# An Analysis of Processes and Contexts for ICT interventions in Malawian Primary School Education System

*A thesis submitted in fulfilment of the requirements for the Degree of Doctor of Philosophy in Education*

*By*

*Frank Auben Mtemang'ombe*

**School of Education**
**Faculty of Humanities and Social Sciences**
**University of Strathclyde**

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## Declaration of Authenticity and Author's Rights

This thesis is the result of the author's original research. It has been composed by the author and has not been previously submitted for examination which has led to the award of a degree.

Signed: *Frank Mtemang'ombe*

Date: 24 November 2017

# Abstract

The introduction of Information and Communication Technology (ICT) in education has greatly transformed and improved the quality of teaching and learning all over the world. In Malawi, efforts are continuously being directed towards having ICT resources in all primary schools through different ICT interventions. However, though the interventions are likely to be widespread, there is no empirical evidence if the interventions are fully adopted and purposively used by the schools and teachers respectively. While there is considerable evidence to show that the integration of ICT intervention in classrooms is influenced by the entire education system, research on ICT in education is generally limited to the study of teacher level factors.

This research examines how ICT interventions in Malawi primary school education system are planned, introduced and guided, and how these processes configure and influence adoption and use of the interventions by schools and teachers, respectively. Based on research questions about how the ICT interventions are conceptualized, implemented and integrated, the main aim of this study is to analyse the activities and processes taking place in the contexts that the ICT interventions are implemented by linking teachers' ICT practices in classrooms to particular mediating processes and contexts.

The study used a qualitative research approach. It firstly investigated the roles, processes and collaborations between government institutions and ICT providers in the conceptualisation of the ICT interventions through interviews and analysis of documents. The baseline data generated from this phase was used to identify case study schools that were used to investigate how the interventions are adopted and used, through interviews with school heads and teachers, classroom observations and analysis of documents. An Activity System Analysis was used to draw relationships between and within how the interventions are conceptualised at national level, how they are implemented in the schools and integrated in the classrooms.

The findings reveal gaps in the national education plans and policies as formal guidelines that regulate investments in the primary school education system. The efforts by the various ICT interventions providers are unguided and unregulated, and the process of conceptualising and implementing the ICT interventions in primary education is still in a form of experimentation, being led by the interventions providers rather than the Ministry of Education. This presents tensions as the schools and the teachers try to accommodate requirements for implementing and integrating different ICT interventions without any policy frameworks, curriculum guidelines, ICT training and technical support.

The implications from this study reveal the need for policy makers, planners and education practitioners to generate rationale, goals, and vision on how the Malawi primary school education system can incorporate the ICT interventions; guide specific roles for relevant stakeholders in the design and development of specific ICT interventions; produce specific plans and curricula for teacher training and development; and guide the development of school-based ICT plans that can facilitate successful adoption and integration of the ICT interventions.

# Dedication

*To my father, for always being my model. You are my hero.*

# Acknowledgements

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# Abbreviations

| | |
|---|---|
| ACEM | Association of Christian Educators in Malawi |
| BECTA | British Educational Communications and Technology Agency |
| CPD | Continuous Professional Development |
| CPDT | Continuous Professional Development and Training |
| DBE | Directorate of Basic Education |
| DEA | District Education Advisor |
| DEDO | District Education Desk Officer |
| DEM | District Education Manager |
| DHRMD | Directorate of Human Resource Management and Development |
| DOC | Division Outreach Coordinator |
| DTED | Directorate of Teacher Education and Development |
| EDC | Education Development Centre |
| FAWEMA | Forum for African Women Educators Malawi |
| ICT | Information and Communication Technology |
| IICD | Institute for Interactive Communication Development |
| IN-SET | In-Service Training |
| IPTE | Initial Primary Teacher Education |
| IRI | Interactive Radio Instruction |
| ITE | Initial Teacher Education |
| MBC | Malawi broadcasting Cooperation |
| MIE | Malawi Institute of Education |
| MoEST | Ministry of Education, Science and Technology |
| NESP | National Education Sector Plan |
| NGO | Nongovernmental Organisation |
| PCAR | Primary Curriculum and Assessment Reform |
| PEA | Primary Education Advisor |
| PIF | Policy Investment Framework |
| SACMEQ | Southern African Consortium for Monitoring Educational Quality |
| TBI | Tablet-Based Instruction |
| TDC | Teacher Development Centre |
| UNESCO | United Nations Educational, Scientific and Cultural Organisation |
| USAID | United States Agency for International Development |
| VSO | Voluntary Service Organisation |

# CHAPTER 1: INTRODUCTION

## Introduction

In recent years, there has been an upsurge of interest in how Information and Communication Technology (ICT) can best be harnessed to improve efficiency and effectiveness of education at all levels in both formal and non-formal settings. However, the adoption and use of ICT in education requires an understanding of how ICT can be incorporated into teaching and learning through dynamic processes and within unique situations and contexts (UNESCO 2004). Thus, the use of ICT in education requires understanding and application of context-relevant concepts, materials, and environments directed towards learning. This study analyses the activities and processes taking place in Malawi Primary Education contexts where the ICT interventions are conceptualised and implemented in order to relate teachers' ICT practices in classrooms to particular mediating processes and contexts in the whole primary education system.

## Study Background

With the wide recognition that learners are motivated and purposefully engaged in the teaching and learning process when concepts and skills are underpinned with ICT and sound pedagogy, education systems across the world remain compelled to adopt and use various ICT interventions for improved teaching and learning processes and enhanced learning outcomes. While there is much research on ICT adoption globally, most of it has concerned itself with developed countries at the expense of sub-Saharan Africa region (SSA) region with its unique contexts as exemplified by Malawi's. Consequently, the use of ICT in such developing countries has been less informed by research that could lead to ICT-enhanced instructional design and learning as discussed in the Literature Review chapter of this thesis.

Generally, the adoption and effective utilisation of ICT amongst education institutions in developing countries, especially in sub-Sahara African countries, has remained low as reported by different studies that are highlighted in the literature review. Development partners attempting to capitalise on the benefits that ICT has been shown to bring to the learning process are introducing different interventions in the school system to overcome the challenges of the developing countries. However, in Malawi, there have been few attempts, if any, to precisely capture the actual situation of ICT conceptualisations, implementation and integration in the education system through empirical studies that could provide a valid explanation on how the ICT interventions are fitting in the education system and structure. The findings of this study could provide a comprehensive account on how ICT interventions are being introduced and implemented in Malawi with specific focus on the primary school education system.

According to the Ministry of Education, Science and Technology (MoEST) National Education Sector Plan of 2008-2017, primary school education harbours most of the challenges in Malawi's entire education system due to ever-increasing enrolment that is not complemented with adequate funding. This has led to various challenges including shortage of qualified teachers, poor management of teachers, inadequate and inferior physical structure, inadequate teaching and learning materials, poor monitoring and supervisory systems, and poor participation of school communities in school management (MoEST, 2008; Kadzamira & Rose, 2001). In response to these challenges, from 2008 to 2017 the Malawi Government implemented a priority scheme titled the National Education Sector Plan (MoEST, 2008) to strengthen primary education through policy measures, quality improvement and investments. The NESP informs all investment decisions about funding, and new approaches and new interventions for development of the education sector by the Government of Malawi and all its development partners.

Following the NESP, there have been a number of government led interventions introduced to overcome the identified challenges. The interventions include decentralisation of the education management system characterised by the devolution of monitoring and supervisory responsibilities to local educational divisions, districts and zones; mobilization of communities to participate in 'whole-school development' and management; building of associated teachers' resource and professional development centres in each educational zone; reforming primary school curriculum and assessment; and most importantly the improving teaching and learning inputs such as books and ICT innovations to facilitate more effective learning and to enhance learning outcomes.

As one way of improving teaching and learning inputs, the Ministry of Education Science and Technology (MoEST) in partnership with one of its development partners, Scottish Malawi Foundation, and in collaboration with Euro-Talk Interactive Limited, introduced an ICT intervention under a programme called *Tiphunzire Limodzi* in 2006. From 2006 to 2010, the intervention gave learners in selected primary schools an opportunity to interact with each other and with instruction through the use of portable multimedia players. Using the players learners accessed lessons based on the Primary School Curriculum Assessment Reform (PCAR) programmes (MoEST, 2008). While supporting the *Tiphunzire Limodzi* project, however, the Malawi government did not adopt it as its programme; instead, through the MoEST, it was working on another ICT intervention under the name Interactive Radio Instruction (IRI) *Tikwere* Project with support from the United States Agency for International Development (USAID).

*Tikwere* was designed for Malawi's basic primary education with an aim of developing, producing, and disseminating interactive radio lessons, for Standards One, Two and Three to be broadcast nationwide. Each standard was allocated 150 lessons aligned with the PCAR initiative (USAID, 2011). An evaluation of the

project focused on schools' readiness in terms of infrustructure, IRI material production and distribution, and alignment of the IRI to the curriculum. This evaluation recommended full adoption of the use of IRI in all public primary schools. Therefore, the Malawi Government, through the MoEST, took over *Tikwere* IRI as a national government programme and recommended that it should be rolled out to all classes at primary school level. However, there have been no known empirical studies that have traced the implimantation and integration of the IRI intervention.

Besides its ongoing efforts to advance the use of the IRI, in June 2014 the Malawi government introduced another ICT intervention with support from other development partners, the Institute for Interactive Communication Development (IICD), in collaboration with the Forum for African Women Educators Malawi (FAWEMA) and the Association of Christian Educators in Malawi (ACEM). The intervention, which was implemented in selected primary schools, uses IICD-developed tablets called *TeachTab* and *LearnTab* to address problems related to shortage of teaching and learning resources in overcrowded classrooms. During the same period, Euro-Talk with funding from the Scottish Government introduced another intervention project which was replicated in 50 more primary schools across the country. This intervention uses tablet based interactive video lessons in Chichewa, Malawi's most widely spoken vernacular. Similarly, in 2014, Voluntary Services Organisation (VSO) introduced a similar intervention with support from Onebillion and the Royal Norwegian Embassy.

The foregoing discussion shows that the use of portable ICT interventions for classroom instruction is an important option for improving educational quality in primary school classrooms in Malawi. Ironically, however, research indicates that such ICT interventions are usually perceived merely as a change in teaching styles, learning approaches, and access to information, and that teachers tend to be threatened by the change because they are not certain on whether such

interventions would support their current pedagogy within existing school operational frameworks or would demand new approaches to teaching and learning (Papert, 1993; Underwood & Brown, 1997; Watson, 2001). In either case, as argued by Borko & Putnam (1995, p. 38), school leaders and teachers need to 'think in new ways about students, subject matter, and the teaching-learning process' in order to adopt the ICT interventions in the schools and classrooms, respectively.

## Research Problem

As presented in the background of the study, in the Malawian primary education context, the process of designing, developing and implementing ICT interventions in primary education is rapid, hence, swift subsequent decisions are made by the MoEST and involved ICT providers, schools and teachers. It is not yet known if the interventions are designed with parallel reforms and support systems within the education structures that could support the schools and teachers in implementing and integrating ICT for their intended purposes. Without such empirical evidence, there is a risk that the ICT interventions are being introduced into the primary education system at a much faster speed than one at which the schools and the teachers may be able to use them effectively. As a result, in order to implement and integrate ICT into the curriculum, the primary schools, in general, and the teachers, in particular, may find themselves feeling compelled to identify their own way forward through an unguided process in the ever-developing ICT landscape (Unwin, 2005). There is need for an empirical understanding on how ICT interventions are conceptualised before they are introduced in Malawi's primary schools, especially to ascertain if primary schools, in general, and teachers, in particular, are supported, guided and prepared to implement them effectively, and how, in turn, the teachers cope with the context they are provided.

Some studies (Baskin & Williams, 2006; Boakye & Banini, 2008; Dawson & Rakes, 2003; Smeet, 2005) show that ICT interventions do not automatically add quality to teaching and learning or better education system. In most developed countries, where nearly all schools are equipped with the infrastructure for conducting ICT mediated teaching and learning, "ICT interventions have been thought about, invited into educational practices, and pushed down the schools and teachers without preparing nor supporting them" (Maclure, 1997; Tsitouridou &Vryzas, 2003 in Teo 2008 p. 414). This has proved a wasteful strategy because although new interventions are argued to have tremendous positive influence on learning attainment and educational practice, optimal benefit from any ICT intervention may only be achieved when teachers actually use ICT to design and develop classroom instruction (Maclure, 1997).

Literature on teachers' practices and experiences regarding the use of ICT for teaching, however, suggests that teachers' ICT integration is a complex process that can be best understood alongside certain interlinked components within the education system or the general context of concerned reforms and interventions. Several studies, therefore, identify the need to link the contextual, social, policy and technology drives to teachers' perceptions and practices in ICT integration (Donnelly, McGarr, & O'Reilly, 2011; Sang, Valcke, van Braak, Tondeur & Zhu, 2011; Vanderlinde, van Braak & Dexter, 2012; Yuen, Law, & Wong, 2003)

## Purpose of the study

The aim of this study was to investigate how ICT interventions are planned, introduced and guided in the primary education system of Malawi, how these processes configure and influence the implementation of the interventions in the schools, and their implications in the teachers' classroom practices. The study began by examining current roles, processes and collaborations between government departments and institutions, on the one hand, and the ICT providers (nongovernmental development partners), on the other, regarding the

conceptualisation of the ICT interventions at national level. Then, it explored potential relationships between the national level conceptualisation of interventions and their implementation in the schools in general and their integration in the classroom.

The objective of this study was to examine the whole configuration of events, activities, contexts, and collaborative processes taking place in the context that the ICT interventions are implemented in Malawi's primary schools. The study linked the effective or ineffective integration of ICT in specific classrooms to particular activities situated within larger contexts.  This was used to build a detailed account of what teachers do to integrate ICT in their teaching, how their activities are supported or hindered by their larger socio-cultural context, and why this is the case.

## Significance of the Study

The study background indicates that, in Malawi, a lot of effort has not only been made towards the provision of ICT resources in all schools but also that these efforts are ongoing, hence their potential to be widespread. However, although the ICT interventions in primary schools are likely to be widespread, empirical evidence regarding the implementation of similar past or present interventions is lacking. Despite the worldwide assumption that the integration of ICT is influenced by the entire education system, research focusing on ICT in education is generally limited to the study of variables at class or teacher level (Voogt, Knezek, Cox, Knezek, & Brummelhuis, 2013; Watson, 2001). Departing from these studies, the present study investigated the conceptualisation, implementation and integration processes of Malawi's current ICT interventions in an effort to inform the adoption and integration of current and possible future ICT interventions in the primary schools, thereby providing context specific explanations regarding visible factors that affect ICT integration in the schools and classrooms.

The research study will also contribute to the existing body of literature in the field of ICT adoption and integration in education by providing empirical contextual analyses of the ICT conceptualisation and adoption processes and their implications to the implementation and integration of ICT interventions in schools and classrooms, respectively. This is significant bearing in mind an existing barrenness regarding studies about how the Malawi education system conceptualises and implements its primary school ICT interventions, and the implications of the conceptualisation and implementation processes to how teachers integrate them into their teaching. The study, particularly, investigated various processes within the Malawian primary education system and structure with respect to the introduction of ICT in the school system. By investigating the context and implications of how the ICT interventions are conceptualised, the study also generated a dynamic view of factors that shape Malawian primary schools' and teachers' context for implementing and integrating the ICT interventions. This was necessitated by the study's need to make recommendations for successful implementation of the interventions.

Besides, insights from this research provide detailed and holistic interpretation of events, activities, contexts, and collaborative processes taking place in the Malawi primary education system in which the ICT interventions are used. This has generated knowledge on how ICT is conceptualised at national level and regarding its implications to schools and teachers, which, in turn, informs government departments and institutions and key stakeholders in the implementation and integration of ICT in the schools and classrooms. The implications of these findings also offer suggestions on how the Malawi government and concerned nongovernmental organisations can support teachers' and schools' ICT development, which can, in turn, help improve the quality of teaching and learning inputs while enhancing learning outcomes.

# Education System in Malawi – The Research Context

The formal education system in Malawi follows an 8-4-4 pattern, comprising three levels; Primary, Secondary and Tertiary with the Malawi Government as the main service provider through the Ministry of Education. Primary school education is divided into three sections; infant section (standards 1 and 2); junior section (standards 3, 4 and 5); and senior section, (standards 6, 7 and 8). The Malawi Government maintains an open access policy, to primary education, albeit a non-compulsory one, and the official ages for primary level education are 6 to 13 years. However, the ages of pupils enrolled are characterised by a wide range of 4 years in Standard 1 to 18 years in Standard 8. The wide range is mainly attributed to unregulated and multiple entries into school and multiple grade repetitions.

The Ministry of Education, Science and Technology (MoEST) is the custodian of the Education Sector in Malawi; it is responsible for providing guidance and direction on all education, science and technology issues. The Ministry has a priority scheme (2008 to 2017 National Education Sector Plan) for primary education through policy measures, quality improvement and investments and formed the basis of all investment decisions about funding, new approaches and new interventions for the development of the education sector by the MoEST and all its development partners. The NESP set out the national view of Malawi's education sector goals, objectives and proposals on how such goals and objectives will be realized over the decade (2008-2017), thereby guiding the management of objectives and activities of the MoEST through its departments and other stakeholders.

The MoEST has central administrative, financial and academic control over all public primary education and the training of primary school teachers. The administrative system of the education system is managed through an education central office, through six education divisional offices, thirty-three education district offices, and more than three-hundred education zones. The academic

control of the MoEST is also centrally regulated and monitored by various education directorates within the MoEST, right under a national secretariat for primary education which heads the national primary education structure.

Primary Schools operate under the Directorate of Basic Education (DBE) which manages the primary education system in Malawi through a decentralized system - with education district offices throughout the country being responsible for running primary school education at a district level. There are thirty-three (33) Education Districts in Malawi and each district education office has a District Education Manager (DEM) who serves as an overall district education administrator; a District Education Desk Officer (DEDO) who is responsible for the technical administrative issues in the district education office, and a District Education Advisor (DEA) who is responsible for the support, monitoring and supervision of teaching and learning activities in schools.  Under the district education office, there are Education Zones, also known as Teacher Development Centres, that are headed by a Primary Education Advisor (PEA), and Primary Schools headed by Head Teachers.

From its independence in 1964 to 1980, the Malawi Government through its first Education Development Plan (1973-1980) prioritised Secondary and Tertiary Education with an objective of filling in a manpower gap left by the colonial government. After achieving its objectives, government, through a second Education Development Plan (1985-1995), presented a change in priority from secondary and tertiary education to primary education in order to increase access, equity and relevance of primary education (Swainson et al, 1998). Although the provision of basic education has been a government priority since 1985, enrolment in primary schools remained low for years (Kadzamira & Rose, 2001). Consequently, primary education has continued to remain a priority to the Malawi Government from the past two decades.

As one of the ways of improving average enrolment ratio in primary schools, in 1994, the Malawi Government introduced Free Primary Education (FBE) to provide equitable access to basic education. However, the introduction of Free Primary Education has, and continues to present the education system with challenges regarding quality.  The most pressing of these include a high national qualified teacher-to-pupil ratio, lack of in-service training for qualified teachers, generally overcrowded classrooms, oversubscribed schools, inadequate school infrastructure and textbooks, and poor delivery systems of teaching and learning materials. As a result, Malawi is offering poor and deteriorating quality education in primary schools, as documented by the Southern African Consortium for Monitoring Educational Quality (SACMEQ) scores and national examination pass rates (Paran & Williams, 2007). Thus, since the advent of the Free Primary Education, the Malawi Government has upheld that the provision of education needs to be well-planned with drawn out priorities through investment strategic priority frameworks such as a Policy Investment Framework (PIF) and a National Education Sector Plan (NESP).

From the analysis of the NESP documents (NESP I: 2008-2017 and NESP II 2013/14-2017/18) it can be observed that MoEST highlighted the inadequacy of teaching and learning materials as one of the major challenges that the ministry is facing (NESP I Document, page 11, Challenge number 4). To facilitate more effective learning and to increase learning achievement, MoEST placed the improvement of teaching inputs and other teaching-learning materials as its first objective under the first priority area (Quality and Relevance) for Primary School Education in its investment framework (Page 11 of the NESP I Document). Based on these priority areas, it is evident that the provision and improvement of teaching and learning materials in primary schools is a number one priority (objective) of the MoEST.

In order to improve quality, equity, relevance, access and efficiency in Basic Education, through the PIF (1995 -2005) and the NESP (2008 – 2017), the Malawi Government has upheld that the provision of education is a collaborative effort between the government itself, the local community, non-governmental organisations, and the donor community. The Non-Governmental Organisations (NGOs), as autonomous development-oriented organisations, provide services either directly to local communities or to government departments or institutions, hence Malawi's long history of NGO involvement in education, with wide diversity of origins and philosophies. Some NGOs are set up based on professional or academic principles, some are based on religious principles, others broadly on humanitarian ethos, and yet others are set up as quasi-consultancies in response to recent donor-funding initiatives.

Nevertheless, the activities of all Malawi's NGOs in education are centred on improving service delivery and providing advocacy work to improve the quality of education in the country while the government, through the MoEST, maintains its responsibility to facilitate the provision of education by offering policy direction, strategic planning, and regulation towards the provision of education in Malawi. As such, most of the NGOs' main concerns have been to address the needs of the basic education system as identified by the MoEST through its investment plans, e.g. NESP. The NGOs have, therefore, pioneered a wide range of participatory methods for improving school and classroom climates, and have developed and introduced approaches, innovations, and ICTs in order to improve learners' achievement.

As explained in the background section, various NGOs are taking a central role regarding improvement of teaching and learning inputs through ICT intervention programmes such as *Tikwere* IRI, *Tiphunzire Limodzi*, LearnTab, and Onebillion Tablet-Based Instruction, to facilitate more effective learning and to enhance learning outcomes. Such NGOs are referred to in this study as ICT Intervention

Providers. As the interventions implementing partners, they offer technical support and manage the governance, finances and compliance of the ICT interventions with support from key MoEST departments and institutions. Thus, the ICT providers offer material, resources, and financial or technical support to the already existing primary education system through the ICT intervention programmes.

The problem, however, is that it is not known how the education system conceptualises these interventions so as to inform stakeholder the type of support required through the ICT interventions and to guide their implementation of the same in the schools. As explained in the foregoing discussion, not only have all ICT intervention providers focused on the provision of different ICT resources with the hope that the technology will enhance learners' achievement, but the interventions have also been rapid and have been associated with swift decisions in their implementation, thereby raising questions regarding how they are designed, planned and regulated by the MoEST, hence the present study.

## Definitions of Terms

### Information and Communication Technology (ICT)

ICT (information and communications technology - or technologies) is an umbrella term that includes any communication device or application, that are used for accessing, gathering, manipulating, communicating, creating, disseminating, storing, and managing information. Therefore, the term ICT is used in this research study as a general term describing any device or application, hardware and software information communication device - encompassing radio, television, cellular phones, computer and network hardware and software, satellite systems and so on, as well as the various services and applications associated with them, such as video-conferencing and distance learning.

## ICT Interventions in education

Many developments have occurred regarding the use of ICT in education. The innovative use of these emerging technologies is identified as interventions that are coming into perspective or existence and commonality in education. Therefore, ICT interventions in education refer to emerging technologies that are reshaping the nature of education by increasing access to information as well serving as a means of promoting learning by transforming classrooms into more engaging, collaborative and productive learning environments in which instruction can be customised to learners' specific needs, interests and learning styles (UNESCO, 2004). The ICT interventions are also understood as technological resources that are redefining the way educators teach and the role they serve in the school (Trucano, 2005).

## ICT Conceptualisation

The term ICT conceptualisation is used in this thesis to describe the process of planning for ICT resources, ideas and other entities or stakeholders in education and drawing their relationships within the education system. This includes the identification of goals or objectives to be achieved by specific ICT interventions and the formulation of strategies to achieve them.

## ICT Implementation

In this thesis ICT implementation is used as an extension to the ICT conceptualisation processes to describe the process of putting a decision or plan into effect, where ICT resources and ideas are implemented, directed and monitored by identified stakeholders following arrangements or strategies formulated during the conceptualisation process, as required.

## ICT Integration

In practice, ICT integration into teaching and learning is the pedagogical employment of ICT to facilitate learning in finding, collating and synthesizing relevant information; applying information; solving problems; communicating ideas effectively; providing a greater degree of independent learning and expanding the learning horizons beyond the teacher and learner interaction (Mumtaz, 2000). The integration involves the use of ICT not only to enhance teaching but also to ultimately facilitate and improve active learning for improved teaching (Jung, 2005). Thus, the term ICT integration is used in the present study to describe the incorporation of ICT into pedagogical process and within the setting of teaching & learning systems to fit to what best suits a specific context (Hennessy, Ruthven & Brindley, 2005).

# Organisation of Thesis

The present chapter provides an overview of the research project and it has covered the background of the study in reference to literature that provides rationale for this study. Similarly, it has presented the aim of the research in the light of the research problem at hand and its significance. Furthermore, the chapter has explained the research context and it defined the key terms in reference to literature to define the scope of the investigation. The significance of the research has also been discussed to highlight anticipated contributions of the study.

Chapter 2 - Literature Review: This chapter discusses relevant literature, proving a theoretical context for the research project and rationale for this study. Guided by the initial purpose of this research, it focuses on the phenomenon of ICT interventions design, adoption, and use in the context of research of primary schools and teachers. The themes identified in this literature review guide the conceptual, methodological and analytical framework of this research. It also

analyses literature on the theoretical perspectives in the planning, adoption and use of ICT interventions in education to set research questions and draw conceptual processes that guide this study.

Chapter 3 – Methodology: Based on the conceptual framework presented in chapter 2, this chapter outlines the study's research design to provide a research approach and methodology that guided the investigations. The chapter also provides the justification for methodological choices and data generation strategies that were employed during the investigation. The process of ensuring credibility and trustworthiness of the investigation and associated ethical considerations are also discussed in the chapter.

Chapter 4 – Summary of Findings: This chapter presents findings from the study, generated from the data collection methods identified in the Methodology chapter. The findings are presented following identified themes that emerged from the collected data and the literature review in line with the conceptual and analytical frameworks.

Chapter 5 – Discussion of Findings: This chapter employs the study's analytical framework to examine and interpret the findings in relation to the study's research questions. The chapter discusses the findings from Chapter 5 and relates them to the literature review to provide a robust discussion on the configuration of activities and processes in the conceptualisation and implementation of ICT interventions in Malawi's primary school education system and to inform the recommendations of this research.

Chapter 6 – Conclusion: The chapter summarises findings of the research by reflecting on the research's outcomes. It particularly relates the outcomes to the study's research questions and the contributions made by the research to how ICT interventions are conceptualised in the national primary education system,

implemented in primary school contexts, and integrated in the classrooms environment. The chapter also explains limitations concerning the research outcomes and identifies areas for further research.

# CHAPTER 2: LITERATURE REVIEW

## Introduction

This chapter discusses issues surrounding the introduction of ICT in education. The basis of this literature review is that an analysis of the configurations and interaction between events, activities, contents, and processes taking place in the context that the ICT interventions are implemented will reveal both the teachers' practices on the one hand, and tension between teachers' practices and context on the other. Thus, the literature review starts with an overview of the importance of ICT in teaching and learning and, in turn, explores the development of ICT in education to identify challenges that have been associated with ICT interventions in education and to locate the current developments in a developing country context such as Malawi's. Finally, it tackles key factors that influence the implementation and integration of ICT in schools and classrooms respectively.

## Importance of ICT Innovations in Education

Over the recent years the use of ICT in education has not only developed rapidly but has also become an integral part of the modern education system with its expected impact on teaching being widely accepted (Kihoza, Suhonen, Vesisenaho, & Tukiaianen, 2014). Such expectations have led to the development of a number of strategies on instructional technology in many countries, to take advantage of opportunities and advantages that the educational innovations in technology mediated learning environments can offer (Enrique Hinostroza, Labbé, Brun & Matamala, 2011). Several advantages of ICT mediated learning environments have so far been mentioned from studies in literature that discusses the importance of the effective use of technology for education (Bottino, 2004; Cartwright & Hammond, 2007; Kellner, 2006).

The importance of ICT in education is supported by different researchers who argue that ICT resources help to create and promote more transformative learning environments to students through active, self-directed and constructive learning (Bottino, 2004; Smeets, 2005; Volman & van Eck, 2001). Bottino (2004), for example, argues that ICT resources can help to improve teaching and learning as tools in the learning process and as communication media.  It has been argued that ICT provides interactive learning environments - through the use of multimedia software and simulations 'that combine text, image, sound, animation, and video' (Volman & van Eck, 2001) to present real-life situations from which learners can actively work (Smeets, 2005). In addition, Smeets argues that ICT applications can be used as tools in the learning process to allow learners to visualize and manipulate abstract or complex concepts of the curriculum while stimulating learners to reflect from the simulations' interactive feedbacks.

Furthermore, it is argued that ICT provide collaborative and interactive learning and communication among learners. Volman and van Eck (2001, p. 164) note that "ICT applications such as groupware are often inspired by the principle of collaborative or cooperative learning, which has a whole tradition of research on the role of group composition and on differential effects." It is further claimed that learners' cognitive development is promoted through such ICT collaborative and interactive learning and communication because it stimulates them "to articulate ideas, ask questions, participate in discussion and work together, and receive feedback on their ideas from their classmates" (p. 614). The growth of ICT, coupled with the power and diversity of information transfer, allows teachers and learners to have access to learning contexts beyond the classroom. Thus, ICT has the potential to transform the nature and process of the learning environment and envision a new learning culture (Trucano, 2005).

The development of ICT in education has led to substantial changes to learning scenarios as it allows learners and teachers to explore, access and represent

information dynamically and in multi-modal forms (Jung, 2005). In addition, the interactivity, flexibility and convenience of ICT use have opened up immense opportunities for the learners to access, extend, transform and share information and ideas at their own pace and time. The real power of ICT in education therefore lies in its use as a tool to promote and encourage critical thinking where learners are actively engaged in the teaching and learning process. Rogers and Finlayson (2004) argue that ICT is meant for not memorizing or engaging with ICT for the sake of activity, but for enhancing meaningful learning that promotes learner centred principles as learners are given more responsibilities for their own learning when ICT is integrated in the curriculum. In addition, Hennessy, Ruthven and Brindley (2005) assert that ICT offers new and innovative modes of learner centred learning culture at all levels of education because it has profound impact on learning environments.

## The Development of ICT in Education - Global Trends

The early attempts to improve education with technology started from the advent of the twentieth century, with innovation such as radio, television and stenographers (Cuban, 1986; Rodriguez, Nussbaum & Dombrovskaia, 2012). Since then, ICT has continuously been introduced and used in schools for different purposes in teaching and learning such as dissemination, discussion, discovery and demonstration of learning activities (Siemens & Tittenberger, 2009). The development of ICT has, therefore, been associated with affordances that help in enlarging learning opportunities that provide richer and sustainable learning (McFarlane, 2001).

Siemens and Tittenberger (2009) have traced this development from the early stages, i.e. mechanical age, through the electronic age, to the present digital age. They observe that during the mechanical age, learners accessed content provided by the teacher using the chalkboard and textbooks through hand written notes

and typed handouts. In addition, interaction with fellow learners and teachers was limited to the classroom and the school, while additional sources of information were available only through the library, laboratories and field trips. As such, teaching and learning was supported by the mechanical media like the textbooks, chalkboard, typewriters and stencils, whose scope was restricted by geographical limitations (ibid).

Nonetheless, the development of ICT into the electronic age provided more affordances to the teaching and learning process above the mechanical media benefits (Siemens & Tittenberger, 2009). In addition to using textbooks, hand-outs, chalkboard, the library and the laboratories, teachers and learners have been able to interact with content, discover and discuss information using overhead and slide projectors, radio, television, film, and electronic laboratory equipment (Siemens & Tittenberger, 2009; Veletsianos & Kimmons, 2012). The electronic age expanded the scope of access to information and removed some geographic limits and also introduced technology mediated teaching and learning such as the use of interactive radio and televised instruction. Thus, most of the electronic ICT resources were, and still are, used as tools for presentation rather than for the promotion of learners' skills because they lack interactive features for active learning (Laurillard, 2013).

Over the past decade, technological innovations have become more prominent. The participative web, also known as web 2.0, mobile smart phones and tablets, social networking services, and portable digital ICT devices have given individual users greater control over information creation and sharing (Butcher, 2010; Siemens & Tittenberger, 2009). Information services such as internet and other offline digital resources have, therefore, improved information access and communication media for teachers and learners. Siemens and Tittenberger (2009) state that technological innovations in both hardware and software applications have since directly impacted teaching and learning by creating new opportunities

for learner-learner, learner-teacher, and learner-information interactions. This is what is identified as the digital age of ICT (Veletsianos, 2011).

Teaching and learning in most of the developed countries has, therefore, largely benefited from the use of the digital ICT resources and provisions (Pearce, Weller, Scanlon, & Kinsley, 2012; Price, Jewitt, & Brown, 2013). In addition to using both the mechanical and electronic ICT resources, teaching and learning now benefits from direct and instant access to a wide range of resources and learning activities through online and offline digital resources, simulations and other software applications (Siemens & Tittenberger, 2009). However, it is worth noting that some developing countries are in transition between the electronic ICT age and the digital ICT age, therefore, the use of digital ICT resources in such countries is emergent due to limited digital ICT infrastructural development (Hennessy, Harrison & Wamakote, 2010; Kipsoi, Chang'ach, & Sang, 2012). Nevertheless, the use of portable digital mobile devices is becoming increasingly widespread and is seen as essential in teaching and learning everywhere (Hanson & Narula, 2013; Khan, Hossain, Hasan, & Clement, 2012).

In developed countries, the use of mobile devices that use wireless internet has enabled teachers and learners to seamlessly access and utilize online content and applications without time and space constraints (Mintz, Branch, March & Lerman, 2012; Park, 2011; Sharples, Taylor & Vavoula, 2010). Recent empirical studies suggest a number of advantages of using wireless technologies and mobile devices in learning environments, including the potential to enhance the availability and accessibility of information networks amongst teachers and learners; engaging learners in diverse physical locations in synchronized learning activities; and enhancing communication and both personal and collaborative learning processes in the classroom (Gawelek, Spataro & Komarny, 2011; Imtinan, Chang & Issa, 2014; Martin & Ertzberger, 2013). These advantages have, so far, led to widespread

introduction of the wireless ICT interventions in most education systems in developing countries, as discussed in the subsequent section.

## Current ICT use in Education in Developing Countries

While research (Smeets, 2005; Teo, 2009; Teo, 2011; Unwin, 2005) shows increasing acknowledgement that ICT enhanced learning significantly contributes to the improvement of teaching and learning across the world, the technology-enhanced learning has not yet been used more widely and effectively for this purpose within the developing world (Bof, 2004; Cabanatan, 2001; Somekh & Davis, 1997). The focus of ICT in education in developing countries presently remains primarily on the importance of giving learners and teachers ICT skills, rather than on using ICT resources to enhance both the teachers' and learners' wider learning experiences (Unwin, 2005). Consequently ICT, very often, has not been used as a teaching and learning resource to deliver a diversity of learning situations (Ibid). Rather, schools and teachers intend to mostly provide education for ICT and not the use of ICT for education (Halewood & Kenny, 2008).

Maldonado, Khan, Moon, and Rho (2011) cite lack of acceptance of ICT as an urgent need as an explanation for slow penetration of ICTs in the developing countries. Absence of policies to regulate the development and the use of ICT in the developing countries, e.g.  Nigeria, Kenya, Uganda, India and Brazil have created a disabling environment (Bof, 2004; Hennessy, Harrison & Wamakote, 2010; Trucano, 2005). Without integrated frameworks for improving the school climate and teachers' professional development provisions, along with ICT infrastructure enhancement, the desired results might not be achieved. Furthermore, innovations in ICT are introduced in the global marketplace much faster than most educational systems are able to utilise them effectively (Rodriguez, Nussbaum & Dombrovskaia, 2012; Trucano, 2005). Therefore, the aspect of timing turns out to be a critical challenge for ICT policymakers to operate with focus on longer term goals for ICT use in education.

In most developing countries such as Malawi, Ghana, South Africa, Peru, Vietnam, Bangladesh, Indonesia and Iran, activities aimed at promoting the use of ICTs to benefit education are, to a larger extent, dependent on donor-supported projects (Hennessy, Harrison & Wamakote, 2010; Khan et al., 2012; Omidinia, Masrom, & Selamat, 2011; Tolani-Brown, McCormac, & Zimmermann, 2011; Unwin, 2009). The focus of these projects is on supplying ICT facilities and connectivity, building school ICT labs, and providing training in ICT literacy. Where ICTs are used for learning, evidence suggests that they are chiefly used to present and disseminate information, as tools for presentation rather than the promotion of learners' skills (Kipsoi et al., 2012; Lin, Wang & Lin, 2012; Ringstaff & Kelley, 2002). It is, therefore, clear that there is need for much more guided and informed interventions that focus on how schools and teachers can benefit from the provided ICT resources to promote learning.

There is need for more research on the ICT interventions in teaching and learning to investigate if schools and teachers are supported and prepared to implement the ICT interventions in a manner that can transform teaching and learning experiences, so that the teachers may take advantage of the potentials that ICT resources offer in their daily classroom teaching (Grace & Kenny, 2003). On the one hand, Leach and Moon (2000) strongly favour the need for use of emerging technologies in a bid to improve effectiveness of the teaching and learning systems in low income countries and argue for the universal application of such emerging ICTs. However, on the other hand, the view on universal application and utilisation of emerging technologies in education is considered impractical in the face of technology-unfriendly realities such as poor infrastructure, erratic power supply in urban schools, or total lack of electricity in rural schools, lack of trained personnel, poverty (low buying power), inadequate funding, and limited or no internet access (Isaacs, 2005).

Unlike in developed countries, such socio-economic challenges prevent the use of digital connectivity in the developing countries (Shaba, 2009). Consequently, education systems in the developing countries have generated ways for addressing the difficulties they face, e.g. the use of offline portable ICT devices (Barker, Krull, & Mallinson, 2009).  In the light of this observation, offline portable handheld technologies offer an important aspect of educational ICT in so far as they make a controlled contribution to improving the effectiveness and efficiency of teaching and learning. Therefore, the use of portable ICT devices with offline preloaded applications for classroom instruction is viewed as an important option for improving educational quality in primary school classrooms in developing countries around the world (Barker et al., 2009).

## Challenges Associated with ICT Development

While technology has been changing and has continuously been used for teaching and learning, classroom practices have for a long time remained unchanged (Kellner, 2006; Rodriguez, Nussbaum & Dombrovskaia, 2012). This suggests that most of the ICT innovations in education have had less than the intended impact on teaching and learning. Nevertheless, in the recent years, ICT resources have been introduced in schools specifically to transform teaching and learning processes and to improve strategies for better educational attainment (Kozma, 2003; Light, 2009). Examples include interactive whiteboards, learning management systems, simulations and different software applications and the portable ICT devices such as smart phones, tablets, and handheld audio-visual devices.

When ICT resources were being introduced in schools, interest and focus were directed towards them as innovations, ignoring the aspects of curriculum integration, the use of ICT in the classroom, and the fundamental frameworks for teaching and learning with or without ICT (Cox & Marshall, 2007; Rodriguez, Nussbaum & Dombrovskaia, 2012; Sutherland et al., 2004). In most developed

countries, where nearly all schools are equipped with infrastructure for conducting ICT mediated teaching and learning, ICT innovations have been conceptualised and introduced in education and pushed down to the teachers without preparing them for the same (Hennessy, Ruthven & Brindley, 2005; Teo, 2011). The greater emphasis placed on technology other than on pedagogy presented challenges in acceptance and effective use (integration) of ICT in classrooms (Rodriguez, Nussbaum & Dombrovskaia, 2012; Trucano, 2005; Watson, 2001). There is, therefore, need to understand how ICT can be incorporated in the pedagogical processes within teaching and learning contexts in order to minimise tensions between significance of ICT and the pedagogy.

Research reveals that ICT tends to have positive impact as well as neutral or negative impact on teaching and learning if not appropriately used (Cartwright & Hammond, 2007; Cox & Marshall, 2007; Moonen, 2008; Warschauer, Knobel, & Stone, 2004). Similarly, it has been observed that ICT resources do not "automatically add quality to teaching and learning or better education system. It is possible to use them for trivial purposes, to waste students' time" (Boakye & Banini, 2008, p. 1). Furthermore, research findings on ICT integration in schools highlight the need to focus on contextual factors such as teachers' pedagogical approaches and philosophies (Coburn, 2003; Cox, 2008), teachers' ICT efficacy, attitudes and skills (Kirkman, 2000; Trucano, 2005), and school ICT infrastructure, supervision, technical support and leadership (Baskin & Williams, 2006; Reynolds, Treharne, & Tripp, 2003; Tondeur et al., 2008).

