practices and policies, which need to be urgently addressed to enable ICT integration into ECD education to be a success.

My review of the literature noted that there were substantial ICT resource challenges in primary schools; a dearth of ICT competencies among lecturers at teachers' training colleges and teachers in general; and a challenging debate over how ICT should be implemented in primary education. The ECD teachers' responses to the questionnaires, interviews and focus group discussions found that their attitudes were positive, despite possessing record low to moderate ICT competencies and experiencing a lack of access to ICT. The study noted that most ECD teachers deployed to urban primary schools confirmed the existence of ICT equipment and infrastructure in form of a computer laboratory. Teachers situated in rural and farm areas tended to view their geographical location as a disabling factor setting an unlevelled playing field for them and their learners. This was mainly due to the evidence found suggesting that on top of the generic ICT integration challenges they also experienced more location-specific challenges. These challenges included lack of electricity, classrooms and furniture; lack of ICT resources to practically teach ICT at the rural ECD education centres; and more limited parental support of ECD education activities.

The participants also expressed their frustration over the limited support they have been receiving from the parents and MoPSE. This is despite donations and fundraising activities being generally perceived as key sources of ICT resources for all primary schools. In addition to the research about teachers' attitudes towards the integration of ICT in education, this study statistically modelled the UTAUT's IS constructs to produce a model that accounted for

87.6% of the ECD teachers' attitudes. One would have expected to find most negative attitudes during an economic crisis such as the one being experienced in Zimbabwe; however, the finding that the attitudes were mostly positive suggests that the other factors not statistically evaluated could have contributed to this. These included the high educational qualifications possessed by the ECD teachers, the high proliferation of ICT in form of devices used by the teachers and their exposure to ICT. It is against this background that this study concluded that the diffusion, acceptance and adoption of ICT in ECD education depend on all the stakeholders' efforts.

11.5 The way forward and recommendations

This research concluded that each of the stakeholders involved with the integration of ICT needs to take part for successful integration. The following is a summary of the key recommendations reported in this study according to stakeholder:

11.5.1 Recommendations for the government, MoPSE and policymakers

- This study recommends that the government should conduct an ICT audit aimed at evaluating the current ICT education status in all primary schools. It is hoped that the results of the audit can be used to guide the development of a strategic plan, which lays out how primary schools can be equipped with instructional materials, ICT resources, furniture and infrastructure and how practising teachers, administrators and MoPSE officials (ECD Trainers, Schools Inspectors and District Schools Inspectors) can receive continuous professional development in ICT.
- An ICT policy on ECD education outlining how ICT-related issues will be handled based on the existing ECD education policies is required at this time. However, policymakers are strongly encouraged to take steps that ensure that once policies reach the final draft stage, approval is not unnecessarily delayed.
- Government is also recommended to provide subsidies to schools for procuring ICT equipment and lower tax rates for ICT equipment purchased for educational purposes.
- To raise funds for national ICT integration activities, the government should consider the introduction of an ICT integration levy for education in general. A quota system could then be used to determine the percentage allocated to ECD education.

- The electricity challenge was one of the key barriers to ICT integration for the Zimbabwean context. The government should partner with inter-governmental organisations to provide non-renewable energy solutions to schools situated in areas with poor electricity infrastructure.
- The MoPSE is also recommended to increase the awareness and promotion of ICT in ECD education by taking some of the following steps:
 - Train teachers with low ICT competencies.
 - Make it a mandatory requirement that officials in key MoPSE positions like the DSI must hold certified basic ICT qualifications.
 - Regularly monitor and evaluate ICT integration activities in primary schools.
 - Recruit ECD education experts in strategic MoPSE positions to steer ICT-related ECD education matters.
 - Facilitate the establishment of innovation hubs aimed at increasing the awareness of ICT in ECD education.
 - Engage unemployed ICT college/university graduates by providing them with platforms such as hackathons to find more ICT integration solutions, which would, in turn, inspire teachers and the corporate community to promote ICT in ECD education.
 - Provide incentives to teachers demonstrating ICT use and integration in ECD education.
 - Setup ICT education campaigns for encouraging more participation of the parents.

11.5.2 Recommendations for school administrators and school development committees

- The school administrators are encouraged to employ strategies that promote ICT in ECD education, which may include:
 - Drafting timetables that accommodate ICT resource sharing in resource-constrained environments.
 - Facilitating the creation of alumni platforms to help steer ICT integration through the support of fundraising and resource mobilisation activities.
 - Encouraging teachers to get ICT-related training and to develop confidence in the use of ICTs in teaching and learning processes.

- Promoting the prioritisation of ICT in ECD education by resourcing the ECD department with requisite ICT resources where possible.

11.5.3 Recommendations for the corporate community, NGOs and churches

It emerged from this study that the corporate community, NGOs and churches have been donating ICT equipment and software to primary schools. Based on this finding I urge them to continue supporting ICT integration activities in primary schools. In addition to their support, I encourage more corporate institutions to partner with the ECD education departments in providing ICT services that are zero-rated to promote ICT integration at the ECD education level.

11.5.4 Recommendations for the teachers' training institutions

The low confidence in ICT use and ICT skills possessed by most practising ECD teachers participating in this study was attributed to the inadequacies in the teacher education programme. This study strongly urges teachers' training institutions to revamp their ICT training programmes so that they are aligned with the new curriculum and enable the trained teacher to discharge his or her duties using contemporary means that include ICT and other technologies.

11.5.5 Recommendations for ECD teachers

This study was focused on the ECD teacher as a key ICT integration driver in the Masvingo province education system. For the full integration of ICT in ECD education, the teacher is recommended to:

- Participate in/receive training to engage with ICT in the ECD classroom.
- Develop confidence in the use of ICTs for teaching and learning activities.
- Use collaboration and peer coaching platforms should they be afforded to them in environments where there is at least one ICT-literate teacher.
- Integrate ICT using the available ICT resources.
- Support ICT integration activities by encouraging more parental involvement.

11.6 Suggestions for future research

Further research is required to establish the ICT competencies possessed by MoPSE officials, the current status of ICT-related training in teachers' training institutions, explicitly understand the effects of the economic crisis on ICT integration in education, the level of ICT literacy versus the literacy rate and why parents are failing to support ICT integration activities in ECD education. The ICT policy on education that has been in draft form for a very long time is also a cause of concern that warrants further research. The last suggestion would be to consider conducting research that takes a longitudinal approach to educators' attitudes and perceptions towards ICT integration. Results from such research can provide profound information that is invaluable to policymakers should they decide to enhance or introduce similar programmes.

11.7 Concluding remarks

This study critically analysed data collected, based on a mixed methods approach, to harvest views that had both breadth and depth. The report concluded that Masvingo province ECD teachers possessed highly positive attitudes and low to moderate ICT competencies. The absence of ICT resources, instructional material and infrastructure were cited as the key barriers to ICT integration in ECD education. A model statistically proving that ECD teachers' attitudes can be predicted by the UTAUT's IS constructs emerged from this study. The government was strongly recommended to conduct an ICT audit in all primary schools and to help resource primary schools. Teachers' training institutions were urged to consider revamping the professional development of ICT in ECD education. Taking cognisance of the summary of key findings presented above based on the ECD teachers' perspectives, it should be noted that ICT integration in ECD education cannot be easily achieved if the above recommendations have not been met. All stakeholders concerned with ECD education have to actively participate for full ICT integration into ECD education teaching and learning processes to be achieved.

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APPENDICES

Appendix A - Questionnaire

Questionnaire

Early Childhood Development (ECD) Teacher Information and Communication Technology (ICT) Integration Survey

Adapted from Govender (2006) and Raulston (2009)

Thank you for accepting to participate in this survey by filling in this questionnaire. This questionnaire is derived from well-validated attitudinal surveys. Confidentiality is a priority in this questionnaire, therefore it will not be used to identify you as an individual. We appreciate you assisting us by completing this questionnaire. The results of this research will be used to develop a profile of how teachers view Information and Communication Technology (ICT) integration in Early Childhood Development (ECD) education, so as to improve the quality and efficacy of teaching and learning ICT in primary schools. Please be honest when completing the questionnaire, usually it is best to respond with your first impression, without giving a question too much further thought. Please indicate by ticking in the appropriate box.

SECTION ONE (1) DEMOGRAPHIC INFORMATION

1. SCHOOL: _____

2. DISTRICT (Please tick one):

Bikita	<input type="checkbox"/>	Chiredzi	<input type="checkbox"/>	Chivi	<input type="checkbox"/>	Gutu	<input type="checkbox"/>	Masvingo	<input type="checkbox"/>	Mwenezi	<input type="checkbox"/>	Zaka	<input type="checkbox"/>
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3. AGE:

4. GENDER:

5. WHICH GRADE DO YOU TEACH?

YEARS	TICK
21 or younger	<input type="checkbox"/>
22 – 30	<input type="checkbox"/>
31 – 40	<input type="checkbox"/>
41 – 50	<input type="checkbox"/>
51 – 60	<input type="checkbox"/>
61 or older	<input type="checkbox"/>

GENDER	TICK
MALE	<input type="checkbox"/>
FEMALE	<input type="checkbox"/>

GRADE	TICK
ECD A	<input type="checkbox"/>
ECD B	<input type="checkbox"/>

6. HOW MANY YEARS OF TEACHING EXPERIENCE DO YOU HAVE? 7. HIGHEST EDUCATION LEVEL:

TEACHING EXPERIENCE	TICK
0 – 5 years	<input type="checkbox"/>
6 - 10 years	<input type="checkbox"/>
11 - 15 years	<input type="checkbox"/>
16 - 20 years	<input type="checkbox"/>
21 – 25 years	<input type="checkbox"/>
26 – 30 years	<input type="checkbox"/>
Over 30 years	<input type="checkbox"/>

EDUCATION LEVEL	TICK
Diploma	<input type="checkbox"/>
Bachelor's Degree	<input type="checkbox"/>
Master's Degree	<input type="checkbox"/>
Doctoral Degree	<input type="checkbox"/>
Other (Please specify):	<input type="checkbox"/>

8a) ARE YOU USING ICT IN YOUR ECD CLASS?

	TICK
No	
Yes	

8b) IF YES, HOW OFTEN DO YOU USE ICTs IN YOUR ECD CLASS?

FREQUENCY	TICK
Daily	
Once or Twice a week	
Once or Twice a month	
Less than once a month	
Never	

9. Have you been trained to use or teach using ICTs in your ECD classes?

	TICK
No	
Yes	

10. Do you have any intentions to undertake ICT – related trainings?

Never	In the next 2 years?	In the next 5 years?	Not Sure

11. When last did you participate in any ICT – related training?

Never	12 months (1 year)	24 months (2 years)	36 months (3 years)	More than 48 months (4 years) ago

12. INDICATE THE MOST SIGNIFICANT FACTOR THAT MIGHT PREVENT YOU FROM USING A COMPUTER:

FACTORS	TICK
I use a Computer	
No Computer	
No Computer Skills	
No Electricity	
No time	
Not Interested	
Other (Please specify):	

SECTION TWO (2): TEACHERS' ATTITUDE TOWARD ICT INTEGRATION

13. PLEASE INDICATE YOUR REACTION TO EACH OF THE FOLLOWING STATEMENTS BY TICKING IN THE BOX THAT REPRESENTS YOUR LEVEL OF AGREEMENT OR DISAGREEMENT WITH IT. MAKE SURE TO RESPOND TO EVERY STATEMENT.

NO.	STATEMENT	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	Working with Computers makes me nervous.					
2	Computers make me feel uncomfortable.					
3	I am glad there are more computers these days.					
4	I do not like talking with others about computers.					
5	I think working with computers would be enjoyable and stimulating.					
6	I dislike using computers for teaching.					
7	Computers save time and effort.					
8	Primary schools would be a better place without computers.					
9	Elementary school learners must use computers in all learning areas.					
10	Learning about computers at ECD is a waste of time.					
11	Computers would motivate learners to grasp key concepts and do more study.					
12	Computers are a fast and efficient way of getting information.					
13	I do not think I would ever need a computer in my classroom.					
14	Computers can enhance learner's learning experience.					
15	Computers do more harm than good.					
16	I would rather do things manually than with a computer.					
17	If I had money to spare I would buy a computer.					
18	I would avoid computers as much as possible.					
19	I would like to learn more about computers.					
20	I have no intention to use computers in the near future.					