## Factors affecting integration of ICT innovations in Teaching

The foregoing arguments regarding advantages and importance of ICT use and integration in teaching present high expectations for the potential of ICT in improving teaching and learning in general. However, studies worldwide have indicated slow absorption of ICT in education, even in the developed countries, despite the presence of ICT facilities in educational institutions for a considerable

number of years (Miège, 2008; Pelgrum, 2001; Sipilä, 2010). The biggest challenge of ICT integration into teaching and learning has been to get rid of the perception of ICT as one more thing teachers need to adjunct for their teaching rather than as a part and parcel of the teaching and learning process and practice (Magambo, 2007).

Research suggest different reasons leading to the low or slow uptake of ICT use in education (Kipsoi et al., 2012; Kreijns, Van Acker, Vermeulen, & Van Buuren, 2013; Prestridge, 2012; Sang, Valcke, van Braak, Tondeur & Zhu, 2011; Teo, 2012; Thayer, 2013). The problem being worldwide, the explanations are offered within different contexts; nevertheless, they point to similar challenges. In addition, just as with any other school-based knowledge, teachers are perceived as a key to the effective implementation and use of ICT interventions in the education system. These factors are interrelated and for the purposes of this review, they have been explored thematically under the following headings: teacher-based factors (teachers' perceptions, attitudes and efficacy); systemic factors (professional working environment conditions and policies); and training-based factors (ICT teacher training/ professional development).

## Teacher based factors

Successful initiation and implementation of educational ICT interventions in schools largely depends on the teachers' support and attitudes (Buabeng-Andoh, 2012). Several studies (BECTA, 2004; Drent & Meelissen, 2008; Guo, Dobson, & Petrina, 2008; Mumtaz, 2000) have made a distinction between factors that can be influenced such as attitudes of teachers towards teaching and ICT and the ICT knowledge and skills of teachers, and factors that cannot be influenced such as age and teaching experience. In view of this, this literature review focuses on the teacher-based factors that can be influenced as opposed to gender, age or length of service, as revealed by most recent studies, they do not have noticeable effects on pedagogical ICT use during inclusive and needs based ICT training and support

coupled with relevant levels of professional advice and guidance on the use of ICT (BECTA, 2004; Drent & Meelissen, 2008; Guo, Dobson, & Petrina, 2008; Mumtaz, 2000; Teo, 2008).

### *Teachers' Perceptions and Attitudes*

Among the factors that influence successful integration of ICT into teaching are teachers' perceptions and attitudes towards ICT (Buabeng-Andoh, 2012; Cox, Cox, & Preston, 2000; Keengwe, Kidd, & Kyei-Blankson, 2009; Mumtaz, 2000; Somekh & Davis, 1997). It is understood that if teachers perceive particular ICT resources as neither fulfilling their needs nor their learners' needs, they are unlikely to integrate them into their teaching and learning (Buabeng-Andoh, 2012). Cox, Cox, and Preston (2000) analysed theories about motivation, attitudes and behaviour to identify a range of factors that contribute to teachers' motivation to use ICT. They argue against the assumption by many national decision makers that teachers' ICT training only requires the teachers to learn how to use the ICT, which results in marginal numbers of teachers being motivated to regularly use ICT in their teaching. It is, therefore, suggested that more attention should be given to evidence concerning factors that motivate the teacher to use ICT more in their teaching (Cox, Cox & Preston, 2000)

Teo (2010) conducted a survey on pre-service teachers' attitudes towards computer use in Singapore based on the teachers' affect (liking), perceived usefulness, perceived control, and behavioural intention to use the computer. He found that teachers were more positive about their attitude towards computers and intention to use them than their perceptions of their usefulness and their ability to control them. On the other hand, Lee, Cerreto & Lee (2010) conducted a study about factors which influence innovative use of ICT by teachers in Korea and the study revealed that the teachers' salient pedagogical approaches and attitude towards ICT were dependent on their perception of the usefulness of ICT in their teaching and their knowledge on the use of pedagogical ICT. However, the studies

further revealed that the teachers' individual personalities have a significant influence on their perceptions and attitudes towards their use of ICT in teaching and learning. This supports the Diffusion of Innovations theory by Rogers (2004), where innovativeness of individual teachers, that is, their venturesome, tremendous interest in innovations, and their activeness in seeking information is regarded as a leading personal characteristic that influences the relativity of adoption of ICT amongst teachers within a particular environment i.e. school. Correspondingly, Cheon et al. (2012), Teo (2012) and Moss et al. (2014) suggest that if a teacher's personality is extraverted and conscientious, she or he is more likely to adopt new ICT-based methods in teaching than a personality that is nervous and cautious about change.

Furthermore, research also shows that teachers' ICT experience relates positively to their perceived usefulness of ICT use for teaching and learning (Hammond, Reynolds, & Ingram, 2011; Kreijns, Vermeulen, Kirschner, Buuren, & Acker, 2013; Smeets, 2005; So, Choi, Lim, & Xiong, 2012). It is, therefore, evident that the more the experience a teacher has in using particular ICT, the more likely that they are to show positive attitudes towards ICT innovations (Kreijns, et al., 2013). These findings overtly suggest that metacognition of ICT relevance is most influential as a teacher is likely to transfer their personal judgment of ICT from the previous general experience to a more dedicated perceived usefulness in teaching and learning (Granger, Morbey, Lotherington, Owston, & Wideman, 2002). Therefore, previous use of related ICT resources improves the teachers' perceived knowledge and skills to use any other ICT innovation hence their positive attitudes. Consequently, appropriate interventions to promote a positive attitude towards pedagogical ICT integration should consider teachers' professional development in the pedagogical use of ICT resources.

### *Teachers' ICT self-efficacy*

Bandura (2006) defines self-efficacy as the confidence in one's own abilities to perform an action or an activity required to achieve a goal or task. From this definition, self-efficacy may be understood as self-confidence that an individual has in his/her abilities and expertise to do specific activities or use particular resources for a certain purpose. Teachers' ICT self-efficacy is, therefore, understood as an individual teachers' decision of his/her personal capabilities to use ICT resources (Buabeng-Andoh, 2012). Self-efficacy is assumed to have three components: (1) magnitude - the levels of task difficulty that people believe they can attain, (2) strength - the belief regarding magnitude, and (3) generality - the degree to which the expectation is generalised across situations (Bandura, 2007; Torkzadeh & Van Dyke, 2002). In other words, teachers' ICT self-efficacy refers to both the teachers' perceived prospect of success in using ICT for teaching and learning and how far the teacher perceives that success as being under his or her control (Peralta & Costata, 2007).

Empirical evidence indicates that individuals with a high ICT self-efficacy are more likely to form positive perceptions of ICT and use the ICT more frequently (Saleem & Higuchi, 2014; Torkzadeh & Van Dyke, 2002). ICT self-efficacy has also been related to teachers' anxiety in using ICT for teaching and learning. In a survey conducted by BECTA (2004), approximately 21% of the teachers in the survey's sampled population, reported that lack of confidence influenced their use of computers in their classrooms. The report states that "many teachers who do not consider themselves to be well skilled in using ICT feel anxious about using it in front of a class of children who perhaps know more than they do" (p. 7). This again points towards teachers' previous use of related ICT resources and professional development in the pedagogical use of ICT resources as discussed in the previous section - teachers' ICT perceptions and attitudes. Wastiau et al. (2013) support this argument by identifying fear of failure, and lack of ICT knowledge as some of

the reasons for teachers' lack of confidence for adopting and integrating ICT into their teaching.

Similarly, Peralta and Costata (2007) observes that teachers' practical ICT competence and the pedagogical and personal factors mostly contribute to their confidence in ICT use. Furthermore, Romeo, Lloyd, and Downes (2012) note that opportunities to work and practice ICT, get support from experienced teachers and professional development as the key positive conditions for improving teachers' confidence in ICT usage. Along the same lines, BECTA (2004) observes that the more confident the schools are in using ICT (using the composite measure of ICT ownership, Internet access, teachers' confidence level and ICT usage in Maths, English and Science), the more likely they are to say that teachers have received the various types of training and support, appropriate levels of professional advice and support on ICT, and guidance on the use of ICT. This observation further underscores the significance of appropriate interventions for pedagogical ICT integration to consider teachers' professional development in the pedagogical use of ICT resources.

### Teachers' ICT Competency

van Braak, Tondeur and Valcke (2004) define ICT competence as the ability to handle a wide range of varying ICT applications for various purposes, and previous research points to teachers' lack of ICT competence as a main barrier to their adoption and integration of ICT (Al-Oteawi, 2002; Pelgrum, 2001). Significantly, findings of recent studies support and extend this assertion by revealing that teachers' ICT competence is significantly related to their attitudes (Kim, Choi, Han, & So, 2012; Lin, Wang, & Lin, 2012b; Prestridge, 2012), which supports previous theoretical and empirical arguments for the importance of ICT competence in determining teachers' attitudes toward ICT integration in teaching (see Baker, Al-Gahtani, & Hubona, 2007; Cheon et al., 2012; Teo, 2012). This, in turn, suggests that the previously discussed strained and anxious teachers' characteristics or

their confident and unrestricted approaches towards the use of ICT innovations could be influenced by their respective levels of ICT competence.

In addition, the relationship between ICT self-efficacy and ICT competence suggests that higher ICT competence may nurture teachers' positive beliefs about the value of using ICT and their perceived ICT control in their professional practice. Peralta and Costata (2007) provide evidence that supports this assumption in a study about primary school teachers' competence and confidence level in five European countries. They affirm that a teacher with more experience with ICT resources has greater confidence in their ability to use them effectively. A teachers' high ICT competence improves their perceived knowledge and skills to use any other ICT innovation hence their positive attitudes. Consequently, appropriate interventions to promote a positive attitude towards pedagogical ICT integration should consider teachers' professional development in both the ICT competence skills and the pedagogical use of the ICT resources.

## Teacher Education and Professional Development

Most arguments for teacher-based factors for ICT integration point to teacher training and preparation because it is perceived as the base of most of the teacher-centred factors that affect teachers' attitudes towards ICT integration in their teaching. Lack of encouragement of students to use ICT by tutors in teacher training (Dunn & Ridgway, 1991; MacDonald, 2008; Wild, 1996) and lack of ICT experience and training at pre-service level (Goktas, Yildirim, & Yildirim, 2009a; Sang et al., 2011) coupled with lack of resources or lack of access to resources in initial teacher training institutions (Sang et al., 2011; Taylor, 2003; Wild, 1996), have been suggested as the main reasons behind such teacher-based factors identified by Cox, Cox and Preston (2000). Hew and Brush (2007) identify teachers' professional ICT development as critical for both pre-service and in-service teachers. However, the rapidly evolving ICT requires more than directed skill-based training. Although teachers may have ICT skills, they may not be able to

consider using ICTs in teaching and learning if their concerns and expectation regarding ICT use for teaching and learning are neither addressed nor appreciated.

ICT integration has to become an authentic and automatic response to teaching and learning moments in the classroom (Jung, 2005). As observed by Cox, Cox and Preston (2000), in the past, it was assumed by many decision makers that "ICT training for teachers only required them to learn how to use the ICT and the rest would follow automatically" (p. 3) and "the use of ICT in the classroom is in terms of skill acquisition instead of as a change process that affects the behaviour of individuals on a very profound level" (Rakes & Casey, 2002, p. 3). Beyond having ICT skills, through training, teachers need to realize how to organize the classroom to structure the learning tasks so that ICT resources become an automatic and natural response to requirements for learning environments in the same way as teachers may use any other teaching and learning resource in the classroom (Boakye & Banini, 2008). However, teacher training for ICT integration could be pre-service teacher education or in-service professional development and their roles cannot uniformly apply, as service teachers and in-service teachers tend to be surrounded by different challenges and factors, hence their different needs, which are discussed separately in the sections that follow:

### *Pre-service Teacher Education*

Pre-service teacher education is considered as having a very important role in developing an ICT pedagogical use culture for teachers. The challenge for teacher preparation programmes is for them to provide systematic instruction in the effective use of ICT to support teaching and learning (Goktas, Yildirim, & Yildirim, 2009a). Newly qualified teachers should be able to plan and design effective learning environments in their classroom, supported by the available ICT (Chai, et al., 2011). Pre-service teacher training has to provide learning opportunities on how to design and implement curriculum plans that include strategies for applying ICT. It is mostly argued that beginner teachers usually bring their learning

experiences into their teaching, which means that they teach the way they were taught in college (Romeo et al., 2012). Thus, teacher educators should identify when, where and how ICT is most appropriately addressed within the teacher preparation programme so that pre-service teachers become comfortable with the curriculum ICT use (Tondeur et al., 2012).

Initial teacher education institutions, thus, have an important role in ensuring that teachers enter the profession adequately prepared to use new ICT (Jimoyiannis & Komis, 2007). If ICT is effectively integrated into the preparation programmes, education students would bring that experience to their teaching when they become teachers (Vrasidas, 2015). Teacher preparation programmes are expected not only offer a course in educational ICT, but they should also ensure that teacher educators demonstrate the integration of ICT in their teaching (Chai, Koh, Tsai & Tan, 2011). Therefore, teacher preparation, through modelling by the teacher educators and based on experience and observation, has to empirically provide and engage students in ICT integrated training. The challenge for teacher educators is to model effective ICT integration practices within a tertiary environment and to link students' content learning outcomes to ICT standards that the students are required to fulfil during pre-service training (Redmond & Albion, 2005).

Redmond and Albion (2005, p. 1) argue that "if teacher education is to be effective in preparing teachers to integrate ICT, it will need to find ways to engage prospective teachers in authentic practices with ICT". This requires a conceptual plan for both the teacher educators and the students to move beyond mere ability to adapt to emerging technologies as a matter of responding to the demand for ICT use to assuming a "pro-active meta-cognitive" use of ICT (Blake, Holcombe, & Foster, 1998, p. 40). Rakes and Casey (2002) state that a clear demonstration of the pedagogical use of ICT as instructional tools through teacher training and education can address teachers' ICT professional self-development needs. This

would produce a positive pedagogy-ICT integration approach in the teachers' general use of ICT facilities. They further argue that the use of meta-cognitive training addresses attitudes and feelings that may inhibit teachers' use of instructional ICT tools, rather than the skill-based training that frequently produces less than desirable effects.

Furthermore, Taylor (2003) argues that positive teachers' attitudes towards the use of ICTs are critical if the ICTs are to be effectively integrated into teaching and learning. He asserts that attitudes towards the use of ICT constitute perceived usefulness, ICT confidence, ICT anxiety, and ICT liking. It can be argued, therefore, that the perceived usefulness and control of ICT by teachers are internal elements of an individual and relate to how ICT may affect an individual. Failure to address these internal elements during pre-service teacher education could account for teachers' intense and less desirable concerns and negative attitudes towards the use of ICT in their teaching (Rakes & Casey, 2002). Furthermore, Teo (2009) found significant correlation between overall ICT attitudes and years of ICT use, on the one hand, and levels of ICT confidence, on the other. Observing that teachers with more ICT experience showed more positive attitudes, he argues that the availability and accessibility to ICT by teachers could attribute to higher levels of ICT confidence and overall positive ICT attitudes.

While it has been argued and assumed that the availability and free access of ICT contribute to conversant and effective use of ICT (Albion & Redmond, 2008; Bingimlas, 2009; Richards, 2004), it should be noted that teachers' attitudes towards ICT use could not easily improve without addressing their concerns and perceived usefulness of ICT to teaching and learning (Phelps, Graham & Kerr, 2004). Pre-service teacher education has to help the teachers to individually identify their own needs regarding the use of ICT in teaching and learning before ICT availability and its corresponding free access could play a role in achieving positive attitudes towards use of the ICT. Redmond and Albion (2005, p. 1) state

that "many teachers have little or no experience of the real-world application of ICT in the knowledge domains around which the curriculum is constructed and are, consequently, less able to design authentic learning activities." This suggests the need for teacher training to promote the desired needs and values of teachers to ensure that the use of ICT in their teaching and learning effectively meets their goals and expectations. This could also help reduce ICT anxiety and inappropriate ICT attitudes.

### *In-service Teacher Professional Development*

Chai et al., (2011) observed that the daily spontaneous duties and demands of the teaching profession gradually stop teachers from thinking of theoretical concepts about ICT and how to adapt strategies for using specific ICTs. As time goes, teachers' interaction with ICT becomes incomplete thereby reducing their understanding and confidence of ICT. In turn, they avoid using technologies, causing ICT to remain unused in many schools (Buabeng-Andoh, 2012). In view of this, teacher training in the use of ICT has to be given high priority during professional development of serving teachers so that they can then continue to build their skills and knowledge in successive steps based on appropriate learning techniques that may focus on reflective practices, exploration, discovery learning and various pedagogical approaches (Unwin, 2005). Thus, in-service training instils in teachers, new skills and abilities needed by them to perform tasks which they were unable to perform previously, and it instils confidence in teachers when undertaking their duties (Tezci, 2011).

Romeo, Lloyd and Downes (2012) argue that considering that training is an investment in skills and productivity of programs, it is essential to emphasize the theme of lifelong learning for capacity building and professional development of teachers. This enables a better understanding of the various roles and the great potential of ICT in supporting access to a wider range of teaching and learning opportunities (Chai, et al., 2011). As earlier discussed, teachers' practices and

traditional pedagogies are challenged by emerging ICTs in education and this, coupled with other school-based or education system contexts contribute to teachers' undesirable attitudes towards ICT use and integration. However, the fact that ICT always involves people and their social systems means that different forms of ICT could be designed for various teaching and learning purposes (Lin, Wang, & Lin, 2012a). The focus of training needs to be on developing appropriate range of ICT pedagogical skills, taking into account teachers' perspectives through a comprehensive contextual approach. This means that practical consideration should be given to specific conditions in providing in-service teacher training as an on-going support for professional self-development, with teachers taking greater responsibility for core competencies in ICT integration (Rogers & Finlayson, 2004).

Phelps, Graham and Kerr (2004) argue that it is not possible for teachers to continue to use ICT in classroom without reflecting on their belief about teaching and learning. This argument prompts consideration of teachers' past and present feelings, attitudes, beliefs and motivation regarding ICT use in teaching. According to their study, the meta-cognition approach to ICT professional development encourages teachers to identify, articulate and pursue personally relevant goals for ICT use rather than specific ICT objectives being imposed on them. This does not only benefit new ICT users but also those with high and diverse ICT knowledge, skills and experience to meet individual learning needs of ICT use in their teaching. The meta-cognitive approach, therefore, helps in development of positive attitudes towards the sustainable ICT integration by teachers because they would perceive ICT as a tool in achieving their intended goals. Teachers could easily use ICT as an engaging medium specifically, and broadly in confronting their own learning, and that of their students and their fellow teachers (Phelps, Graham & Kerr, 2004). This demonstrates the role of teachers' individual concerns and needs in developing positive attitudes towards the use of ICT for life-long self-professional development

## Systemic Factors

It may be disputed that proponents of teacher-based factors do not make effort to analyse factors behind the visible characteristics of teachers' personalities; there could be reasons behind teachers' cautious and nervous characteristics towards the use of ICT innovations. Predominance of other pressures in the teaching profession (Wild, 1996) has been implicated as one of the reasons behind the slow uptake of ICT in education. While ICT learning environment requires enhanced new forms and modes of teaching (Selwyn, 2007), teachers' schedules and work conditions have not responsively changed (Cuban, 2001), despite the rapidly changing ICT.

In the present chapter, the literature review about the systemic factors for ICT integration focuses on school factors, i.e. those that can be influenced by the school, and outside school factors such as government policies and the availability of external ICT support for the school. This is the case because research on the implementation of ICT in schools has shown that these factors are interrelated so much that the success of the pedagogical integration of ICT is not dependent of the availability or absence of one individual factor; rather, it is determined in a dynamic process involving a set of interrelated factors (Drent & Meelissen, 2008), including ICT accessibility, technical support, ICT school leadership support, and ICT policy and planning.

### *ICT Accessibility*

Several research studies indicate that access to ICT infrastructure and resources in schools is essential for teachers to integrate new technologies into education (BECTA, 2004; Bingimlas, 2009; Granger et al., 2002; So et al., 2012). Effective adoption and integration of ICT into teaching depends mainly on the availability and accessibility of ICT resources in question; if teachers cannot access the ICT resources, then they will not use them (Buabeng-Andoh, 2012). BECTA (2004) describes teachers' inaccessibility to ICT resources as not always merely limited to

the non-availability of the hardware and software or other ICT materials within the school; it is also as a result of poor organization of resources, poor quality hardware, inappropriate software, or lack of personal access for the teachers. Therefore, access to relevant, adequate, updated software and hardware are key elements to successful adoption and integration of ICT interventions.

Equitable access to hardware, software and the ICT infrastructure within schools is often a starting point for research related to the first level of the ICT integration. Empirical studies have identified numerous reasons for the lack of access to ICT resources. In developing countries where the use of ICT in education is still in its infancy, most times the ICT resources are not available when teachers need them because they are in short supply and, therefore, must be shared by teachers (Isaacs, 2007). Similarly some teachers tend not to have full access to the ICT resources owing to restrictive school policies (Albirini, 2006; Unwin, 2005). The mind-set amongst school leadership of providing education for ICT in most schools has worsened the problem as access to ICT resources is mostly, if not only, given to teachers who teach ICT-related subjects (Unwin, 2005). Teachers who would want to use the ICT resources for teaching their lessons, rather than teaching ICT, have limited access to them because they are not considered a priority.

Universally, barriers related to accessibility of ICT resources for teachers are widespread and they differ from country to country. Studies in Europe, Asia and America reported different access-related barriers to using ICT interventions in teaching ranging from lack of ICTs, slow ICT systems, and scarcity of educational software in the schools (Al-Alwani, 2012; Albirini, 2006; Boakye & Banini, 2008; Khan et al., 2012; Pelgrum, 2001). However, overcoming such hardware barriers does not, in itself, ensure ICT will be used successfully (Bingimlas, 2009). As Baskin and Williams (2006) assert, the accessibility of ICT resources does not guarantee its successful integration in teaching. It is eminent that apart from lack of ICT infrastructure, there are other barriers such as: poor hardware quality, lack of

suitable educational software, limited access to the available ICT resources and "lack of consideration of what is suitable for classroom teaching" (Bingimlas, 2009, p. 241).

*Technical Support*

General lack of human resource capacity to provide ICT technical support and equipment servicing results in a lag between the availability of ICT resources and the ability of teachers to integrate them into teaching (Lin, Wang & Lin, 2012). Due to some other work-related pressures in the teaching profession, such as high student numbers, attending to students with special needs, and ever-increasing workloads, teachers are likely to be easily frustrated with any technology breakdown in the use of ICT (Tondeur et al., 2012). Lack of proper set up, service, maintenance and technical advice on the use of ICT resources interrupts the teaching and learning process and classroom activities, hence high likelihood of teachers not using them regularly or effectively. BECTA (2004) noted that teachers are discouraged from using ICT resources because of fear of equipment failure on an understanding that no one would give them technical support in case of technical problems.

Technical support and maintenance is an important element of the school ICT environment; if there is no technical support for teachers they become dissatisfied with the ICT and eventually become reluctant to use it (Lin, Wang & Lin, 2012; Tezci, 2011). These conditions could lead to teachers' negative perceptions and considerations about the use of ICT. In addition, to the multifariously demanding work environment, Cuban (2001) observes that the impositions of ICT system failure could also be responsible for teachers' cautious behavioural traits towards ICT integration. Inversely, where there is an effective ICT technical support system, teachers appreciate its significance in helping them to integrate different technologies into their teaching without wasting time in equipment set-up and

troubleshooting hardware and software problems (Hammond, Reynolds, & Ingram, 2011; Voogt, et al, 2013).

### *School leadership support*

Although ICT technical support is imperative, school ICT leadership is a fundamental and prognostic element for teachers' use of ICT in teaching (Anderson & Dexter, 2005).  Leadership is an important factor in the effective implementation of ICT in schools. ICT will be integrated and implemented effectively in schools if school leaders, particularly the head teachers, support them; learn and use them in their instructional and administrative tasks; support their teachers in the process of change; and provide sufficient development opportunities for themselves and teachers (Afshari et al., 2010).  Chang (2012) and Dawson and Rakes (2003) attest that leadership is an important issue in effective technology use in schools and suggest that effective utilization of ICT by teachers requires strong leadership to drive well-designed technology plans in schools. Head teachers as change facilitators carry the responsibility of initiating and implementing school change through the use of ICT interventions and can therefore facilitate key decisions to integrate them into learning, teaching, and school administration (Chang, 2012).

School leadership that identifies and articulates an ICT vision, promote and accept teachers' ICT goals, and provide individualized ICT support could influence effective integration of ICT in teaching and learning (Weng & Tang, 2014). Anderson and Dexter (2005) examined school principals' technology-related leadership characteristics in 800 schools in the USA and found that "although technology infrastructure is important, technology leadership is even more necessary for effective utilization of technology in schools" (p. 49). In addition to having ICT technical support for teachers, ICT adoption and use could only be effective if school leadership involve both the teachers and the ICT technical support personnel in developing and implementing technology plans. In that way,

teachers are free to implement new ideas to improve the integration of ICT into teaching and learning processes in a supportive and enhancing professional environment (Tan & Ong, 2011).

### *Policy and Planning*

Vanderlinde, Aesaert, and Van Braak (2014) advance the view that whatever the goals of ICT interventions in education, their effective attainment requires policymaking, planning and management that will support them to ensure effective implementation. This suggests the need for ICT policies in education to be drawn from rational knowledge-based planning and management to ensure a sustainable and diverse understanding and development of the ICT interventions implementation at different levels. According to Haddad and Demsky (1995) policy constitutes either explicit or implicit single decision or group of decisions which may set out directives for guiding future decisions, initiate or retard action, or guide implementation of previous decisions. They identify policy making as the first step in any planning cycle that planners must appreciate in order to design implementation and evaluation procedures effectively. The actualization of ICT policies in education requires analysis, planning and management of resources in the education system. Accordingly, analysis, planning and management of resources require overlapping incidents in which a variety of institutions with diversified perspectives are actively involved technically and politically (Haddad & Demsky, 1995).

ICT policies in education are built in a highly uncertain and fluid context in response to a dynamic situation, i.e. ever-changing ICT development and evolving contexts, and technically derived from a diagnosis of specific situations. Consequent contextual strategic adjustments should be made so that strategic ICT policies and plans provide a rationale, a set of goals, and a vision for how education systems can incorporate ICT interventions, and the specific roles for relevant stakeholders in the design and development of specific ICT interventions

in education (Yusuf, 2005). However, different theoretical and empirical work in social research reveal the two essential dimensions of policy planning, i.e. who does it (the actors), and how (the process) (Haddad & Demsky, 1995; Patton, Sawicki & Clark, 2015; Wright, 2003).

Allison and Graham (1999) identify two models of these dimensions in policy planning process; the organizational process model (the process), and the governmental politics model (the actors). On the one hand, the organizational process model, according to Haddad & Demsky (1995, p. 20), "assumes a complex government consisting of a conglomerate of semi-feudal, loosely allied organizations, each with a substantial life of its own". Thus, policy planning decisions involving different institutions with different roles and objectives within the education system function independently according to standard patterns of behaviour partially coordinated by government. This provides an integrated framework for improving the school climate situations and teachers' professional development provisions and infrastructure enhancement to support the ICT use and to coordinate the deliberate efforts from different stakeholders (Kozma, 2005; Vanderlinde, Dexter & van Braak, 2012; Wagner et al., 2005; Yusuf, 2005).

Evidence suggests that developing countries with ICT policies and planning strategies that include procedures for maintaining and enhancing the ICT capability and infrastructure of the government departments, institutions, and all other key stakeholders have best opportunities for exploiting the potential of ICT intervention in their education systems (Isaacs, 2005; Jhurree, 2005). Apart from harmonizing and regularizing efforts of different key stakeholders in the design, development and management of ICT interventions, national strategic ICT policies and plans are found to be important in providing a framework against which to regulate national investment in education (Jhurree, 2005). Ringstaff and Kelley (2002) argue that coherent planning for ICT investments in education is a fundamental condition for desirable outcomes for ICT intervention at both

national and institutional levels. Furthermore, Kozma (2005) asserts that it is less likely that classroom innovations will add to overall national goals and have ultimate intended effects if their interventions and desired outcomes are not developed from strategic ICT plans, policies and programs.

On the other hand, the governmental politics model does not only assume an organizational approach to policy planning and decision making but also goes further to focus on the individual players in the process. Haddad and Demsky (1995, p. 20) observes that "government decisions are not made by a monolithic state based on rational choice, but rather are education policy-planning process: an applied framework negotiated by various leaders who sit on top of the organizations involved in that particular decision-making process". The different institutions involved in the implementation of ICT interventions are compelled by their own conception of the ICT interventions as well as by the imperatives of their organizational goals. Schools, as the main implementers of all ICT interventions (actors), are expected to develop school-based ICT policy and plans as comprehensive school guidelines providing a variety of strategic and operational elements concerning the integration of ICT in teaching and learning (Frazier & Bailey, 2004; Tondeur et al., 2008).

ICT policy plans act as blueprints for subsequent events in schools' implementation and teachers' integration of the ICT provisions and interventions because schools are able to describe their own expectations, goals, contents and actions concerning the implementation of the interventions and integration of the ICT provisions. This provides schools with an ability to use ICTs in order to improve teaching and learning based on their own ICT vision, professional development, curricula strategies, planning and evaluation (van Braak & Goeman, 2003). Several studies suggest that school based professional development and ICT curricula strategies provide teachers with guidelines to support their instructional decision making and lesson planning processes for the use of the available ICTs in raising

quality and enhancing learning (see Bingimlas, 2009; Karagiorgi & Charalambous, 2004; Lim & Khine, 2006; Wang & Woo, 2007). Therefore, as observed by Vanderlinde, Dexter and van Braak (2012), ICT policy planning and subsequent establishment of a school-based ICT plan act as a lever for successful ICT integration. As discussed in the section about ICT school leadership, creating an ICT plan is a crucial step towards the practical implementation of the integrated use of ICT in the schools.

However, neither of the two dimensions (process and actors) exclusively captures the dynamics of policy planning and decisions fully, hence the need to have them combined and structured into a synchronised configuration where the policy decisions could be made at the national education system level (conceptualisation) and then adapted and converted into local policies (implementation) by different stakeholders (actors) among a variety of stakeholders (Schools, ICT intervention providers, ministry of education directorates and institutions, etc.), driven by their own conception of their roles and goals in the integration of ICT in teaching and learning (Bauer & Kenton, 2005; Haddad & Demsky, 1995; Tondeur et al., 2008). Strategic policies in ICT investment and interventions should harmonise and regularise plans and efforts of different stakeholders in the design, development and management of ICT interventions by defining priorities, setting targets and providing a framework for monitoring and evaluating both national and schools' progress.

## Main Theoretical Perspectives on ICT Interventions

As observed in the above sections, the adoption and implementation of ICT interventions in education is a change process that requires accepting, adopting, integrating and diffusing the use of the interventions for teaching and learning. This change is viewed as the process of converting existing systems and practices from the status quo into something new. As identified by Rogers (2003), this is where "an idea, practice, or object is perceived as new by an individual or other

unit adoption" (p. 12). The change in education systems through ICT interventions is a complex process and is affected by many factors including economics, politics, culture, technology, attitudes, perceptions, and communication (Rogers, 2003; Surry & Gustafson, 1994).

Given the complexity of change, it is appropriate to explore previously defined theories and models of change; the exploration provides a theoretical base for the development and implementation of ICT interventions in education. It is estimated that more than 50 theories and models of change have been proposed by researchers, highlighting different complexities that come with change (Gundy & Berger, 2016). However, out of the various proposed theories and models, the most prevalent ones in ICT intervention reforms include Rogers' Diffusion of Innovations Theory (Rogers, 1993), Conditions for Change (Ely, 1990), Concerns-Based Adoption Model (CBAM) (Hall & Word, 1987) and the Theory of Planned Behaviour (Ajzen, 1991).

## Diffusion of Innovation Theory

The Diffusion of Innovations theory has been used to suggest that ICT diffusion is dependent on a decision-making process that occurs through awareness, interest, evaluation, trial, and adoption (Gwayi, 2009; Lee, Hsieh, & Hsu, 2011; Minishi-Majanja & Kiplang'at, 2005; Rogers, 1993). The theory has proven to be robust in assessing and predicting if teachers might accept or reject a particular ICT innovation (Gwayi, 2009; Rogers, 1995; Thayer, 2013). The theory provides an effective framework in studies that trace a specific innovation in a group phenomenon; it evaluates the spread of a specific ICT innovation over a specified period of time.

The theory explains how specific ICT innovations are taken up by teachers as a process of social change by focusing on qualities that supposedly determine the success of an innovation (Gwayi, 2009; Minishi-Majanja & Kiplang'at, 2005;

Thayer, 2013). Ironically, however, there are no defined standards of what constitutes these qualities; it depends on the particular perceptions and needs of the teachers in particular user segments, i.e. innovators, early adopters, early majority, late majority and laggards. The qualities are as follows (Rogers, 1993):

a. Relative advantage - the degree to which a specific ICT intervention is perceived by teachers as being better than other existing ICT resource in terms of educational advantage, social prestige, convenience, or satisfaction. The greater the perceived relative advantage of an intervention by the teachers, the more likely its rapid rate of adoption.

b. Compatibility with existing values and practices - the degree to which a specific ICT intervention is perceived as being consistent with the values, past experiences, and needs of the teachers. The understanding is that an ICT intervention that is incompatible with a teachers' values, norms or practices will not be adopted as rapidly as an intervention that they perceive compatible.

c. Simplicity and ease of use - the degree to which a specific intervention is perceived as difficult to understand and use. It proposes that ICT innovations that are simpler to understand and use are adopted more rapidly than interventions that require the teachers to develop new skills and understandings.

d. Trialability - the degree to which an intervention can be experimented without a limit basis. An intervention that is trialable represents less risk to teachers considering using it.

e. Observable results – this suggests that the easier it is for teachers to see the positive impact of an innovation, the more likely they are to adopt it because it lowers the levels of uncertainty and also stimulate peer discussion of the innovation.

The Diffusion of Innovations Theory has been used by the above-mentioned studies to demonstrate that the success of an innovation depends on how well it evolves to meet the needs of teachers from innovators to laggards, based on these five qualities. Thus, instead of focusing on the changes in teachers' understanding, perceptions and practices towards ICT interventions, the theory places focus on the evolution or reinvention of the interventions to satisfy the identified qualities for teachers' acceptance. However, the five identified qualities of an intervention are based on the teachers' perception about the ICT innovation itself (Gwayi, 2009; Lau & Woods, 2008; Tezci, 2011; Wozney, Venkatesh, & Abrami, 2006). The literature analysis in the previous sections identifies these as teacher-based factors for ICT adoption and integration (Buabeng-Andoh, 2012; Cox, 2008; Teo, 2011).

Thus, the basis of this theory on these ICT intervention qualities depends on the particular perceptions and needs of the teachers and not on any defined standards. Its fundamental arguments for qualifying ICT interventions based on teachers' perceptions ignores factors behind the teachers' perceptions. Thus, there could be contextual reasons behind teachers' perceptions on the ICT relative advantage, simplicity and ease of use, triability and their own personal ICT values and practices. Furthermore, apart from the fact that the theory does not capture the social contextual factors in understanding teachers' perception on the use of ICT for teaching, it is limited in its understanding of how and why the teachers use the ICT interventions they accepted to use. The problem is that it does not go further than identifying reasons why teachers accepted or rejected a particular ICT intervention.

## Conditions of Change Theory

In contrast to the theory of diffusion that examines the internal attributes of an intervention, the Conditions of Change Theory focuses on factors that exist in the change setting outside the intervention. Donald Ely, who is considered one of the

leading theorists in the field of instructional technology, emphasizes the importance of environmental conditions on the change process. Through a study on Creating Conditions for Change (Ely, 1990), and a series of subsequent studies conducted specifically to investigate facilitating factors for successful implementation of interventions, his work helped to reveal a set of conditions that facilitate the implementation of ICT interventions (Ellsworth, 2000). These studies have been used to present a refined and generalized Theory of Conditions of Change in implementing ICT interventions in education.

The Conditions of Change Theory concerns itself with factors that exist in the change environment, outside of the inherent qualities ICT intervention, by focusing on "the impact of environmental factors on the extent which members of a social system are ready to consider change" (Ellsworth, 2000, p. 40). The theory posits that there are social conditions which, when present or introduced in the environment where an intervention is implemented, facilitate its adoption, implementation, and the change process as follows:

a. Dissatisfaction with the status quo -  Discontent arising from an individual's or a system's perception of the current situation as being problematic or ineffective. It argues that people, institutions or socio-systems accept change when they perceive the need to change the environment.

b. Existence of knowledge and skills - Individuals or institutions that are intended adopters, in the present case schools and teachers that are expected to implement the ICT interventions, must have the knowledge and skills to implement the intervention proficiently. Lack of necessary knowledge and skills result in the low adoption level of the intervention by the schools and less integration of the innovation by the teachers as discussed under teachers' ICT efficacy and ICT competence (see page 28).

Therefore, training, as discussed under teacher training, is integral to most successful implementation of ICT interventions in education.

c. Resource availability- In addition to being able to adopt and use ICT interventions, the ICTs and other resources must be readily available for schools and teachers to implement the intervention. Thus, resources in this case refer to anything that is needed for successful implementation of the ICT interventions which includes funds, hardware and software, support (see discussions on ICT leadership and on Technical Support, under School Based factors on pages 40-41) and other supplemental materials related to the intervention. Resources also relate to the other conditions of commitment, leadership, and rewards (Ensminger & Surry, 2008).

d. Availability of time - Schools, in general, and teachers, in particular, as implementers of ICT interventions must have time to spend on learning, using, and reflecting on how they are adopting and using the interventions (Ely, 1990). ICT intervention providers and schools' leaders should provide teachers with time to learn how to use the interventions, to develop skills to use the interventions, and for their personal reflection in order to integrate the interventions into their general use. This relates to one of Rogers' Diffusion of Innovation (DoI) attributes, namely "Trialability" in that the successful and implementation of ICT interventions in schools may require repeated efforts, and hence time.

e. Rewards or incentives - Rewards help implementers to have something to look forward to and hence facilitate successful ICT interventions adoption and integration. That is, reasons to adopt and use any ICT intervention should exist in rewards that benefit the implementers. Such rewards may vary from the improvement of the teaching materials to personal skills and

professional development or progression and efficiency in the teaching learning process. Implementation conditions such as dissatisfaction with the status quo, availability of time and resources are linked to this condition of rewards and incentives. Similarly, this relates to another of Rogers' Diffusion of Innovation (DoI) attributes, "Relative Advantage" in that the successful implementation of ICT interventions depends on how the specific ICT intervention is perceived by teachers as being better than the other existing ICT provisions, in terms of educational advantage, social prestige, convenience, or satisfaction.

f.  Participation - Authentic participation, i.e. one in which implementers are not just involved in the implementation systems but also, more importantly, in decisions relating to planning and designing an ICT intervention serves to enhance communication and inculcate a sense of ownership in all concerned parties. At least teachers should feel they have an opportunity to comment on the ICT interventions that will directly impact their work through direct participation when possible, shared decision-making, and direct communication with all relevant stakeholders in the ICT intervention conceptualisation and implementation processes.

g.  Commitment - The need for those involved in the implementation to be committed by visibly demonstrating firm and continued support for the intervention. The adoption and use of any ICT intervention should be supported by key players in the system, such as the school head teachers and management committees, zonal/regional/national education managers, planners and policy makers.

h.  Leadership is evident - The need for active involvement by immediate supervisors or intervention project leaders in helping implementers' activities. This is vital for the success of the implementation of the

intervention as leaders' expectations and commitment translate into availability and provision of support to implementers. As discussed under school-based ICT integration factors, school ICT leadership has significant influence on the successful implementation of the interventions by guidance, support, and motivation to teachers as users of the interventions.

These conditions are important for change to be implemented as a way of identifying consistencies among those facilitating factors for different ICT interventions and in varied contexts. However, although the conditions are listed as independent of each other, they are interrelated and may support or undermine one another (Nawawi, Ayub, Ali, Yunus & Tarmiz, 2005). This, in turn, necessitates the need to explore how the ICT interventions are conceptualized before investigating the implementation context in an effort to understand how and why the factors are influencing each other, thereby explaining teachers' classroom integration practices. However, this theory is limited because it focuses on implementation only.

## Theory of Planned Behaviour (Ajzen's Theory)

The theory of planned behaviour is a psychology concept that was proposed by Icek Ajzen as one of the predictive theories to explain the link between beliefs and behaviour (Ajzen, 1991). The theory, also known as Ajzen's Theory, has been extensively applied to studies of the relations among beliefs, attitudes, behavioural intentions and behaviours in various fields related to social innovations such as marketing and public relations in education, agriculture and health (Ajzen, Albarracín & Hornik, 2012; Burak, Rosenthal, & Richardson, 2013; Burton & Wilson, 2006). The theory states that attitudes toward behaviour, subjective norms, and perceived behavioural control, together shape an individual's behavioural intentions and behaviours (Ajzen, Albarracín & Hornik, 2012). This argument has been used in various studies on the motivation of

teachers to use ICT to suggest that teachers' ICT intentions and practices are shaped by their ICT attitudes, subjective norms, and perceived behavioural control (Goh, 2011; Kripanont, 2007; Polizzi, 2013; Stols & Kriek, 2011).