14. PLEASE INDICATE YOUR REACTION TO EACH OF THE FOLLOWING STATEMENTS BY TICKING IN THE BOX THAT REPRESENTS YOUR LEVEL OF AGREEMENT OR DISAGREEMENT WITH IT. MAKE SURE TO RESPOND TO EVERY STATEMENT.

NO.	STATEMENT	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	Computers will improve ECD education					
2	Teaching with computers offers real advantages over traditional methods of instruction.					
3	Computer technology cannot improve the quality of a learner's learning.					
4	Using computer technology in the classroom will make the subject matter more interesting.					
5	Computers have no place in schools.					
6	Computer use fits well into my curriculum goals.					
7	Class time is too limited for computer use.					
8	Computer use suits my learner's learning preferences and their level of computer knowledge.					
9	It would be difficult for me to learn to use the computer in teaching.					
10	I have no difficulty in understanding the basic functions of computers.					
11	Computers complicate my tasks in the classroom.					
12	Everyone can easily learn to operate a computer.					
13	I have never seen computers at work.					
14	Computers have proved to be effective learning tools worldwide.					
15	I have never seen computers used as an education tool.					
16	I would rather do things by hand than with a computer.					

15. PLEASE INDICATE YOUR REACTION TO EACH OF THE FOLLOWING STATEMENTS BY TICKING IN THE BOX THAT REPRESENTS YOUR LEVEL OF AGREEMENT OR DISAGREEMENT WITH IT. MAKE SURE TO RESPOND TO EVERY STATEMENT.

NO.	STATEMENT	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	Computers will not make any difference in our classrooms, schools or lives.					

NO.	STATEMENT	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
2	Learners need to know how to use computers for their future jobs.					
3	Learners prefer to learn from teachers rather than computers.					
4	Knowing about computers earns one the respect of others.					
5	We need computers that better suit the African culture and identity.					
6	Computers will improve our standard of living.					
7	Using computers will not hinder African generations from learning their traditions.					
8	Computers are proliferating too fast.					
9	People who are skilled in computers have privileges not available to others.					
10	Computers will increase our dependence on foreign countries.					
11	There are other social issues that need to be addressed first before implementing computers in ECD education.					
12	Computers will make our lives easier.					
13	Computers dehumanise society.					
14	Working with computers does not diminish peoples' relationships with one another.					
15	Computers encourage unethical practices.					
16	Computers should be a priority in education.					

16. IF A COMPUTER WAS MADE FREELY AVAILABLE TO YOU AND YOU KNEW HOW TO USE IT, WHAT WOULD YOU LIKE TO USE THE COMPUTER FOR AND HOW OFTEN DO YOU EXPECT TO USE IT FOR THESE PURPOSES?

PURPOSE	Daily	Once or twice a week	Once or twice a month	Less than once a month	Never
Teaching					
Electronic Learning (e.g. Accessing Study material)					
Online Banking					
Online Shopping (e.g. buying a car on be forward)					
Research					
News					

PURPOSE	Daily	Once or twice a week	Once or twice a month	Less than once a month	Never
Vacation Planning (e.g. Airline booking)					
Communication (Social Networking – Facebook, WhatsApp and Email)					
Downloading Entertainment Media (e.g. Movies, games, music)					
Other (Please Specify):					

17. PLEASE INDICATE YOUR LEVEL OF PROFICIENCY FOR EACH OF THE FOLLOWING COMPUTER TOOLS AND / OR APPLICATIONS BY MARKING THE APPROPRIATE COLUMN. IF YOU ARE NOT SURE OF A TOOL OR APPLICATION, PLEASE TICK IN THE "NONE" COLUMN.

NO.	TOOL / APPLICATION	PROFICIENCY			
		HIGH	MODERATE	LOW	NONE
	COMMON INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) DEVICES:				
1	Computer (e.g. Laptop, personal computer, MacBook, iMac, Chromebook)				
2	Mobile Device (e.g. smartphone, tablet, iPad)				
3	Digital Camera				
4	Scanner				
5	LCD Panel and / or Digital Projector				
6	Video Conferencing System				
	GENERIC SOFTWARE APPLICATIONS:				
7	Browsing software (e.g. Internet Explorer, Google Chrome, Firefox, Adobe Reader, Opera)				
8	Word Processing (e.g. Microsoft Word, Pages)				
9	Database (e.g. Microsoft Access, MySQL)				
10	Spreadsheet (e.g. Microsoft Excel)				
11	Graphics Design (e.g. CorelDraw, Photoshop, Microsoft Publisher)				
12	Presentation software (e.g. Microsoft PowerPoint, Keynote)				
13	Other Specific Software (e.g. educational computer games)				
	WEB APPLICATIONS:				
14	Social Media Networks (e.g. Facebook, YouTube)				
15	Website Development tools (e.g. Dreamweaver)				
16	Electronic References (e.g. Encarta, World Book)				
17	Discussion Groups (online forums)				
18	Electronic mail (e.g. Gmail, Yahoo, Cool Toad, Hotmail)				
19	Internet (WWW – World Wide Web)				
20	Assistive Technologies (computer systems for disabled users e.g. deaf, visually impaired)				

18. PLEASE INDICATE HOW FREQUENTLY YOU HAVE ENGAGED IN THE FOLLOWING TASKS DURING THE LAST SIX (6) MONTHS USING ICTs:

NO.	I used Technology to...	FREQUENCY					
		Daily	Once or twice a week	Once or twice a month	Less than once a month	Never	
1	Keep track of learner grades						
2	Keep track of learner attendance						
3	Create schemes of work / syllabi						
4	Create worksheets and / or assignments						
5	Share teaching material online (e.g. google drive, drop box)						
6	Create a website for my subject to guide learner assignments						

19. PLEASE INDICATE IN BOXES PROVIDED HOW OFTEN YOU AS AN ECD TEACHER MAY HAVE USED THE ICT TOOLS / APPLICATIONS PROVIDED BELOW DURING THE LAST SIX (6) MONTHS IN YOUR CLASSROOM. Examples of Teacher use are: Teacher Demonstrations - Using digital projector and laptop in PowerPoint presentations, email communication and word processing etc.