According to this theory, teachers' ICT use is immediately preceded by the teachers' intention to use and integrate ICT in their teaching (see Figure 1). The teachers' intentions to use and integrate ICT into teaching and learning are, in turn, predicted by three main determinants; their attitudes towards the ICT use for teaching and learning, their subjective norm to use or not to use ICT for teaching and learning, and their perceived control over ICT use for teaching and learning. Therefore, the extent to which teachers view the integration of ICT in their teaching positively (attitude) and think that significant others want them to integrate ICT into their teaching (subjective norm) on the one hand, and the belief that they are able to competently integrate ICT in their teaching (perceived behavioural control), on the other, serve as direct determinants of the strength of their intention to integrate ICT in their teaching (Mathieson, 1991).
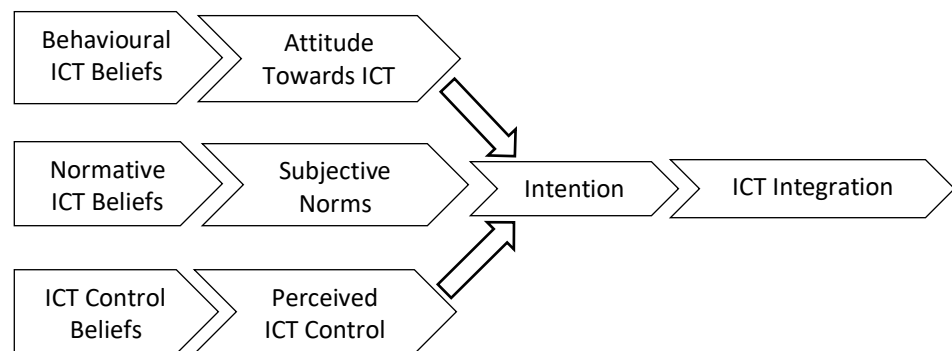


*Figure 1 - Ajzen's Theory of Planned Behaviour - Adapted from Ajzen (1991)*

Ajzen's theory has, therefore, been used to determine factors that motivate or distract teacher to use and integrate ICT for teaching and learning and determining their decisions regarding the use ICT for teaching and learning in various contexts (Renzi, 2011; Stols & Kriek, 2011; Tarcan, Varol, Kantarcı, & Fırlar, 2012). These factors as discussed in the previous sections include the teachers'

attitudes, ICT self-efficacy, ICT competence, perceived social pressure, and perceived usefulness of ICT in their pedagogy. However, on the down side, the theory is not detailed enough in its determining of social variables and it ignores the context of ICT use. While the Theory of Planned Behaviour is useful for gathering general information about teachers' perception of a ICT use, Ajzen's theory does not provide the potential links between each of its components to specific background factors such teachers' personalities, demographics, social and structural contexts that have the potential to influence teachers' ICT intentions and behaviour (Truong, 2009) (See Figure 2).
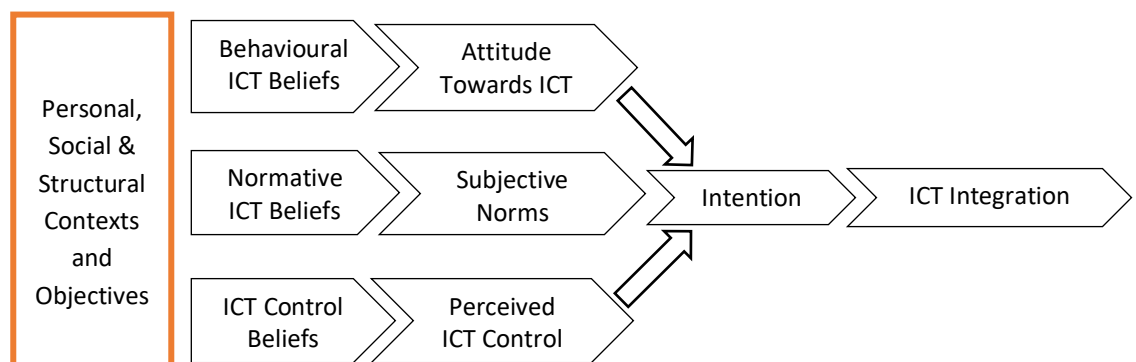


*Figure 2- Ajzen's Theory of Planned Behaviour in Context*

There could be other social factors that directly influence the observed behaviour other than the psychological attributes that the Theory of Planned Behaviour explores. As such, the TPB is mostly relevant in understanding teacher level factors for ICT use and integration into teaching and learning as discussed previously under teacher-based factors.

## Theoretical Context

The literature review has so far shown that the integration of ICT in teaching and learning is premised on complex factors that surround the planning, designing and implementation of the ICT interventions. It has also revealed the need to analyse the relationships and the implications of these factors. This section engages with

literature on the theoretical perspectives in the planning, adoption and use of ICT interventions in education to draw conceptual processes that underpin this study.

As revealed by the literature review so far conducted, the dynamic nature of ICT places high expectations on teachers' ability to anticipate and respond to new professional demands and particularly new teaching and learning environments. There are several theories and models that have been used in attempts to explain teachers' implementation of ICT interventions and reforms. These theories have been developed and used on the premise that the adoption and implementation of ICT interventions in education often results in concerns, tensions and anxieties, hence they seek to offer an explanation of the processes of accepting, adopting, integrating and diffusing the use of ICT interventions for teaching and learning. The discussion on the main theoretical perspectives on ICT interventions has presented an analysis of Conditions of Change Implementation, the Diffusion of Innovations, the Theory of Planned Behaviour and the Concern-Based Adoption Model as the most extensively used and the most evolved theories for planning, implementing and evaluating ICT intervention changes in education.

These theories have been widely used as important frameworks to describe and explain the implementation of educational ICT interventions. The major proposition of all these theories is that the use of ICT for teaching and learning, as with any new educational interventions, is not implemented uniformly by the schools' systems and that the schools and the teachers as the ICT intervention implementers, go through different experiences and levels of ICT social contexts. In reference to this observation, various studies cited in this literature review have employed these theories to study teachers' perceptions of ICT and their ICT self-efficacy, their professional environment, professional development and training, and school leadership, policies, and support.

These theories have their unique perspectives and offer different focal arguments for the conceptualisation, implementation and integration of the ICT interventions. However, the implementation of ICT interventions has been observed to be a complex process that cannot be investigated in isolation from other interlinked components within the school system or the professional context in which the reforms and innovations are being implemented. Several studies have, therefore, identified the need to link the contextual, social, policy and technology drives to implementation (adoption and use) and the teachers' integration of the interventions (Donnelly, McGarr & O'Reilly, 2011; Sang et al., 2011; Vanderlinde, Dexter & van Braak, 2012; Yuen, Law & Wong, 2003).

Given that the implementation of ICT interventions is usually perceived as a change in policies, plans, teacher education, school leadership and management, teaching style, learning approaches and access to information, no single model or theory can claim to be completely thorough in aiding our understanding of the multifaceted and complex processes associated with the conceptualisation, implementation and integration of ICT interventions in education systems. The discussion on some of the widely used theories and models in investigating ICT interventions implementation has also revealed the deficits of the theories in explaining the process of ICT use for teaching and learning.

While, on the one hand, this study sought to understand teachers' ICT integration practices, it also sought to reveal the factors that influence those practices in order to reveal why the teachers use the interventions in specific ways. The propositions of the Ajzen's TPB, the DoI theory and CBAM have the potential to explore teachers' perceptions of ICT use and their levels of ICT integration, however, their scope is limited to the prescribed stages for explaining teachers' ICT practices, hence their inability to probe and link the contextual, social, policy and technology drives to teachers' practices in ICT integration. As such, these theories could not adequately inform the understanding of the contexts of this study in

order to locate, identify, define and relate specific teachers' decisions in the ICT integration process that relate to their context, as obtained by how the interventions are conceptualised and implemented.

The objective of this study was to investigate the configuration of events, activities, contexts, and collaborative processes taking place in the context that the ICT interventions are implemented. This was done by relating the effective or ineffective integration of ICT in the classrooms to particular activities situated within their larger socio-cultural contexts in order to build a detailed account of what teachers are doing to integrate ICT in their teaching. In the same vein, effort was made to understand why, and how the teachers' activities are supported or hindered by their larger socio-cultural context. This broad research purpose is supported by the proposition derived from the literature review, that the phenomena of teachers' ICT perceptions and practices are not intelligible except through their interrelations with the contextual structure and the constant rules of abstract cultures behind it. To adequately achieve the purpose of this study and address the research problem, there was need to study elements of teachers' ICT integration practices in terms of their relationship to a larger, overarching system or structure. The purpose was to uncover, the structures that underlie all the things that teachers do, think, perceive, and feel with regards to the integration of ICT in their teaching.

Therefore, the research problem and the purpose of this study could not be researched meaningfully by referring to only one theory or concepts resident in one theory, hence the need to blend the existing views in the literature concerning ICT integration – both from the theoretical and empirical findings. This revealed a need for conceptual and analytical frameworks to locate ICT pedagogical integration activities as an interaction among teachers, their objectives, the available ICT resources, their classrooms, school and national environments, the ICT plans, policies and curriculum guidelines, and the roles and responsibilities of

other key players in the conceptualisation and implementation of the ICT
interventions (Teacher Education, Professional Development, ICT intervention
Provision). The framework needed to relate the ICT integration contexts at
national, school and the classroom levels bearing in mind that, as revealed by the
literature review, the school and the wider external contexts mediate teachers'
activities through the available tools and the existing rules and roles, i.e. training,
policies and curriculum guidelines, and plans. As discussed in the subsequent
section, the conceptual framework, provided an interface for identifying
interrelationship between teachers' practices (ICT intervention integration),
technological (ICT intervention conceptualisation) and organisational (school ICT
intervention implementation) processes.

## Conceptual Framework

Cole (1995) relates the role of the researcher to that of the gardener arguing that
they both must simultaneously attend to two classes of concerns: "what
transpires inside the system ('garden') they study and what transpires around it''
(p. 196). Teachers' thinking and the teachers' doing context cannot be addressed
independent of each other, just like the 'garden' is dependent on the larger
ecological system within which it is embedded (Petko, 2012). While teachers'
beliefs and attitudes, and their confidence and competence with ICT, remain
centrally important in the pedagogical adoption of ICT interventions, the teachers'
use of the interventions for teaching and learning depends on the inter-locking
cultural, social and organisational contexts in which they live and work (Somekh &
Davis, 1997).

The conceptual framework for this study was therefore built from the constructs
and proposition of an ecological perspective of education that recognises that a
variety of systems interact in the global system and that a microsystem, such as a
classroom, is nested within another system, the school, which, in turn, is part of
the nation's macro educational system (Davis, 2008 p. 508). Figure 3 presents the

perspective of the Malawi national education sphere, derived from the context provided in chapter one. The figure depicts classroom ICT use as nested within a multilevel ecological hierarchy that includes the school administration, government departments, other social and educational institutions, non-governmental organizations and the Ministry of Education, Science and Technology (MoEST) bureaucracy.
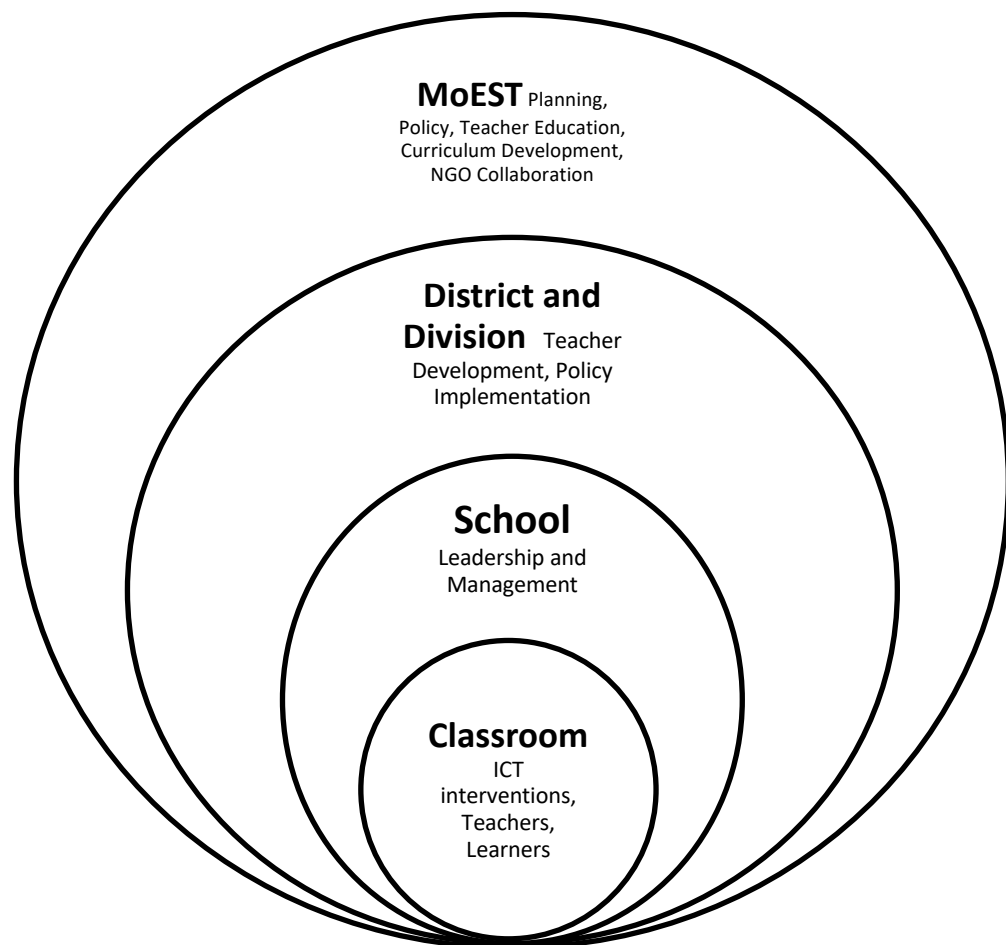


*Figure 3 - ICT Interventions Context Map*

The education system that provides context for ICT intervention is portrayed by the figure as being multi-levelled and interconnected. However, the present study's literature review and theoretical perspectives revealed that previous

studies and the extensively applied theories have attempted to separately address the introduction of the ICT interventions from the wider education systems (MoEST & Division), the implementation of the interventions in the school system, and the integration of the interventions in classrooms. Thus, the processes of change in the MoEST, the schools and the classrooms cannot be understood in isolation because they are co-constructed by several eccentric systems such as teacher education and professional development, the curriculum development, the NGOs and the MoEST national regulatory frameworks and policies.

In order to holistically understand the configuration of these events, activities, developments and the collaborative processes taking place in the context that the ICT interventions are implemented, the present study applied systemic perspectives to develop a conceptual process from the literature review and the discussed theories based on the premise that ICT classroom integration is a situated process mediated by the context of the classroom, the school, and the larger society, and that teachers' pedagogical integration of the ICT interventions is driven by the values and assumptions embedded in the context they are provided. The conceptual process, illustrated in Figure 4, draws from;

i. The literature on the systemic factors such as ICT policies, strategic planning and regulation in education to understand how ICT interventions in the primary school education system are conceptualized;

ii. The literature and theories on school level factors for ICT integration and the propositions of the conditions of ICT implementation to explain findings regarding how the ICT interventions in the primary schools are implemented;

iii. The literature and theories on teacher-based factors for ICT integration and the constructs of theories on ICT perceptions, attitudes and motivation to explain the teachers' classroom ICT practices, perceptions and attitudes;

iv.    An analytical system analysis to map the development and network of events involved in the conceptualisation, implementation and integration between the taxonomic systems and the eccentric processes and contexts, and how they affect one another.
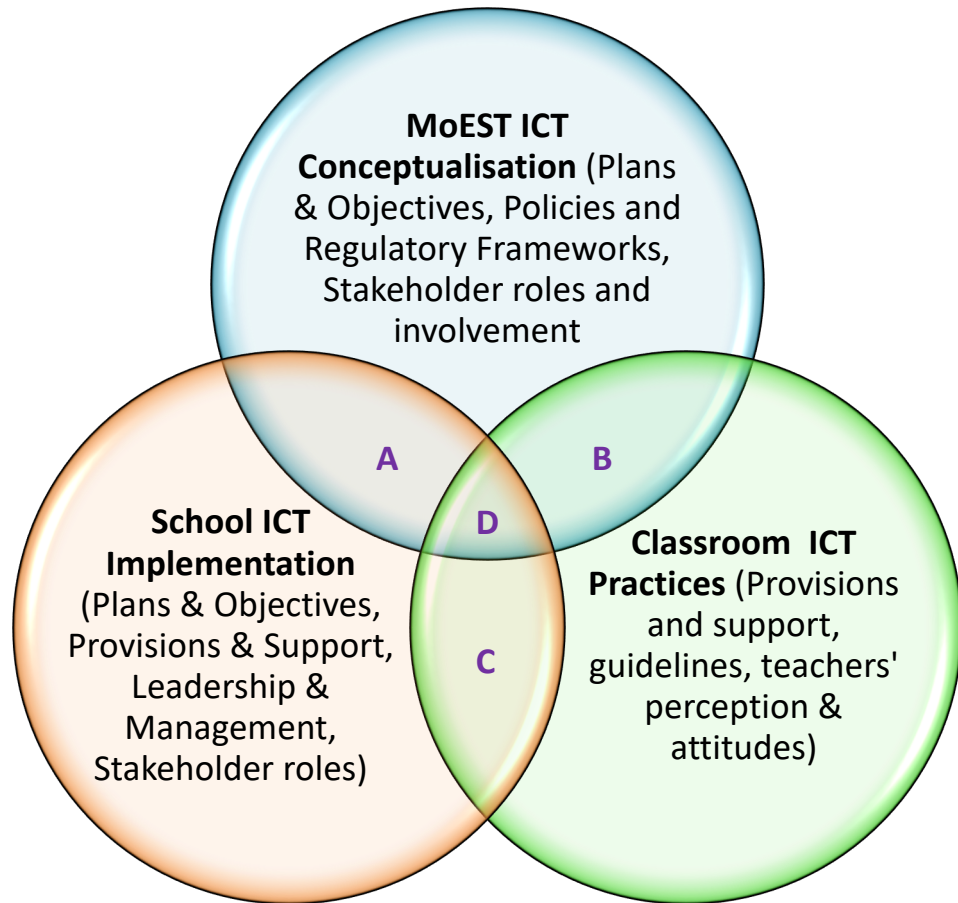


*Figure 4 - ICT interventions conceptual process*

From the conceptual process illustrated in Figure 4, the MoEST, school and classroom contexts are conceptualised as socio-cultural contexts in which their elements cannot be considered in isolation. Hence, Figure 4 presents ICT intervention environments and derives the research questions from the overlaps between the MoEST conceptualisation and the school implementation contexts (A); the MoEST conceptualisation and the classroom integration contexts (B); the

school implementation and the classroom integration contexts (C); and the MoEST, school and classroom contexts (D).

## Research Questions

The literature review suggests that teachers' ICT integration is a complex process which cannot be understood independent of the other interlinked components within the school context or the general education system in which the interventions are being implemented. The literature review has also revealed that research on ICT in education is generally limited to the study of variables at classroom or teacher level. This presents a knowledge gap between the multilevel contextual, social and technology drives and teacher's ICT integration classroom practices in education systems where ICT interventions are still emerging. The study was guided by the following research questions in order to holistically investigate the ICT intervention environments and processes, capture the intricacies of each of these environments, and understand how the characteristics of the national conceptualisation of ICT interventions, the school implementation context and the classroom integration practices interact;

1. How is the introduction of ICT interventions in Malawi Primary Education System conceptualised?
    a. How are the ICT interventions planned, guided and regulated in the national primary school education system?
    b. How are teachers and schools prepared for the uptake of the ICT interventions?
2. How does the national conceptualisation of ICT interventions shape and influence their implementation contexts and processes in schools?
3. How do the national conceptualisation process and the school ICT interventions implementation contexts mediate the teachers' classroom integration contexts and practices?

## Summary

This literature review was conducted to unravel the importance of understanding the contemporaneous school and teachers' contexts in order to understand teachers' classroom ICT practices. Thus, the chapter has considered literature from different and unique perspectives and it offers different focal arguments for the conceptualisation, implementation and integration of ICT interventions in education. Against this background, it has revealed that the dynamic nature of ICT places high expectations on teachers' ability to anticipate and respond to new professional demands and particularly new teaching and learning environments. Different study findings, theories and concepts have been analysed in an attempt to explain teachers' implementation of ICT interventions and reforms in different countries and education systems. The major proposition of all the findings, theories and concepts discussed is that teachers, as the implementers of ICT interventions, go through different experiences and levels of ICT use in their teaching and learning depending on both their personal and social contexts. Just as with any new educational interventions, the adoption and implementation of ICT interventions in education often results in concerns, tensions and anxieties.

In reference to these observations, various studies assert that teacher preparedness for the integrated use of ICT in teaching and learning is largely centred on their perceptions, pedagogical knowledge of ICT use and their ICT self-efficacy. Furthermore, these are, in turn, shaped by their professional environment and policies, professional development and training, and the school leadership and support. The different study findings, theories and propositions have also revealed the importance of understanding the conceptualisation of ICT interventions (the process) and the roles of the implementation agents (actors) and their implications on the teachers' practices towards ICT integration in order to explain the processes of accepting, adopting, integrating and diffusing the use of ICT interventions in teaching and learning.

# CHAPTER 3: METHODOLOGY

## Introduction

This chapter describes the methodology of the study built upon the conceptual framework discussed in chapter 2. The discussion revolves around the following areas: philosophical stance of the study, rationale for research approach, description of the research sample, overview of research design, methods of data collection, analysis and synthesis of data, ethical considerations, issues of trustworthiness, and limitations of the study. The chapter concludes with a brief summary of issues discussed in it.

## Philosophical Framework

A notion from Newby (2010) suggests that research, as a process of discovering knowledge or truth, emanates from different assumptions. As such different researchers have so far claimed different assumptions about the nature of truth or knowledge and its acquisition (Anderson, Crabtree, Steele & McDaniel 2005; Manion & Morrison, 2000). The major considerations that tend to inform such assumptions are associated with different ways of constructing reality (ontology), different forms of knowledge of that reality (epistemology) and particular ways of knowing that reality (methodology) (Grix, 2010). Therefore, as argued by Cohen, Manion and Morrison (2000), there are different ways in which one might view socially constructed realities and the choices one might make in regard to the ontological, epistemological and methodological considerations.

Existing literature presents an on-going historical debate regarding the classification of research paradigms with different authors proposing different classifications. For example, Burrell and Morgan (1979) propose four classes of research perspectives; functionalism, interpretativism, radical humanism, and

radical structuralism. The work of these two authors has played an important role in discussing and conceptualising philosophical approaches by many authors (Cohen, Manion & Morrison, 2000; David & Sutton, 2004; Grix, 2010; Huberman & Miles, 2002; Newby, 2010). However, it is disputed that Burrell and Morgan's strong emphasis on the conceptualisation of research as subjective and objective "reproduces a neo-positivist philosophy of science and obscures the nature of other research programs" (Deetz, 1996, p. 194). The argument is that, consequently, it fails to "draw attention to important differences in research programs" (ibid, p. 191).

Recent research work recognises four distinctive research paradigms, namely positivism, post-positivism, constructivism, and critical research (see Guba & Lincoln, 1994; Newby, 2010). Further to this, concurrent research scholars offer a fairly concrete typology of philosophies that uses classifications commonly employed today, and that apply across social science research. The scholars distinguish between positivist/post-positivist, interpretivist/hermeneutic, critical, and constructionist orientations (Denzin & Lincoln, 2002). However, as observed by Hammersley (2008), the existence of different classifications of research paradigms entails no single, and an all-purpose way of drawing distinctions among the various paradigms that can now be found within the field of educational research. Therefore, for the purpose of this study, two competing research paradigms, positivistism and interpretivism were analysed. While the choice of these two paradigms is generic and not exhaustive, it picks out the most important dimensions of the concurrent social and educational research.

The positivist paradigm assumes the existence of an objective world that can be observed, measured and described with scientific precision based on the nature of a specific phenomenon (Cecez-Kecmanovic, 2005). The paradigm argues that reality means the state of things as they are or as they appear to be rather than what or how one may perceive them, by any system of analysis (Creswell &

Garrett, 2008). It assumes that reality can be classified and measured in a strictly objective way and can also be accurately described by a set of rules or formulae, or procedures which make the truth clear and independent of human perception (Brewerton & Millward, 2001; Guba & Lincoln, 1994). Accordingly, social reality depends on quantifiable observations that lead themselves to statistical analysis (Onwuegbuzie, Leech, & Collins, 2010).

In contrast, the interpretivist paradigm recognizes the need to consider human beings' subjective interpretations, and their perceptions of their world in understanding social phenomena (phenomenology) (Guba & Lincoln, 1994). This implies that, unlike most non-human objects, people interpret or give meaning and value to their environment and themselves, and as a result, social reality is shaped by particular cultures that people live in (Pring, 2000; Schwandt, 1994). The research can never be objectively observed from the outside, rather it must be observed from inside through the direct experience of the people (Mack, 2010). The role of a researcher is, therefore, to, "understand, explain, and demystify social reality through the eyes of different participants" (Cohen, Manion & Morrison, 2007, p. 19).

These claims and assumptions about the nature of social reality led the present researcher to consider whether to adopt the belief that the world of social interactions exists independent of what one perceives it to be; or to adopt the belief that social reality is a co-constructed by individuals who interact and make meaning of their world in an active way so that the study could approach the search for truth in people's lived experiences (Byrne-Armstrong, Higgs, & Horsfall, 2001; Graue & Walsh, 1998). With reference to the discussion on the two competing research paradigms, the study adopted the interpretive research paradigm as a framework within which to collect, analyse, interpret, and verify data and address the research questions in this study.

The choice of the interpretive paradigm was determined by the notion of fitness of purpose which entails that a research paradigm should be chosen because of its capacity to fulfil the goals of the study (Cohen, Manion and Morrison, 2007). As argued by Lanier and Little (1986) specifically for the ontological and epistemological assumptions of the interpretive paradigm in studying teacher practices and contexts, the field of education is a social area that is too complex to be meaningfully understood using the ontological and epistemological assumptions as advanced by the positivist paradigm.

This study endeavoured to understand how the implementation of ICT interventions in primary schools is conceptualised and structured in order to appreciate how and why primary school teachers use the interventions in their context. It specifically sought to investigate teachers' ICT integration contexts to understand its possible implications on the teachers' practices and experiences in the use of emerging instructional technologies in schools and classrooms. As noted under the interpretive paradigm, knowledge claims are made based on the research participants' construction of their own social reality, therefore the study was convinced that this ontological assumption was better suited to gain access to teachers' own interpretation of their context and experiences than with the positivist paradigm.

Based on the assumption that one cannot understand why people do what they do, or why particular institutions exist and operate in characteristic ways without grasping how those involved interpret and make sense of their world, interpretivism calls for the understanding of the distinctive nature of people's perceptions, beliefs, attitudes, and similar personal attributes. The paradigm aims at bringing consciousness into the hidden social forces and structures by exploring social meanings and realities that are constructed in and out of interactions between humans and their world, developed and transmitted in a social context

(Crotty, 1998, p. 42). Thus, the social world can only be understood from the standpoint of individuals who are participating in it (Cohen, Manion & Morrison, 2000).

The interpretive paradigm was also deemed ideal in order for the study to capture a holistic picture of the teachers' experiences and context. It gave a voice to teachers who are the users of the ICT interventions considering that more often than not, it is the voice of policy makers and innovation planners that has been at the fore as educational interventions are initiated by government officials with the support of development partners, using a top–bottom approach (Lewin & Stuart, 2003). Thus, the study was able to offer a voice to voiceless teachers as far as making educational reforms is concerned (Maree, 2007). Furthermore, the study needed to gain access to "insiders" experiences and context for ICT use in teaching and learning in order to appreciate the teachers' practices.

The choice of the interpretive paradigm was also motivated by the nature of the research questions. This study investigated how the implementation of ICT interventions is conceptualised and structured and how teachers' experiences and practices are influenced by the context shaped by the implementation structure. The questions on "how" could only be answered meaningfully using the interpretive paradigm because it calls for the understanding of the distinctive nature of people's perceptions, beliefs, attitudes, and practices. Thus, as noted earlier on, the social world can only be understood from the standpoint of individuals who are participating in it. Furthermore, Cohen, Manion and Morrison (2000) argue that the interpretive research paradigm allows for an empirical investigation of a contemporary phenomenon within its real-life context. The present study interrogated the practices of stakeholders involved in the implementation of ICT interventions and the teachers' experiences and context for teaching and learning using the interventions, which is a concurrent and an on-going phenomenon.

In addition, the analysis of literature revealed that ICT integration in teaching and learning encompasses the teachers' thinking (intentions and objectives for using ICT) and the teachers' doing context (school leadership and support and the stakeholders' roles). ICT integration in teaching and learning has therefore been observed to be a complex process which cannot be understood independent of other interweaved elements within the school system or the professional context in which the ICT interventions are conceptualised, implemented and integrated. It is extremely difficult to attempt to reduce or isolate this complex and interwoven process by simplifying and controlling variables through the positivist paradigm.

Finally, the interpretivist paradigm supports the research conceptual framework which builds on the understanding of social structure, processes, practices and context. By linking the teachers' ICT practices in the classroom to particular activities and processes situated within their larger school context and the national setting, the framework provided a conception of the study context and the phenomenon being investigated. Employing the interpretivist epistemology therefore reinforced the conceptual framework of this study in building a methodology that focuses on the whole configuration of events, activities and processes taking place in the context that the ICT interventions are conceptualised, implemented and integrated. The interpretivist paradigm therefore enhanced a rich local understanding of the real-life experiences of teachers and the cultures of the classroom, school and the wider structural context in which the teachers operate.

## Research Strategy

This section describes an overall strategy that was chosen to integrate the different components of the study in order to effectively address the research problem, based on the philosophical framework that has been discussed in the previous section.  The section outlines the rationale of the chosen research

strategy in terms of a qualitative research approach, a case study design and the associated data collection methods as follows:

## Qualitative Research Approach

Throughout the process of this study, it was recognised that there are differing positions on the choice and use of research approach as a way of generating knowledge. Two main schools of thought for empirical research are presented in literature; quantitative methodology and qualitative methodology. Based on the need for the study to choose between ontological and epistemological positions, this researcher had to decide whether to take a deductive approach by hypothesising theory in order to test and assess its validity through a quantitative methodology; or take an inductive approach by developing theory/knowledge to explain empirical observations through a qualitative methodology; or employ a pragmatic approach that would employ both the quantitative and qualitative approaches. According to Grix (2010), the ability to identify the relationship between the philosophical foundations and the methodological approach in conducting research is critical if the study is to be truly meaningful. The qualitative research approach is deemed consistent with the chosen interpretivist position. In addition, a qualitative research approach affords a more in-depth study of a particular situation and provides specific methods to generate data rich in details and embedded in a context.

Similarly, Creswell (2013) indicates that the choice of a research approach should not only reflect the nature of the study but also the objectives of the study. This is an important observation because the aim of this research was to capture the rich complexities of ICT interventions implementation and integration in teaching and learning. The qualitative research approach allows for observations and interpretations of phenomenon, to gain insights and discover meaning about particular experiences, situations, cultural elements, historical events and the

social dynamics that are at play in the context of ICT implementation and integration in education system (Myers, 2013). It was the present study's position that qualitative methods are likely to elicit the rich data necessary to understand the processes by which events and actions take place and to facilitate the interaction between the researcher and research participants and context in order to develop contextual understanding in the present study.

The researcher in the present study was aware that, at his disposal was a wide range of methodologies for conducting qualitative research such as phenomenology, action research, ethnography, case study and grounded theory. Certainly, there are overlaps between these methodologies, though the distinctions are evident in the implications they have for the data collection process, the type of data to be collected and the role of the researcher. The optimum choice for the present study, between these methodologies, is defined through the development of a research strategy that is presented in the following section, which provides the major direction of this study.

## Case Study Design

Different research designs serve different purposes in meeting particular research objectives hence the choice of the case study design in the present study was guided by the potential of its associated characteristics to address the study objectives. Yin (2009) defines a case study as an empirical inquiry that investigates a contemporary phenomenon in depth, and within its real-life context. Thus, the purpose of a case study is to use empirical evidence from real people in real organisation by bringing an understanding of a complex issue or phenomenon to make an original contribution to knowledge (Myers, 2013; Soy, 1997).

Furthermore, the case study research method is viewed as the most flexible form of research design because it allows different techniques of data collection and

the richness of data that can be obtained by multiple means and/or multiple cases (Woodside, 2010). It also brings an understanding of a complex issue or phenomenon and can extend or add strength to experiences of what is already known from previous research by investigating a contemporary phenomenon within its real-life context (Soy, 1997). Therefore, with reference to the objectives of the study, the case study design offered the present study an opportunity for an in-depth implementation of the research questions and enabled it to use specific associated methods to generate data rich in detail and embedded in a context.

The use of the case study design similarly enhanced the study of ICT conceptualisation and implementation structure and related teachers' practices and experiences in their natural setting, to generate explanations from practice. Besides, the case study design enabled an understanding of the nature and complexity of the processes taking place within the classrooms, the school and the wider contexts in implementing and integrating ICT for instruction. Furthermore, the case study approach was considered an appropriate way of researching an area of ICT use and integration in Malawi primary schools where previous studies are limited. Through an in-depth contextual study, the study was able to reveal existing dilemmas, tensions, organisational gaps.

### *Schools as Study Cases*

The cases for this research were primary schools since the conceptual framework locates ICT integration activity as the interaction between teachers and the available ICT resources, their classroom, school and wider environments that should be studied within an integral system (i.e. the primary school education system). While teachers could be cases for this research, the objective of the study was to reveal how the conceptualisation of ICT interventions and their implementation context, as obtained in the schools, configure the classroom activities and process. Having teachers as cases of this study could have limited

the study to the teachers' ICT qualities and their classroom practices, hence its inability to link them to the ecological factors and process that mediate the teachers' classroom practices.

### *Multiple Study Cases*

The decision regarding the number of schools to study as cases was guided by the study's research questions, research objectives, and research area. Dyer and Wilkins (1991) argue that the number of cases to study depends on how much is known about the phenomenon and how much information can be uncovered by either using a single case or including additional cases. In this study, the research strategy was based on a multiple case study design in order to establish both broader and deeper understanding of the phenomenon as they enable cross-case analysis for richer knowledge building. While focusing on a single case could have assisted the study to devote more attention to the case, multiple cases helped to strengthen the findings from the entire study because the different cases exposed useful insights that helped the study to generate a collective understanding and explanation of the ICT conceptualisation, implementation structure and integration practices (Yin, 2011).

### *Triangulation*

Although case studies are deemed selective by focusing on one or two issues which are fundamental to understanding the system being examined, they are regarded as a triangulated research strategy (Apulu, 2012). Stake (1995) argues for the need for triangulation to confirm the credibility of a study processes by using multiple sources of data. Anderson et al. (2005) and Denzin and Lincoln (2002) assert that triangulation can occur with data, investigators, theories, and even methodologies. The choice of a triangulation method in this study was dependent on and limited to the practicality of the research design with reference to the research objective. In this case, the main goal of the study was to develop

knowledge and understanding of context and practices and not to test any theory, hence non-consideration of theory triangulation. Being a holistic multiple case study research, data source triangulation and methodological triangulation were more appropriate because data collection methods were perceived to contribute different perspectives on the issues being investigated (Woodside, 2010).

## Data Collection Methods

In order to answer the research questions, it was necessary to obtain sufficient and relevant data through appropriate data collection methods. Having explored the nature and purpose of a qualitative research approach and a case study methodology, the following data collection methods were deemed most suitable for this study:

### *Semi-structured Interviews*

Interview allows a researcher to "find out what is in and on someone else's mind" and adds an inner perspective to an outward behaviour (Patton, 1990, p. 278). The purpose of research interviews in the present study was to explore the views, experiences, beliefs and motivations of teachers and key informants on specific matters relating to ICT interventions in primary schools. Interviews were considered one of the most appropriate data collection methods for this study as little is already known about the ICT interventions conceptualisation, implementation and integration; where detailed insights were required from key informants and individual participants. The interviews were believed to provide a deeper understanding of the social phenomena than would be obtained using other methods.

While there are three fundamental types of research interviews: structured, semi-structured and unstructured - the study used semi-structured interview format because it provides participants with guidance on what to talk about, while

allowing flexibility (Merriam, 1998). This allowed for the discovery or elaboration of information that is important to participants but may not have previously been thought of as pertinent by the researcher (Patton, 1990). Hence, each interview with any of the key informants and the teachers was guided by research questions to standardise the questions that were asked while "allowing me to respond to situations at hand and to the emerging view points of the respondents" so that other important information could still arise (Merriam, 1998, p. 78). In addition, prompts were used to guide and structure the interviews to ensure that they had comparable coverage for the research questions (Turner, 2010). The use of prompts also allowed the present researcher to "explore, probe and ask questions that elucidated and illuminated on particular subjects and the research questions in particular" (Patton, 1990, p. 238). The prompts were therefore structured to allow for probing and modification to the line of inquiry of the research questions during the interviews (Refer Appendices 6 and 7).

### *Observations*

Observation is a way of gathering data by watching behaviour, events, or noting physical characteristics in their natural setting (Newby, 2010). Observation method was preferred as one of the data collection methods in the present study because case study methodology design places emphasis on investigating a contemporary phenomenon within its real-life context. The use of observation also supported the conceptual framework that centres on the understanding human activity in its context. As observed by Stakes (1995), observations allow capturing peoples' behaviours and interactions directly and in their natural setting. The observations enabled the process of understanding the teachers' ICT integration practices and experiences in their natural setting.

In addition, observation afforded the researcher an interaction with the physical setting which forms part of the context of the case being studied. Seeing the place

or environment where something takes place can help increase the understanding of the event and the situation being evaluated (Tellis, 1997). This enabled the present study to relate the classroom activities and the available ICTs to the teachers' classroom practices and the responses from other data sources. Furthermore, on grounds that they require little from individuals from who one needs to collect data from, observation enabled the researcher to assess the credibility of the information from data obtained through other data generating strategies which were potentially dependent on the respondents' subjectivity or willingness to provide some information.

As a data collection strategy, observation can be overt or covert. While covert observation could have provided the study benefits of having teachers more likely to behave naturally by using regularly video recorded sessions of classroom environments and interactions, overt observation was used because it was not ethical to record class sessions without the teachers' and learners' knowledge or consent. Observations were done in at least 2 lessons (40 minutes each) for each lesson in order to know that the observation setting is itself not unusual or atypical, and to produce patterns from particular events and infer linkages between observable events and their probable causes (Newby, 2010).

### Document Analysis

Document analysis is an important research tool and an invaluable method for seeking convergence and corroboration which can reduce the impact of potential bias by examining information collected through different methods (Merriam, 1998). Documents were considered an alternative source of evidence to support the understanding of the teachers' ICT instructional practices and the roles played by different key informants in the conceptualization, implementation and integration of the ICT interventions. As Merriam (1988) pointed out, 'documents of all types can help the researcher uncover meaning, develop understanding, and

discover insights relevant to the research problem' (p. 118). Therefore, this method was considered appropriate in this study in order to develop insights about the research phenomenon through an analysis of documented materials that depicted issues of the primary education systems at all levels (national, school and classroom). Apart from technical literature, other documents such as reports, plans, policies and curriculum materials were considered potential sources of empirical data for this case study research, where data on the context within which the participants operated was obtained.

## Data Sources

The primary data sources, based on the conceptual framework, were Teachers, Head Teachers, Teacher Educators, Schools' ICT Providers, Ministry of Education officials (Education Planning, Basic Education, Teacher Education and Development) and the Malawi Institute of Education (MIE) through document analysis, observations, and semi-structured interviews as discussed in the subsequent sections. Table 1 summarises the investigation procedure and indicates the number of participants that were involved at each stage and through each data collection method.

Table 1 - Investigation Procedure Summary

| Data Collection Method | Level | Participants | Number of Participants | Frequency |
|---|---|---|---|---|
| Semi-structured Interviews | National Key Informants | Teacher Development Directorate | 1 | 1 |
| | | Teacher Educators | 4 | 1 |
| | | Basic Education Directorate | 1 | 1 |
| | | Intervention Organisation | 1 | 1 |
| | | Institute of Education | 1 | 1 |
| Document Analysis | Classroom, School and National | Any | - | - |
| Observations | School and Classroom | Head Teachers and Teachers | 10 | 2 |
| Semi-structured Interviews | School | Teachers | 10 | 1 |
| | | Head Teachers | 3 | 1 |

## Research Process

This section outlines the processes that were followed during the investigation. It outlines the rationale of the data sources in terms of the data collection methods identified under the research approach. The investigation process followed a pragmatic approach, where the preliminary findings from each stage of the investigation informed the choice of potential participants, data collection methods and the order of subsequent stages as follows:

### Stage 1 – Key Informant Interviews and Documents Analysis (June – August 2015)

This was a baseline investigation based on themes identified from the literature review to generate data related to the conceptualisation of ICT interventions in the primary schools and also to guide the selection of case study schools. The key

informants were identified for the roles they played in relation to issues identified from literature such as ICT teacher training and development, ICT plans and policy in education, and the roles and objectives of donor agencies and organisations through their school-based ICT interventions. Relevant data was generated from documents and interview as presented in

*Table 2* below.

*Table 2 - Thematic Areas for Key Informants Interviews and Document Analysis*

| Key Informants | Thematic areas |
|---|---|
| ***Ministry of Education Directorates***<br><br>Planning; Basic Education; Teacher Education and Development | - Governments' ICT related policies, frameworks and plans in Education<br>- Teacher Education and Professional Development in ICT<br>- ICT development partnerships in education |
| ***ICT Providers***<br><br>Tiphunzire Limodzi (SMF through Euro-Talk); The Interactive Radio Instruction – Tikwere (USAID, 2011); LearnTab (IICD, FAWEMA & ACEM); Unlocking Talent through Technology (VSO) | - ICT Intervention programmes aims and structure<br>- Collaborations, stakeholders' and participating schools' roles and objectives<br>- Interventions impact evaluation |
| ***Teacher Training Colleges – Teacher Trainers*** | - Teacher preparation for ICT competencies and pedagogical use |
| ***Malawi Institute of Education*** | - Teachers' In-service professional development in ICT pedagogies<br>- Curriculum guidelines for ICT integration |

The researcher conducted semi-structured interviews with Ministry of Education officials (Education Planning, Basic Education, Teacher Education and Development) to generate data on the governments' ICT related policies, frameworks and plans in Education and the Malawi Institute of Education (MIE) to have baseline information on the curriculum guidelines on ICT use. Each interview

lasted between 40-60 minutes. The study also intended to have interviews with the ICT intervention providers to get data relating to the background to their interventions and their objectives, but that was not possible; the reasons could not be disclosed here for ethical reasons. The preliminary findings from the data generated during this stage guided the identification of three case study schools.

### Stage 2 - Identification of Cases

The selection of a case is a key decision in a qualitative study (Creswell, 2013). While there are different ways of selecting a case, the present study used the purposive selection technique because it allows "selecting information-rich cases for study in depth" (Patton, 1990, p. 169). In addition, Silverman (2013) argues that purposive sampling enables researchers to choose a case because it possesses characteristics that they are interested in. A paradigmatic case selection technique was particularly used with the purpose of identifying exemplary cases that could provide rich information that manifest the ICT integration phenomenon intensively, but that were not atypical cases.

The cases were selected based on the findings from the analysis of traceable ICT intervention programmes documents and the findings from the interviews with key informants from the MoEST Departments, Teacher Training Colleges (TTCs) and the Malawi Institute of Education. According to Merriam (1998), such a pragmatic purposeful sampling should include selection criteria used in choosing cases to be studied in order to guide the researcher to identify information-rich cases. From the baseline findings, schools were identified based on;

    i.    Number of ICT interventions in each school

   ii.    Length each intervention has stayed in the school

  iii.    Number of ICT related in-service teacher trainings in each school

In addition to this selection criteria, convenience screening was used to further narrow the selections of the cases based on;

i.   Distance from each other – Possibility of reaching the cases in a limited possible time bearing in mind that the cases were to be studied concurrently within one school term.

ii.  Accessibility by road - Other schools, though close to each other could not be easily reached by road.

These two screening techniques guided the selection of the information-relevant and conveniently accessible cases during the study period. Three schools reflected these particular qualities and were all chosen as cases for this investigation. All the three case study schools belonged to the same Education District, but they were under different Education Zones. The Education District had five Educational Zones under the supervision of sixteen Primary Education Advisors (PEAs). All the three schools had School Management Committees, Parent/Teacher Associations and mother groups. These community committees helped in school management by working as a bridge between the community and the leadership of the school.

### Stage 3 – Head Teachers' Interviews (September 2015)

Head teachers of the identified three case study schools were identified as key informants because of the role they play as leaders of the schools. Semi-structured interviews were conducted with each of them to get the school leadership perspective on the following; ICT interventions available in the schools, ICT leadership and technical support, ICT provisions and infrastructure available in the schools, and the ICT intervention providers and their roles, level of involvement, targeted classes and learning areas. Each interview session lasted between 40 and 60 minutes. The initial findings from the interviews with the head teachers, in turn, guided the identification of teachers who could potentially participate in the study through classroom observations and interviews.

*Stage 4 - Selection of Participants*

Each head teacher of the case schools, as a key informant, provided information on the available ICT interventions in the school, the objectives of the interventions, ICT leadership, technical support and structural setting within the school, and the classes or learning areas that the intervention targeted. These findings were used in developing criteria for selecting potential participants within the cases. The potential participants were teachers who were identified based on the following criteria:

i.    the classes (levels) that the available ICT resources used for and why

ii.   the learning areas (subjects) which the ICT resources are used in and why

Based on these findings, potential participants were invited through letters and Participant Information Sheets (PIS) that explained how and why they had been identified and invited to participate in the study, respectively (see Appendix 3). The potential participants were invited to a briefing where the researcher introduced himself and explained the objectives and the methodology of the study.  A total of 10 teachers expressed interest to participate in the study. This screening technique helped me to identify research participants that would provide expanse but focused information that directly relates to the research purpose.

*Stage 5 – School & Lesson Observations, Documents and Interviews (Oct – Dec 2015)*

**School and Lesson Observations**

Observations were used to assess school and classroom environments, ICT resources and infrastructure and classroom processes and practices. Arrangements to gain access to undertake observations during class sessions were done in liaison with the school management, with separate consents from the school leadership and each teacher. However, before identifying which class or

lesson to observe, as part of the preliminary research findings, effort was made to identify which classes (levels) were the available ICT resources used for and why; and for what subjects and why. Based on these findings, classes and lessons to observe were decided.

The lesson observations were done prior to conducting interviews with the teachers to prevent influencing their usual classroom practices to suit the interview responses. The lesson observations focused on the availability of and access to ICT resources and infrastructure, teachers' planning for ICT based learning activities and their teaching methods and strategies for applying ICT. This allowed for monitoring classroom processes and teachers' ICT integration practices that are being investigated as they occur.

The data generated through observations was made possible using an observation schedule (Appendix 5) that was generated from the following main themes, as emerged from the literature review:

a. Available ICT resources and Infrastructure
b. Planning and designing of learning environments and experiences for ICT
c. Implementation of curriculum plans that include methods and strategies for applying ICT
d. Application of ICT to facilitate teaching and learning and assessment
e. Use of ICT in general professional practice by teachers

These themes were drawn to identify issues that guided the observation process to generate data that could provide answers to the research questions.

**Teachers' Interviews**

Semi-structured interviews were conducted with teachers to learn about things that could not be observed and to get answers to specific issues that emanated from the observed context. The purpose of these interviews was to elicit the

teachers' perspective on reasons behind their observed ICT practices in teaching and learning and also their actual expectations on both the ICT interventions and their learners' use of the interventions. Because the study was seeking to investigate the teachers' practices from a contextual approach, it was vital for the researcher to understand the issues from the perspective of the teachers themselves. Data collected from each interview was also used to generate information that was, in turn, compared and contrasted with information from other data collection methods, e.g. observations and documents analysis, and the responses from other interviews.

**Documents**

Various documents were collected from teachers and from all the key informants that were reached during the study period. These documents include the curriculum syllabus, teachers' guides, lesson plans, ICT intervention project documents, schemes and records of work, education sector plans and reports, and government policies. The documents were used to draw relationships between teachers' perspectives and the observed practices against the aims of the ICT intervention programmes, the governing policies and frameworks, and the implementation structure of the interventions. This provided a perspective on the overall expectations and context of the ICT interventions upon which the teachers' use of the available ICTs was based. In addition, this offered an alternative source of evidence to support the understanding of the teachers' ICT instructional practices and the roles played by the school management, the Ministry of Education departments and other stakeholders.

## Data Analysis

A full articulation of the analytical framework to investigate the research questions is considered useful in order to understand the range of complex factors that relate to how the ICT interventions are used in the classrooms. It also

provides a focus on the mediating contexts on the attainment of the interventions. Based on the literature review, this conceptual analysis recognises that teachers' classroom practices are influenced by the interwoven socio-cultural environments and processes at both micro and macro levels. Therefore, in the following section, Activity Theory system analysis is described and justified as an analytical framework that supported this conceptual framework to examine the complex and interrelated elements of the primary school education systems, school contexts and classroom environments.

## Data Analysis Framework - Activity Theory

Activity Theory (AT) is an approach that seeks to understand subjects (individuals or institutions) in their natural setting and circumstances or environment (Yamagata-Lynch, 2003). The theory provides a set of principles that constitute a general conceptual system that accounts for environment, history of the person or organisation, culture, role of artefact (tools), motivations, and complexity of real life activity to bridge the gap between the individual subject and the social reality through a mediating activity (Kaptelinin & Nardi, 2006). The unit of analysis in Activity Theory is the concept of object-oriented, collective and culturally mediated human activity, or an Activity System that includes an object (or objective), subject, mediating artefact (tools), rules, community and division of labour.

Activity Theory is based on the work of Lev Vygotsky that was further developed by Alexei Leont'ev and Engeström to provide "a framework for understanding transformations in collective practices and organizations" (Engeström, Engeström, & Suntio, 2002, p. 211). In an attempt to develop a new and comprehensive approach to psychological processes that treated the organism and the environment as two disembodied entities, Vygotsky used Marx's political theory "regarding collective exchanges and material production to examine the organism

and the environment as a single unit of analysis" (Yamagata-Lynch, 2003, p. 15). Through this re-conceptualisation of psychology, Vygotsky attempted to embrace the "co-evolutionary process that individuals encounter in their environment while learning to engage in shared activities" (Stetsenko, 2005; Yamagata-Lynch, 2003, p. 15).

Vygotsky introduced a cultural-historical psychology that accounts for the inseparable unity of mind and culture and their development in a socio-historical setting (Barab, Barnett, Yamagata-Lynch, Squire, & Keating, 2002; Kaptelinin & Nardi, 2006; Kuutti, 1996). He used mediated action as a concept to explain the semiotic process that enables the development of human consciousness through interaction with artefacts, tools, and other social beings in an environment, and the outcomes in individuals to find new meaning in their world by assuming that the relationships among artefacts, tools, and social others were not constant and that they changed over time (Engestrom, 2000). Through their interactions, individuals make meaning of their world while they modify and create activities "that trigger transformations of artefacts, tools, and people in their environment" (Mediated Action) (Yamagata-Lynch, 2003, p. 7). This is known as the genesis of Activity Theory or the First-Generation Activity Theory (See Figure 5).

Mediating artefact/tools

Subjects                    Obiective
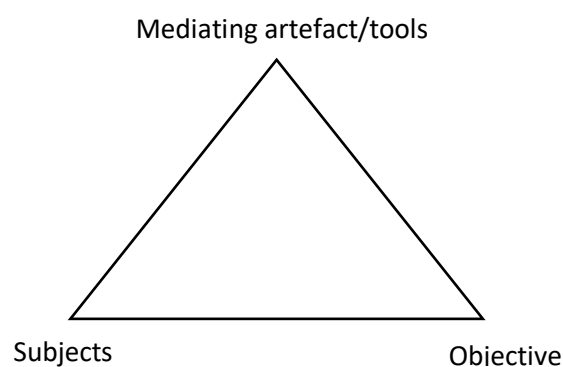
*Figure 5 - Vygotsky's Basic Mediated Action Triangle - Adapted from Cole & Engeström (1993)*

Alexei Leont'ev re-examined Vygotsky's propositions by broadening the scope of the mediated action to introduce human activity as a unit of analysis that is distributed among multiple individuals and objects in the environment (Barab et al., 2002; Kuutti, 1996; Yamagata-Lynch, 2003). This introduced analytic categories for examining the interactions between the subject and the environment to create a distinction between individual actions and collective activity. Leont'ev identified goals and motives as the driving force behind human activity and as opposed to activities of animals; the human goals are culturally and historically developed (Kuutti, 1996; Yamagata-Lynch, 2003). This provided a framework in psychology that did not treat the human activity and the environment as isolated entities (Stetsenko, 2005). This understanding of human activity, is identified as Second-Generation Activity Theory.

## Rationale for Activity System Analysis

Yrjo Engeström (also presented as Engestrom in this thesis) further developed analytical methods within activity theory by introducing activity systems analysis "to map the co-evolutionary interaction between individuals or groups of individuals and the environment, and how they affect one another" (Yamagata-Lynch, 2003, p. 22). The activity system analysis is designed to enhance understanding of human activity situated in a collective context with a six-element model; *Subjects, Tools, Object, Community, Rules and Division of Labour* (Engestrom, 2000). He puts forward a matrix (See Figure 6) that conceptualises the activity system analysis which is considered to be central in contextual studies in education.

Tools

Subjects

Objective ⟹ Outcomes

Rules  Community  Division of Labour
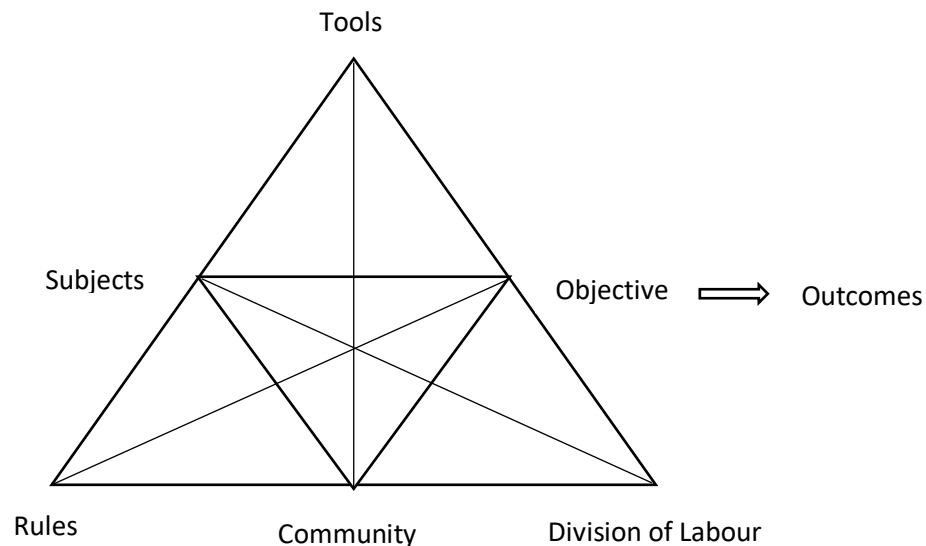
*Figure 6 - Engeström's Activity System adapted from Engeström (1987)*

In this model of activity system, the *subject* refers to the individual or a group whose point of view is taken in the analysis of the activity. The *object*, also known as objective, is the target of the activity within the system. *Tools* refer to internal or external mediating artefacts which help to achieve the *outcomes* of the activity. The *community* is comprised of one or more people who share the objective with the subject. *Rules* refer to the explicit and implicit regulations, norms and conventions that constrain actions and interactions within the activity system. In contrast, the *Division of Labour* discusses how tasks are divided horizontally between community members as well as referring to any vertical division of power and status (see Barab et al., 2002; Kaptelinin & Nardi, 2006; Stetsenko, 2005; Yamagata-Lynch, 2003).

The activity system analysis, also known as the Third Generation Activity Theory, is particularly considered useful as a lens in qualitative research methodologies (e.g., ethnography and case study) because it provides methods of understanding and analysing a phenomenon, finding patterns and making inferences across interactions, describing phenomena and presenting phenomena (Barab et al., 2002; Kaptelinin & Nardi, 2006). Within data analysis process, activity systems

analysis provides opportunities to work with manageable units of analysis, find systemic implications, understand systemic contradictions and tensions, and communicate findings from the analyses. Activity System Analysis is, therefore, a framework that is helpful in making sense of complex real-world data sets in a manageable and meaningful manner while building reliable interpretations of the data. Significantly, Activity System analysis has, in recent years, emerged as a new practice in the analysis of qualitative research (Karasavvidis, 2009). It recognises the process of interpreting data by acknowledging the context in order to reveal the dynamics within social and cultural contexts.

From the literature review, teachers' ICT integration has been understood as a complex process which cannot be targeted singly and in isolation from other interlinked components within the education system or the school and classroom contexts in which the interventions are used. Several studies have, therefore, identified the need to link the contextual, social, policy and technology drives to teachers' perceptions and practices in ICT integration (Donnelly, McGarr, & O'Reilly, 2011; Sang et al., 2011; Vanderlinde, van Braak & Dexter, 2012; Yuen, Law, & Wong, 2003). There is need to understand reasons behind the visible characteristics of teachers' perceptions, ideas and practices. Investigating how the ICT interventions are designed and implemented would offer a baseline for understanding teachers' ICT use (Cabanatan, 2001; Keengwe, Kidd & Kyei-Blankson, 2009; Unwin, 2005). Activity System Analysis seeks to generate meaning through interpretations that examine the phenomena between understanding data as a whole and interpreting the parts that constitute it as a representation of social reality (Lim & Chai, 2004). This application enabled the present study to construct and interpret different data sets as well as to develop a deeper understanding of the contextual structures that influence such understandings. Activity System Analysis has also been used in different studies to facilitate understanding of how technological advances influence change (Engeström, 2001; Murphy & Rodriguez-Manzanares, 2008).

Furthermore, the analysis provides a broad-spectrum framework for studying different forms of human activity as a development processes (Kuutti, 1996) and has been used in many recent studies of ICT integration in teaching and learning (Demiraslan & Usluel, 2008; Hong & Songan, 2011; Lim & Hang, 2003; Murphy & Rodriguez-Manzanares, 2008). It has, similarly, been used in professional development of teachers, both the pre-service and in-service, in ICT (Hooker, 2009; Karasavvidis, 2009; Verenikina, Wrona, Jones & Kervin, 2010). The analysis provides "a socio-cultural perspective that supports the idea that ICT must be studied within the learning environment and the broader context in which it is situated" (Demiraslan & Usluel, 2008, p. 458). Furthermore, Activity System Analysis requires the probing of the dynamics and possibilities of change and development that are involved in the investigated activities, i.e. ICT interventions conceptualisation and implementation and teachers' ICT integration. The use of activity system framework for data analysis in the present study filled the gaps between the fragmented and isolated discourse from different data sources and the larger activity system analysis by linking the configuration of events, activities, contents, and collaborative processes taking place in the context that the ICT innovations were used (Engeström, 1999).

## Data Analysis Process

The data generated from this research was in form of observation records and notes, interviews records and transcripts, records and reports documents from the schools and other stakeholders, i.e. key informants. Data analysis and interpretation process was on-going from the data collection process characterised with back and forth activities in order to get a consistent, coherent and holistic understanding of the data. The data analysing process was guided by Activity System Analysis as a data analysis framework, right from the initial data collection process. The framework was also used as a method of interpretation of

data obtained from the observations, interviews and documents to answer the research questions.

The data analysis procedure encompassed the process of arranging and structuring information in a systematic way in order for me to be able to attribute meaning to it (Rossman & Rallis, 2011). This included working intensively with the research data in order to become familiar with it, dividing it into manageable units, being able to synthesise it, and seeking out patterns and themes emerging from the data collected in order to process and interpret it to generate conclusions or present new knowledge. Data analysis processes applied the following methodological stages:

### *Stage 1: Observations*

Data from school and classroom observations were used as baseline data for further data collection (interviews and document analysis). Post-observation reflections were used to interpret the conditions of the school and classrooms before, during, and after observations; the behaviour and actions of teachers, as individuals or as a group; and the interactions and the organisational culture of the schools (Newby, 2010).

### *Stage 2 – Immediate interpretation of oral data*

The researcher wrote the first interpretation of each of the interviews while conducting them. Interview notes were used to generate immediate interpretations of the interview proceedings and identified cues to generate prompts as the interview progressed. In doing so, the researcher was able to attach his own interpretation to the interviews as presented by the research participants in an attempt to unveil the richness of research participants' perceptions, feelings and practices (Kvale & Brinkmann, 2009).

### Stage 3 - Conversion of oral data into written text

Immediately after the interview data collection, the researcher transcribed the interviews into written text. This generated texts that were easily subjected to analysis and interpretation processes. Inadvertently, this process also helped the researcher to relive the interview sessions; vividly recalling the verbal and non-verbal responses of the participants (Miles & Huberman, 1994).

### Stage 4 – Thematic Analysis

Thematic analysis was conducted using all interview transcripts, school/classroom records, observation notes and reports. The interview transcripts provided the researcher with different perspectives of Stage 2 notes of the same interviews. It was possible to visualise the discourse produced by each of the research participants. During stage, it was possible to create a list of themes across all and from each of the data sources, i.e. interviews, observations and the other documents. According to Braun and Clarke (2006), a theme captures something important about the data in relation to the research question and represents patterned responses or meaning within the data set by searching across a data set, e.g. a number of interviews, or a range of texts, to find repeated patterns of meaning.

The data analysis process was commenced by using a grounded approach in which the researcher repeatedly compiled, examined, and organized the data sets to identify salient themes based on the Activity System Analysis and the literature review. The themes were coded based on the elements of the activity system as defined by the Activity Theory as follows:

*Activities*             ICT intervention conceptualisation/implementation/integration in primary school education.

| | |
|---|---|
| *Subjects* | Individuals or institution/department involved in the in the ICT conceptualisation/implementation/integration activity. |
| *Tools* | Artefact or documents that act as resources for the *Subjects* in each of the identified activities. |
| *Objects* | The goal or motive of each of the identified activities. |
| *Rules* | Any formal or informal regulations that can affect how each of the identified activities takes place. |
| *Community* | The social group that the *Subject* belongs to while engaged in each of the identified activities. |
| *Division of Labour* | How the tasks are shared among the *Community* in each of the identified activities. |
| *Outcome* | The end result of each of the identified activities. |

All the text data, including the interview transcripts, were coded using a combination of prior identified themes from the literature review and an empirical coding system of themes that emerged from the data (Smith, 2000). The use of themes enabled the study to compare and contrast the perceived experiences of the research participants and at the same time provided an overview representation of social reality of each data source. The following strategy was adopted:

- Reading of interview transcripts for further familiarisation
- Re-reading the interview transcripts to link to observation notes
- Re-reading the interview transcripts to link to themes identified in the literature review. With this, the researcher was able to reduce the text without losing its original meaning and to summarise key features of a large body of data to offer a thick description of the data sets.
- Re-reading the interview transcripts to identify emergent themes. This enabled me to highlight similarities and differences across data sets,

generate unanticipated insights and generate contextual interpretations of data.

- Data display - dismantling and reassembling all the text data into the themes by coding relevant citations into an organized and compressed assembly of information within a matrix, thereby enabling the researcher to generate a visual display of the central issues arising out of data collected.

- Exploring contradictions and tensions within each and across each data source with reference to the theoretical perspectives of ICT conceptualisation and implementation in education and its integration into teaching and learning. This made it possible for the researcher to gauge the strength of the theoretical perspectives in explaining the ICT implementation structure and the teachers' practices as they use the ICT interventions for instruction.

***Stage 5 – Interpretation***

Interpretation was a final step towards refining the data interpretation by matching the analysed data to the study's research problem, its literature review, and its research questions. Interpretation involved understanding beyond the meaning that was immediately apparent in the analysed data (Coffey & Atkinson, 1996). In addition, I compared the identified themes to the narratives I developed in order to check whether there were discrepancies or gaps between them. With this in place, it was possible to establish how the ICT integration activity settings, elements, and goal-directed actions were fluid, intertwined, and changing from one level of activity analysis to another. This resulted into the expansion of meaning interpretation so as to respond to the need that emerged from the research problem and to address the knowledge gap identified from the literature review.

In order to bring together all most relevant and essential contextual information from different data sources, activity settings were identified through an interpretive process by exploring the relationships between different data sources, the social environment and any other observed contextual information to the identified themes. Through this intense engagement with the data, the researcher was able to interpret how the different data sources were connected in a social context at different levels of the activity system by code identification. Thick descriptions of the data sets were therefore developed in narrative format to identify units of ICT interventions activity systems by closely following the connections and relationships within and between identified themes. By binding actions and activity systems elements anchored with other related activities with similar goals or motive, three settings of ICT interventions conceptualisation, implementation and integration activity in the primary school education system were identified as follows (and see Figure 7):

1. The national activity system (Conceptualisation of ICT interventions)
2. The school activity systems (Implementation of the ICT interventions)
3. The classroom activity system (Teachers' ICT practices - Implications of the ICT interventions Conceptualisation and Implementation)
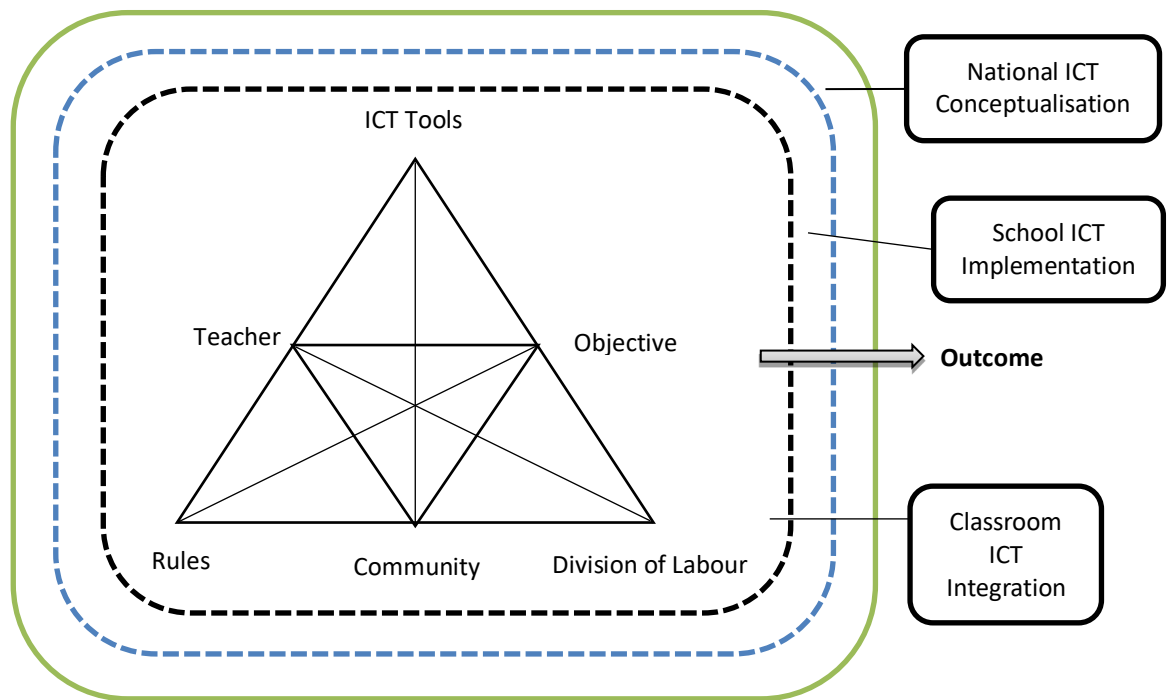
*Figure 7 - Activity System Analysis Levels*

Figure 7 represents identified activity system levels with the national level activity system being the top-most activity level that directed the activity systems in the schools and the classrooms. All the three activity systems were understood as interdependent with one another, with each activity system having an impact on the elements of the other activity systems. Knowledge of the connections and interactions of the activity systems at various levels provided a better understanding of the whole ICT intervention process. Thus, I was able to coordinate multiple levels of analysis to arrive at meaningful conclusions by analysing the context shaped by the national conceptualisation of ICT in Malawi's primary education. This provided an understanding of the thoughts and practices of the schools and teachers with respect to the implementation and integration of the ICT interventions by revealing the relationship (consistencies and contradictions/tension) and their implications amongst and between the key stakeholders' objectives/plans/guidelines and the school/teachers' practices respectively.

Likewise, apart from defining and mapping the ICT integration context, the activity system analysis provides a framework for illuminating the relationships (the consistencies and contradictions) that exist between the contextual levels —within and between activity systems— in the adoption and use of ICT in teaching. Activity System Analysis has philosophical principles that are premised on the hierarchical structure of the activity, object orientation, internalization, tool mediation and systemic contradictions (Kaptelinin & Nardi, 2006). These principles are considered as an integrated system, because they are associated with various aspects of the whole activity. Interpreting the Activity Systems in this study required a systematic application of each of these principles to engage and relate to all the elements in the activity system as follows:

**Hierarchical structure of activity (Multilevel Analysis):** Activity Theory holds that the constituents of activity are not fixed but can dynamically change as conditions change (Barab et al., 2002; Kaptelinin & Nardi, 2006). By linking the effective or ineffective integration of ICT in specific classrooms to particular activities situated within their larger context and the exterior inputs, the framework was used to build a detailed account of what teachers were doing to integrate ICT in their teaching. In turn, it was used to build an account of why, how the teachers' activities were supported or hindered by their larger socio-cultural context. This was particularly critical to this study as the objective of its inquiry was to focus on the whole configuration of events, activities, contexts, and collaborative processes taking place in the context that the ICT interventions are implemented and not only focusing on selected variables.

**Object orientation:** The principle of object orientation states that reality is objective and constituted by properties that are socially/culturally considered to be objective (see Engestrom, 2000; Kaptelinin & Nardi, 2006; Yamagata-Lynch, 2003). This provided the present study with a basis for revealing different

objectives within the classroom, school and national context and their respective activity systems. Each Activity System in the conceptualisation, implementation and integration of ICT was derived from an objective which motivated the activity, giving it a specific direction. Thus, all the activities during the conceptualisation, implementation and integration of ICT interventions in the primary education system were assumed to be composed of different goal-directed conscious actions that were undertaken to fulfil the same object (see Demiraslan & Usluel, 2008; Karasavvidis, 2009; Lim & Hang, 2003; Murphy & Rodriguez-Manzanares, 2008).

**Internalization:** Activity System Analysis draws a distinction between internal and external activities with emphasis that internal activities cannot be understood if they are analysed separately from external activities, because they transform into each other (Kaptelinin & Nardi, 2006; Yamagata-Lynch, 2003). The transformation of external activities into internal activities (Internalisation) provided a means for exploring potential interactions with reality. This was used to uncover the structures that underlie all the things that teachers were doing, thinking, perceiving and feeling with regards to the integration of ICT in their teaching by positioning elements of teachers' ICT integration practices in terms of their relationship to a larger, overarching system or structure. This is supported by the argument derived from the literature review that the phenomena of teachers' ICT perceptions and practices are not intelligible except through their interrelations with the contextual structure.

**Mediation:** An activity is mediated by tools that are created and transformed during the development of the activity itself (Kaptelinin & Nardi, 2006; Yamagata-Lynch, 2003). Mediation was used to locate the ICT interventions conceptualisation and implementation context (the external activity system) and the classroom activity system since both the teachers' classroom ICT integration activity (internal classroom activity system) mediate the teachers' activities through the available tools and the existing rules and roles (training, policy and

curriculum guidelines, national education sector plans as discussed in the literature review). This provided an interface for identifying how the teachers, technological (ICT tools) and organisational elements were interrelated.

**Tensions:** Activity System Analysis explores the epistemic relationship between elements of the activity systems with particular attention to how they relate to one another as the conceptualisation and implementation of ICT intervention systems develop and evolve (Barab et al., 2002; Engeström, 2014; Porter & Van der Linde, 1996). Exploring the relationship between and within activity systems illuminated the contradictions/tensions that potentially existed in the ICT conceptualisation, implementation and integration systems. These contradictions/tensions revealed the misfits within elements of an activity system, between them, between different activities, or between different developmental phases of a single activity (Kuutti, 1996). Similarly, they revealed the intimate connection that link the conceptualisation and implementation contextual settings to the ICT use in teaching and learning (Lim & Chai, 2004).

## Credibility and Trustworthiness

Several authors on research methods have demonstrated how qualitative researchers can incorporate measures that deal with issues of validity and reliability (Guba, 1981; Guba and Lincoln, 1994: Berg & Lune, 2004). As proposed by Guba (1981), credibility is one of the frameworks, which has been considered in many qualitative research studies in pursuit of a trustworthy and internal validity and for ensuring rigour. The following measures were employed in order to ensure that the study accurately recorded the phenomena under scrutiny;

### *Adoption of relevant research methods and instruments*

The process of developing data collection tools was based on the research questions, the epistemology, ontology and methodology of the study and the data collection methods to ensure that the tools were effective in generating the

desired information. In addition, all the data collection tools (the interview and the observation guide) were peer validated by the researcher's colleagues in the Faculty of Education at University of Malawi's Chancellor College. This helped in ensuring that the data collection tools generate the desired information.

### *Familiarity with the school and the teachers*

Shenton (2004, p. 65) recommend "prolonged engagement" between an investigator and participants in order for the researcher to gain an adequate understanding of an organisation and for the establishment of a relationship of trust between the researcher and the participants. Through analysis of appropriate documents and preliminary visits to the case study schools, the present researcher was able to develop familiarity with the schools' culture and the participants, i.e. teachers, before the first data collection dialogues took place.

### *Triangulation*

Berg and Lune (2004) note that triangulation is used in qualitative studies to capture a holistic picture of a phenomenon through the use of different data collection methods and different data sources.  The present research utilised multiple data collection methods from same data sources (teachers' interviews, observation and documents analysis), and multiple data collection methods from multiple data sources; teachers, head teacher and key informants in order to generate holistic and credible data. In addition, the concurrent use of different data collection methods compensated for their individual limitations while exploiting their respective benefits (Guba & Lincoln, 1994).

### *Member checks*

Member checks refer to a practice in which a researcher provides his or her research participants with an account of his findings. The practice, which is considered by Guba and Lincoln (1994) as the single most important provision

that can be made to strengthen a study's credibility, was employed in the present study to ensure that participants' views were accurately captured, and that the researcher shared with them his transcriptions and interpretation of their responses to see if he accurately presented their views.

## Ethical considerations

The study subjects in this investigation, like with most other studies in the field of social and behavioural sciences, were humans. Miller, Birch, Mauthner, and Jessop (2012) observe that a social science researcher should, in all situations deal and treat participants with respect, in a manner that they should not be harmed in any way and should be fully informed about the research procedures that may be performed; it is proper for participants to exercise their rights with regard to their involvement in the research project. Guillemin & Gillam (2004) describe ethics in the context of research as the appropriateness of behaviour in relation to the rights of whoever participates in the study.

The University of Strathclyde has an ethical validation process which ensures that researchers conform to reasonably accepted standards. The ethics approval process of the University ensured that this study did not, in any way, interfere with participants' physical and psychological well-being, and that the research materials and process were not sensitive, discriminatory or inappropriate. All the research methods and instruments that were used in the study were subjected to the requirements of the University's research ethics committee. In carrying out this study, due attention was given to the following ethical issues;

### *Access Permission*

Permission and clearance to carry out my investigation in Primary Schools and with relevant stakeholders was obtained from the Ministry of Education, Science and Technology (MoEST).  The researcher personally wrote the Permanent

Secretary of Education to ask for access and permission to conduct the study. See Appendices Appendix 1 and 2 on page 236.

### *Informed Consent and the Right to Withdraw from the Study*

Miller, Birch, Mauthner and Jessop (2012) argue that potential participants in a study should give consent only after being adequately informed about the goals of the study and all factors that could influence their decision. In this regard, first of all, all potential participants were contacted to inform them the purpose of the study and to formally request them to participate in the study through an information sheet and a participation consent form. Furthermore, it was borne in mind that the freedom to withdraw from participating in the study must be clearly explained to avoid compromising the quality of the results (Duncombe and Jessop, 2002). Thus, all participants had the right to withdraw from the study at any point they would have felt it was not in their best interest to continue participating in the study.

### *Anonymity and Confidentiality*

Anonymity in research requires that any information provided by any participant should in no way reveal their identities (Miller et al., 2012).  Participants in this study were assured of anonymity and confidentiality when the researcher was seeking their consent. It was emphasised to them that any information they would provide shall remain strictly confidential and be used only for the purpose of this research. All the data gathered were treated in a manner that protect their confidentiality and anonymity as individuals and institutions involved in the study.

### *Data collection, storage and security*

In order to ensure data security, all the raw data from the investigation were anonymised and given code names (pseudo-anonymised), and the key for the code names was securely stored in a separate location from the raw data. In

addition, all the data generated from this study was used exclusively for purposes of this study and will never be available for any other use, not even for incidental use or to support measures or decisions relating to any identifiable individual. Furthermore, the results of this research activity and any resulting information were and will never be available in a form that identifies the data subjects. Apart from that, all data gathered in the course of this research was managed with appropriate security irrespective of the media in which the data was stored, that is, whether in hard copy or electronic/digital form.

### *Potential risks*

Participants to this research were never exposed to any situation - for the purposes of this study - that could have caused physical or psychological discomfort or injury. Also, the research did not involve any observations of behaviour/practices or ask questions that required responses which the participants could have considered private or personal. However, it may have been possible for participants to feel anxious either to be observed or to provide information on their practices and experiences. Therefore, in addition to providing the participants with an information sheet and anything they wanted to know before agreeing to participate, prior to the commencement of the investigation, each one of them was clearly informed about the research methodology and the procedures to be taken to ensure confidentiality.

Similarly, any participant observation and/or interview neither required any information from the participants nor discussed any of their practices/experiences that might have made them feel de-skilled and incompetent. Nevertheless, debriefings were done after each data collection session to provide an opportunity for the participants to ask questions and discuss their perception of the study and their experience/feeling as participants to the study. This enabled me to identify and address any incidence where inadvertently a participant was made to feel de-skilled and/or undermined. In addition, participants' time was

always greatly valued to avoid unnecessary loss of time, which, otherwise, could have led to their discomfort.

## My Role as a Researcher

In this study, I interacted with teachers at their workplaces through semi-structured interviews and by observing their teaching sessions in classes. I also interacted with their head teachers through interviews and conducted interviews with key informants from the Directorate of Teacher Education and Development and the Planning Directorate of the Ministry of Education, the Malawi Institute of Education and the ICT Intervention organization. I was, therefore, an active instrument of data collection throughout the data generation process.

Throughout my career, I had a range of opportunities to work with primary school teachers in their workplaces in different contexts and with the other relevant Ministry of Education departments under different projects. I am a former secondary school teacher and vocational training instructor under the Ministry of Education, and currently I am a Teacher Educator in the Faculty of Education of the University of Malawi. Therefore, I am familiar with the education system and landscape in Malawi and I am of the opinion that this situation helped to reduce anxiety associated with social divisions or power differences that often exist between a researcher and participants. As a researcher, I was readily accepted as part of the participants in the education system.

While my professional experience helped me to understand the context of the study, it potentially presented biasness in the way I could have interpreted issues. However, although as a I did not have any preconceptions about the topics under this study, I made effort to ensure that I bracketed any preconceptions about the research participants, the research context and the key informants. Punch (2013) supports this process where he posits that a researcher should attempt to capture

data on the perceptions and practices of local actors from the inside, through a process of deep attentiveness, empathetic understanding and suspending or bracketing preconceptions about the topics under discussion.

## Limitations of the study

As is the case with other studies, there are some limitations to this study. One of the limitations is that the generation of empirical data depended mainly on the level of access that was granted to me as the researcher by the participants and the key informants. Therefore, the participants and the key informants may have either knowingly or unknowingly left out some vital information from me without my knowledge, which could possibly have affected the research outcome. Similarly, some of the key informants did not provide consent to be interviewed and opted to provide relevant documents that contained information relating to the interview questions. This limited the chance to probe the data sources. However, such key informants provided alternative data sources that provided equally relevant information. Furthermore, I used multiple sources of data and different methods of data generation to capture different dimensions of the same phenomenon and I believe that the triangulation of data collection methods and data sources helped ensuring trustworthiness of research findings and significantly reduced the effects of this limitation.

Also, this study was limited to schools in one education district in Malawi. Nevertheless, it is my belief that although the research was limited to one education district, the research findings are likely to be similar to those in other parts of Malawi since the three schools were only used as case studies for exploring the implications of a national ICT interventions conceptualisation process which applies to any other primary school within Malawi. Similarly, though this research made use of multiple case studies to provide broad insights on ICT implementation and integration in schools and classrooms, the findings

from these schools cannot be generalised to other schools. Thus, the intention of this study was only to investigate the phenomenon and not necessarily to generalize its findings. Nevertheless, the tensions that this study has identified are generic and can be used to inform further research, practices and policies in the implementation and integration of ICT in Malawi primary school education system.