NO.	TOOL / APPLICATION	FREQUENCY				
		Daily	Once or twice a week	Once or twice a month	Less than once a month	Never
	COMMON INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) DEVICES:					
1	Computer (e.g. Laptop, personal computer, MacBook, iMac, Chromebook)					
2	Mobile Device (e.g. smartphone, tablet, iPad)					
3	Digital Camera					
4	Scanner					
5	LCD Panel and / or Digital Projector					
6	Video Conferencing System					
	GENERIC SOFTWARE APPLICATIONS:					
7	Browsing software (e.g. Internet Explorer, Google Chrome, Firefox, Adobe Reader, Opera)					
8	Word Processing (e.g. Microsoft Word, Pages)					
9	Database (e.g. Microsoft Access, MySQL)					
10	Spreadsheet (e.g. Microsoft Excel)					

		Daily	Once or twice a week	Once or twice a month	Less than once a month	Never
11	Graphics Design (e.g. CorelDraw, Photoshop, Microsoft Publisher)					
12	Presentation software (e.g. Microsoft PowerPoint, Keynote)					
13	Other Specific Software (e.g. educational computer games)					
WEB APPLICATIONS:						
14	Social Media Networks (e.g. Facebook, YouTube)					
15	Website Development tools (e.g. Dreamweaver)					
16	Electronic References (e.g. Encarta, World Book)					
17	Discussion Groups (online forums)					
18	Electronic mail (e.g. Gmail, Yahoo, Cool Toad, Hotmail)					
19	Internet (WWW – World Wide Web)					
20	Assistive Technologies (computer systems for disabled users e.g. deaf, visually impaired)					

20. How often does your school service computers?

FREQUENCY	TICK
Weekly	
Monthly	
Yearly	
When they break down	
Never	

21. Who provides technical support for your ICT devices and services (e.g. computers and computer network)?

ECD Teachers (stationed at the school)	ICT Technician (stationed at the school)	External Provider (Support is outsourced)	No one (ICT devices are not maintained / supported / repaired)

This questionnaire is confidential and will not be used against you and to identify you as an individual.

A follow-up of this questionnaire involves focus group discussions and interviews. Would you be interested in participating in either one or both? This is purely voluntary. Please tick appropriate boxes:

	Yes	No
Focus Group Discussion		
Interview		

DECLARATION

I hereby give permission that my responses may be used for academic purposes.

Signature: _____

Date: _____

Appendix B – Semi-Structured Interview Guide for ECD Teachers

Greetings. My name is Ronald Manhibi. I am very pleased that you have agreed to join me for a face-to-face interview today. You are one of my chosen participants because I think you have important ideas regarding the implementation of ICT in ECD education. We are here to talk about your perceptions of the integration of Information and Communication Technology (ICT) in Early Childhood Development (ECD) education in Zimbabwe. To gather information, I am interested in asking you some questions. You are assured that the information you provide will be kept confidential and will only be utilised for research purposes. You must be honest in giving your views and feel free to ask questions if you do not understand any question. I will not refer to you by name in the reports I prepare. The information will be kept confidential and used for research purposes only. You are free to withdraw from the discussion or indicate whenever you feel uncomfortable. This session will be recorded; therefore, I kindly ask you to indicate by signing on the consent form before we proceed, if you agree.

QUESTION ONE: Please provide a brief history of your personal experiences and professional development in ICT as an ECD teacher?

.....

QUESTION TWO: Do you think ICTs should be taught in ECD?

Probe / Follow-up Question: Explain your answer, why do think they should or should not be taught at that educational level?

.....

QUESTION THREE: Are you using ICTs to teach in your ECD classes (e.g. computers, projectors, computer games etc.)?

Probe / Follow-up Question: If yes, how are you using ICTs? If no, why are you not using them?

.....

QUESTION FOUR: Have you been trained to teach and use ICTs in your ECD classes?

Probe / Follow-up Question: If you have what ICT-related skills or competencies do you have? If no, do you have any intentions of getting trained?

.....

QUESTION FIVE: What kind of ICT devices are installed/found in your ECD classrooms (hardware and software, e.g. projectors, laptops, radios etc.)?

Probe / Follow-up Question: How are learners interacting with these ICT devices? If none, how are ICT classes conducted

QUESTION SIX: Are the ICT devices (e.g. computers) in your school maintained/repaired when they break down?

Probe / Follow-up Question: If yes, who conducts the repairs? If no, why are your computers not regularly repaired?

QUESTION SEVEN: What ICT-related help/assistance is made available to you by the Ministry of Primary and Secondary Education and the school?

Probe / Follow-up Questions: Is the assistance adequate to your need for help/assistance? Has the assistance provided improved ICT-related learning activities in the ECD department?

.....

QUESTION EIGHT: How would you describe the school's, MoPSE's and School Development Committee's (SDC's) support of ICT-related teaching activities in ECD?

Probe / Follow-up Questions: If any, what kind of support is provided towards the ECD department? What do you think is the reason why your SDC and school administration is not supporting you to integrate ICTs into ECD education?

.....

QUESTION NINE: What expectations, if any do you perceive the Ministry of Primary and Secondary Education (MoPSE) and the school hold for you as an ECD teacher pertaining to the introduction of ICTs?

.....

QUESTION TEN: What are some of the challenges and issues you commonly face as an ECD teacher in teaching ICTs?

Probe / Follow-up Questions: How have you been overcoming them? What do you think should be done to remove these challenges?

.....

QUESTION ELEVEN: What suggestions can you give to enhance support for ICT integration in ECD?

.....

Thank You

Appendix C - Focus Group Discussion Session Guide for ECD Teachers

Greetings. My name is Ronald Manhibi. I am very pleased that you have agreed to join me today. We are here to talk about your perceptions of the integration of Information and Communication Technology (ICT) in Early Childhood Development (ECD) education in Zimbabwe. The discussion we are going to have is called a focus group discussion. Please allow me to take this opportunity to explain a little bit about focus group discussions.