## Summary

This chapter has outlined the methodology and research design employed in this study and has given a description of the study participants. This includes the rationale for the chosen research paradigm, the research approach, the criteria employed for selecting study cases, data sources and data generation procedures. The methodology also discusses ethical measure taken with regard to data collection as well as the method of data analysis. Furthermore, it has highlighted the various steps that were taken to ensure credibility and trustworthiness of the investigation.

# CHAPTER 4: FINDINGS

## Introduction

This chapter presents findings from the case studies following the identified themes from the data sets and guided by the connexions of the Activity Systems Analyses that guided the data analysis process. The findings are laid out to represent a combination of the emerged themes and the elements of the ICT intervention activities at different activity levels. The analysis of activity systems based on Activity Theory provided a framework for not only conducting the analyses of interactions within and between ICT integration systems, but also a method for communicating the results of the analysis. Thus, through this method, the study is able to present its findings based on the units of activities identified in the analysis.

## Presentation of Findings

The main objective of this research was to explore how ICT interventions in Malawi's primary schools are conceptualised at a national level and how this is affecting the implementation of the interventions in the schools and the integration in the classrooms. Furthermore, the research sought to use these findings to explore the implications to suggest strategies for the effective implementation and integration of ICT in primary schools in Malawi. In this research, crucial gaps in the national conceptualisation of ICT interventions have been identified and the systemic tensions in the implementation and integration of interventions by schools and teachers respectively have been presented. The following section provides the research findings per each research question.

# Research Question One – Conceptualisation of ICT interventions

This research question investigated the process of planning, guiding and regulating the introduction of ICT interventions within the existing primary education systems and structures. The question looked into the configuration of activities and processes taking place in the context that the ICT interventions are conceptualised as follows:

***How is the introduction of ICT interventions in Malawi primary schools conceptualised?***

In order to answer this research question, the findings on how the national primary school education context and system conceptualise ICT interventions are presented in the following themes, based on the Activity Systems Analysis: Tools for Introducing ICT in schools; Roles of different stakeholders in the introduction of ICT interventions; Rules and Regulations that affect the introduction of the ICT interventions.

The main sources of data in this phase were semi-structured interviews with national key players in ICT provision, implementation and integration, officials from different Ministry of Education departments, and the analysis of all the relevant documents on how the ICT integration activity took place within the national level context. The generic details of the key informants and their respective reference codes are indicated in *Table 3*.

*Table 3 - Reference Codes for Key Informants*

| Key Informant | Source | Reference Code |
|---|---|---|
| Officer at the Directorate of Basic Education | Interview Documents | DBEO |
| Officer at the Malawi Institute of Education | Interview | MIEO |
| Officer at the Directorate of Teacher Education and Development | Interview Documents | DTEDO |
| Officer at the Directorate of Planning | Documents | Not applicable |
| Officer at Voluntary Services Organisation (VSO) | Documents | Not Applicable |
| Tutor, Teacher Training College 1 | Interview | TT1 |
| Tutor, Teacher Training College 2 | Interview Documents | TT2 |
| Tutor, Teacher Training College 3 | Interview | TT3 |
| Officer at Directorate of Inspection and Advisory Services | Documents | Not Applicable |
| Officer at Education Development Centre | Documents | Not Applicable |

## Roles of different stakeholders in the introduction of ICT interventions

The study found that under the MoEST, the Directorate of Basic Education (DBE) was responsible for the provision of Basic Education (Primary School Education) by setting, formulating and reviewing of policies, rules and regulations on basic education at national level. As such, the DBE was identified as the subject of the analysis of the introduction of the ICT interventions in the primary school system activity.  The study further found that there are other institutions within and outside the MoEST that were actively involved in the designing, planning and implementation of ICT interventions at national level of the primary education system. The roles of these institutions were analysed and are presented below based on the following themes that were identified during the literature review; Teacher Education, Teacher Professional Development, and Provision of ICT interventions.

*Teacher Education*

The study found that the Directorate of Teacher Education and Development was the only institution that was responsible for coordinating the designing and development of policies and programmes for teacher education. A key informant from DTED highlighted the objective of the Directorate regarding training and professional development of primary school teachers towards the use of ICT for instruction:

> *The Directorate of Teacher Education and Development provides a cross-cutting function that serves the need for primary school teachers in the Ministry of Education. It aims at providing support and guidance, and it also coordinates and regulates initial teacher education, training and continuous professional development in order to promote quality, adequately trained and competent primary school teacher, including the use of ICT for teaching. (DTEDO)*

The specific activities that DTED was implementing in order to achieve this goal were also highlighted by the same key informant:

> *DTED is mainly responsible for policy, control and maintenance of standards through designing of teacher education curriculum program activities. We are not involved in the implementation of teacher training activities. The Teacher Training Colleges are our implementers who contextualize the policies and plans of DTED. (DTEDO)*

It was noted that while the DTED played a central role in formulation of plans and policies for teacher training and professional development, it did not have specific plans and/or policies for teacher training and development towards teachers' capacity for ICT integration:

> *We always encourage the Teacher Training colleges to promote the use of ICT during initial teacher training so that the teachers we are producing have computer skills that are very useful in the modern world. If you could visit the TTCs you will note that all of*

*them have ICT labs and clubs as part of the co-curricular activities.*
*So, we might not have ICT as a course under IPTE[1] programme but*
*we hope teachers are able to get relevant ICT skills from the*
*exposure they get during their pre-service training. (DTED)*

This observation was also supported by the Tutors (Teacher Educators) from various Teacher Training Colleges (TTCs) who appreciated the significance of developing pre-service teachers' capacity in pedagogical ICT integration during the initial primary school teacher education programmes:

*We have different courses under the IPTE curriculum, but ICT is not*
*included as a course or as part of any course. I think we need to*
*find a way of preparing our students to be able to use ICT for*
*themselves and also for their teaching. There are so many*
*technologies coming in to the schools, we see them when we go*
*to supervise our students during their TP[2], but our students would*
*need special training to be able to use them. (TT2)*

The study found that that teacher educators felt that they were just implementers of decisions by the curriculum designers and that the pressure of national examinations that the student-teachers have to sit for at the end of their training affected the teacher educators' decision on whether to help the student teachers develop ICT skills through co-curricular activities or not:

*I wish ICT was offered as a foundational course but we just*
*accept because we are called implementers so we are so much*
*influenced by what our students will be examined on, so all the*
*time that we are teaching, we are looking at the coverage of the*
*curriculum, how it is to be covered, so that our students in the*
*end pass in examinations. (TT1)*

It was noted that in some TTCs, pre-service teachers had access to personal and institutional ICT facilities from where they learn basic ICT skills for personal interests. However, the teacher educators felt that basic ICT skills were not

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[1] Initial Primary Teacher Education
[2] Teaching Practice

adequate for the student teachers to be able to design and facilitate learning through appropriate pedagogy and technology:

> *Some students use their personal laptops and smartphones or tablets in their own time; others are members of the Computer Club so they come to learn how to use the computers in the ICT lab but that is done out of their own interest and enthusiasm and not really that they are expected or required to do so as part of their training. So, I would say no - at present I have little expectations on students' use of ICT for instruction, though they themselves seem to be enthusiastic or excited with it, but I feel that is not adequate...(TT3)*

Furthermore, the study found that all the Primary Teachers Training Colleges (TTCs) that provided pre-service teacher training had no role in promoting ICT methods and competencies:

> *We recognize that structured inclusion of pre-service training institutions would be an effective way for teachers in training to develop ICT lesson management skills and this is a gap that needs to be filled. We always request the intervention programmes to assist by training TTC tutors and to help them incorporate ICT methodologies into pre-service teacher education, but I think for budgetary reasons this is always deferred... (DTEDO)*

In other words, based on the interviews with DTED and the Teacher Educators from the three TTCs, the study found that there were no set guidelines for ICT training within the teacher training programme structure which the teacher educators could follow.

### Teacher Professional Development

The investigation found that the MoEST, through the 2013-2018 National Education Sector Plan (NESP), prioritised the institutionalization of In-Service Training (IN-SET) and Continuous Professional Development for Teachers (CPDT) for primary school teachers under Teacher Education Priority Number Two,

Objective Five (page 25). As such, In-service teacher training and continuous professional development on the use ICT for teaching and learning was expected to receive similar priority as part of the national ICT integration activity system for serving teachers. According to the Report of the *Functional Review of the Ministry of Education, Science and Technology* by the Directorate of Human Resource Management and Development of Malawi Government (DHRMD, 2005), the Malawi Institute of Education was responsible for providing in-service training for education personnel at national level (DHRMD, 2005). While the DHRMD 2005 Report indicated that the DTED had a similar role, the study found that DTED was only concerned with the upgrading of teacher and not in-service training:

> *We are responsible for planning and coordinating teacher development through upgrading programmes to ensure that our teachers have the right qualifications and competencies for their job. The Malawi Institute of Education is responsible for providing specific in-service training to address specific needs of teachers according to the curriculum... (DTEDO)*

Further data analysis revealed that while the Malawi Institute of Education (MIE) recognised its role in training in-service primary school teachers, head teachers and education advisors, it did not provide training for the use and integration of ICT interventions that are introduced in the schools:

> *We have a Department of School and Teacher Development that promotes the continuing professional development of teachers, head-teachers, Primary Education Advisors (PEAs) and teacher trainers in special needs education, gender issues, human rights education and the curriculum and assessment reforms. We have not been able to provide training on ICT with primary school teachers because most of the ICT interventions in the primary schools start as projects and the agency responsible for that project trains and monitors the teachers and provides CPD[3] when required… (MIEO)*

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[3] Continuous Professional Development

It was found that the ICT intervention providers took the responsibility of designing and coordinating the in-service training that was required for the teachers to effectively implement and use specific intervention that they provided:

> For example, 'Tikwere' was a USAID project for several years before it became a government programme and USAID was responsible for 'Tikwere' CPD programmes. They also established 'Tikwere' Coordinators at TDCs[4] who organised CPD activities within their respective zones. So, that responsibility was left with those coordinators even after the 'Tikwere' became a government programme… (MIEO)

Similarly, considering that the process of adoption and use of ICT is associated with rapid and swift changes, the MIE had not yet developed a national framework to support the interventions:

> Now there have been, of late, several ICT interventions in different Education Zones and Districts. From my understanding, these are run as projects by different organisations, so it is difficult to have a coordinated ICT in-service training programme through the Institute[5] because the interventions have different pedagogical demands. So, the projects implementers take responsibility of the training so that teachers can effectively use the technologies they are providing to the schools….It could also be difficult to include all aspects of all the ICT interventions into a CPD programme, first because they are too many interventions out there and secondly because some of them stay in the pilot schools for one academic year and then they are discontinued (MIEO)

This assertion confirmed the need to consider specific conditions of the ICT intervention programmes in order for the MIE to manage to provide in-service teacher training as an on-going process.

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[4] Teacher Development Centres
[5] Malawi Institute of Education

*Provision of ICT interventions*

It was found that since 2006, the MoEST had worked with different development partners to introduce and provide ICT interventions in primary schools at different scales (small, medium and large scale). The ICT interventions that were still in the schools during the study period and those that were introduced at a large scale (in more than one education district) were the Tikwere Interactive Radio which started in 2007 and the Unlocking Talent through Technology which was introduced in schools in 2011.

The study found that these two ICT intervention programmes had the same learner target groups in the primary schools (Standards 1 and 2) with reference to the NESP priorities on basic education.  According to the *Tikwere* Learner Assessment Report of 2010, on the one hand, the main objective of the Interactive Radio Instruction intervention was to improve the learning outcomes in basic subjects in early primary school classes 1-3, and to support and reinforce the introduction of the new Primary Curriculum and Assessment Reform (PCAR) in Malawi with reference to NESP. On the other hand, a project document of the Unlocking Talent through Technology (2014) states that the intervention aligned its objectives to the aims of NESP in order to improve the quality of the available instructional materials and resources for Standards 1 and 2 in literacy and numeracy through the use an innovative methodology of mobile tablet technology in the classroom.

The study also found that apart from providing ICT resources and infrastructure, both interventions provided technical and administrative support, and project management. Tikwere Interactive Radio Instruction Evaluation Report by USAID (2011) indicates that, through Education Development Centre (EDC), USAID provided Freeplay Lifeline Radios to schools, upgraded MoEST recording studios and provided staff support for monitoring, evaluation and coordination functions. Similarly, the Unlocking Talent through Technology intervention report indicates

that the project was responsible for building learning centres and providing iPad mini tablets to the schools, providing technical support, project management and administrative support.

It was, however, observed that such inputs depended on other activities managed by the MoEST directorates and in close coordination with the Malawi Institute of Education, which is responsible for developing other curriculum materials. In support of this observation, the Malawi Institute of Education indicated that it provided expertise to the ICT intervention implementers by synchronising the content and activities that were provided through the ICTs with the curriculum and knowledge levels of learner they were meant for:

> *So far, we have only been responsible for assuring that the technologies are directly supportive of and aligned to content within the curriculum and other materials like textbooks and teachers' guides. MIE's staff is involved only as subject experts because they only provide guidance for curriculum content to be used along with the technologies, for example in the level of vocabulary and the density of activities… (MIEO)*

## Rules and Regulations that affected the introduction of the ICT interventions

An analysis of the national policies and all other relevant documents which provide formal regulations on deployment and use of ICT in education revealed that the Nation ICT Policy (2013) was the only policy that provided direct institutional, regulatory and legal framework to support the successful deployment and utilization of ICT in education. The policy highlights that government has a lot of pressure on its social expenditure for education in order to provide adequate and quality ICT services, with the objective of improving access to education and the teaching and learning materials at all levels of education in Malawi. In relation to this assertion, the Policy Priority Area Number Two (Human Capital Development), Policy Statement One (page 8) states that

Government shall integrate ICTs in the education systems at all levels in order to improve access to and quality of education; and improve management of education systems. However, the policy does not specify how government through different agencies and stakeholders can facilitate the deployment, implementation and integration of ICT within the education system in order to meet the policy objectives, namely to improve access, quality, relevance and delivery of education at all levels.

This observation is also supported by the key informant from the Directorate of Basic Education who, as subjects of the ICT Integration Activity System at national level, acknowledged the gap that existed between the Nation ICT Policy and the ICT implementation frameworks in the primary schools, during an interview:

> *The coordination and collaboration on ICT aspects appears to be less harmonized and somehow irregular. We have attempted to address such differences in approach and implementation through the establishment of task forces and working groups that include the Development Partners. However due to exigencies of work, it takes a long time for these groups to meet hence it takes a long time before decisions are made and in the meantime ad-hoc decisions and informal guidance are used without formal policy directives. (DBE)*

 Other policies and documents that were analysed are: the Early Childhood Development Policy, which provides framework for child development from age zero to eight that includes learners in the first two classes of primary education; the National Language Policy that regulate language of instruction in public schools; the documents and legislation that incorporate issues relevant to children with disabilities in schools; the NESP as an ICT integration tool of this Activity System; and the project documents of the ICT intervention programmes in primary schools. It was found that none of these made any reference to regulations or a framework for the deployment and use of ICT in education, hence

their lack of any relationship with the ICT conceptualisation system under this study.

The study noted that a Tikwere Interactive Radio Instruction Evaluation Report by USAID (2011) indicated that National Language Policy required Infant (Standards 1 and 2) and Junior (Standard 3 and 4) Mathematics classes to be taught in local languages. This implied that some teachers were officially required to teach mathematics in local languages of the school area (e.g. Tumbuka and Yao). However, it was observed that Tikwere IRI presented all the mathematics lessons in Chichewa only. This implied that teachers were required to translate instructions for the children from Chichewa to the local language of the school area, which signalled for a special focus on the Classroom ICT Integration Activity System where the implications of the national language policy could be identified.

## Summary of Research Question One

This far, findings from the first Research Question have revealed gaps that exist at the national level in the conceptualisation and the introduction of the ICT interventions in the primary school education system. The findings have revealed that the ICT interventions are conceptualised and introduced into the school system through unguided and unregulated processes, where teachers are not prepared for the ICT interventions uptake and with limited ICT professional development for serving teachers. This reveals the context that the schools and teachers are provided for implementing the interventions.

# Research Question Two – Implementation of ICT interventions in primary schools

This second research question investigated the context for ICT implementation in the schools. The question looked into the relationship between the conceptualisation of ICT intervention and the contexts where the ICT

interventions are implemented by probing how the conceptualisation of ICT interventions shaped and influenced their implementation contexts and processes in schools.

***How does the national conceptualisation of ICT interventions shape and influence their implementation contexts and processes in schools?***

The utilisation of Activity System Analysis to interpret the context shaped by the findings from Research Question One revealed a gap in the conceptualisation of ICT interventions relating to the NESP, namely that, as the guiding tool for ICT implementation in the schools, it did not specifically provide strategies or frameworks that could guide ICT investments and intervention in education. In addition, the Nation ICT Policy did not address specific frameworks for government departments and different agencies and stakeholders to facilitate the deployment, implementation and integration of ICT within the educational system. This is illustrated in Figure 8 and Table 4 below:
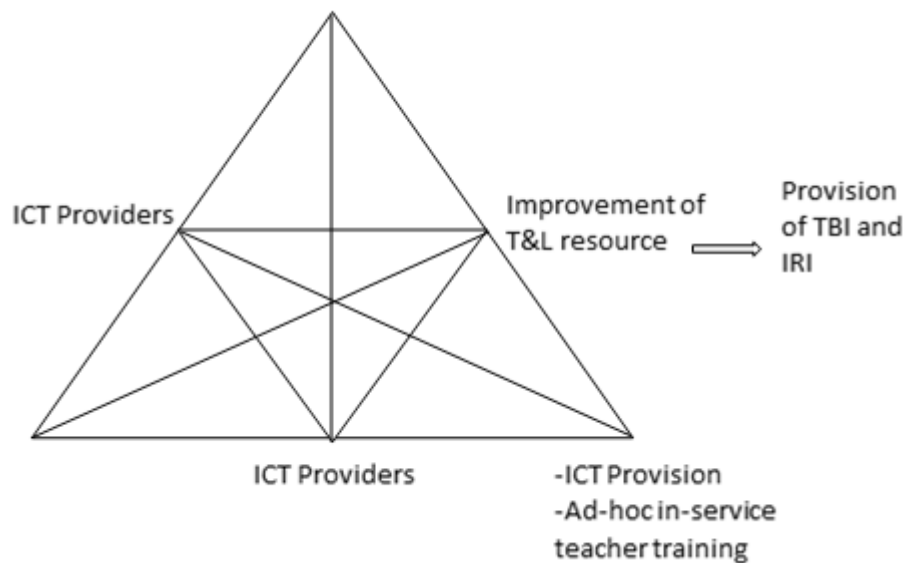


*Figure 8 - National ICT implementation context*

While the ICT interventions provided by the different development partners sought to improve the quality of the teaching and learning inputs in the schools,

their implementation was neither guided nor regulated. These missing links in the conceptualisation of the interventions shaped the context and structure of ICT implementation in the primary schools and, therefore, affected how ICT intervention were adopted and used in the primary schools. *Table 4* draws upon this interpretation of the conceptualisation of the ICT interventions to reveal the contexts for the implementation in the primary school education system:

*Table 4 - Interpretation of Activity System Context for ICT implementation*

| Activity | Introduction of ICT interventions in primary schools |
|---|---|
| Subject | The ICT providers worked directly with the schools. The Directorate of Basic Education (DBE) is not involved to formulate, manage or evaluate the ICT interventions |
| Tool | The National Education Sector Plan does not provide strategies and plans that could have been used to guide, prioritise, harmonise, regularize, monitor and evaluate efforts of different key stakeholders in the design, development and management of ICT investments and interventions in education |
| Regulations | The National ICT Policy does not provide any national or institutional regulatory framework to support the successful deployment and utilization of ICT in education |
| Community and Division of Labour | The ICT interventions providers were the only key stakeholders directly involved in the ICT implementation activity. They provided ICT Technical and Material Support and coordinated and facilitated in-service teacher training. |
| Objective | Improvement of quality of teaching and learning resource as stipulated in the NESP |
| Outcome | The primary outcome of the ICT intervention was the integration of the ICT interventions in the primary school education systems and not defined by the NESP or any other plan by MoEST |

## The Case Studies' Contexts

The case study schools were selected based on the findings on the best ICT resourced primary schools and the most trained teachers in ICT use for instruction. This was part of the findings from the interviews with the respective Ministry of Education Departments and the review of Programme Documents and Reports from the School ICT intervention providers. The findings from the selected case study schools with respect to their ICT interventions are collectively

presented because it was observed during data analysis that the schools shared the same elements of the ICT interventions implementation system (they had the same interventions, the same providers and were all governed and supported by MoEST policies and structures). For the purpose of anonymity, the names of the cases have been disguised in this report as Chimwemwe Primary School, Chisomo Primary School, and Chikondi Primary School.

The study found that all the three schools had the same provider for the Interactive Radio Instruction (IRI) and the same provider for the TBI. Similarly, the three schools, being public primary schools, followed the same curriculum (National Primary School Curriculum) and were governed by the same policies from Malawi government. However, the three case study schools had varied characteristics in terms of learner: teacher ratio, types of ICT interventions, lengths of the ICT interventions, and the learners' catchment area. Table 5 shows characteristics of the schools involved in this study.

*Table 5 - An overview of Case Study schools*

| Case | Learners | Teachers | Classrooms | Catchment | Interventions | Target | Length |
|------|----------|----------|------------|-----------|---------------|--------|--------|
| Chimwemwe Primary School | 8951 | 106 | 30 | Urban | Radio | Std 1-3 | 6 Years |
|  |  |  |  |  | Tablets | Std 1-2 | 4 Years |
| Chisomo Primary School | 4346 | 87 | 18 | Urban | Radio | Std 1-3 | 3 Years |
|  |  |  |  |  | Tablets | Std 1-2 | 2 Years |
|  |  |  |  |  | IPods | Std 1-2 | 4 years |
| Chikondi Primary School | 3425 | 44 | 12 | Semi-urban and rural | Radio | Std 1-3 | 6 Years |
|  |  |  |  |  | Tablets | Std 1-2 | 2 Years |
|  |  |  |  |  | Handheld Video players | Std 1-2 | 4 Years |

Participants from the case study schools were teachers and head teachers identified for the specific roles that they played towards the integration of ICT in

the schools. The primary details of the participants from the case study schools are described in Table 6 below.

*Table 6 - Overview of Study Participants*

| Case | Participants | Teaching Experience | ICT Training | Teaching Area | Class |
|---|---|---|---|---|---|
| Chimwemwe Primary School | Head Teacher | 12 Years | None | Not Applicable | - |
| | Teacher 1 | 13 Years | None | All subjects | 2 |
| | Teacher 2 | 4 Years | None | All Subjects | 1 |
| | Teacher 3 | 7 Years | None | All Subjects | 1 |
| | Teacher 4 | 8 Years | None | All Subjects | 2 |
| Chisomo Primary School | Head Teacher | 16 Years | None | Mathematics | 7 and 8 |
| | Teacher 1 | 5 Years | None | All Subjects | 1 |
| | Teacher 2 | 3 Years | None | All Subjects | 2 |
| | Teacher 3 | 2 Years | None | All Subjects | 1 |
| Chikondi Primary school | Head Teacher | 14 Years | None | Not Applicable | - |
| | Teacher 1 | 1 Year | None | All Subjects | 2 |
| | Teacher 2 | 6 Years | None | All Subjects | 2 |
| | Teacher 3 | 4 Years | None | All Subjects | 1 |

## ICT Interventions in use at the case study schools

The ICT interventions that were operational in the schools at the time of this study were the Interactive Radio Instruction (IRI) and the Tablet-based Instruction (TBI). The use of IPods at Chisomo Primary School and the Hand-held Video players at Chikondi Primary School was discontinued after the end of their respective pilots, and before the study participants joined the schools:

> *I just heard that before I came here there was a similar project, but I am not sure how it used to operate. Most of the teachers that were here then have been transferred to other schools and others got promoted to become heads of other schools… I only found the radios and the tablets, but the radios have not been working… (Head teacher, Chikondi Primary School)*

The head teacher for Chisomo Primary School had no knowledge of any other ICT-based intervention that was undertaken at the school prior to the introduction of the radio and the tablets:

> *The school may have other projects before, but I only know about the tablets and Tikwere. May be if I could look for old documents or if I can ask teachers that have been here for a very long time, they may know more about these things. (Head teacher, Chisomo Primary School)*

It was noted that Chisomo Primary School and Chikondi Primary School no longer had available any of the provisions of their other respective projects, namely Interactive Video and the *Tiphunzire Limodzi*. Ironically, the project documents that were sourced from the MoEST (Tiphunzire Limodzi Report on Using Technology in Malawi Primary Schools and The Potential of Mobile Technology within Basic Education in Malawi) identified Chisomo and Chikondi Primary Schools as schools that participated in the respective projects. It was also noted that the offices of the head teachers had no traceable records, documents or reports of the past or present ICT-based interventions. The findings on the ICT interventions that were operational in the schools at the time of this study, the Interactive Radio Instruction (IRI) and the Tablet-based Instruction (TBI) are presented in the following sections.

### *Radios*

From the interviews with the head teachers of the schools, the study found out that all the three case study schools were each provided with wind-up/solar Freeplay Lifeline radios for Tikwere IRI for each class in standards One, Two and Three:

> *We were provided with winding radios for each class in standard one, two and three. We were also given user manuals on how to use the radios during 'Tikwere' lessons. The manuals were like teachers' guides for the 'Tikwere' lessons. Teachers were supposed to tune in to the radio broadcast every morning. (Head teacher, Chisomo Primary School)*

*The lessons are broadcast from MBC[6] every morning for 30 minutes each for standards one, two and three… teachers and the learners follow the radio instructions. We were provided with solar powered radios to use for 'Tikwere' and each class had one radio. (Head Teacher, Chikondi Primary School)*

During the third term of the 2014/15 primary school calendar (April to July 2015) the researcher listened to and followed the IRI lessons that were broadcast by the public broadcasting house, Malawi Broadcasting Cooperation (MBC). The broadcast session for each level (Standard, 1, 2 and 3) was 28-30 minutes long, and it included three short lessons (8-10 minutes each) in Mathematics, Chichewa Literacy, and English. However, it was not possible to observe the Tikwere IRI lessons in the case schools during this study because all the three schools indicated that the Radios had developed faults and had not been used for more than one academic year:

*So far it was a good experience using 'Tikwere' radio program as it was guidance to teachers, motivating leaners and it was encouraging uniformity in form of school curriculum, like a guide for all the teachers. Currently they have not been using 'Tikwere' radios for the whole of 2014 and 2015, since they are not functioning (Head teacher, Chimwemwe Primary School)*

While the teachers identified other challenges on the use of radios, they highlighted the delay in repairing the radios as the major reason for stopping to use the Tikwere IRI.

*Due to the overcrowding of classes, some were not able to hear clearly due to the noise made in the class and also some of the radios had sound problems. The other thing is; it was taking longer time to repair the faulty radios when they were reported to the authorities. Due to this, most of the radios were just left unrepaired since we were not allowed or given permission to repair them on our own. This gave a wrong impression to the learners and parents that 'Tikwere' radio program has come to an*

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[6] Malawi Broadcasting Cooperation – The Malawi Public National Broadcasting Station

*end hence bringing frustration to the learners and us teachers (Teacher 2, Chisomo Primary School)*

This assertion is supported by the Tikwere IRI Evaluation Report (2012) which indicates that when radios are broken or appear broken, the teachers notify the Head Teacher, who, in turn, informs the PEA, who again, in turn, takes the radios to the District Education Office. The Tikwere Division Outreach Coordinator (DOC) at the district office was responsible for taking them to Blantyre[7] for repair and bringing them back to the school. Teaching and learning was, therefore, expected to continue without the radios. This was frustrating to most teachers and all the three schools had since completely stopped using the Tikwere IRI:

> *In the beginning, we had doubts if the radios will work with this program but by and by as we went on we got used to teaching using Tikwere radios and we found it ok but at first it was difficult since it was a new thing. However, one radio was insufficient for our big classes and we just stopped using them because of faulty radios which were taking long to be repaired once they were damaged (Teacher 4, Chimwemwe Primary School)*

> *I have been a Head here for two years, this is my third year and since I came here radios have never been used. Most teachers are frustrated, and their attention has shifted to the new projects like the tablets and EGRA[8]... (Head teacher, Chikondi Primary School)*

However, MoEST expected all the public primary schools to be using Tikwere IRI in standards one, two and three and it continued to pay for the broadcast of the IRI lessons on MBC:

> *Government, through the Ministry of Education, has been running adverts recommending that IRI should be used in every public schools and there are indications that they will roll it out to all classes at primary school level beyond the lower classes (Head teacher, Chisomo Primary School)*

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[7] City in Malawi, approximately 400Km away from the case study schools
[8] Early Grade Reading Assessment – An intervention for assessing and improving reading skills in Standards 1-4

*Some parents and school committee members have been asking why we are not using Tikwere yet they have heard announcements on radio saying that every school has to be using the radios...But they understand why we are not using them, it is beyond our control... (Teacher2, Chikondi Primary School)*

**Tablets**

Observations on the ICT facilities of the case study schools revealed that each of the three schools was provided with a newly-built ICT resource room within the school but detached from the main school buildings. Each resource room accommodated up to 25 learners at a time, with each learner individually using tablets connected to personal headsets. A class teacher was present in the Resource Room during the tablet-based instruction sessions primarily to assist the children with using the tablets. The tablets used in all the case study schools were iPad Minis. These were deemed suitable because of their size which made them handy to young children who were expected to use them whilst seated on a floor mat. Each school had 25 iPads and a solar power system for charging, all housed within the tablet-based instruction (TBI) resource room. Each of these rooms had the following provisions:

*Table 7 - Tablets Resource Room provisions*

| Item | Description | Quantity |
|------|-------------|----------|
| Room Size | Approximately 6m x 10m | 1 |
| Tablets | A 7.9inches screen iPad mini with a protective leather case | 25 - 30 |
| Headsets | Sonun stereo headphones with 120cm cable | 25 - 30 |
| Solar Unit | Solar charged batteries and panel | 1 Each |
| Server | Solar powered server | 1 |
| Printer | Portable instant printer | 1 |
| Furniture | Teachers' desk and chair | 1 Each |
| Shelf | iPad storage and charging shelf with 25-30 slots | 1 |

While learners sat on a floor mat in the TBI resource room when using the tablets and the teacher sat on a chair and a table in the front section of the room from where she was able to use a tablet to control and monitor learners' activities and achievements respectively. Figure 9 shows the room soon after a group of learners had just left, and the teacher had gone to class to call names of another set of learners to come to the resource room.



*Figure 9 - Tablet Resource Room setup*

All the tablets were configured and connected wirelessly to a server that kept learners' progress data and also connected the learners' tablets to a teachers' dedicated tablet that the teachers used to monitor learners' progress.  The server was connected to a portable instant printer that printed certificates as rewards for learners after they successfully completed a TBI lesson within that session. The server and the printer were solar powered, and the tablets were recharged after the school hours from solar power storage batteries. The solar power storage batteries were charged using a solar panel that was installed on the roof of the resource room.

## School Guidelines for ICT Integration

The study found out that the schools did not have their own specified guidelines on how the available ICTs could be used to support any curriculum-based activities.  The Head Teachers indicated that the schools did not have any guidelines in place on how they would use different ICTs for teaching and learning:

> *As a school, we are not involved in the monitoring of the interventions. The intervention implementers come and meet the teachers to discuss their experiences. When the teachers have any challenges, my responsibility is to facilitate communication between the teachers and the ICT providers... (Head teacher, Chimwemwe Primary School)*

> *We are simply implementers, we do not have our own plans on how to use or implement these innovations. As a school, we do not have any framework or policy on how to use the technologies that are provided to us. We just agree to the terms and conditions that are just verbally explained to us since they come together with our bosses from the Ministry, Division[9] or Headquarters[10]. (Head teacher, Chikondi Primary School)*

Documents that provided formal guidelines for all teaching and learning activities in the schools were analysed in order to investigate how they influenced the school level ICT implementation activity. The Curriculum Documents (Syllabus, Teachers' Guides and Textbooks), National Education Standards, School Improvement Plans were the only available documents available in the schools that provided direct institutional, regulatory and formal frameworks to support all the teaching and learning activities in the schools during this study.

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[9] Education Division
[10] MoEST Headquarters

The Syllabus and the Teachers' Guides were the only documents that provided suggestions and recommendations on teaching and learning resources that could be used by the schools and teachers to support instruction on specific learning outcomes. All the suggested and recommended teaching and learning resources in the syllabi and the teachers' guides were assumed to be locally available within the schools and did not include the use of IRI or Tablet-based Instruction, radio in general, or any other ICT tools. The interviews with the head teachers revealed that the IRI and TBI were provided as special lessons that were not part of the teachers' schemes of work that the head teachers periodically checked:

> *The Tikwere IRI does not always synchronise with what the teachers planned in their schemes of work… We used to have a special period for Tikwere on the timetable and all lessons were ending 30 minutes later than usual…The same with the tablets, and because the numbers are many, we just take 25 learners in turns during each period to the resource room while the rest continue to learn in their classroom (Head Teacher, Chisomo Primary School).*

> *There were some challenges been met with the use of Tikwere radio, the speed of teaching from the radio was a bit faster hence it was hard for the teachers to teach since some pupils are slow learners, so teachers had to add some more hours to teach them properly but by then most learners are already tired and had lost focus on the subject (Head Teacher, Chimwemwe Primary School).*

The lack of the school-based ICT integration guidelines presented the schools with challenges to accommodate the different requirements for integrating different ICTs, as highlighted by one head teacher:

> *It would have been difficult to combine the radio and the tablets. Since all these require special conditions, teachers would have to choose which one they would prefer. There was an instance when both the radios and the tablets were working, and it was very difficult for the teachers and their learners to coordinate the two*

*learning environments correspondingly on top of their normal lessons (Head Teacher, Chikondi Primary School).*

## School ICT Leadership

The Malawi education system follows a decentralised management paradigm, where power and most decision-making processes are expected to be more profound at the local level. Each of the case study schools had a Parents and Teachers Association (PTA) that served as a School Management Committee (SMC) and helped in providing leadership within the school. However, according to the head teachers, the school management committees are not involved in teaching and learning related activities:

> *These community school management committees are active and meet monthly and one or two members are always available within the school once a week. These community committees are helpful in school management as they take an active role in ensuring that pupils are enrolled and persevere in school, they also help solve minor discipline and maintenance problems and they work as a bridge between the community and us[11], but not how teachers are handling their lessons… (Head Teacher, Chimwemwe Primary School)*

This observation is supported by the Tikwere IRI Report of 2011 which indicated that the local school management committees were not directly involved in the Tikwere IRI program because they were not necessarily given the power or incentive to keep track of classroom activities. This appeared to be the general separation of roles, with parents neither having nor expecting to have such roles in instructional activities in general. Parents generally saw teachers as being concerned with classroom work while they (the parents) helped with infrastructure development and school improvement plans. However, the infrastructure development and school improvement plans are done on small

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[11] The leadership of the school

scale because of limited funds hence ICT infrastructure development and implementation are beyond their scope, as observed by one of the head teachers:

> *We develop and revise our school improvement plans in order to manage funds that the school may have which parents contribute for small projects such as procurement of teaching and learning materials like chalkboards, cleaning materials and small equipment for use at the schools. We cannot afford to buy expensive resources like radios, computers or tablets… (Head teacher, Chikondi Primary School)*

The study also established that the school management and the Head Teachers had no role in either developing nor managing or monitoring the ICT interventions activities within the schools and only acted as conduits of information:

> *Each intervention brings in its own management structure. For example, for the tablets if they are faulty, then the teachers have to directly report to the providers. I have never been trained on how to use the tablets, I am only responsible for ensuring that the resource room is secure and that teachers have access to it when they need it…I just provide them with airtime to call the number they were provided to call when they need support… (Head Teacher, Chimwemwe Primary School)*

> *As school management, we are not necessarily given the power to keep track of these ICT interventions. They bring the interventions through my office as head of the school but do not place any responsibility in managing or monitoring them. (Head Teacher, Chisomo Primary School)*

> *It is difficult to make decision relating to these technologies because we are not given responsibility. For example, under the school improvement plans, we could have been able to repair the broken-down radios or tablets using the small grants from parents, but we are not allowed to. (Head Teacher, Chikondi Primary School)*

An analysis of the Tikwere IRI Report and the Tablet-based Instruction Project (Unlocking Talent through Technology) documents revealed that head Teachers

and school management committees were not included in the programme implementation or management structure and did not have any role in the project management or oversight, project steering or the intervention's performance monitoring and evaluation.

## School-based Technical Support

All the three schools identified found problematic lack of school-based technical support from government and the ICT providers as a factor militating against their effective utilisation of ICT interventions in their teaching and learning activities. One of the teachers highlighted the following:

> *We only get administrative support from school management but for the lessons the school management does not have any idea, they do not know what we do here in the resource rooms because they have never been oriented, we are the only ones who have the technical knowledge and we coordinate ourselves and make a phone call to the technical person who comes to address whatever challenges we face, though she takes a couple of weeks to come from overseas (Teacher 3, Chimwemwe Primary School)*

Similarly, another teacher said:

> *It happens that, for example, the I-Pads, we do not use them because there is a software problem and we have to wait for an expatriate who most time we are told she is in London. So, for her to come and fix the software problem it takes too long. I wish the Ministry had a person attached to the schools to able to fix them immediately instead of us waiting for someone (Teacher 1, Chisomo Primary School)*

Another teacher explained that they mostly depended on a fellow teacher for technical support and it still proved to be challenging:

> *We do not get any support when these technologies break down or are not working properly. Most of the time we really on our fellow teacher Mrs Samson who helps us to figure out what to do*

*but she also forgets and most of the times she is also busy with her own teaching (Teacher 3, Chikondi Primary School)*

These assertions were consistent with the findings from the remarks the teachers and the head teachers made on why the schools stopped following Tikwere IRI lessons (See **Radios** from page 123).

## Awareness of the TBI intervention amongst teachers

The study found that teachers and head teachers had limited knowledge and understanding of the TBI intervention objectives, stakeholders (community), and their respective roles (division of labour). *Table 8* summarises teachers' responses on the aspects of the TBI interventions in the schools.

*Table 8 - Participants' Awareness of the TBI Intervention*

| Aspect of the TBI Intervention | Chimwemwe Primary School | | | | | Chisomo Primary School | | | | Chikondi Primary School | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | HT | T1 | T2 | T3 | T4 | HT | T1 | T2 | T3 | HT | T1 | T2 | T3 |
| **Objectives** | x | x | X | x | x | X | x | x | x | x | x | x | X |
| **Stakeholders** | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| **Roles** | √ | √ | X | √ | √ | √ | x | √ | x | x | √ | √ | X |

**Key**     *X = Do not know*
             *√ = Know*

Table 8 shows that all the teachers indicated that they did not know the objectives for using the TBI lesson with their learners.  Below are excerpts from responses from some of the teachers:

*I was at first teaching in Standard 5 and when some teachers were promoted they were transferred to other schools, so last term they just assigned me to teach in standard 2, where I found these gadgets, I was never oriented on how to use them and why, my colleagues just helped me on what to do when I go with the learners to the tablets room… (Teacher 1, Chisomo Primary School)*

*When they came, they told us that we will be using these tablets with the learners. They also explained how we can use them, charge them and the groups of learners and the timetables. May be the ministry[12] knows…by that time the head was also teaching Standard 2. So, we are just using them as we were told (Teacher 1, Chikondi Primary School)*

*I don't know. Maybe those who were trained by the owners[13] of the project because I found them already here. I did not see any documents explaining that. My friends just helped me how to use them. May be if there were refresher trainings (Teacher 2, Chimwemwe Primary School)*

Similarly, the Head Teachers indicated that they were not aware of the specific objectives of the TBI intervention:

*We were only told that our school has been chosen for this intervention and teachers were explained on how to use the tablets. Our main responsibility was to ensure enough security and cleanliness of the resource rooms. They came with the DEM and other people from the ministry so maybe they were given documents about the programme - (Head Teacher, Chikondi Primary School)*

*I am new to the school and I did not find any documents in my office. So, I only ensure that the room is secure and accessible to the teachers and learners. I only know what they do, and the classes involved, but I do not even know how to use those tablets - (Head Teacher, Chisomo Primary School)*

While all the teachers and head teachers indicated that they knew the stakeholders and their respective roles in the TBI interventions, a close analysis of their responses revealed that they only knew about the intervention sponsors:

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[12] MoEST
[13] NGO ICT providers

*Yes, VSO who constructed the resource room and provided the tablets. We also call them when the tablets are faulty…I also assume that the ministry is involved because they came together with some ministry officials when they came to launch the project, but I don't who is involved and what they do (Teacher 2, Chikondi Primary School)*

*I am not involved as head teacher, even when the PEA comes, they do not get involved with what happens at the VSO room. The teachers talk directly with the people at VSO when they have problems and they come to meet them. Maybe at the higher level, other offices are involved but on at school level (Head teacher, Chimwemwe Primary School)*

*I don't know. I can't tell. The thing is, we do not get involved when planning for these things, so they just come and tell us to do ABC… so we just do as they say. They gave us a number to call when we have problems, so the head gives us the phone units to call them, that's all (Teacher 4, Chimwemwe Primary School)*

However, the TBI project documents (Unlocking Talents Through Technology documents) indicated that primary objective of the TBI interventions in the case study schools was to improve attainment of literacy and numeracy core competencies. The intervention aimed at integrating technology in the primary school curriculum and teaching methodologies in order to develop learners' achievement of the learning outcomes and to provide digital education technology literacy. The documents also provide the intervention monitoring and management structure, that included a District Commissioner, District Education Manager, Primary Education Advisors, a representation of Head Teachers, VSO Project Manager and VSO volunteers. While the project documents provided relevant information on the TBI intervention objectives, stakeholders, and their respective roles, these documents were not available at the case schools of this study.

## Access to the TBI Resource Room

Each of the classes (Standards 1 and 2) and each stream (1A, 1B, 1C and 2A, 2B, 2C etc.) was divided into groups of 25 learners (with both boys and girls) that were, in turns, taken to the resource room by the teacher during each timetable period (40minutes). Figure 10 shows the TBI resource room timetable for one of the case study schools.



*Figure 10 - TBI Resource Room Timetable*

It was observed that there was need for two teachers for each class to effectively facilitate the access to the TBI Resource Room – with one teacher taking a group of 25 learners to the resource room for a TBI lesson and the other teacher remaining with the rest of the learners in the classroom. This observation was also supported by all the teachers during interviews; they indicated that if only one teacher was present for each class, it was not possible to access the TBI Resource Room and facilitate the TBI lessons:

> *We have got a time table for Standard 1 and 2…the other day they start the standard 1s and the other day the standard 2s… but it only works when we are two teachers present so that one stays in class while the other is at the gadgets room. But suppose you are now one, it means that there will be a problem, like the way things were*

*today before my colleague came in, I was not able to take my learners to that room because I had no one else to take care for my class (Teacher 1, Chimwemwe Primary School)*

While the arrangement presented by Teacher 1 from Chimwemwe Primary School seemed to work effectively in a school that had more than one teacher per class (stream), it proved very challenging in schools that had few teachers:

*Like in my case I have more than 200 learners in my class but I am their only teacher, so when it is my day to take my learners to the resource room, there is no one to take care of those who remain in the class, they stay without a teacher since I can only take 25 learners per period and by the end of the day I can only take four groups. (Teacher 3, Chimwemwe Primary School)*

In some cases, teachers chose to combine their classes (streams) into one big class to enable the one teacher to facilitate the TBI lessons while the other was teaching the normal classroom lesson:

*We arrange to be 2 teachers per class, but we are supposed to be 1 per class, but due to the shortage of teachers we combine the classes to become double, like A and B, one class, C and D one class so that one of us should be able to take the learners to the resource room (Teacher 2, Chisomo Primary School)*

## School Context Tensions

Interpretation of the findings at the school level presents contradictions that explain how the tensions that exist within and between elements of the ICT interventions in the schools' implementation system. The findings reveal the NESP as a document that acted as a resource for the primary schools in the ICT interventions implementation activity; improving teaching and learning resource as the goal or motive of the ICT interventions in the schools; and the ICT interventions providers as the only key stakeholders directly involved in the school ICT implementation activity. The schools do not have any formal or

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informal regulations that effected how the ICT interventions implementation activities occurred, and apart from the teachers, no one else was involved. The school ICT implementation system is, mapped in *Figure 11*.
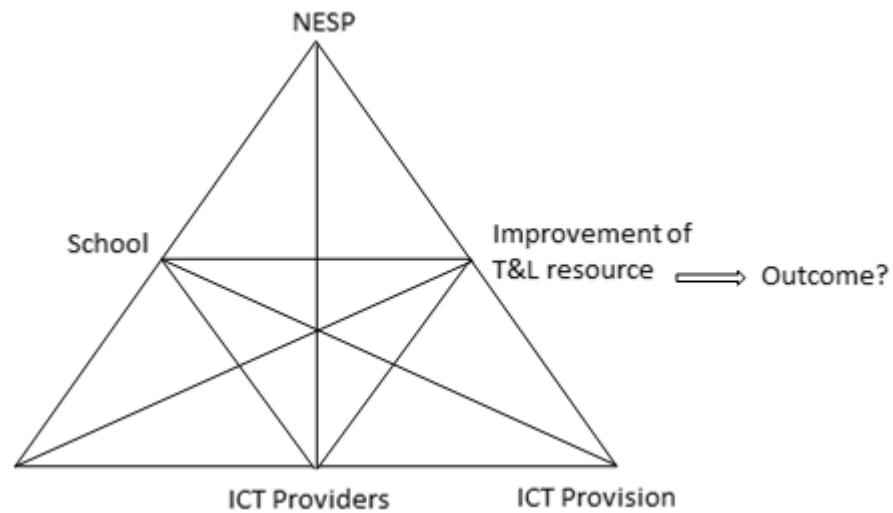


*Figure 11 - ICT implementation Activity System*

This activity system analysis reveals the gaps in the implementation of ICT interventions, that the schools do not have any ICT Plans or guidelines on which to base their decision-making and planning processes in order to support successful adoption and utilization of the interventions by teachers. In addition, the school Management Committees and the Teacher Development Centres were not involved in the development, monitoring and evaluation of school ICT plans and guidelines nor in the provisions of zone level ICT Continuous Professional Development programs for teachers respectively. These are missing links that caused tensions in the structure of ICT implementation in the primary schools and, therefore, affecting how ICT interventions are used in the classrooms. While the ICT interventions providers seek to improve the quality of the teaching and learning inputs in the schools, these gaps present tensions between what the ICT providers expected from the schools and vice versa, with schools trying to accommodate different demands and expectation from different ICT interventions

while not having their (the schools) own ICT plans and not involved in the designing of the interventions.

Figure 12 highlights the tensions between the lack of the school-based ICT integration guidelines in the schools and the schools as the ICT intervention implementers (**Tensions A**) and the tensions between the lack of guiding frameworks from NESP and the schools and the school ICT implementation community (**Tensions B**). These contradictions reveal further tension due to the subsequent lack of leadership support from school management and the unguided efforts and collaboration between the schools and the ICT intervention providers as explained in subsequent paragraphs.
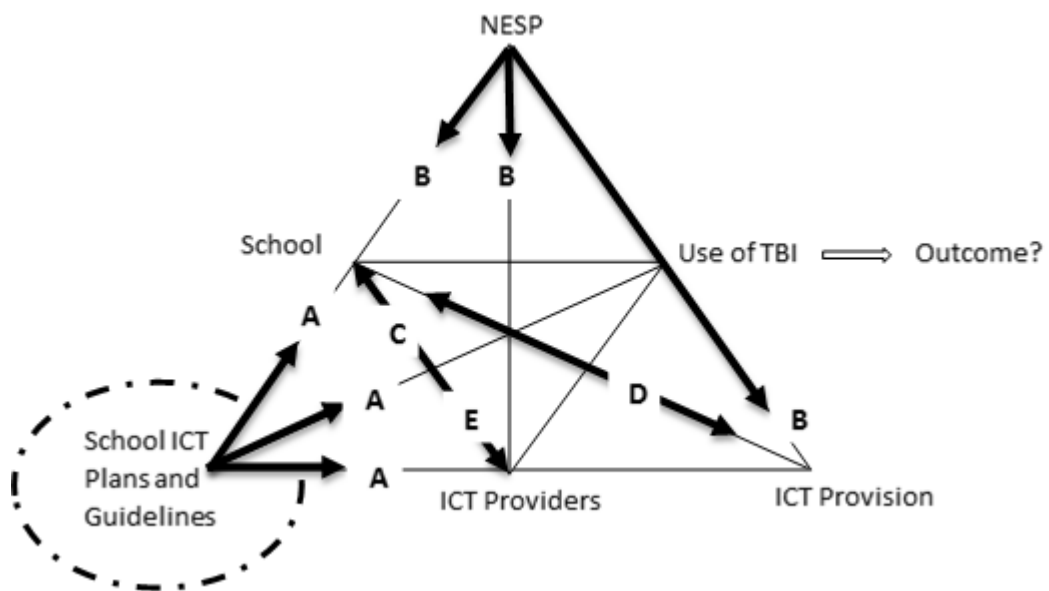


*Figure 12 - ICT Implementation Activity System Tensions*

The lack of school-based ICT integration guidelines presented tension in the school ICT interventions implementation system since schools had to accommodate the different requirements for integrating different ICT interventions (see **Tension C** in *Figure 12*). This, coupled with the finding that the NESP does not provide any guidelines for ICT implementation, meant that the

schools depended on whatever the ICT intervention providers brought and required from them. The available ICT interventions were not used to support the already existing teaching and learning activities or fit into the existing school standards but rather required that the schools make special arrangements to accommodate the respective teaching and learning settings for the specific interventions. This highlights the tension that existed between the schools as subjects of the system and the provision of ICT interventions in the schools (See **Tension D** in *Figure 12*). As indicated by the head teachers, the schools did not have their own specified guidelines on how the available ICTs could be used to support any curriculum-based activities. The implication of this observation could be that, considering that the MoEST did not have any frameworks for the implementation of ICT interventions in the schools, it has been difficult for the schools to have their own guidelines or frameworks, especially bearing in mind that all public schools are governed by policies from Malawi central government.

Furthermore, the gaps in the NESP and the absence of school-based ICT integration guidelines presented the schools system with more forms of tension on how the school management performed their roles in the ICT implementation system. Since the schools were left to implement the ICT intervention without any guidelines, there were tensions between the ICT providers and the school management, who ideally would have been key stakeholders in the implementation of the ICT interventions in the schools (as presented under the section on 'Context for the implementation of ICT Interventions', page 170).

An analysis of the interviews has revealed that the school management structures had no role in developing, managing and monitoring the ICT interventions activities within the schools. They only acted as channels of information while the ICT providers worked directly with the teachers. This further illuminates the tension between the schools and the ICT interventions providers because the Head Teachers felt that the ICT interventions were beyond the scope of the school

management committees as they were not involved at any stage of the designing and implementation or monitoring and evaluation (See **Tension E** in *Figure 12*).

# Research Question Three – Integration of ICT interventions in classrooms

This research question investigated the integration of the ICT interventions in the classroom activities. The question specifically looked into how the conceptualisation of ICT intervention (the findings in research question one) and their implementation context, as obtained in the schools (research question two) configure classroom activities and processes (classroom ICT integration):

*How does the national concetpualisation process and the school ICT interventions implementation contexts mediate the teachers' classroom integration processes and practices?*

Findings relating to research questions one and two were used to extract, analyse, generate and relate meanings from the teachers' classroom practices, activities and processes to draw the following findings on access to the access to the Tablet-Based Instruction (TBIs), synchronization of TBI to the curriculum activities, TBI classroom management and TBI classroom tensions:

## Access to the Tablet-Based Instruction

During the study, twenty TBI lessons from ten different teachers from the three case study schools; 8 lessons from Chisomo Primary School, 6 lessons from Chikondi Primary School, and 6 lessons from Chimwemwe Primary School were observed. All the twenty lessons were based on learners' interaction with the TBI. When a teacher brought a group of learners from the classroom to the resource room, she activated the learners' tablets from a dedicated teacher's tablet to enable the learners to use them. The tablets presented interactive mathematics video lessons in Chichewa, Malawi's most widely-spoken local language, covering the Standard 1 & 2 curricula. Each learner had a personal profile on the server and

on the tablet from where he or she was able to choose his or her name or profile picture (his/her face picture) to log in to the lessons on the tablet.

When a learner logged into the tablet-based instruction, he/she was able to choose an activity-based interactive lesson from a menu of different lessons. During each group session, it was possible for each learner to follow a lesson that was different from a lesson that any other learner could have been following and the teacher had no control on which lesson the learners should follow. Figure 13 shows a TBI session with learners of the same class following different TBI lessons.



*Figure 13 - TBI session with learners following different TBI lessons*

The learners followed and performed the TBI and respective activities at their own pace, guided by an interactive virtual teacher-character that demonstrated instructions, explained activities and provided feedback to the learners. Every learner who successfully completed a lesson was rewarded with an accomplishment certificate that was automatically printed through the server.

## Synchronisation of TBIs to the curriculum activities

The study found out that the TBI lessons covered the standard 1 and 2 Mathematics curricula and supplemented the textbook based instruction.

Teachers observed that learners were able to transfer and apply the knowledge from the TBI to the classroom lessons. One of the teachers explained that:

> *In the learners' books there are no pictures, the learners see them here from the tablets, let's say when they can draw three beans, and that learner can see and count the three beans, and when they are back in the classroom and are asked to draw beans they easily draw on the chalkboard three beans, two beans… (Teacher 1, Chimwemwe Primary School)*

Another teacher observed that the lessons presented through TBI helped learners to easily understand concepts that they otherwise found challenging:

> *One good thing I have observed is that, with the tablets, learners are able to catch up with other skills apart from learning mathematics because of the visual, for example they are able to easily identify colours, match items and identifying numbers... especially standard 1 learners, it was very difficult for them to identify colours and numbers but now they are able to because they seem them on the tablets. (Teacher 2, Chisomo Primary School)*

However, the study significantly found that TBI lessons were not aligned to the classroom lesson as learners were allowed to carry out differentiated learning. Teachers also felt that learners who go to the TBI resource room miss out the concepts that are covered in the classroom lessons. This was also evident during the lesson observations as indicated by one of the teachers:

> *It is difficult because for the learners, if one (Teacher) is here (at the TBI Resource Room) one is there (in the main classroom) with the learners and the learners that are here miss also some subjects that are being taught in the classroom during the time they are here... (Teacher 2, Chikondi Primary School)*

Furthermore, it was found that teachers had problems assessing learners' progress because of the differentiated learning levels amongst learners when they were learning though TBI, on the one hand, and the knowledge gaps between

what was learnt at the TBI resource room and what was covered by the other learners who remained and learnt in the classroom, on the other hand.

> *…but only if the lessons, the lessons that are in the tablets, could tally with the lessons in our classrooms, since they are different, that is where there is a problem, because the children are learning different things and when assessing their learning there are gaps because they all have missed different parts of the curriculum on different days of the term (Teacher 3, Chimwemwe Primary School)*

## TBIs Assessment Processes

The study found that TBIs presented parallel Learner assessment processes, where Learners were subjected to two different assessment regimes. The TBI had assessment tasks that learners performed in order to successfully complete a lesson while teachers also assessed learners based on the classroom instruction, as indicated by *Teacher 3* from Chikondi Primary School:

> *Whatever we do at the resource room with the tablets ends there, in class we teach and assess learners based on the schemes of work, based on our normal classroom lessons, because the lessons are different, so whatever happens there ends there and whatever happens in the classroom ends in the classroom. (Teacher 3, Chikondi Primary School)*

There was evidence that teachers did not have access to the assessment records from the TBI lessons hence their inability to follow individual learner's progress under the TBI lessons as they would do with the classroom lessons:

> *The owners of the project, they have access to the assessment records, they come to tell us that on such such a day this learner got a certificate, on counting numbers this learner has a certificate on matching objects, but we don't have those records (Teacher 3, Chimwemwe Primary School)*

> *We don't assess what they learn from the tablets; they[14] come with their computers and analyse that information because everything*

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[14] NGO ICT Intervention Providers

> *is there in the tablet and in this[15], we only know when a learner's certificate comes out from that printer, but this (the server) has all the records of who is successful on what and who is not (Teacher 1, Chikondi Primary School)*

This is consistent with the findings on how the TBI lessons did not synchronise with the generic classroom lessons where teachers indicated that they had problems assessing learners' progress owing to differences in the teaching and learning levels and progress amongst and between the TBI lessons and the generic classroom lessons.

## TBI Class Management

Teachers identified challenges in class management during the TBI lessons. The observed lessons revealed that the teachers had to share responsibilities in order to find means for managing their large classes, where one teacher had to take part of the class (25 learners) to the TBI Resource Room, leaving the remainder of the class with another teacher in the classroom. *Table 9* presents the order of activities teachers undertook when facilitating the TBI lessons:

*Table 9 - TBI session with learners following different TBI lessons*

| Order of Teacher's Activity | Respective Learners' Activity |
|---|---|
| Opens the TBI resource room | None |
| Identifies which group of learners to bring to the TBI resources room, according to the already set groups (each group has 25 learners of both sexes) | None |
| Goes to classroom to call names of the learners of the group | Listen and respond to their respective names |
| Takes the learners to the TBI resource room | Follow the teacher to the TBI Room |
| Instructs learners to sit down and distribute the Tablets and headsets | Sit down and receive the tablets and headsets |
| Activates learners' tablets from the dedicated Teacher's Tablet | None |
| Gives instruction to the learners on how to log in to their respective profiles | Listen and log in to their respective profiles |
| Helps learners who have problems logging in | Log in to their respective profiles |

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[15] TBI Resource Room Server

| | |
|---|---|
| Instructs/reminds learners on how to connect the headsets and put them on | Connect headsets to their Tablets and put them on |
| Instructs learners to choose any available activity (lesson) under their respective profiles | Choose a lesson activity |
| Helps learners who have problems connecting headsets | Connect headsets to their tablets and wear them |
| Instructs learners to follow their respective TBI lessons | Follow and perform activities on their respective TBI lessons |
| Monitors learners' activity and progress from the Teacher's dedicated Tablet | Follow and perform activities on their respective TBI lessons |
| Announces and congratulates learners who successfully complete a TBI lesson | Congratulate successful colleague(s) and continue to perform activities on their respective TBI lessons |
| Informs the learners when the TBI lessons time is over | Stop following the TBI lesson |
| Deactivates the learners' tablets using the Teacher's dedicated tablet | None |
| Instructs learners to go back to their classroom | Leave the TBI resource room and go back to their classroom |
| Identifies another group of learners to bring to the TBI resource room according to the already set groups | |

Therefore, while one teacher had to take learners in turns to the TBI resource room, another teacher had to sit in her/his class to take care of the rest of the learners. However, this could not be possible when there was only one teacher present per class, as earlier discussed under Access to the TBI Resource Room (See page 136). In such cases, the study found that teachers combined their classes (streams) into one big class so that one teacher is able to facilitate the TBI lessons while the other teacher(s) was/were teaching the generic classroom lessons.

## Classroom Technical Support

The lesson observations revealed that the main role of the teacher during the TBI lesson was to offer technical support to learners - on how to log onto their profiles, connect headsets, and increase/reduce volume and to attend to any other hardware problems. However, teachers also indicated that they depend on fellow teachers whenever they need technical support:

*We get some technical support from our colleagues, the ones who have been using the tablets for a longer time or those who have their own tablets for their personal use; they helped us to start using them because they were already experts and when we have some problems we ask for their support… (Teacher 2, Chisomo Primary School)*

Nevertheless, teachers felt that they needed more technical support from dedicated technical personnel during their lessons because the support they received from fellow teachers was limited; in most cases, the other teachers were also attending to their classes and, therefore, they could only be consulted after their teaching hours:

*The support from our fellow teachers who help us to figure out what to do is not adequate because most of the times they are also busy with their own teaching. We have to wait for them to finish their teaching to help us. If we had someone for that job he could come immediately or be with us during the lesson at the tablets room to be helping solve the problems with the software... (Teacher 4, Chimwemwe Primary School)*

In this light, the teachers were the only key players in the implementation of TBI lessons at the classroom level. They were responsible for the immediate technical support and classroom management through teamwork and collaboration amongst themselves. However, they highlighted challenges that undermined their efforts to effectively integrate the available ICTs in their daily teaching activities. Though learners were seen to play specific roles within the classroom system, their roles were passive, and they were only receptive to teachers' instructions; actually, they had no active role in the classroom activity system.

## Teachers' Perceptions

Teachers shared a strong perception that the use of the ICT for instruction generated benefits for their learners. They perceived that the use of ICT promoted active learning and captured the learners' attention:

> *Compared to the classroom, when these children come here (TBI Resource Room), maybe you noticed that on your own, they are always eager to come and learn here. You saw them ran to come here and immediately they started paying attention to their activities in the tablets. They like whatever they do on the tablets and they are always happy to come here… (Teacher 2, Chimwemwe Primary School)*

> *As you saw them, they are always focused when they are working on their tablets and they pay attention to what they are doing, which is different from how they behave in the classroom. They are eager to learn and enjoy their learning experience. It is amazing, it is wonderful to see them responsible for their learning…they do really well… (Teacher 1, Chikondi Primary School)*

The teachers also acknowledged that the use of the TBI offered learners with alternative learning opportunities, beyond the classroom chalkboard and textbook based instruction:

> *It is very good. The learners are always interested with learning with the tablets and they easily catch up with things they were finding difficult in class. The learners are able to get supplementary learning materials and activities that help them learn things in a different way and individually --- it is like having one to one lessons with the learners. Plus, they are able to see pictures and diagrams, sounds and music ---so they are learning from all these things… (Teacher 3, Chikondi Primary School)*

Teachers perceived the TBI as fulfilling both their needs and the learners' needs. The teachers in this study were more positive about their attitude towards TBI and their intentions to use the TBI. However, they felt that the TBI lessons are extra work for them:

> *No, we were not trained on any ICT use during our initial teacher training, so it is too much for us. For example, if another teacher who is teaching Standard 3 to 8, next term is assigned to teach standard 1 or 2, she will have problems because she was not trained on any ICT use before and will depend on other teachers to teach her. This is extra work; to learn to use the tablets, to use the tablets and for other teachers to teach you how to use them, it is too much… (Teacher 2, Chisomo Primary School)*

> *I feel this is extra work; I can call it extra work because we were never trained or oriented during our initial teacher training or the CPDs on the use of ICT for teaching. In our college training these things were not there because they know what our work demands, now to be told to do things that we not trained on, it becomes extra work… (Teacher 1, Chimwemwe Primary School)*

While the teachers had positive perceptions and attitudes towards the use of TBI for teaching and learning, without proper teacher training they found it more demanding and challenging to them. They also felt that if it were part of their job, then they should have been prepared for it during initial teacher education and, later, through continuous professional development.

## Class context tensions

Analysis of the school contextual tensions illuminates the effects of the tensions present in the national and school contexts and reveals the contradictions that provide explanations on how the teacher used available ICT interventions. The findings established that teachers were the only individuals involved in the ICT interventions implementation in the classroom; the tablets were the only

available and functional ICT innovation for the teachers in the classroom ICT activity system; the use of TBI with the learners are the objective of the teachers in the classrooms; and fellow teachers are the only key stakeholders that directly supported the classroom ICT integration activity. Figure 14 gives the representation of this classroom activity system.
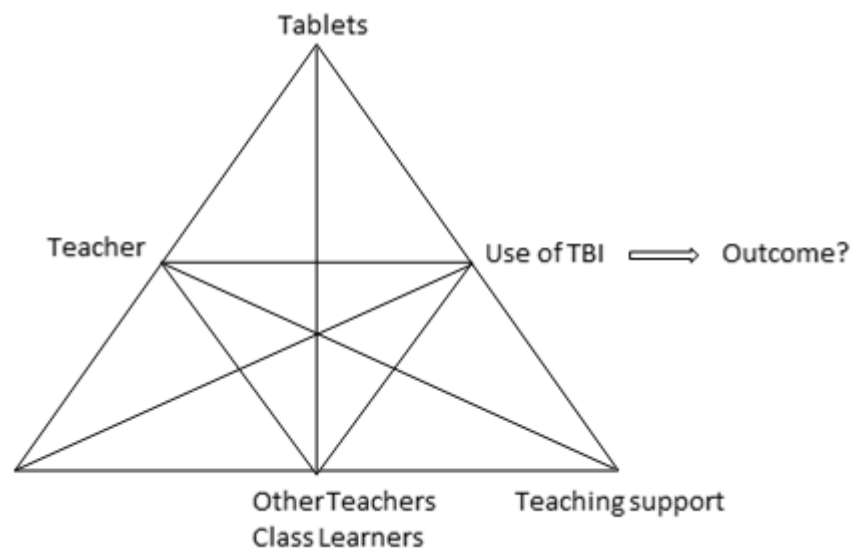


*Figure 14 - Classroom Activity System*

The Activity System Analysis reveals the gaps in the classroom use of the ICT interventions where teachers do not have any ICT related lesson plans or curriculum guidelines on which to base their decision-making and planning processes in order to use the available ICT interventions for teaching and learning. In addition, the teachers did not have any ICT support services to provide technical and logistical support during their use of the ICT interventions in the classroom. These are missing links that caused tension in the integration of ICT interventions in the classroom (see Figure 14).

As illustrated in Figure 14, the classroom activity system did not have any Rules that could mediate between the activity system subjects, community and a

division of labour. Thus, teachers did not have any formal provisions that guided their use of the ICT interventions in their class, and apart from their fellow teachers, no one else was involved in the classroom integration activity. Furthermore, *Figure 14* illustrates that the teachers were the only key players in the implementation of TBI lessons at the classroom level; no one else apart from the teachers and their learners was involved in the classroom activities. The revelation that teachers were responsible for the facilitation of the learning process using the TBI; the provision of immediate technical services; the classroom management through teamwork and collaboration amongst themselves presented tensions between the teachers' use of the tablets and the lack of a school-based support systems such as technical and leadership support (Subject and Community tensions).

*Figure 15* below illustrates the tensions that existed in the Classroom Activity System. It illustrates tensions between lack of the classroom or curriculum guidance and frameworks on the use of the ICT tools in classroom and teachers as ICT interventions users, the actual use of the ICT tool, and the classroom community (Tensions A); classroom community and their role in the use of the Tablets (Tension B); teachers and the role of the classroom community (Tension C); teachers' practice and the use of the Tablets (Tension D); Teachers and the objectives of using the Tablets (Tension E); teachers, class size and the support from other teacher (Tensions F and G). These tensions are further discussed in subsequent sections.
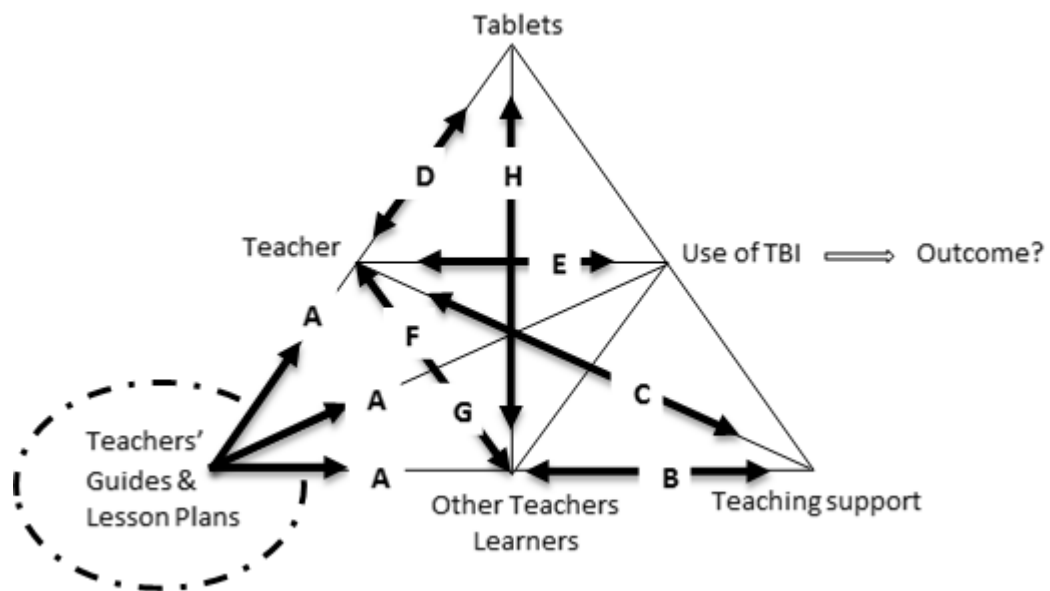
*Figure 15 - Tensions in Classroom Activity System*

### Classroom ICT instructional Guidelines Tensions

*Figure 15* illustrates the tensions between the teachers as ICT interventions users and lack of classroom or curriculum guidance and frameworks on the use of the ICT tools in classroom (Subject and Rules – See Tensions A). The documents that guided the general curriculum activities, such as the Syllabus, Teachers' Guides and Textbooks and the National Education Standards, did not contain anything that could have guided the adoption and use of the ICT interventions in the schools or classrooms. Teachers were, therefore, dependent on ICT intervention providers to provide guidance on how to adopt and use the interventions they are bringing in to the schools. This highlights the various forms of tension that existed between the teachers as subjects of the system and the lack of guidance on how they could adopt and use the ICT interventions for their specific pedagogical needs. Figure 15 highlights this contradiction (see – Tension G and see also the Subject and Division of labour – Tension C). These tensions further reveal more tensions as a result of the unguided efforts and interactions between the teachers

and the ICT intervention providers (Teachers and TBI tensions; Teachers and Objective of Using TBIs tensions; and Teachers, Class size and Technical Support Tensions as presented in the subsequent paragraphs).

*Classroom Support Tensions*

As earlier presented, the ICT providers did not have designated staff for ICT technical support and teachers had to wait for a very long time to have the hardware or software problems attended to. The teachers mostly depended on the technologically savvy teachers for immediate technical support, but this also proved to be challenging as this was not a dedicated role for those teachers, who were also busy with their own teaching (**Tension B**). Teachers were therefore unsatisfied with the support they were getting. Lack of proper set up, service, maintenance and technical advice on the use of ICT resources caused interruptions and could lead to teachers' negative self-reflective perceptions and considerations about further use of the available and the emergent ICT interventions. In addition to the already multifariously demanding work environment, the impositions of ICT system failures resulted in teachers' anxious behaviour towards ICT use. Teachers therefore felt that an effective ICT technical support system would help them to integrate different ICTs into their teaching without wasting time in equipment set-up and troubleshooting hardware and software problems.

*Teachers and TBI Tensions*

The analysis of the findings reveals that while teachers were willing to use the tablets in the teaching-learning process and make use of various ICTs in their schools, they found that the available tools were not synchronising with their pedagogy. While the TBI lessons were aligned to the curriculum, they were not aligned to the classroom lessons (teachers' guides) considering that learners were allowed to carry out differentiated learning and that teachers did not have access

to the assessment records from the TBI lessons. Teachers did not follow individual learners' progress under the TBI lessons as they would do with the classroom lessons. The TBI lesson delivery and learners' assessment, therefore, did not synchronise with the teachers' generic classroom lessons and assessment. This presented tension between the teachers' practice and the use of the tablets (*Subject* and *Tools* tensions - Tension D in Figure 15).

The findings also showed that whenever learners went to the TBI resource room, they ended up missing lessons that were covered in the classroom. Similarly, the findings revealed that the IRI was always either ahead or behind the teachers' planned lessons. It was difficult for the teachers to assess learners based on what they have learnt through the interventions. This reveals that the ICT interventions were not compatible with the teachers' classroom context and existing practices thus affecting the teachers' perceptions of the ICTs' usefulness.

### Teachers and Objectives of Using TBI Tensions

The study also found that teachers and head teachers had limited knowledge and understanding of the TBI intervention objectives, stakeholders (community), and their respective roles (division of labour). While teachers were using the TBI interventions, they did not know why they were using them, and who else, apart from the TBI intervention providers, was involved in the implementation of the TBI interventions. This created tension between the teachers' use of the TBI intervention and the objectives (Tension E in Figure 15). Thus, teachers used the TBI as an obligation and not necessarily to support any identifiable objectives in their teaching practice or pedagogy. This also contributed to the tensions between *Subject* and *Tools* (Tension D) because the teachers' willingness and efforts to use the TBI in the teaching-learning process were not outcome based.

Similarly, teachers felt that the use of the ICT resources that were brought in through the various interventions amounted to extra work because they lacked

the ability to plan and design their own effective teaching and learning environments in the classroom, supported by the provided ICT innovations. This illuminated the gaps in the conceptualisation of the ICT interventions that revealed deficiencies in initial teacher education.

### *Teachers, Class Size and Teacher Support Tensions*

The number of tablets available in each school against the total number of learners the TBI intervention was meant for created other systemic tensions. The findings revealed an average ratio of six learners to one tablet (6:1) per class (stream), while the TBI required personalised interaction (one learner per tablet). There was need for two teachers for each class to effectively facilitate the access to the TBI, one teacher to take 25 learners to the resource room for the TBI lessons, and the other teacher to remain with the rest of the learners in the classroom. This exposes tensions between the Tablet as a tool for the TBI and the learners' class size (Tension F in *Figure 15*). This contributed to tension between the Teacher as a subject of the TBI intervention classroom integration system and Teachers as a community and support service providers in the same activity system (Tension G), and tension between the tablet as a Tool and the teacher as the subject (Tension D), as well as between the Learners and the Tablets (Tension H) – Refer to *Figure 15*.

As presented under the Teacher and TBI tensions, a few learners that had access to the TBI during each specific timetable period missed lessons in the main classrooms and the vice versa. It was, therefore, difficult for the teachers to synchronise the teaching and learning experiences between the two different learning environments. This illuminated tensions between the ICT interventions and the teachers' classroom context and existing practices and could have an influence on the teachers' perceptions and attitudes towards the use of the ICT interventions.

## Summary

This chapter has presented the findings of the data obtained from the interviews, documents analyses, and observations that were conducted in different phases of the investigation. It has revealed that the national conceptualisation and provision of ICT interventions in primary schools lacked national education sector planning, national ICT policies, ICT teacher training and professional development. The chapter has also presented findings regarding the ICT school implementation context which reveal deficiencies in school ICT leadership, available ICT provisions and interventions, school ICT plans and policies, and other ICT support systems. Finally, the chapter has highlighted tensions in teachers' classroom context and observable practices based on national and school contexts. Having accomplished this, the next chapter discusses the contemporaneousness and implications of these findings.

# CHAPTER 5: DISCUSSION OF FINDINGS

## Introduction

This chapter discusses findings of the study presented in Chapter 4 and relates them to the literature review to provide a robust view about issues related to the subject under consideration. The discussion is integrated into two main sections based on the literature review themes and the sets of the activity systems for national, school and classroom activities. These main themes are: the conceptualisation and introduction of ICT interventions in Malawi primary education system, and the implementation of ICT interventions in the schools.

## The conceptualisation and Introduction of ICT interventions in Malawi primary education system

This section discusses, primarily, the complexities that exist within the ICT context for ICT implementation by analysing the configuration of events, activities, contents, and processes in the conceptualisation of ICT interventions in the primary school education system. Activity System Analysis was used to extract meaningful information and generate interpretations from massive and complex qualitative data sets and to conceive how the ICT interventions are conceptualized, introduced and entrenched within the primary school education system (Yamagata-Lynch 2007). The discussion theorises the findings to reveal how ICT interventions should be conceptualised in Malawi primary schools based on the literature review.

The presentation of findings of the present study has revealed that ICT interventions are conceptualised and introduced into the school system through unguided and unregulated processes, with teachers who are not only unprepared for ICT uptake but also have limited access to ICT professional development. These findings relate to the factors that affect the effective adoption of ICT

interventions in education such as lack of policy and regulatory frameworks to guide the roles of key stakeholders in the introduction of the ICT interventions (Kozma, 2005; Sawicki & Clark, 2015; Vanderlinde, Aesaert & Van Braak, 2014); lack of national planning to establish needs and goals for ICT to direct the ICT investments in the education system (Kozma, 2005; Ringstaff & Kelley, 2002; Yusuf, 2005); lack of ICT integration during pre-service teacher education to prepare teachers for ICT uptake and integrations (Blake, Holcombe, & Foster, 1998; Jimoyiannis & Komis, 2007; Rakes & Casey, 2002; Tondeur et al., 2012); and lack of relevant in-service professional development in ICT for serving teachers (Romeo, Lloyd & Downes, 2012; Tezci, 2011; Unwin, 2005).

In view of these findings, an Activity System theoretical framework was developed to conceptualise the introduction of ICT interventions into the primary school education system in Malawi. Mapping theory from literature discussed above and the findings from this study on the conceptualisation of the ICT interventions, the Activity System Analysis reveals the following things. Firstly, the Directorate of Basic Education (DBE) should be responsible for formulation, management and evaluation of plans and policies in primary school education. Secondly, the National Education Sector Plan (NESP) should serve as a tool for primary education ICT investments from 2008 to 2017 by the Government of Malawi and all its development partners. Thirdly, the National ICT Policy should be used as a regulatory framework for deployment and utilization of ICT in education. Fourthly, the Directorate of Teacher Education and Development (DTED), the Teacher Training Colleges (TTCs) and the Malawi Institute of Education (MIE) should be responsible for the development, coordination, facilitation and reviewing of Initial Teacher Education and Continuous Professional Development in ICT. And finally, the ICT Providers should be responsible for provision of ICT Technical and Material Support. *Figure 16* illustrates how the activity system analysis has been used to theorise the conceptualisation of ICT interventions in the education system:
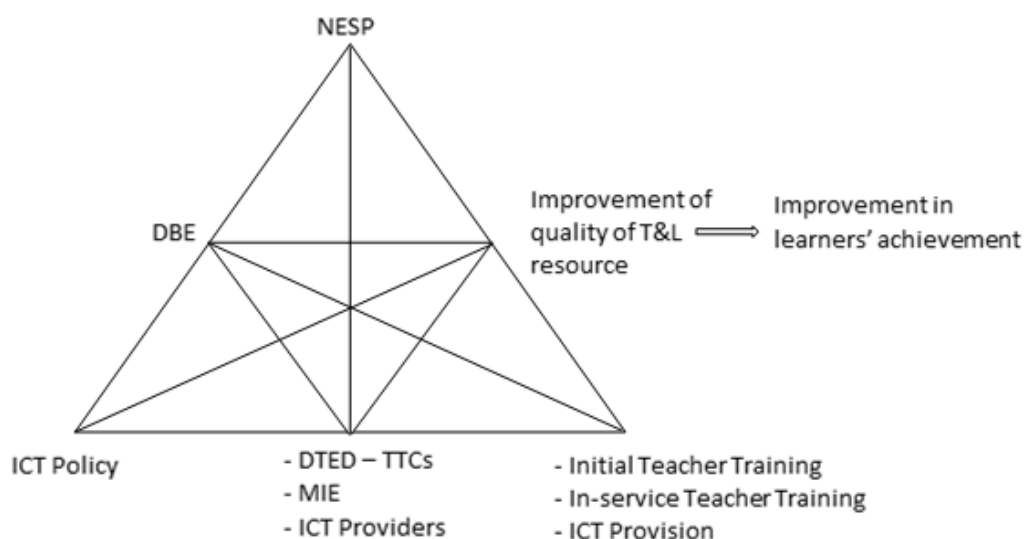
*Figure 16 – Proposed Activity System Framework for conceptualisation of ICT interventions in Malawi Primary education*

The subsequent sections theorise the context for the implementation of ICT interventions in the primary school education system. This is done by drawing upon the proposed Activity Framework to discuss the role of the directorate of basic education in the conceptualisation of ICT interventions in primary schools; the national education plans for ICT interventions in schools; the national education plans for ICT interventions; the policy guidelines and regulations for ICT interventions in schools; pre-service ICT teacher education; in-service ICT teacher professional development; and the provision of ICT intervention and resources in schools.

## The Role of the Directorate of Basic Education in Conceptualisation of ICT interventions

The findings revealed that the Directorate of Basic Education (DBE) is responsible for the provision of Basic Education (Primary School Education) in Malawi by setting, formulating and reviewing of policies, rules and regulations on Basic Education at national level. From the analysis of the processes and context for the conceptualisation and introduction of ICT interventions, the Directorate of Basic

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Education (DBE) is expected to be the custodian of all policies and plans towards ICT interventions in primary schools. However, the findings have revealed that the DBE is not involved at any stage during the conceptualisation and implementation of the ICT interventions that were introduced in the primary schools. Lack of participation by the DBE in the conceptualisation of ICT interventions in primary school education systems relates to challenge faced by the developing countries, such as Malawi, to create conditions that support the ICT developments in their countries and to craft policies and programs that cope with these developments and harness their effects to support the improvement of educational systems and increased educational attainment (Haddad & Draxler, 2002; Kozma, 2008). This leads to the introduction of ICT interventions in the schools without national rationale, goals, and vision for how the Malawi primary education system can incorporate the ICT interventions and guide specific roles for relevant stakeholders in the design and development of specific ICT interventions (Yusuf, 2005). This implies that efforts of the individual ICT intervention providers are neither integrated into a coordinated national process, through the existing policies and plans for basic education nor are they under the control of the DBE.