Focus group discussions are economic interviews used to gather information informally from a small group of individuals who have a common interest in a particular subject, in this particular instance the integration of ICT in ECD education. In focus groups, there are no right or wrong answers. I encourage everyone in this room to participate in the discussion. I am pleased that you can be part of this group because I think you have important ideas regarding the implementation of ICT in ECD education Don't hesitate to speak up when you have a point you would like to make. I will be moderating the session and moving us along so that we evaluate all of the key subjects on our agenda. My role today is to see that we have a productive discussion and to summarise the group's feelings. I will not refer to any participant by name in the reports I prepare. The information will be kept confidential and used only for research purposes only. You are free to withdraw from the discussion or indicate whenever you feel uncomfortable. This session will be recorded; therefore, I kindly ask you to indicate by signing on the consent forms before you, if you agree.

1. QUESTION ONE: Please provide a brief history of your personal experiences and professional development in ICT as an ECD teacher?

Probe / Follow-up Questions: Why do you think the experiences are what they are for ECD teachers in terms of professional development in ICT?

.....

2. QUESTION TWO: Do you think ICTs should be taught in ECD? Explain your answer

Probe / Follow-up Questions: Do you agree with some of the responses and why?

.....

3. QUESTION THREE: Are you using ICTs to teach in your ECD classes (e.g. computers, projectors, computer games etc.)?

Probe / Follow-up Question: If yes, how are you using ICTs. If no, what is preventing you from using them?

.....

4. QUESTION FOUR: Have you been trained to teach and use ICTs in your ECD classes?

Probe / Follow-up Questions: If you have what ICT-related skills or competencies do you have? Whose responsibility is it for you to receive ICT training and why?

.....

5. QUESTION FIVE: What kind of ICT devices are installed/found in your ECD classrooms (hardware and software, e.g. projectors, laptops, radios etc.)?

Probe / Follow-up Questions: How are learners interacting with these ICT devices? What other devices do you think are necessary?

.....

6. QUESTION SIX: Are the ICT devices (e.g. computers) in your school maintained/repared when they break down?

Probe / Follow-up Questions: If yes, who conducts the repairs? Whose responsibility do you feel it is to ensure that the computers/computer room is fully functional?

.....

7. QUESTION SEVEN: What ICT instructional resources (time, money, assistance, resources (hardware or software)) are made available to you by the Ministry of Primary and Secondary Education (MoPSE) and the school?

Probe / Follow-up Questions: Do you consider these resources sufficient or are there additional resources that are required?

.....

8. QUESTION EIGHT: How would you describe the school's, MoPSE's and School Development Committee's (SDC's) support of ICT-related teaching activities in ECD?

Probe / Follow-up Questions: If any, what kind of support is provided towards the ECD department? If none, what do you can be done to improve the situation?

.....

9. QUESTION NINE: What expectations, if any do you perceive MoPSE and the school hold for you as an ECD teacher pertaining to the introduction of ICTs?

.....

11. QUESTION ELEVEN: What are some of the challenges and issues you commonly face as ECD teachers in teaching ICTs?

Probe / Follow-up Questions: How have you been overcoming these challenges? How have you managed to integrate ICTs in ECD without any challenges? What can you advise schools that have not managed to alleviate the challenges associated with ICT integration in ECD education?

.....

12. QUESTION TWELVE: What suggestions can you give to enhance support for ICT integration in ECD?

.....

Thank You

Appendix D - Informed Consent Letter to Participants

University of KwaZulu-Natal
Edgewood Campus
Private Bag X03
Ashwood
3605

15 June 2017

Dear Participant,

INFORMED CONSENT LETTER

My name is **Ronald Manhibi** a student studying for a **Doctor of Philosophy** degree in **Computer Science Education** at the University of KwaZulu-Natal, South Africa. My research study is titled: **Information and Communication Technologies (ICTs) integration into Early Childhood Development (ECD) Education in Zimbabwe: A Critical Analysis**. The purpose of my study is to understand the integration of ICT in ECD through exploring and assessing educators' attitudes and perceptions, with a view to improve the quality and efficacy of teaching and learning ICT in primary schools. The study will be confined to Masvingo province and will include questionnaires, focus group discussions and interviews with selected ECD teachers. The focus group discussion and interview are a follow-up to the questionnaire and involve a face-to-face dialogue with me on integrating ICT in ECD education. The interview will cover inter alia how you perceive teaching activities involving the use of ICT tools; their challenges and your opinion on how ICT can enhance effective student learning in ECD. You have been identified on the basis of your in-depth knowledge about ECD education.

Please note that:

- Your confidentiality is guaranteed as your inputs will not be attributed to you in person, but reported only as a population member opinion.
- The questionnaire may take you 30 minutes to complete and face-to-face interviews and focus group discussion may last for about 45 minutes and may be split depending on your preference.
- Any information given by you cannot be used against you, and the collected data will be used for purposes of this research only.
- Data will be stored in secure storage and destroyed after 5 years.
- You have a choice to participate, not participate or stop participating in the research. You will not be penalized for taking such an action.
- Your involvement is purely for academic purposes only, and there are no financial benefits involved.
- If you are willing to be interviewed, please indicate (by ticking as applicable) whether or not you are willing to allow the interview to be recorded by the following equipment:

	WILLING	NOT WILLING
AUDIO EQUIPMENT		
PHOTOGRAPHIC EQUIPMENT		
VIDEO EQUIPMENT		

I can be contacted at:

Email: ronmanhibi@gmail.com **Phone:** +263783157321 OR +263772550389

In the event that you need any further information or you have experienced any discomfort with the interviews do not hesitate to inform me or contact my supervisor, Professor Govender, D. who is located at the *School of Education, Science and Technology cluster, Edgewood campus of the University of KwaZulu-Natal, South Africa.*

Email: Govenderd50@ukzn.ac.za **Phone:** +27312603428

OR

Mariette Snyman, the Humanities and Social Sciences Research Ethics Committee (HSSREC) Administrator who is located at the *HSSREC Research Office, Westville Campus of the University of KwaZulu-Natal, South Africa.*

Email: snymanm@ukzn.ac.za **Phone:** +27 31 260 8350 **Fax:** +27 31 260 3093

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.

Signature of participant

Date

Appendix E - Gatekeeper's Letter to the Provincial Education Director

School of Education
Edgewood Campus
Private Bag X03,
Ashwood, 3602,
South Africa

18 May 2017

The Provincial Education Director
Ministry of Primary and Secondary Education
Wigley House
Masvingo

Dear Sir/Madam

Re: Request for Permission to carry out educational research in Masvingo Province

I hereby apply for the permission to carry out my research in your province. My name is Ronald Manhibi and I am presently studying for a PhD degree with the University of KwaZulu-Natal. As part of my studies, I am required to conduct research on an aspect of interest and I am interested in the integration of ICT in ECD education. The title of my thesis is **Information and Communication Technologies (ICTs) integration into Early Childhood Development (ECD) Education in Zimbabwe: A Critical Analysis.**

The purpose of my study is to understand the integration of ICT in ECD through exploring and assessing educators' attitudes and perceptions, with a view to improve the quality and efficacy of teaching and learning ICT in primary schools. The study will be confined to Masvingo province and will involve qualified ECD teachers completing questionnaires, interviews and focus group discussions. Both interview and questionnaire completion are expected to last for not more than an hour, while focus group discussions are expected to last no more than one and a half hours.

I undertake to observe confidentiality and protect participants from physical, social and/or psychological harm. All participants shall voluntarily participate in the study and may withdraw at any time if they so wish. Results of the study shall be used for academic purposes only. I assure you that no interruptions shall be made to the normal school programme and I will work within the guidance and permission of school heads and teachers. My contact details and those of my supervisor have been provided below in case you might need further information.

Yours faithfully,



Ronald Manhibi (PhD Candidate-216076971)

Cell: +263772550389 **Email:** ronmanhibi@gmail.com

My supervisor is Professor D. W. Govender who is located at the School of Education, Edgewood campus (Computer Science Education) of the University of KwaZulu-Natal. Contact details: email: Govenderd50@ukzn.ac.za Phone number: Tel: + 27 031 2603428 / 3455 (admin)

Appendix F - Gatekeeper's Permission Letter: Provincial Education Director (Masvingo Province) to the Permanent Secretary

ALL communications should be addressed to
"The Provincial Education Director for Primary and
Secondary Education"
Telephone: 263585/264331
Fax: 039-263261



Ref: C/440/1

Ministry of Primary and Secondary
Education
P.O Box 89
Masvingo

19 May 2017.

The Secretary
Ministry of Primary and Secondary Education

Attention: Director Policy Planning Research and Statistics

**RE: SEEKING PERMISSION TO CARRY OUT AN EDUCATIONAL
RESEARCH IN SCHOOLS IN MASVINGO PROVINCE: RONALD MANHIBI:
MASVINGO PROVINCE**

The above matter refers.

Ronald Manhibi, a student at University Of KwaZulu-Natal (South Africa), is seeking permission to carry out research in Schools in Masvingo Province on,

**"INFORMATION AND COMMUNICATION TECHNOLOGIES (ICTs)
INTEGRATION INTO EARLY CHILDHOOD DEVELOPMENT (ECD)
EDUCATION IN ZIMBABWE: A CRITICAL ANALYSIS".**

Attached please find the applicant's letter, research instruments and a copy of the student's I.D. The application is supported since it meets the minimum requirements. Your authority to grant permission is therefore sought.

Z. M. Chitiga
Provincial Education Director
MASVINGO PROVINCE



Appendix G - Gatekeeper's Letter to the Permanent Secretary (Primary and Secondary Education)

School of Education
Edgewood Campus
Private Bag X03,
Ashwood, 3602,
South Africa

18 May 2017

The Permanent Secretary
Ministry of Primary and Secondary Education
P.O Box 89
Causeway
Harare

Dear Sir/Madam

Re: Request for Permission to carry out educational research in Masvingo Province

I hereby apply for the permission to carry out research in one of your provinces. My name is Ronald Manhibi and I am presently studying for a PhD degree with the University of KwaZulu-Natal. As part of my studies, I am required to conduct research on an aspect of interest and I am interested in the integration of ICT in ECD education. The title of my thesis is **Information and Communication Technologies (ICTs) integration into Early Childhood Development (ECD) Education in Zimbabwe: A Critical Analysis.**

The purpose of my study is to understand the integration of ICT in ECD through exploring and assessing educators' attitudes and perceptions, with a view to improve the quality and efficacy of teaching and learning ICT in primary schools. The study will be confined to Masvingo province and will involve qualified ECD teachers completing questionnaires, interviews and focus group discussions. Both interview and questionnaire completion are expected to last for not more than an hour, while focus group discussions are expected to last no more than one and a half hours.

I undertake to observe confidentiality and protect participants from physical, social and/or psychological harm. All participants shall voluntarily participate in the study and may withdraw at any time if they so wish. Results of the study shall be used for academic purposes only. I assure you that no interruptions shall be made to the normal school programme and I will work within the guidance and permission of school heads and teachers. My contact details and those of my supervisor have been provided below in case you might need further information.

Yours faithfully,



Ronald Manhibi (PhD Candidate-216076971)

Cell: +263772550389 **Email:** ronmanhibi@gmail.com

My supervisor is Professor D. W. Govender who is located at the School of Education, Edgewood campus (Computer Science Education) of the University of KwaZulu-Natal. Contact details: email: Govenderd50@ukzn.ac.za Phone number: Tel: + 27 031 2603428 / 3455 (admin)

Appendix H - Gatekeeper's Permission Letter: Permanent Secretary (Primary and Secondary Education)

All communications should be addressed to
"The Secretary for Primary and Secondary
Education
Telephone: 732006
Telegraphic address : "EDUCATION"
Fax: 794505



Reference: C/426/3 Masvingo
Ministry of Primary and
Secondary Education
P.O Box CY 121
Causeway
HARARE

22 May 2017

Ronald Manhibi
School of Education
Edgewood Campus
P. Bag X03
Ashwood, 3602
South Africa

Re: PERMISSION TO CARRY OUT RESEARCH IN MASVINGO PROVINCE: ALL DISTRICTS: ALL PRIMARY SCHOOLS:

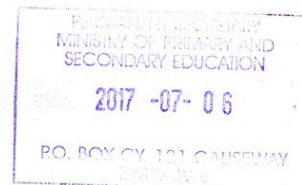
Reference is made to your application to carry out research at the above mentioned schools in Masvingo Province on the research title:

**"INFORMATION AND COMMUNICATION TECHNOLOGIES (ICTs)
INTEGRATION INTO EARLY CHILDHOOD DEVELOPMENT (ECD)
EDUCATION IN ZIMBABWE: A CRITICAL ANALYSIS"**

Permission is hereby granted. However, you are required to liaise with the Provincial Education Director, Masvingo Province, who is responsible for the schools which you want to involve in your research. You should ensure that your research work does not disrupt the normal operations of the school. Where students are involved, parental consent is required.