## National Education Plans for ICT Interventions

The findings have exposed gaps relating to ICT planning in education considering that the National Education Sector Plan (NESP) does not provide strategies and plans that can guide ICT investments and interventions in education. As discussed in the literature review, this is an important but missing link in the structure of ICT conceptualisation in the primary schools where the ICT-based interventions occur in classrooms without a close linkage to any national plans. Ringstaff and Kelley (2002) argue that coherent planning for ICT investments in education is a fundamental condition for desirable outcomes for ICT intervention both at national and institutional level.

Along the same vein, Kozma (2005) asserts that it is less likely that classroom innovations will add to overall national goals and have the ultimate intended effects if their interventions and desired outcomes are not developed from strategic ICT plans, policies and programs. The strategic plans in ICT investment and interventions have to harmonise and regularise efforts of different key stakeholders in the design, development and management of ICT interventions by identifying priorities, setting targets and providing a framework against which to monitor and evaluate national progress. As Vanderlinde, Aesaert, and Van Braak (2014) observe, effective attainment of whatever goals of ICT interventions in education requires strategic planning to ensure their effective implementation. This suggests the need for knowledge-based planning to ensure sustainable implementation of ICT interventions in education.

Kozma (2005) also observes that having national Education ICT Plans helps in setting a national vision and plan for ICT enabled teaching and learning by aligning the work of: researchers, school and national education leaders, teachers, ICT developers and ICT providers to build activities that would support the effective use of ICT in basic education. Therefore, having specific and strategic national ICT plans through a National Education Sector Plan (NESP) would harmonise and regularise plans and efforts of different stakeholders in the design, development and management of ICT investment and interventions in basic education. This could be done by defining priorities, setting targets and providing a framework against which the Directorate of Basic Education (DBE) could monitor and evaluate both the national progress and the roles and activities of different key players and stakeholders.

Furthermore, Ringstaff and Kelley (2002) and Jhurree (2005) highlight the need for national education ICT plans to act as blueprints for the subsequent of events in the schools' implementation and teachers' integration of the ICT provisions and interventions. Schools should be able to define their own expectations, goals, contents and actions concerning the implementation of the interventions and

integration of the ICT provisions based on the national education ICT plans. Consequently, NESP should be able to provide schools with a broad philosophy of ICT use for them to explore how ICT can improve teaching and learning through school-based ICT vision, professional development, curricula strategies, planning and evaluation (van Braak & Goeman, 2003).

Since NESP does not provide specific strategies for schools and other stakeholders to facilitate the implementation and integration of ICT within the schools, it presents tensions in the primary schools' ICT implementation structure and therefore affecting how the interventions are implemented (Ringstaff and Kelley, 2002; van Braak & Goeman, 2003; Kozma, 2005). Thus, while the ICT interventions as provided by the different development partners sought to improve the quality of the teaching and learning inputs in the schools, their implementation is not guided by any national agenda or strategy. Consequently, efforts of different stakeholders in the design, development and management of ICT interventions are neither regulated by national policies nor monitored or evaluated against any national standards (Bauer & Kenton, 2005; Haddad & Demsky, 1995; Tondeur et al., 2008).

## Policy Guidelines and Regulation for ICT Interventions

The findings have revealed that there is lack of specific policies to regulate the development, introduction and the use of ICT in education. Yusuf (2005) argues that while having ICT policy and plans in education does not guarantee effective implementation of ICT intervention and integrated use of the associated innovations in schools and classrooms, strategic ICT policies and plans in education can provide a rationale, a set of goals, and a vision for how education systems can incorporate ICT, and the specific roles for relevant stakeholders in the design and development of specific ICT interventions. On the contrary, the findings have revealed that the system lacks an integrated framework for

improving the school climate situations and teachers' professional development provisions and infrastructure enhancement to support the ICT interventions and to coordinate the deliberate efforts from different stakeholders (Kozma, 2005; Vanderlinde, Dexter & van Braak, 2012; Wagner et al., 2005; Yusuf, 2005). This, in turn, affects other key elements of ICT interventions conceptualisation in the education system, such as ICT pre-service teacher education, continuous professional development, and the provision of the ICT interventions as discussed in the subsequent sections.

It should be noted that countries with socioeconomic status similar to Malawi's, but where national ICT policies and planning strategies included procedures for maintaining and enhancing the ICT capability and infrastructure of the government departments/institutions or key stakeholders, tend to have best opportunities for exploiting the potential of ICT intervention in their education systems (see Isaacs, 2005; Jhurree, 2005). Apart from harmonizing and regularizing efforts of different key stakeholders in the design, development and management of ICT interventions, national strategic ICT policies and plans are found to be important in providing a framework against which to regulate national investment in education (Jhurree, 2005). Lack of systematic structural approaches in form of policy and strategy in the national education system reveals one of the key drawbacks to the development of ICT interventions in Malawi primary school education system.

## Pre-service Teacher Education

The findings have revealed that the Department of Teacher Education and Development (DTED), which is responsible for policy, control and designing of teacher education curriculum, does not have specific plans and curricula for teacher training and development towards the development of teachers' capacity for ICT integration. While it has been argued and assumed that the availability and

free access to ICT derives conversant and effective use of ICT (Albion & Redmond, 2008; Bingimlas, 2009; Richards, 2004), Phelps, Graham & Kerr (2004) and Tondeur et al., (2012) corroborate that teacher training should prepare teachers for the real-world application of ICT in the knowledge domains around which the curriculum is constructed in order for them to use ICT to support their pedagogy. On the contrary, this study has found that there are no set guidelines for ICT training within the teacher training programme structure which the teacher educators could follow.

In addition, other researchers propose that initial teacher training should develop teachers' Knowledge in using various ICTs to teach and facilitate knowledge creation of specific subject content (see Chai, et al., 2011; Lin et al., 2013). Apart from using the available ICT interventions as prescribed by the intervention programmes, teachers need to take advantage of the ICTs to support their own pedagogy or to address learners' specific needs. For example, some teachers could not use the tablets to teach learning areas of the curriculum other than facilitating learners' access to the pre-loaded lessons and instructional activities in the tablets. Similarly, teachers were using the radios during the *Tikwere* lessons only and could not use them as teaching and learning resources during other lessons. Sang et al., (2011), Taylor (2003) and Wild (1996) reveal that teacher education has a very important role in developing a pedagogical ICT use culture for teachers. Teacher preparation programmes have to provide systematic instruction for the effective use of ICT to support teaching and learning and provide learning opportunities both on how to design and implement curriculum plans that include strategies for applying ICT as observed by Goktas, Yildirim and Yildirim (2009a).

Teacher educators should be able to ensure that the ICT needs in the primary schools are appropriately addressed within the initial teacher education programme so that pre-service teachers feel comfortable with the use of ICT in

their pedagogies (Tondeur et al., 2012). However, this study finds that the primary school teacher training colleges in general and the teacher educators in particular are not involved in the introduction of ICT interventions in the primary schools. If teachers are going to be prepared for ICT pedagogy integration, they must be taught by confident and competent teacher educators through adequate teacher education, training and development of teachers (Dunn & Ridgway, 1991; MacDonald, 2008; Wild, 1996). Goktas, Yildirim and Yildirim (2009b) recommend that the best way to inspire teachers to integrate ICT into their teaching is to develop their level of ICT competency and efficacy through teacher education. Teacher preparation, through modelling by the teacher educators has to empirically provide and engage student in ICT integrated training (Redmond & Albion, 2005). The lack of knowledge of pedagogical demands of the ICT interventions in the primary schools presents challenges in how teacher educators could prepare the pre-service teachers for ICT interventions pedagogical integration.

The gaps in the NESP and the ICT policy present tensions in how the stakeholders perform their roles in the ICT implementation system. The initial primary school teacher training in Malawi does not prepare teachers for ICT use and integration into their pedagogy. The lack of initial teacher education for ICT pedagogical integration has a significant influence on the teachers' perceptions and attitudes towards their use of ICT in teaching and learning (See Chai, et al., 2011). As observed by Rakes and Casey (2002), a clear demonstration of the pedagogical use of ICT as instructional tools through teacher education addresses teachers' ICT professional self-development needs, produces positive pedagogy-ICT integration approach in teachers' general use of the ICT facilities, and addresses attitudes and feelings that may inhibit their use of instructional ICT resources.

Various studies argue that teachers' ICT competence and self-efficacy and their ICT perceptions and attitudes are based on their initial teacher training and

preparation such as the lack of encouragement for pre-service teachers to use ICT by tutors in teacher training (Dunn & Ridgway, 1991; MacDonald, 2008; Wild, 1996), and lack of ICT experience and training at pre-service level (Goktas, Yildirim, & Yildirim, 2009a; Sang et al., 2011), coupled with lack of resources or lack of access to resources in initial teacher training institutions (Sang et al., 2011; Taylor, 2003; Wild, 1996). This explains why teachers could not use the available ICT resources (e.g. radio and tablets) to address their own pedagogical needs other than as prescribed by the intervention providers.

## In-service Teacher Professional Development in ICT

Recent research has found that the main challenge to implementation of ICT interventions in schools is insufficient amount of in-service training for teachers (Buabeng-Andoh, 2012; Chai et al., 2011; Tezci, 2011). The current study has found that the MoEST prioritised the institutionalization of In-Service Training (IN-SET) and Continuous Professional Development for Teachers (CPDT) for primary school teachers under Teacher Education through the 2013-2018 NESP. However, the findings have also revealed that Malawi Institute of Education (MIE) which is responsible for providing in-service training for education personnel at national level does not provide training for the adoption and use of ICT interventions that are introduced in the schools through the different interventions. This further illuminates the effects of the absence of national strategic policies and plans that could have guided the ICT interventions' implementation structure in the education system. Cox et al. (1999a) argue that teachers do not value the use of ICT in their teaching only unless their training addresses pedagogical issues for ICT use. Inadequate and inappropriate ICT in-service training leads to teachers' insufficient preparedness and poor confidence that prevents them to integrate the ICT interventions in their instructional activities (Balanskat et al. 2006)

Phelps et al. (2004a) argue that it is not possible for teachers to continue to use ICT in classroom without reflecting on their belief about teaching and learning. This argument prompts consideration of teachers' meta-cognition of ICT pedagogy integration to identify, articulate and pursue personally relevant goals for ICT use rather than specific ICT objectives being imposed on them. The findings of the current study reveal that ICT intervention providers took the responsibility of designing and coordinating the in-service training that are required for the teachers to effectively implement and use the specific ICTs they provide. This is contrary to the argument that in-service teacher training should focus on the competences of teachers in developing appropriate range of pedagogical skills in using ICT as a process of long-term experiential learning' i.e. taking into account their perspectives through a comprehensive context approach as suggested by Chai, et al. (2011) and Romeo, Lloyd & Downes (2012).

Furthermore, in-service teacher training is argued to instil new skills and abilities for teachers to perform tasks that were not possible previously thus providing confidence in teachers in undertaking their duties (Chai, Ling Koh, et al., 2011). However, the in-service training by the ICT intervention providers is only done when the intervention is being introduced into the schools and only focus on teachers who, at the time of introducing the intervention, are teaching in Standards 1 and 2. Therefore, the training is not in form of a continuous professional development. All the teachers that were involved in this study indicated that they had never been trained in any use of ICT as part of the professional training and development. This finding is not in tandem with the view that practical consideration should be given to specific conditions in providing in-service teacher training as an on-going support for professional self-development, with teachers taking greater responsibility for core competencies in ICT-pedagogy integration (Rogers & Finlayson, 2004). There is a need, therefore, for the ICT providers to work with the MIE to develop teacher ICT training as part of professional development for serving teachers so that they can, in turn, continue

to build their skills and knowledge based on appropriate learning techniques with focus on reflective practices, exploration, discovery learning and various pedagogical approaches (Tezci, 2011).

Chai, et al. (2011) observe that due to the daily extemporaneous duties and demands of the teaching profession, there is a risk of teachers gradually stopping to think about ICTs and how to adapt new strategies for specific and emerging technologies, therefore, reducing their understanding and confidence of ICT. As a result, teachers tend to avoid using technologies thereby causing ICT to remain unused in many schools (Buabeng-Andoh, 2012). In view of this, the lack of teacher training in the use of ICT as part of professional development for serving teachers in the case study schools prevented them from building their skills and knowledge that would focus on reflective practices, exploration, discovery learning and various pedagogical approaches (Unwin, 2005). This confirms that schools and teachers are not supported and prepared to implement the ICT interventions in a way that can transform teaching and learning experiences so that they can take advantage of the potentials that ICT resources offer in their daily classroom teaching (Grace & Kenny, 2003).

## Provision of ICT Interventions and Resources

Effective adoption and integration of ICT into teaching depends mainly on the availability and accessibility of the ICT resources (BECTA, 2004; Bingimlas, 2009; Granger et al., 2002; So et al., 2012). In the present study, teachers had free access to the available radios and tablets to use for their teaching and learning. Free and equitable access to the hardware and software and the infrastructure within schools was identified to be the starting point for the teachers' adoption and use of the ICTs for pedagogy. This finding is consistent with the findings from the other studies that established that access to ICT infrastructure and resources in schools is essential for schools to integrate new ICTs (see Cabanatan, 2001;

Jung, 2005; Keengwe, Kidd, & Kyei-Blankson, 2009). In addition, the schools had very limited ICT provisions compared to their high student enrolment. For example, regarding radios, some learners were not able to hear the broadcasts clearly due to noise made by learners in over-crowded classrooms on average containing more than 90 learners. Similarly, some of the radios were faulty and therefore had poor audibility. For the tablets, the TBI resource rooms could only accommodate 25 learners against an average class size of 100 learners per stream (class) and for more than twelve streams (classes). This agrees with research findings by BECTA (2004) on barriers to the uptake of ICT by teachers which show that inaccessibility to ICT resources is described as not always merely limited to the non-availability of the hardware and software or other ICT materials within the school but also as a result of poor organization of resources, poor quality hardware, inappropriate software, or lack of personal access for the teachers and learners.

As observed by (Isaacs, 2007) inequitable access to hardware, software and the ICT infrastructure within schools is often related to lack of ICT integration where the use of ICT in education is still minimal. In such circumstances, the ICT resources are mostly not available when the teachers need them because they are inadequate, hence the need to have them shared by their intended users. In the present study, case study schools where access to the ICT resources was limited and only available to the teachers during specified times on the timetable can easily identify with this point.

Similarly, the Condition of Change Theory (Ely, 1990) suggests that besides being able to adopt and use ICT interventions, the resources must be readily available for schools and teachers to implement them. Such resources should include funds, hardware and software, support, commitment, leadership and other supplemental materials that are needed for successful implementation of the ICT interventions. Specifically, school leadership should identify and articulate its own

ICT vision, promote and accept teachers' ICT goals and provide individualized ICT
support for effective integration of ICT in teaching and learning (Weng & Tang,
2014). Chang (2012) and Dawson and Rakes (2003) attest that effective utilization
of ICT by teachers requires effective leadership to drive well-designed technology
plans in schools. Head teachers should carry the responsibility of initiating and
implementing school change through the use of ICT interventions and, as change
facilitators, they can facilitate key decisions to integrate the interventions into
learning, teaching, and school administration (Chang, 2012).

## Context for the implementation of ICT Interventions

The unguided and unregulated efforts of the individual ICT intervention providers
are not integrated into a harmonised national process; they remain as individual
ICT Provider's initiatives. This implies lack of visionary support for the schools and
lack of collaboration among the ICT interventions providers. As discussed in the
preceding sections, the introduction of ICT interventions lacks guiding framework
for designing and planning for the interventions in primary school education
system which could harmonise the ICT implementation and integration processes.
This reveals a general lack of rationale, goals, and a vision on how the Malawi
education system can incorporate the ICT interventions and guide specific roles
for relevant stakeholders in the design and development of specific ICT
interventions. Contrary to most study findings that suggest the need for specific
national ICT policies in education to converge with the roles of the public and
private stakeholders, and communities (Haddad & Demsky, 1995; Vanderlinde,
Aesaert and Van Braak, 2014; Yusuf, 2005); and to address barriers associated
with  cost, access, capacity and technical infrastructure (Kozma, 2005;
Vanderlinde, Dexter & van Braak, 2012; Wagner et al., 2005; Yusuf, 2005), the
discussion on the conceptualisation of ICT interventions reveals that the
Directorate of Basic Education under the Ministry of Education, Science and
Technology, does not actively set the agenda for  creating and promoting the

national vision for ICT in education across  sectors to create an enabling and efficient environment through efficient regulatory policy frameworks.

## Proposed Framework for Introducing ICT interventions in Malawian Primary Education

In the light of the context affecting the effective introduction of ICT interventions in Malawian primary schools, this study proposes a framework for introducing ICT interventions in Malawi primary education system as shown in *Figure 17*  below. The framework suggests possible strategies that can assist in the successful introduction of ICT interventions within the Malawian primary school education system. It proposes that the Directorate of Basic Education (DBE) in the Ministry of Education, Science and technology (MoEST) should take a central role in the generation of the rationale, goals, and vision regarding how the Malawi primary education system can incorporate the ICT interventions and guide specific roles for relevant stakeholders in the design and development of specific ICT interventions. This suggests that the DBE, as the custodian of basic education, should guide and regulate efforts of the different key players in the introduction of ICT interventions to ensure that the efforts are integrated into a coordinated national process, through the guiding frameworks (policies and plans) for ICT implementation.

The discussion has, so far, revealed that key players in the introduction of ICT interventions in the Malawian primary education system are: the ICT providers for their role in providing material and technical support; the Malawi Institute of Education for their roles in curriculum development primary schools learners and teachers; and the Directorate of Teacher Education and Development (DTED) for their role in teacher education and development through teacher training colleges. The already existing frameworks that could guide and regulate ICT interventions are the National Education Sector Plan (NESP) and the National ICT Policy in Education. The proposed framework, presented in Figure 18 mobilises

elements of an activity system that form the context for the introduction of ICT intervention in Malawi's primary school education system.

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┌──────────────────────────────────────────────────────────────┐
│ Planning, management and evaluation of national ICT investment │
│ in primary school education by Directorate of Basic Education   │
│ (DBE)                                                          │
└──────────────────────────────────────────────────────────────┘
                              │
                    ┌─────────────────┐
                    │     Through      │
                    └─────────────────┘
          ┌───────────────────┴───────────────────┐
┌─────────────────────────────┐       ┌─────────────────────────────┐
│ Provision of priorities and │       │ Provision of national       │
│ strategic plans of ICT      │       │ regulatory frameworks to    │
│ improvement and investments │       │ support the deployment and  │
│ in basic education for      │       │ implementation of ICT in    │
│ Ministry of Education       │       │ basic education (National   │
│ directorates, departments   │       │ ICT Policy in Education)    │
│ and all its development     │       └─────────────────────────────┘
│ partners (National          │
│ Education Sector Plan)      │
└─────────────────────────────┘
                    ┌─────────────────────────────┐
                    │ Coordinate, Guide and        │
                    │ Regulate                     │
                    └─────────────────────────────┘
┌───────────────────┐  ┌───────────────────┐  ┌───────────────────┐
│ Management and     │  │ Development and    │  │ Provision of ICT   │
│ facilitation of    │  │ reviewing of Basic │  │ Technical and      │
│ Initial Teacher    │◄─│ Education          │─►│ Material Support in │
│ Education and      │  │ Curriculum, ICT    │  │ Schools and        │
│ Continuous         │  │ Initial Teacher    │  │ Teacher Training   │
│ Professional       │  │ Education and      │  │ Institutions by    │
│ Development in ICT │  │ Continuous         │  │ ICT Providers      │
│ by Directorate of │  │ Professional       │  │ (Government        │
│ Teacher Education  │  │ Development        │  │ development        │
│ and Development    │  │ curricula by       │  │ partners)          │
│ (DTED)            │  │ Malawi Institute   │  └───────────────────┘
└───────────────────┘  │ of Education (MIE) │
                       │ for...             │
                       └───────────────────┘
            ┌─────────────────────────────┐
            │ Provision of initial training│
            │ in ICT to primary school     │
            │ teachers by Teacher Training │
            │ Colleges (TTCs)              │
            └─────────────────────────────┘
                 ┌─────────────────────┐
                 │ Introduction of ICT  │
                 │ interventions in     │
                 │ primary schools      │
                 └─────────────────────┘
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## Implementation of ICT Interventions in the schools

This discussion theorises the present study's findings to reveal how ICT interventions should be implemented in Malawi's primary schools based on the literature reviewed by the study. The discussion has, so far, shown that there are external factors that are currently affecting how primary schools adopt and implement the available ICT interventions. Hence, in order to work out proper success strategies for implementing ICT interventions in Malawian primary schools, there is need to highlight the internal and external factors that affect them. Thus, in addition to the context shaped by the national conceptualisation of the ICT interventions, there are other obstacles that also affect the implementation of ICT innovations in schools, such as: lack of appropriate administrative and technical support for the effective use of ICT (Lim, 2007); lack of clear goals for ICT use in schools (Vanderlinde, Dexter & van Braak, 2012; Vanderlinde, Van Braak & Tondeur, 2010); technical problems in the classroom (Goktas, Yildirim & Yildirim 2009a; Honan, 2008); classroom management with large class sizes (Genc, 2011; Tezci, 2011); uncertainty about the possible benefits of using ICT in the classroom (Goktas, Yildirim & Yildirim, 2009b); and lack of specific and definite ideas about how integrating ICT into instruction could improve students' learning (Bauer & Kenton, 2005). To address these barriers, some studies suggest that schools need to: provide appropriate access to technology (Bauer & Kenton, 2005; Chai, Koh, Tsai, & Tan, 2011), develop and employ school-based guidelines that involve teachers in decision-making and planning processes regarding ICT in their classrooms, as well as the division of labour among the school community (Tezci, 2011; Vanderlinde, Dexter & van Braak, 2012; Vanderlinde, Van Braak, & Tondeur, 2010).

In the light of these findings, an Activity System theoretical framework has been developed to propose an ICT intervention implementation system as shown in Figure 19 below. The framework suggests that the primary schools should be responsible for planning, managing and evaluating ICT interventions implementation; the National Education Sector Plan (NESP) should be used as a tool for the quality improvement and investments in the schools, and schools should develop ICT plans and guidelines for school-based decision-making and planning processes to support the successful adoption and utilization of ICT by teachers. Similarly, School Management Committees should be responsible for the development, monitoring and evaluation of school ICT plans and guidelines based on NESP and National ICT policy while teachers should be involved in the development and implementation of school ICT plans and guidelines. Furthermore, Teacher Development Centres (TDCs) should be involved in developing and providing education zone level ICT Continuous Professional Development programs for teachers, while ICT Providers should provide ICT Technical and Material Support in the schools, improve quality of the Teaching and Learning resource as stipulated in the NESP and Improvement in learners' achievement based on the NESP (See *Figure 18*).
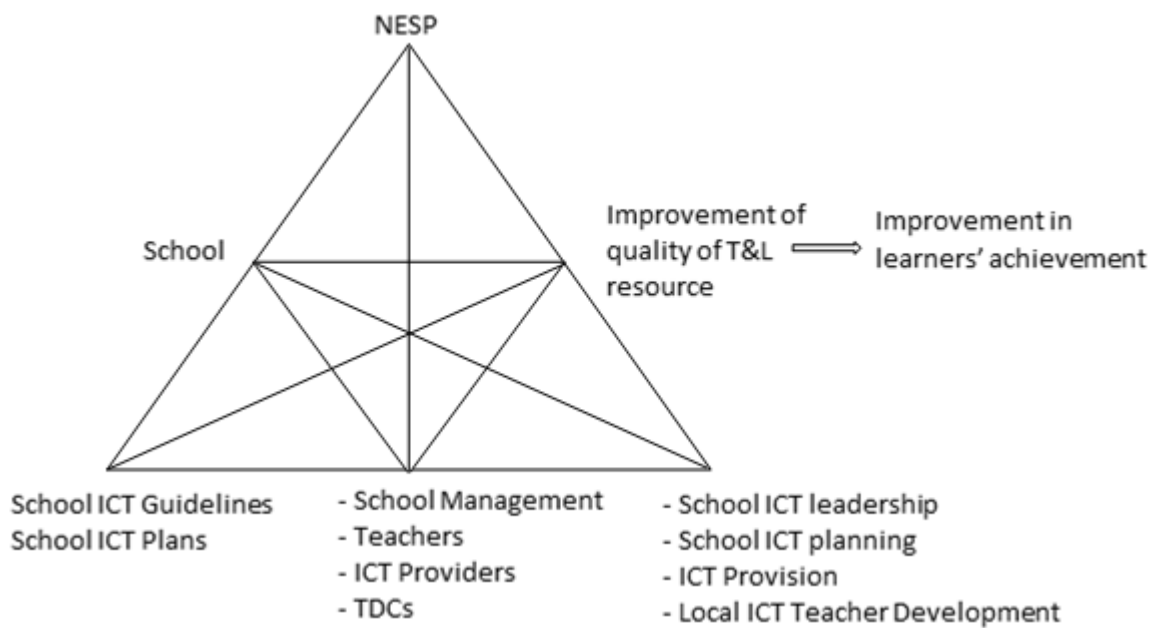
*Figure 18 – Proposed ICT implementation System*

The activity system in *Figure 18* theorises the introduction and implementation of the ICT interventions in the primary schools. It generates a discussion on how schools plan and guide the implementation of the ICT interventions, how the ICT interventions are managed and the availability of ICT technical support in the schools, as follows:

## School ICT Plans and Guidelines

The study findings at the school level have revealed tension that explain how the ICT interventions are implemented which, in turn, illuminate the effects of the gaps within the national conceptualisation of the ICT interventions and provide explanations on how the schools manage the available interventions. Since the MoEST does not have any frameworks for the implementation of ICT interventions in the schools, consequent contextual strategic adjustments should be made so that strategic school-based ICT policies and plans provide a rationale, a set of goals, and a vision for how schools can incorporate ICT interventions, and the specific roles for relevant stakeholders in the implementation of specific ICT interventions in the schools (Yusuf, 2005). This has been observed as presenting

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tension in the school ICT interventions implementation system because schools have to accommodate different requirements for integrating different ICTs interventions. Other studies suggest that ICT policy planning decisions involving different institutions with different roles and objectives within the education system should be centrally coordinated by government (see Kozma, 2005; Vanderlinde, Dexter & van Braak, 2012). This provides an integrated framework for different roles and objectives of different independent institutions such as improving school climate situations, teachers' professional development provisions and ICT infrastructure enhancement, hence the coordination of the deliberate efforts from different stakeholders (Wagner et al., 2005; Yusuf, 2005).

Schools should, however, be compelled by their own conception of the ICT interventions as well as by the imperatives of their organizational goals derived from the national policy framework. Schools as the main implementers of all ICT interventions are expected to develop school-based ICT policy and plans as comprehensive school guidelines for providing a variety of strategic and operational elements concerning the implementation of ICT in teaching and learning (Frazier & Bailey, 2004; Tondeur et al., 2008). Such ICT policy plans would enable schools to describe their own expectations, goals, contents and actions concerning the implementation of the interventions and integration of the ICT provisions and would not be driven by the agenda of the ICT providers as is the case now.

In addition, the school-based ICT plans and guidelines would empower the schools to explore how ICT could improve teaching and learning through school-based ICT vision, professional development, curricula strategies, planning and evaluation (van Braak & Goeman, 2003). The establishment of school-based ICT plans would facilitate successful ICT integration as several studies suggest that school based professional development and ICT curricula strategies provide teachers with guidelines to support their instructional decision making and lesson planning

processes for the use of the available ICTs in raising quality and enhancing learning (Bingimlas, 2009; Karagiorgi & Charalambous, 2004; Lim & Khine, 2006; Wang & Woo, 2007).

## School ICT Interventions Management

The absence of school-based ICT integration plans presents the school system (school management and teachers) with challenges on how they could perform their roles in the ICT implementation system. The study has established that the school management, in general, and the head teachers, in particular, do not have any role in the development, management and monitoring of activities of the ICT interventions within the schools. Studies, conducted elsewhere, however, show that ICT interventions are effectively integrated and implemented in schools when school leaders, particularly the head teachers, support them, learn and use them in their instructional and administrative tasks, support their teachers in the process of change, and provide sufficient development opportunities for themselves and teachers through well-designed ICT plans in their schools (see Dawson and Rakes, 2003; Anderson & Dexter, 2005; Afshari et al., 2010; Chang 2012). Head teachers as facilitators of change have the responsibility of initiating and implementing school change through the use of ICT interventions and facilitate key decisions to integrate them into learning, teaching, and school administration (see Chang, 2012). Ironically, however, teachers and head teachers have limited knowledge and understanding of the TBI intervention objectives, stakeholders and their respective roles in the implementation of the ICT interventions. This reflects how the TBI intervention disempowered the school management teams in its implementation.

Tan and Ong (2011) and Voogt, et al., (2013) found that ICT adoption and use could only be effective if the introduction of ICT in school involves the school leadership, the teachers and the ICT technical support personnel in developing

and implementing technology plans. In that way, the school leadership and the teachers could be free to implement new ideas to improve the integration of ICT into teaching and learning processes in a supportive and enhancing professional environment (Anderson & Dexter, 2005). In the present study, while the schools are using the ICT interventions, they do not know why they were using them, and who else, apart from the intervention providers, is/should be involved the implementation of the interventions. This observation reveals the existence of tension within the teachers' use of the ICTs and the objectives of the interventions; the teachers used the ICT interventions as an obligation and not necessarily to support their own pedagogical objectives during teaching. As such, the school management teams did not have the capacity to identify and articulate the objective of the ICT interventions available in their schools and, therefore, not able to promote effective integration of ICT in teaching and learning (see Weng & Tang, 2014). This contributes to more tensions in the integration of the interventions in the classroom since the teachers' willingness and efforts to use the ICTs in the teaching and learning process are not outcome based.

While other studies established that teachers have to be driven by their own conception of their roles and goals in their ICT integration in teaching and learning (Bauer & Kenton, 2005; Haddad & Demsky, 1995; Tondeur et al., 2008), the present study has found that teachers only use the available ICTs just as prescribed by the intervention programmes. Therefore, teachers are not able to take advantage of the provided ICTs to support their own pedagogy or to address other specific learners' needs. Rather, the implementation and integration of the ICT interventions in the schools and the classrooms, respectively, is characterised by a lack of school-based guidelines, lack of ICT leaderships and lack of technical service and advice on the use of the ICT resources. Other studies on the implementation of ICT in schools show that these factors are interrelated, such that the successful implementation of the ICT interventions is not independent of the availability or absence of one individual factor but is determined in a dynamic

process involving a set of interrelated factors (Drent & Meelissen, 2008). Cuban (2001) observes that, in addition to the already diversely demanding work environment, the lack of school-based guidelines, ICT leadership and technical service as identified in the implementation of the ICT interventions in this study, cause anxiety in teachers towards the use ICT for teaching. This potentially leads to teachers feeling disempowered by the ICT interventions. Evidently teachers have negative self-reflective perceptions and considerations about further use of the old interventions, e.g. Tikwere IRI, which was no longer in use in the case study schools, the current and any other emergent ICT interventions such as the Tablet Based Instructions – TBI. The understanding is that if teachers feel disempowered by a particular ICT intervention, they are unlikely to integrate them into their teaching and learning (Buabeng-Andoh, 2012; Cox, Cox, and Preston, 2000).

As argued by other studies, there is need for authentic participation where the schools as implementers are not just involved in the implementation systems but more importantly, in decisions related to planning and design of the ICT intervention in order to inculcate a sense of ownership and enhance understanding of the intervention by all concerned parties (see Anderson and Dexter, 2005; Chang, 2012; Dawson & Rakes, 2003; Weng & Tang, 2014). At least, school management and teachers should feel that they have an opportunity to comment on the ICT interventions that directly impact their work through a shared decision-making process, direct participation and communication with all relevant stakeholders in the ICT intervention conceptualisation and implementation processes (Ely's Conditions of Change, 1990).

## School ICT Technical Support

The need for the available ICT resources to be fully functional in schools at all times requires regular maintenance and rapid responses to problems when they

arise (see BECTA, 2004). More often than not, teachers neither have time nor expertise to adequately perform this role, hence the need for schools to have their own ICT support technicians. However, the cost to schools of employing a resident technician can be prohibitive.  Furthermore, while the ICT Interventions Providers supplied schools with ICT resources and support infrastructure, this study found that the School ICT providers did not offer recurring or scheduled onsite ICT support service to the schools. Similarly, the study found that schools do not employ full-time ICT technicians but required additional skillsets to support the teachers' day-to-day management of the ICTs for the classroom teaching and learning and the regular maintenance and repair of the ICT resources.

Other studies have revealed that such general lack of human resource capacity to provide ICT technical support and equipment servicing as the one discussed in the foregoing sections broadens the gap between the availability of ICT resources and the ability of teachers to integrate them into teaching (see Lin, Wang & Lin, 2012). Thus, the lack of proper set up, service, maintenance and technical advice on the use of the available ICT resources affects and interrupts the regular and effective use of the resources (Lin, Wang & Lin, 2012; Tezci, 2011; Tondeur et al., 2012). As observed by BECTA (2004), teachers are discouraged from using ICT resources because of fear of equipment failure since no one would give them technical support in the event of a technical problem. This was evident in all the case study schools as all the other ICT resources that were brought in through different interventions, apart from the Tablet, for example Radios, iPods and Multimedia Players, were all no longer being used by the teachers because of lack of maintenance. Technical support and maintenance is an important element of the school ICT environment without which teachers become unsatisfied with the use of ICT resources and eventually become reluctant to use them (see Lin, Wang & Lin, 2012; Tezci, 2011).

## Proposed Framework for ICT Implementing ICT interventions in Malawian Primary Schools

So far, the discussion has shown that there are contextual factors that are currently affecting teachers' ICT integration in their classroom such as school ICT leadership, school-based ICT technical support, school-based ICT plans and policies, and the compatibility of the ICT intervention with the existing school practices and contexts. Hence, in order to work out proper success strategies for Malawian teachers to integrate the ICT interventions in their classroom practices, there is need to highlight the school-based factors that affect them. The discussion of the findings has revealed that resolving these school-based factors can assist teachers to effectively utilise the ICT interventions. This discussion leads to the development of a framework in *Figure 19* which suggests possible success strategies that could assist the schools to adopt and effectively implement ICT interventions. This framework suggests that school management committees and head teachers are the key stakeholders and change facilitators who should carry the responsibility of setting the agenda for adoption and use of the ICT interventions in the school. This, they should do by developing school-based ICT plans that can facilitate successful ICT integration and establishing comprehensive school-based ICT technical support. Furthermore, this framework suggests, as revealed in the discussion, that the school-based ICT plans and the curriculum guidelines could provide strategies that could guide the implementation of the ICT interventions through different players within the schools (teachers, school management committees and teacher development centres). The framework, therefore, proposes how activities of these school-based players could help the teachers to use the interventions to support the already existing teaching and learning activities or fit into the existing school standards and practices.
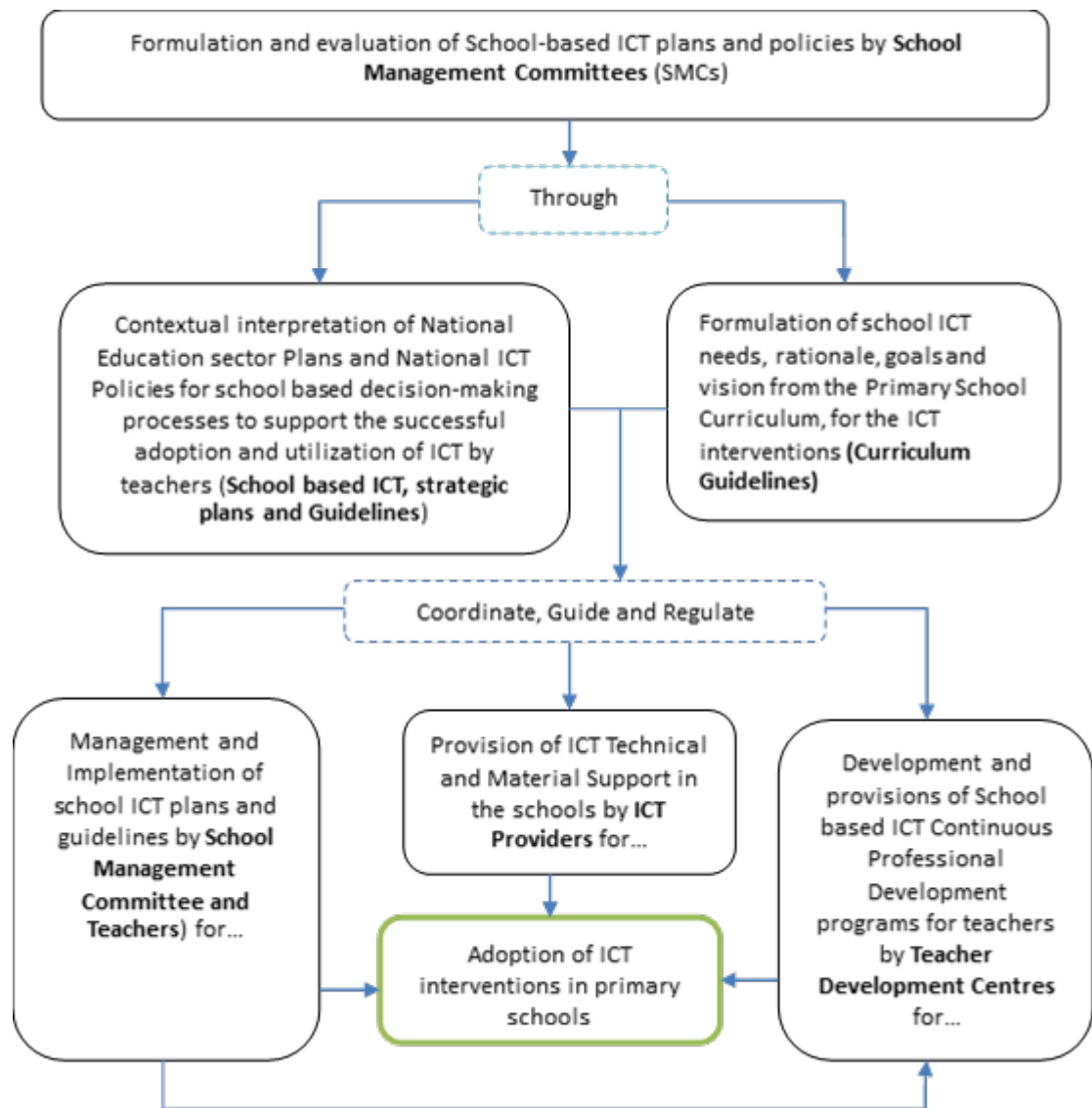
*Figure 19 – Proposed Framework for Adoption of ICT Interventions in Malawian Primary Schools*

## Integration of ICT Interventions in the classroom

The tension and gaps characterising the national conceptualisation of the ICT interventions and the implementation of the interventions in the schools have implications for classroom ICT integration in terms of compatibility of the intervention with existing school values and practices, the relative advantage of the interventions and general perceptions of teachers. This tension explains how

teachers manage and use the available interventions, and implications of the management and use of the interventions as discussed in the subsequent sections:

## Compatibility with existing values and practices

There is need for a specific ICT intervention to be consistent with values, past experiences, and needs of the teachers. Gwayi (2009) and Lee, Hsieh and Hsu (2011) argue that ICT interventions that are incompatible with the teachers' values, norms or practices will not be adopted as rapidly as an intervention that they perceive to be compatible (see discussion on Diffusion of Innovations). The Tablet Based Instruction (TBI) and Interactive Radio Instruction (IRI) lessons cover standard 1 and 2 curricula and supplement the textbook-based instruction, thereby enabling learners to transfer and apply the knowledge from the ICT interventions' lessons to the generic classroom lessons. This promoted active learning, captured the learners' attention and offered learners with alternative learning opportunities beyond the classroom chalkboard and textbook-based instruction (Bottino, 2004; Smeets, 2005; Volman & van Eck, 2001).