You are also required to provide a copy of your final report to the Secretary for Primary and Secondary Education.

Dr S. J Utete- Masango
SECRETARY FOR PRIMARY AND SECONDARY EDUCATION
cc: PED – Masvingo



Appendix I - Gatekeeper's Permission Letter: Provincial Education Director (Masvingo province)

ALL communications should be
addressed to
"The Provincial Education Director for
Primary and Secondary Education"
Telephone: 263585/264331
Fax: 039-263261



Ref: C/426/3

Ministry of Primary and Secondary
Education
P. O Box 89
Masvingo

10 July 2017

Ronald Manhibi
School of Education
Edgewood Campus
P. Bag X03
South Africa

RE: PERMISSION TO CARRY OUT RESEARCH IN ALL PRIMARY SCHOOL: ALL DISTRICT: MASVINGO PROVINCE

Reference is made to your application to carry out a research in schools in all
Districts, Masvingo Province on the research title:

"INFORMATION AND COMMUNICATION TECHNOLOGIES (ICTs) INTEGRATION INTO EARLY CHILDHOOD DEVELOPMENT (ECD) EDUCATION IN ZIMBABWE: A CRITICAL ANALYSIS

Please be advised that the Secretary for Primary and Secondary Education has
granted permission to carry out your research.

You are also advised to liaise with the District Schools Inspectors who is responsible
for the schools which are part of the sample for your research.

A handwritten signature in black ink, appearing to read 'Z. M. Chitiga'.

Z. M. Chitiga
Provincial Education Director
MASVINGO PROVINCE



Appendix J - Gatekeeper's Permission Letter: Bikita District Schools Inspector (DSI)

All correspondence should be addressed to: Ministry of Primary and Secondary Education
The District Schools Inspector-Bikita P.O. Box 250
Nyika



12 July 2017

Att: Bikita Primary School Heads

PERMISSION TO CARRYOUT RESEARCH IN ALL PRIMARY SCHOOLS IN BIKITA DISTRICT: RONALD MANHIBI

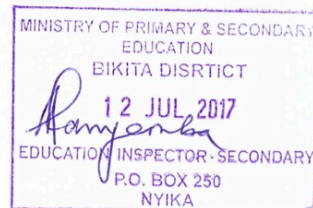
The above matter refers.

The above named has been granted permission to conduct research in all the 89 Primary schools. The member has been authorized to carry out this research by the Permanent Secretary and the Provincial Education Director.

Please assist whenever he visits your school.

A. Kanyemba

For: **District Schools Inspector- Bikita**



Appendix K - Gatekeeper's Permission Letter: Chiredzi District Schools Inspector (DSI)

All communications should be addressed to
"The Secretary for Primary and Secondary Education"
Telephone: 0231-2313253
Telegraphic address: "EDUCATION"
Fax: 0231231 3253
<http://www.moesac.gov.zw>




Ministry of Primary and Secondary Education
P. O. Box 181
Chiredzi
bspzchiredzi@gmail.com

Ref/P: *Manhibi Ronald*
Student: *Kwazulu Natal University*

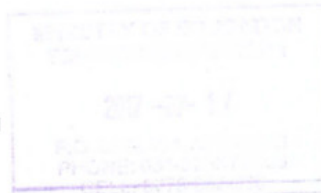
17 July 2017

RE: PERMISSION TO CARRYOUT RESEARCH IN ALL PRIMARY SCHOOLS: CHIREDDI DISTRICT

Chiredzi District has given Ronald Manhibi permission to carryout his research in all schools as per Secretary and Provincial Education Director's recommendations in the move.


Njltimani O.

FOR DISTRICT SCHOOLS INSPECTOR – CHIREDDI



Appendix L - Gatekeeper's Permission Letter: Chivi District Schools Inspector (DSI)

ALL communications should be addressed to
"The District Schools Inspector for Primary and
Secondary Education "
Telephone: 0337-278/397



**RE:/:PERMISSION TO CARRY OUT
RESEARCH**

Ministry of Primary and Secondary Education
P. Bag 545
CHIVI

18 July 2017

TO ALL PRIMARY SCHOOL HEADS (CHIVI DISTRICT)

**RE: PERMISSION TO CARRY OUT RESEARCH IN ALL PRIMARY SCHOOLS IN
CHIVI DISTRICT: MANHIBI RONALD.**

The above matter refers.

The above named has been granted permission by the Permanent Secretary to conduct a research in all primary schools in Chivi district.

Please assist whenever he visits your school

KZendera

Zendera K. (Schools Inspector)

pp **FOR: DISTRICT SCHOOLS INSPECTOR**



Appendix M- Gatekeeper's Permission Letter: Gutu District Schools Inspector (DSI)

ALL communications should be addressed to
"The Provincial Education Director for Primary and Secondary Education"
Telephone: 263585/264331
Fax: 039-263261



Ref: C/426/3

Ministry of Primary and Secondary Education
P. O Box 89
Masvingo

10 July 2017

Ronald Manhibi
School of Education
Edgewood Campus
P. Bag X03
South Africa


**RE: PERMISSION TO CARRY OUT RESEARCH IN ALL PRIMARY SCHOOL:
ALL DISTRICT: MASVINGO PROVINCE**

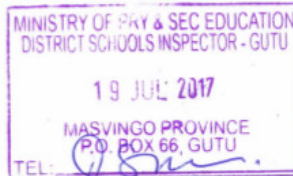
Reference is made to your application to carry out a research in schools in all Districts, Masvingo Province on the research title:

**"INFORMATION AND COMMUNICATION TECHNOLOGIES (ICTs)
INTEGRATION INTO EARLY CHILDHOOD DEVELOPMENT (ECD)
EDUCATION IN ZIMBABWE: A CRITICAL ANALYSIS**

Please be advised that the Secretary for Primary and Secondary Education has granted permission to carry out your research.

You are also advised to liaise with the District Schools Inspectors who is responsible for the schools which are part of the sample for your research.


Z. M. Chitiga
Provincial Education Director
MASVINGO PROVINCE



Appendix N - Gatekeeper's Permission Letter: Masvingo District Schools Inspector (DSI)

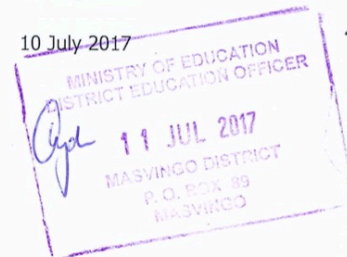
ALL communications should be addressed to
"The Provincial Education Director for Primary and Secondary Education"
Telephone: 263585/264331
Fax: 039-263261



Ref: C/426/3

Ministry of Primary and Secondary Education
P. O Box 89
Masvingo

10 July 2017



Ronald Manhibi
School of Education
Edgewood Campus
P. Bag X03
South Africa

RE: PERMISSION TO CARRY OUT RESEARCH IN ALL PRIMARY SCHOOL: ALL DISTRICT: MASVINGO PROVINCE

Reference is made to your application to carry out a research in schools in all Districts, Masvingo Province on the research title:

"INFORMATION AND COMMUNICATION TECHNOLOGIES (ICTs) INTEGRATION INTO EARLY CHILDHOOD DEVELOPMENT (ECD) EDUCATION IN ZIMBABWE: A CRITICAL ANALYSIS

Please be advised that the Secretary for Primary and Secondary Education has granted permission to carry out your research.

You are also advised to liaise with the District Schools Inspectors who is responsible for the schools which are part of the sample for your research.

Z. M. Chitiga
Provincial Education Director
MASVINGO PROVINCE



Appendix O - Gatekeeper's Permission Letter: Mwenezi District Schools Inspector (DSI)

All communications should be
Addressed to
The District Schools Inspector
Mwenezi



Ministry of Primary & Secondary Education
P.O Box 45
Neshuro
Zimbabwe

0772268542

18 JULY 2017

Att: Mwenezi Primary School Heads

**PERMISSION TO CARRYOUT RESEARCH IN ALL PRIMARY SCHOOLS IN
MWENEZI DISTRICT: RONALD MANHIBI**

The above matter refers

The above named has been granted permission to conduct research in all primary schools with ECD classes. The member has authorized to carry out this research by the Permanent Secretary and the Provincial Education Director.

Please assist whenever he visits your school.

pp.mhahwa
.....
Zanamwe L
D.S.I MWENEZI



Appendix P - Gatekeeper's Permission Letter: Zaka District Schools Inspector (DSI)

All communications should be addressed to
"The District Education Officer, Ministry of Primary
and Secondary Education
Telephone: 0342362 and 0342652
Telegraph
address: "EDUCATION"
Fax: 039263261



ZIMBABWE

Ministry of Primary and Secondary
Education
P.O. Box 239
JERERA
ZIMBABWE

17 July 2017

TO ALL PRIMARY SCHOOL HEADS-ZAKA

**RE: PERMISSION TO CARRYOUT RESEARCH IN ALL PRIMARY SCHOOLS IN
ZAKA DISTRICT: RONALD MANHIBI.**

The above matter refers.

The above named has been granted permission to conduct research in all the 94
Primary schools.

Please assist whenever he visits your school.

Shambambeva
Shambambeva B.

A/District Schools Inspector-Zaka



Appendix Q – Publication from Thesis submission proof

for journal article titled “Ramifications of Information and Communication Technology (ICT) integration in Early Childhood Development (ECD) education in Zimbabwe: Critical teachers’ perspectives”

From: Portia Sindane psindane@iie.ac.za
Subject: IJTL ONLINE SUBMISSION
Date: 09 October 2018 at 12:35 PM
To: ronmanhibi@gmail.com

PS

Good day Mr Manhibi

Thank you very much for your online submission, everything was received in good order

Kindest regards

Portia Sindane
Research and Development Administrator



ADvTECH, Building 7, Inanda Greens Business Office Park, 54 Wierda Road West, Wierda Valley, Sandton, South Africa, 2196
P.O. Box 2369, Randburg, Gauteng, 2125.
Tel: +27 11 676 8021 | Fax: +27 11 783 2574
Email: psindane@iie.ac.za
Website: www.iie.ac.za



Disclaimer

This message and any attachments and or links are confidential and intended solely for the addressee. If you have received this message in error, please notify ADvTECH immediately, telephone number +27 11676 8000 or e-mail disclaimer@advtech.co.za. Any unauthorized use; alteration or dissemination of the contents of this email is strictly prohibited. In no event will ADvTECH or the sender be liable in any manner whatsoever to any person for any loss or any direct, indirect, special or consequential damages arising from use of this email or any linked website, including, without limitation, from any lost profits, business interruption, loss of software programs or other data that may be stored on any information handling system or otherwise from any assurance that this email is virus free even if ADvTECH is expressly advised of the possibility of such damages.

From: Portia Sindane psindane@iie.ac.za
Subject: JTL ONLINE SUBMISSION
Date: 21 December 2018 at 9:58 AM
To: ronmanhibi@gmail.com

PS



Good Day

This is just to let you know that your article is still in the review process. As you are aware, this time of the year is a very difficult time to source or get responses from reviewers and so the movement is very slow during this period but we will keep you updated in the new year.

Once we receive all reports we then consolidate the information and send you a report with the outcome of your submission. An author has the right to withdraw an article at any stage of the review process.

We thank you for your patience and wish you and your loved ones a happy and healthy festive season and well into 2019.

Kindest Regards

Professor Dolina Dowling: Editor-in-Chief

Dr Brenda van Wyk: Managing Editor

The Independent Journal of Teaching and Learning

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A thesis by

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