The ICT intervention lessons (both IRI and TBI), however, are not aligned to the classroom lesson in that learners are either allowed to carry out differentiated learning in the case of the TBI or, in case of IRI, the lessons presented were ahead/behind the schemed lesson. Ideally, the ICT interventions should be used to enhance teaching by facilitating and improving active learning in collating and synthesizing relevant information; applying information; solving problems; communicating ideas effectively; providing a greater degree of independent learning and expanding the learning horizons beyond the teacher and learner interaction (Jung, 2005; Mumtaz, 2000). The available ICT interventions in the schools should be incorporated into the pedagogical process within the teaching & learning settings of the classroom activities to fit to what best suits the context of the schools (Hennessy, Ruthven & Brindley, 2005). It has been revealed from

the findings of the present study that the ICT interventions lessons did not synchronise with the generic classroom lessons, hence difficulties experienced by the teachers in their efforts to integrate the ICT interventions in their pedagogy. This underscores the observation that the available ICT interventions were not used to support the already existing teaching and learning activities or did not fit into the existing school standards but rather required that the schools make special arrangements to accommodate their respective teaching and learning settings. This is a disadvantage of using the interventions against the existing values and practices thereby influencing the teachers' perceptions and attitudes toward the use of the interventions as discussed in the subsequent sections. These tensions also present ethical dilemmas to teachers when integrating the interventions (See discussion of Ethical Values and Conflicts on page 190)

## Relative Advantage of ICT interventions

Research into the adoption of ICT innovations in general has raised the relevance of understanding the advantages which the use of a specific ICT intervention is perceived to present (Lee, Hsieh, & Hsu, 2011; Rogers, 1993). The discussion on theoretical perspectives on ICT pedagogical integration argues that the degree to which the use of ICT interventions for teaching and learning are perceived by teachers as being better than the teaching and learning practices they supersede influences the teachers' decision on whether to accept or reject an intervention (see Gwayi, 2009; Lau & Woods, 2008; Tezci, 2011; Wozney, Venkatesh, & Abrami, 2006). Specifically, the Diffusion of Innovations Theory (Rogers, 1993) says that an innovation should be compatible with its users' values, practices, experiences, needs and philosophies for them to assimilate it into their lives. Gwayi (2009) observes that an ICT innovation that is incompatible with teachers' values, norms or practices will not be adopted as rapidly as another that is compatible with the values. In the present study, teachers identified challenges in class management during the TBI lessons.

There was need for two teachers for each class to effectively facilitate the access to the TBI Resource Room – with one teacher taking a group of 25 learners to the resource room for a TBI lesson, and the other teacher teaching the rest of the learners in the main classroom. The ICT interventions are less convenient and present teachers with extra work. It is clear that there is need for much more guided and informed interventions that focus on how schools and teachers can benefit from the provided ICT resources to promote learning. This reveals that interest and focus of the ICT interventions is directed towards the technological innovations while ignoring the fundamental frameworks for teaching and learning with or without ICT and aspects on how the schools and teachers would implement and integrate the interventions in the classrooms (Cox & Marshall, 2007; Rodriguez, Nussbaum & Dombrovskaia, 2012; Sutherland et al., 2004). While ICT interventions providers may help all schools to be equipped with the infrastructure to conduct ICT mediated teaching and learning, there is still a need to prepare the school and classroom contexts for their implementation and integration to ensure compatibility with the existing values and practices and, therefore, influence the teachers' perceptions (Gwayi, 2009; Minishi-Majanja & Kiplang'at, 2005; Thayer, 2013).  Similar claims are made by Rodriguez, Nussbaum and Dombrovskaia (2012); Trucano (2005); and Watson (2001) by observing that greater emphasis placed on technology than on pedagogy presents challenges relating to acceptance and to effective use (integration) of ICT in classrooms. This relates to the concept of disempowerment of teachers as highlighted under the School ICT Interventions Management and the School and Teacher Disempowerment sections, on pages 177 and 187 respectively.

## Teachers' Classroom ICT Practices

Simplicity and ease of use of a specific ICT intervention is considered as an influence on teachers' development of new skills and understandings. This argument has been used in various studies on the motivation of teachers to use

ICT to suggest that teachers' ICT intentions and practices are shaped by their ICT attitudes, subjective norms, and perceived behavioural control (see Goh, 2011; Kripanont, 2007; Polizzi, 2013; Stols & Kriek, 2011). According to the Theory of Planned Behaviour (Ajzen, 1991), teachers' ICT use is influenced by their attitudes towards the ICT use for teaching and learning, their leaders' expectations over them to use ICT for teaching and learning, and their perceived control over ICT use for teaching and learning. The findings of this study reveal that while teachers have positive attitudes towards the use of ICT for teaching and learning, they do not have the required pedagogical knowledge about technology and their school leaders do not have any expectations and commitment regarding the use of the ICT interventions by teachers.

Phelps, Graham and Kerr (2004) argue that it is not possible for teachers to continue to use ICT in classroom without reflecting on their belief about teaching and learning. The understanding is that that if teachers perceive particular ICT resources as neither fulfilling their needs nor their learners' needs, they are likely not to integrate them into their teaching and learning. Schools, in general, and teachers in particular, as implementers of ICT interventions must have time available to learn, use, and reflect on how they are adopting and using the interventions respectively (see Ely, 1990). The ICT intervention providers and the school leaders should provide teachers with opportunities to learn how to use the interventions, to develop skills to use the interventions and for their personal reflection in order to effectively integrate the interventions into their lessons (see Renzi, 2011; Stols & Kriek, 2011; Tarcan, Varol, Kantarcı, & Fırlar, 2012). This is discussed further under School and Teacher Disempowerment Section on Page 187.

Schools and teachers that are expected to implement the ICT interventions must have the knowledge and skills to implement the interventions proficiently. As observed by the present study, lack of necessary knowledge and skills results in

the low adoption level of the intervention by concerned schools and less integration of the innovation by concerned teachers, as discussed under teachers' ICT efficacy and ICT competence in the literature review. Training is integral to most successful implementation of ICT interventions in education as it addresses the teachers' attitudes, ICT self-efficacy, ICT competence, perceived social pressure and perceived usefulness of ICT in their pedagogy.

## School and Teacher Disempowerment

According to Clarke and Kissane (2002, p. 733), disempowerment is an experience that takes away someone's confidence and feeling of being in control of their life that is associated feelings of helplessness, hopelessness, meaninglessness, subject incompetence and diminished self-esteem. According to this definition, disempowerment describes the negative emotional experiences people may possess towards their jobs. This perspective suggests the design and introduction of ICT interventions, which is too much top-down control instead of being decided at school management and teacher levels, are a threat to the effectiveness of teachers and teaching and erodes teacher autonomy. While ICT interventions are seen as a significant means to improve the effectiveness of teachers and teaching the findings show that the ICT interventions have negative impacts on school and teacher autonomy. For instance, the findings show that teachers are reported to be stressful, dissatisfied, anxious, and exhausted because of how the ICT interventions are designed and implemented at school and classroom levels. The findings have revealed that teachers' sense of disempowerment has a negative impact on their profession and reflections on the use of the current or emerging ICT interventions.

Evidence, as provided in the findings chapter, shows that the ICT interventions do not empower school-based management administration of the interventions and in turn eliminates schools' and teachers' autonomy in the implementation and

integration of the interventions respectively. The design and implementation of both the IRI and the TBI removes the teacher from the instructional loop. Similar patterns are found in other studies such as Cox, Cox and Preston (2000); Ensminger and Surry (2008); and Donnelly, McGarr and O'Reilly (2011). These studies indicate that the disempowered teachers tend to feel demoralized because they are incapable to use ICT based on their metacognition. Lack of teacher education and training in pedagogical ICT use, lack of school-based ICT plans and policies and the dependence of the education system on the ICT interventions providers to lead the conceptualization, implementation and integration of ICT in primary schools structurally disempowers both the schools and the teachers to control the processes of adopting and using the ICTs the schools and classrooms respectively. The findings have revealed that this process disregards the school autonomy and the teacher agency. This, based on the extent to which the teachers perceive the context they are provided with, is affecting the morale teachers have about their job in meeting their goals in teaching. Thus, teachers interpret the ICT school context as not favouring them to fulfil their goals in teaching. This observation is supported by the studies conducted by (Lau & Wood, 2008; Kripanont, 2007; Goh, 2011). According to these studies, teachers' disempowerment is determined by whether the teachers perceive their teaching environments or outcomes match with their instructional goals. Moreover, Lee, Hsieh and Hsu (2011) and Lee, Cerreto and Lee (2010) provide further arguments that support to the observation. They found that the teachers perceive that the top-down ICT reform create many constraints that discourage them from integrating the ICTs in their lessons. This situation, as evidenced by the current findings, makes the teachers feel frustrated and depressed with the ICT interventions.

There is need for schools and teachers to take charge of their own growth and able to address or resolve their own problems by developing mechanism to do so. Schools and teachers should have the ICT competencies, skills and knowledge to

act on and improve on situations. However, for this to be realized the conceptualization of the ICT interventions should provide supportive schools settings and opportunities for school-based ICT development for teachers (see proposed frameworks for ICT the Introduction and Implementation in Malawi primary education system and schools on page 173 and page 182 respectively). The prescriptive demands from the ICT interventions, with limited controls of their use in curriculum and instruction, and the reducing of teachers' role to working as technicians for TBI, limits teachers' control over the ICT intervention in their work. Thus, reducing teachers' professional abilities resulting in a decline in their professional status.

## Context for the Schools

The findings of this study have revealed that the national conceptualisation and provision of ICT interventions in primary schools lacks national education sector planning, national ICT policies, ICT teacher education and teacher ICT professional development. Schools are therefore expected to adopt and implement ICT interventions without any guiding policies and frameworks from MoEST. The lack of participation and ownership by MoEST in the conceptualization of the ICT interventions leaves the schools at the mercy of the ICT providers who in turn assume the responsibility of directing how the schools should adopt and use the ICTs they are providing. It is from this disempowered position that the school leaders, their education advisors and management teams passively implement the interventions based on the terms and conditions prescribed by the ICT providers. Hennessy, Ruthven and Brindley (2005) and Teo (2011) argue against such tendencies that conceptualise and introduce ICT innovations in education by pushing down them to the schools without preparing the schools and teachers for the same. The way the schools placed through this top-down ICT provision approach reflects the contexts that the schools and the education system provide for the teachers, as discussed in the subsequent section.

## Context for Teachers

The context discussed above, and findings presented in Chapter 4 reveal deficiencies in school ICT leadership, the available ICT provisions and interventions, the school ICT plans and policies, and other ICT support systems. As such teachers are placed in a context that is not supported with relevant school-based ICT plans, policies and guidelines for their effective and meaningful use of the ICT provisions from the interventions. These are teachers that have never been trained in any use of ICT innovations for teaching and learning, neither during their pre-service training nor through continuous professional development. The assumption by the ICT providers is that what teachers need is training in how to use ICT innovations that they are providing to the schools, rather than more pedagogical support in how, what, when and why to use the ICTs for their teaching. This approach is disempowering to the teachers and counters the development of teacher agency. It ignores contextual factors for ICT integration such as teachers' agency, pedagogical approaches and philosophies (Coburn, 2003; Cox, 2008), teachers' ICT efficacy, attitudes and skills (Kirkman, 2000; Trucano, 2005), and school ICT leadership and support (Baskin & Williams, 2006; Reynolds, Treharne, & Tripp, 2003; Tondeur et al., 2008). The role of the teacher to facilitate learning and address learners' needs with the ICT provisions is therefore undermined by the context they are provided with.

## Ethics and Values Conflicts

The finding of this study has raised a number of ethical and value conflicts related to how the ICT interventions are conceptualised at national level, implemented in the schools and integrated in the classrooms. The ethical and values conflicts include the general lack of ownership of the interventions by the MoEST, teachers' lack of ICT pedagogical knowledge and quality of the curriculum, and the

uneven provision of and access to ICT provisions to schools and by learners, respectively. These have been discussed in the subsequent sections.

## Lack of ownership by the Ministry of Education Science and Technology (MoEST)

The Directorate of Basic Education (DBE), under MoEST, is expected to be the custodian of all policies and plans towards ICT interventions in primary schools, as it is responsible for formulation and evaluation of policies and for setting and reviewing standards on basic education in Malawi. The MoEST has an ethical responsibility to provide national and institutional regulatory frameworks to support the successful deployment and utilization of ICT in education. However, this study has found that the DBE was not involved at any stage during the conceptualisation and implementation of the ICT interventions that were introduced in the primary schools.  This reveals ethical conflicts in the conceptulaisation of the ICT interventions as the MoEST does not guide nor regulate the designing, planning and implementation of such interventions. These are the missing links in the conceptualisation of the interventions that shape and influence the context and structure of ICT implementation in the primary schools. Consequently, the ICT providers work directly with the schools and the DBE does not formulate, manage or evaluate the interventions.

Similarly, the school system lacks strategies and plans that could be used to guide, prioritise, harmonise, regularize, monitor and evaluate efforts of different key stakeholders in the design, development and management of ICT investments and interventions in education. Such ethical inconsideration illuminates general lack of ownership of the ICT interventions by the MoEST, which affects how the ICT intervention are adopted and used in the primary schools. There is need for the DBE to take a central role in spawning the rationale, goals, and vision on how the Malawi primary education system can incorporate the ICT interventions and guide specific roles for relevant stakeholders in the design and development of specific

ICT interventions. The passive approach by the MoEST in the conceptualization of ICT interventions, to some extent, reflects the colonial mentality by implementing the plans of the ICT providers wholesale without reflecting on the MoEST policies and guidelines and the local primary school context and systems. The consequences of such an approach have been highlighted throughout this chapter and in the Conclusion chapter.

## ICT Pedagogical Knowledge and Curriculum Quality

Teacher expertise and curriculum quality are interrelated, because expert teachers are a prerequisite for the successful implementation of the curriculum. Teachers who are well-prepared for ICT uptake are better able to use the ICT interventions in their pedagogical strategies that respond to learners' needs and learning styles. As discussed in the previous chapter, there is a need for meta-cognition approach to ICT teacher education and professional development to support teachers to personally identify, articulate and pursue pedagogically relevant goals for ICT use rather than specific ICT objectives being imposed on them. This would help teachers to meet their individual needs for ICT use in their teaching, and therefore develop positive attitudes towards the sustainable ICT integration, as they would perceive ICT as a tool in achieving their intended goals.

Effective use and integration of ICT resources in the schools requires novel and sound pedagogical principles aimed at improving the quality of teaching and learning rather than the routine tasks associated with the ICT interventions that are provided in the case school in this study. Lack of knowledge about how to manage and integrate the ICT interventions through teachers' objective-oriented classroom instruction can lead teachers to turn to passive roles that dumb down the curriculum to learners through the IRI/TBI rather than using the IRI/TBI to purposively engage learners in the curriculum activities. In this context, mere introduction of the ICT resources and the basic orientation of teacher on their use

to the educational process is not enough. Teacher education has to develop skills and appropriate knowledge among teachers for using and integrating the correct ICT in an appropriate manner.  Apart from knowing how to operate the hardware and the relevant software resources, every teacher has to know how the curriculum content can be taught or represented by ICT, how ICT can facilitate pedagogical approaches and how to facilitate learning of a specific content through appropriate pedagogy and ICT; responsive to learners' needs and learning styles. It is important to ensure ICT pedagogical integration, since ICT by itself will not lead to positive change, rather, it is the way in which teachers integrate ICT that has the potential to bring desired change in the teaching and learning process.

## Uneven IT provision of ICT by Intervention providers

According to the current findings, there is differential access to class activities and lesson by learners because of how learners access the TBI resource rooms. The process of having small groups of learners go the TBI resource rooms in turns while others remain and continue to learn from the normally scheduled lessons in the classroom raises ethical concerns on the design and implementation of the intervention. In addition, the findings have revealed that in situations where there was one teacher only, the ICT providers expect the teacher to abandon his/her classroom lessons to provide technical support to learners who, on that day, attended the TBI resource room, denying the rest of the learners their right to education. While schools are expected to provide equal access to learning opportunities, the TBI intervention introduces inequalities in how learners access both the classroom lessons and the TBI lessons. Such a system may substantially increase and reproduce the extent of learning differences and knowledge gains by promoting inequality of learning opportunity.  In this situation, the schools become a source of social inequalities. Ethical dilemmas and value conflicts therefore arise because the design and implementation of the TBI intervention marginalized some learners in the school contexts since the educational

differentiation introduced by the TBI presents inequalities in the provision of education. The educational differentiation could potentially affect performance and attainment of learners throughout their lives, hence unethical.

Beyond the specific school and classroom contexts, the uneven provision and access to ICT presents more ethical issues that require further research for all learners across the primary education system. The findings reveal that the interventions are implemented in selected primary schools out of all the public primary schools. This raises issues of inequality in access to resources amongst learners from public primary schools that have different types and levels of ICT interventions. Furthermore, it is not clear how learners who transfer from a school with ICT interventions such as TBI to another school without such interventions, or vice versa, are able to cope with their new learning environments. Furthermore, since both the Interactive Radio Instruction (IRI) and the Tablet Based Instruction (TBI) target learners in Standard 1 and 2, it is also not yet known how learners are able to progress in Standard 3 onwards where such interventions are not available. The uneven and unequal introduction of and access to the ICT interventions raises more ethical challenges that could have beeen addressed if the MoEST through the DBE provided rational and ethical frameworks for policy directions and implantation guidelines during the conceptualization of the ICT interventions. From these observations, this study, argues that the uneven and unequal introduction of and access to the ICT interventions is less ethical to the learners than none at all. Further research on learners' voices to further unravel these ethical conflicts has been suggested in the Conclusion chapter.

## Summary

The chapter has discussed the configuration of events, activities, contexts, and processes in the conceptualisation, implementation and integration of ICT

interventions in Malawi's primary school education system. Activity System Analysis has been used to theorise the findings and interpretations and, in turn, reveal systemic contradictions from them. The analysis has revealed the gaps in the conceptualisation of ICT interventions relating to the NESP, the Nation ICT Policy, initial teacher training, teachers' ICT continuous professional development and the provision of the ICT interventions in the schools.

These missing links in the conceptualisation of the interventions have been noted to present tensions in the implementation of the ICT interventions in the schools. The analysis of these systemic tensions has revealed how the contextual changes in the conceptualisation of the ICT intervention can shape the teachers' ICT implementation context and portray how the teachers' activities are tied to several complex phenomena in the wider setting. The chapter that follows presents conclusions drawn by the study.

# CHAPTER 6: CONCLUSION

## Introduction

This study was set out to investigate the conceptualisation, implementation and integration of ICT interventions in primary school education system in Malawi. The study draws on the relationships between national ICT conceptualisation activities, schools' implementation contexts and teachers' ICT integration practices in the classrooms. The present chapter reviews research questions that guided this investigation and draws together its findings and contributions in order to make conclusions, recommendations and suggestions for further research.

## National Conceptualisation of ICT Interventions and its implications

The findings about the national primary school education context and systems have revealed how ICT interventions in the primary school education system are conceptualised. The findings presented in Chapter Five and the discussion that followed them in Chapter Six have revealed that there are gaps in the NESP as a guiding tool for the introduction of ICT in education; in the roles of different stakeholders in the introduction of ICT intervention; and in the ICT policy and plans as the formal regulations that affect how the introduction of ICT interventions takes place.

### Policy Considerations

The study has found that the NESP does not provide specific strategies and framework that could guide ICT investments and interventions in education. In addition, the Nation ICT Policy does not provide specific frameworks for government departments and agencies and other stakeholders to facilitate the deployment, implementation and integration of ICT within the education system. These gaps cause certain types tensions in the primary schools' ICT

implementation structure and, in turn, affect how the interventions are implemented. Thus, while the ICT interventions as provided by the different development partners sought to improve the quality of the teaching and learning inputs in the schools, their implementation is neither guided nor regulated.

Therefore, the unguided and unregulated efforts of the individual ICT interventions providers do not integrate into a coordinated national process but remain as initiatives by the individual ICT providers that are greatly affected by the contextual tensions identified by this study. The present study therefore concludes that the process of conceptualising and implementing ICT in primary education is in a form of experimentation, being led by nongovernmental organisations (the ICT providers) instead of the Directorate of Basic Education of MoEST, who are mandated by law to formulate and review plans, policies, rules and regulations on Basic Education nationwide.

**Potential Role of Initial Teacher Education**

The gaps characterising the NESP and the ICT policy present tensions regarding how the stakeholders perform their roles in the ICT implementation system. ICT interventions providers and the MoEST departments and other institutions that are key stakeholders in the ICT interventions implementation activity have no reference point in their service delivery. While the Directorate of Teacher Education and Development (DTED) is responsible for coordinating the designing and development of policies and programmes for teacher education and development, it does not have specific plans or policies for teacher training and development towards teachers' capacity for ICT integration. Consequently, the Teacher Training Colleges (TTCs) do not have guidelines for ICT training within the teacher training programmes that the teacher educators could follow. Similarly, the Malawi Institute of Education (MIE), which is responsible for providing in-service training for education personnel at the national level, does not provide

training for the use and integration of ICT innovations due to the absence of national strategic policies and plans that could guide the ICT interventions' implementation structure in the primary school education system. Therefore, MoEST does not provide any pre-service teacher training or any continuous professional development for ICT integration. This presents a disparity between the expectations of the ICT providers that the teachers would effectively use the provided ICTs and the teachers' knowledge and competencies in ICT use for instruction. Thus, while the ICT intervention providers expect teachers to effectively adopt and use their interventions, TTCs and MIE do not prepare teachers for ICT uptake and use in their profession.

In order to address this gap, the ICT intervention providers take the responsibility of designing and coordinating the in-service training that is required for the teachers to effectively integrate the use of the specific ICTs that they provide. As such, the in-service training offered by the ICT intervention providers is done only when the interventions are being introduced into the schools and focus only on teachers who at the time of introducing the intervention are teaching the concerned classes. Such training is only tailor-made for the interventions at hand and is not guided or prioritised as part of professional development for serving primary school teachers to build their ICT integration skills and knowledge. The present study concludes that the national primary school teacher training curriculum neither has an ICT related course nor does it provide ICT as a crosscutting skill, therefore affecting teachers' perceptions and attitudes towards the ICT interventions in their schools. With passage of time, teachers' understanding and confidence in the use of the provided ICT is reduced.

## Tension and Implications in the schools and classrooms

The analysis of findings at school and classroom levels have revealed tensions that, in turn, explain how the ICT interventions are implemented and integrated respectively. The findings illuminate the effects of the gaps in the national

conceptualisation of the ICT interventions and provide explanations regarding how the schools and teachers manage and use the available interventions respectively. Since the MoEST does not have any frameworks for the implementation of ICT interventions in the schools, the study found that it is difficult for the schools to have their own guidelines or framework bearing in mind that all public schools are governed by policies from Malawi central government. The absence of school-based ICT integration plans or curriculum guidelines also means that the schools, in general, and the teacher, in particular, are left to implement the ICT interventions without any guidelines. This presents tensions in the school ICT interventions implementation system because schools have to accommodate different requirements for integrating different ICT interventions as teachers do not have any curriculum frameworks nor instructional guidelines that can guide them how to adopt and use the ICT interventions in the classroom. The schools and the teachers depend on whatever the ICT interventions provide and/or demand from them. Therefore, the available ICTs are neither used to support the already existing teaching and learning activities nor teachers' generic classroom lessons and assessment nor to fit into the existing school standards. The present study concludes that the schools and the teachers are required to make special arrangements to accommodate specific requirements for each ICT intervention, raising issues of school and teacher disempowerment and ethical dilemmas.

**Disempowerment of School Management Teams and Teachers**

Furthermore, the absence of school-based ICT integration plans presents the school system i.e. school management with challenges regarding how they could perform their roles in the ICT implementation system. The study established that the school management in general and the head teachers, in particular, have no role in either developing, managing or monitoring the ICT intervention activities within the schools. Instead, they only act as channels of information as the ICT providers directly prescribe to the teachers how the ICTs they are providing to the

schools should be used. This highlights how the interventions are disempowering the school management teams and teachers by not affording them any meaningful opportunity to pursue shared leadership, take control over their work and participate in decision making regarding how the interventions could be adopted in the school and integrated in the classrooms.

The disempowerment of the school management and teachers is also evident throughout the findings as teachers and head teachers have limited knowledge and understanding of what the TBI intervention objectives are, who are the key stakeholders and their respective roles in the implementation. While teachers are using the ICT interventions, they do not understand why they are using them, and who else, apart from the TBI intervention providers, is/should be involved the implementation of the interventions. This, generates tensions in the teachers' use of the ICTs and the objectives of the interventions. Teachers used the ICT interventions as an obligation and not necessarily to support their own pedagogical objectives in their teaching. This contributes to more tensions in the integration of the interventions in the classroom considering that the teachers' willingness and efforts to use the TBI in the teaching-learning process are not based on the teachers' instructional objectives. The present study concludes that teachers only use the available ICTs just as prescribed by the ICT intervention programmes. Thus, teachers are not able to take advantage of the provided ICTs to support their own pedagogy or to address other specific learners' needs.

**Ethical Conflicts**

As already implied, the implementation and integration of the ICT interventions in the schools and the classrooms, respectively, is characterised by a lack of school-based guidelines, lack teacher education and agency, lack of ICT leaderships and lack of technical service and advice on the use of the ICT resources. These forms of tension cause interruptions and potentially lead to the teachers' negative self-

reflective perceptions and considerations about possible further use of old interventions, such as Tikwere IRI which was no longer in use in the case study schools during the study period, as well as current and any other emergent ICT interventions exemplified by the Tablet Based Instructions (TBI). More tensions arise from the ethical dilemmas and value conflicts because the design and implementation of the TBI intervention marginalises some learners in the school contexts since the educational differentiations introduced by the TBI present inequalities in the provision of education by the teachers. In addition to the already diverse and demanding work environment that the schools operate in, the present study raises the ethical alarms on the design and implementation of the TBI intervention from the general lack of ownership of the interventions by the MoEST, the lack of ICT pedagogical knowledge by teachers and the uneven provision of and access to ICT provisions to schools and by learners, respectively.

## Research Contribution

This study makes the following contributions:

### The Present Study's Contribution to Knowledge

This research contributes to the existing body of literature and the field of ICT adoption and integration in education by identifying inadequacies of previous studies regarding the introduction of ICT in education in developing countries, particularly in Malawi. Hitherto, no known empirical study considered how the Malawi primary school education system conceptualises and implements ICT interventions being introduced in primary schools and the implications of the conceptualisation and implementation processes on how teachers integrate them into their teaching. There is lack of published scholarly work on the conceptualisation, implementation and integration of ICT in Malawi education system in general. The present research has empirically identified contextual systemic factors and their implications in the implementation and integration of ICT interventions in schools and classrooms respectively. This is not only an

important contribution to the existing body of literature on the subject in general, but also a specific contribution to the field of ICT in education. This is the case because it provides insights regarding approaches to ICT implementation and because it is able to identify the process of ICT intervention planning in education.

It has been revealed from the literature review that no previous research has put forward success strategies or a guide for resolving the various issues facing Malawian education system and structure with respect to the introduction ICT in the school system. In view of this, the present research is an important pioneer in the area. The study particularly suggests some strategies as it discusses its finding's implications to policy makers, teacher educators and other relevant institutions involved in the conceptualisation and implementation of ICT interventions in Malawi's primary schools as captured in subsequent sections. Based on empirical data, the discussion about the study's findings also present a dynamic view of the factors that shape Malawi's school system context for implementing and integrating ICT interventions in order to make recommendations for successful implementation of the interventions. This approach is not evident in any previous research.

Finally, insights from the present research show that contexts which shape and affect the implementation and integration of ICT in every country are different, depending on how the education system is structured and managed. Previous research, as indicated in Chapter Two (Literature Review), identified key factors that affect ICT adoption and integration in schools. However, although similar factors have emerged in the present research, what is significant is the fact that the new findings link the ineffective integration of ICT in specific classrooms to particular activities situated within their larger context and the exterior inputs. In other words, the present research builds a detailed account of what teachers are doing to integrate ICT in their teaching and why and how their activities are supported or hindered by their larger socio-cultural context. This is a key

contribution by the present study because it provides a detailed interpretation of the ecological events, activities, contexts, and collaborative processes taking place in Malawi's primary education system where the ICT interventions are used. Furthermore, the study raises questions relating to disempowerment of school management and teacher, and ethical conflicts in the design and implementation of the interventions. Put differently, the study provides explanations about visible factors that affect ICT integration that are richer than those found in the previous studies as observed during the review of existing literature.

## Contribution to Methodology

The research makes a methodological contribution by using multilevel activity systems analysis of Activity Theory to examine different phenomena in the processes of introducing ICT interventions in the primary schools. Many of the studies that have examined the adoption of ICT in education institutions and systems using activity system analysis have focused on a single level data generation and analysis and do not capture how various epistemic considerations are organised in different levels of research. This study has investigated processes and contexts at national level, school level and classroom level through a multilevel research strategy.

Through this methodology I have been able to consciously choose activity systems at different scales and levels in order to expose a wide range of epistemic issues that are suitable for investigating the introduction of ICT in education. This makes a contribution to three different dimensions of research (conceptual, methodological, and explanatory dimensions) that involve multiple lines of evidence and require a combination of approaches to produce integrated knowledge of ICT interventions in these systems.

The research makes a substantial contribution through the conceptual dimensions because the activity systems ranged over multiple scales and levels that required

diverse units of analysis; methodological dimensions because this conceptual heterogeneity necessitated approaches that are capable of addressing multilevel composition and dynamics; and explanatory dimensions due to different activities and entities connected in multilevel systems that required explanatory methodology to capture these interactions. To my knowledge, this is one of the few research studies that have employed a multi-method data collection approach based on interpretivist paradigm for investigating ICT intervention processes amongst and within education systems. Therefore, this study makes a methodological contribution to ICT research in education.

## Contribution to Practice

This research has contributed to practice by providing a rich insight into schools' and teachers' experiences with respect to the implementation and integration of ICT interventions. The analyses of how ICT is conceptualized at the national level and the implications in the subsequent systems revealed the areas that require the attention of government departments and institutions and the other relevant stakeholders in the implementation and integration of ICT in the schools and classrooms. It also highlights the ethical dilemma associated with the teachers use of the intervention which are seen to introduce inequalities through differentiated provision of education. The study has also revealed how teachers and school leadership is disempowered from making decision that could help them effective adopt and use the ICT interventions. Therefore, the implications of this research offer suggestions on how the Malawi government and the nongovernmental organisations can support teachers' and schools' ICT development, to effectively improve the quality of the teaching and learning inputs and enhance the learning outcomes.

Moreover, in view of the tensions that have been identified as issues militating against the effective  implementation and integration of the ICT interventions by schools and teachers respectively, and given the current efforts of the Malawi government and the nongovernmental organizations (ICT providers) to scale-up ICT infrastructure and resources investment, the proposed strategies in this research provide laudable

approaches in the conceptualisation of such investments towards effective implementation and integration in the schools and classrooms (see Study Implications). These contributions are timely, as the Malawi primary education system is embracing ICT pedagogy in the delivery of educational outcomes in literacy and numeracy as discussed in Chapter One (see Study Background). The study recommendations can be incorporated in the formulating ICT plans and implementation strategies that could help schools and teachers, the MoEST and other stakeholders that are involved in ICT interventions in the primary school education system.

## Contribution to Policy

This research makes a contribution to policy by highlighting gaps in the National ICT policy and the National Education Sector Plan as a priority schemes for primary education through policy measures, quality improvement and investments. These policies do not provide any guidelines for ICT interventions in Malawi primary school education system. As such, although the Malawi government with its development partners (through the nongovernmental ICT providers) have increasingly been supporting the ICT infrastructure and resource investment for teaching and learning, the same has not occurred in ICT teacher preparation, professional development, school and classroom ICT support systems and provisions.

This has created an imbalanced approach in the introduction of ICT interventions as teachers are challenged to develop approaches of integrating the interventions in uncorroborated teaching and learning environments that they are not prepared for. Thus, this research informs institutional leaders and policy makers to take the necessary measures to ensure policies guide and align quality improvement and investments in ICT in education in order for the teachers to be able to fully embrace the ICT interventions in their teaching.

# Research Implications

The findings of this research have a number of important implications that may assist the ICT providers, the MoEST and policy makers to facilitate the conceptualisation and implementation of ICT in Malawi primary school system, as earlier stated. Hereunder, I discuss implications of the results of this study in the following sectors; the Directorate of Basic Education, the Department of Teacher Education and Development, the Education Zone Officers and the Primary School Management teams.

## Implications for Basic Education Directorate

The study found that the National Education Sector Plan does not specifically provide strategies and plans that can guide ICT investments and intervention in primary schools and that the national ICT policy does not specify how government through different agencies and stakeholders could facilitate the deployment, implementation and integration of ICT within the educational system. In view of this, there is need for DBE which, under MoEST, is responsible for formulation and review of policies and for setting and reviewing standards on basic education in Malawi, to be the custodian of all policies and plans towards ICT interventions in primary schools.

The study also found that the DBE was not involved at any stage during the conceptualisation and implementation of the ICT interventions that were introduced in the primary schools. There is need for DBE to take a central role in generating the rationale, goals, and vision for how the Malawi primary education system can incorporate the ICT interventions and guide specific roles for relevant stakeholders in the design and development of specific ICT interventions. This will guide and regulate efforts of the individual ICT intervention providers so that they are integrated into a coordinated national process, through the guiding frameworks (policies and plans) for ICT implementation.

## Implications for Teacher Education and Development

The study found that the MoEST does not provide ICT training for preservice teachers but only provided teacher training institutions with computer laboratories with the hope that the teachers will be able to get relevant ICT skills from the access and exposure to the ICTs they get during their pre-service training. This strategy has been proven to be ineffective since the study found that teachers lack relevant knowledge on how to facilitate learning through appropriate pedagogy and ICT. This revealed why teachers failed to take advantage of the available ICTs to support their own pedagogy or to address specific learners' needs – as they only used them just as prescribed by the intervention providers. Therefore, there is need for DTED, which is responsible for policy, control and designing of teacher education curriculum, to provide specific plans and curricula for teacher education and development institutions (Teacher Training Colleges) towards the development of teachers' capacity for ICT integration – to prepare teachers for the real-world application of ICT in the primary school curriculum in order for them to use ICT to support their pedagogy.

## Implications for In-service Teacher Professional Development

The study found that the MoEST does not provide training for the adoption and use of ICT innovations that are introduced in the schools through the different interventions and instead the ICT interventions providers took the responsibility of designing and coordinating the in-service training that are required for the teachers to effectively implement the use the specific ICTs they provide. However, the in-service teacher training provided by the ICT intervention providers does not support the serving teachers to adapt and take advantage of ICT interventions to transform their teaching and learning practices, i.e. ICT pedagogy integration. There is need for MIE, which was responsible for providing in-service training for education personnel at national level, to provide in-service teacher training as an

on-going support for primary school teachers' professional self-development for core competencies in ICT pedagogy integration.

In addition, the study found that teachers lacked curriculum guidelines to base their instructional decision making and lesson planning processes on. This reduced the teachers' potential use of the available ICTs to raise quality and enhance learning since they were only dependent on the ICT intervention providers to provide them with guidance on how to adopt and use the ICT innovations that they bring in to the schools. There is need for MIE to consider including strategies within the syllabus documents, Teachers' Guides and Textbooks that could guide the adoption and use of the widely available ICT interventions in classroom activities.

Further to the suggestions for the MIE, the Education Zone Officers who head the Education Zones (also known as Teacher Development Centres) that are located in close proximity to the schools which they serve are responsible for implementing the training program for school staff in order to strengthen the capacity of the MIE to support teacher development activities. Along with the Primary Education Adviser (PEA) and other staff from within the zone, Education Zone Officers could form a zonal training team that can develop and coordinate zone level ICT Continuous Professional Development programs for teachers.

## Implications for School Management

The Study found that the schools did not have any ICT Plans or guidelines to base their decision-making and planning processes on, in order to support the successful adoption and utilization of ICT by teachers. In addition, the school management committees and the head teachers had no role in either developing nor managing or monitoring the ICT interventions' activities within the schools. However, in this study, school management committees and head teachers have been identified to be key stakeholders and change facilitators who are expected to

carry the responsibility of initiating, implementing and facilitating key decisions to integrate the ICT interventions into the school activities.

Therefore, there is need for head teachers and school management committees to develop school-based ICT plans that can facilitate successful ICT integration by establishing comprehensive strategic and operational elements such as school based technical service and advice during the integration of ICT in teaching and learning. This would help the schools to use the interventions to support the already existing teaching and learning activities or fit into the existing school standards and practices rather than the schools making special arrangements to accommodate the respective teaching and learning settings for the specific ICT interventions.

## Areas for further research

Since this study has established that the conceptualisation and implementation of ICT interventions in the Malawi primary school education system is still developing, there remains more ground that require further research to provide answers to questions regarding the implementation and integration of ICT interventions in the primary school education. As this phenomenon develops, there are sets of questions that may be worth exploring through empirical studies such as;

### i. Learners' Voice on ICT interventions in schools

This study has raised ethical issues relating to the uneven provision of ICT innovations to learners and schools, limited access to the ICT resources provided by the interventions, and the unavailability of the ICTs provided by the interventions to other classes beyond Standard 2.  These ethical issues have to be explored further and be addressed to the interests of learners who are supposedly the primary beneficiaries of the interventions. Understanding learners'

experiences, perception and attitudes towards how the ICT interventions are designed and implemented would also contribute towards the development of contextually relevant pedagogical knowledge for ICT integration.

Furthermore, it is increasingly important to consider the learners' views especially with the increasing uptake of ICT in the schools, since they are key stakeholders in the educative process too. Finding out what affects their learning in regard to ICT use in the classroom can inform teachers' practices and school management ICT plans and perhaps lead to the development of a more collaborative ICT implementation and integration processes.

### ii.   Capacity of School Management Teams to develop and manage school-based ICT plans

In this study, school-based ICT planning has been considered as one of the underlying school level conditions influencing the ICT implementation and integration process in the Malawi primary schools and school leadership has been identified to be key facilitators to carry the responsibility of initiating, implementing and facilitating the school-based ICT planning process to integrate the ICT interventions into the school activities. Although school ICT planning is also recommended by other studies elsewhere, research on ICT planning is underdeveloped. There is need therefore to investigate the ICT planning capacity, practices and context for the primary school head teachers and management committees.

### iii.   Initial Teacher Educators' ICT pedagogical skills, ICT competencies and efficacy and practices

While this study recommends initial teacher training to provide systematic instruction for the effective use of ICT to support teaching and learning, there is limited knowledge about the primary school teacher educators' understanding,

perceptions and competencies on the use of ICT to model the preservice teachers on how to facilitate learning using appropriate ICT and pedagogy in different learning areas. Considering the role that the teacher education institutions are expected to fulfil, it is important to understand how the teacher-educators perceive and recognise the use of ICT to model the effective ICT integration practices within the teacher training institutions through empirical research.

## Summary

This chapter has presented the contributions this research has made to the body of knowledge by providing empirical evidence and implications that can increase the knowledge base on the conceptualisation and implementation of ICT interventions in education systems. Other contributions of this research include the adoption and application of activity system analysis and the implications for policy and practice. The chapter has also presented the key limitations of this research as well as recommendations for future research.

In conclusion, this research has fulfilled its goals and expectations and has answered all research questions that were set out during the study. The conclusions drawn in this study may be beneficial in providing necessary guidance for policy makers and practitioners to develop strategies that would enhance the effective implementation and integration of ICT in education. It is also expected that the insights from this study will inform future research that would extend the knowledge on ICT in education.

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# APPENDICES

# Appendix 1 – Request to Ministry of Education to conduct research



**PRINCIPAL**
**R. Tambulasi, B.A, BPA (Hons), MPA, PhD**

Ref: CC/PS/01/15

**CHANCELLOR COLLEGE**
**P.O. Box 280, Zomba, Malawi**
Telephone: (265) 524 222
Fax: (265) 524 046
E-mail: principal@cc.ac.mw

10 February, 2015

The Principal Secretary,
Ministry of Education, Science and Technology,
Capital Hill Circle,
Private Bag 328,
Lilongwe

REQUEST FOR PERMISSION TO CONDUCT RESEARCH IN PUBLIC
PRIMARY SCHOOLS

Dear Madam,

My name is Frank Mtemang'ombe and I am a Lecturer of Education at
Chancellor College, University of Malawi; currently studying for a
doctoral degree at the University of Strathclyde in Scotland.

I wish to conduct a study for my Doctoral Thesis on ICT Integration into
Teaching and Learning in Public Primary Schools in Malawi. This project
will be conducted under the supervision of Dr Lio Moscardini of the
School of Education at the University of Strathclyde, Scotland and Dr
Mercy Kazima Kishindo of the Faculty of Education at the University of
Malawi.

The aim of this study is to explore teachers' experiences and practices and their working context in the implementation of emerging instructional technology interventions in Malawi primary schools. I will therefore involve teachers through lesson observations and interviews. I will also consult and interview the Head teacher(s), the Primary Education advisor(s), the District Education Manager(s) and the ICT Provider(s) of the school(s) as key informants to my investigation.

I am therefore seeking your permission to approach schools to identify participants for this project and carry out my investigation with them. Upon completion of the study, I undertake to provide the Ministry of Education with a bound copy of the full research report. If you require any further information, please do not hesitate to contact me through the contact details below.

Thank you for your time and consideration in this matter.

Frank Mtemang'ombe
University of Malawi
Faculty of Education
Box 280, Zomba.
fmtemangombe@cc.ac.mw
Phone: +265993450115

# Appendix 2 – Ministry of Education Research Clearance

Telegrams: MINED, Lilongwe
Telephone: (265) 01 789 422/ 01 789404
Telex: 44636
Fascimile: (265) 01 788 064

MINISTRY OF EDUCATION
PRIVATE BAG 328
CAPITAL CITY
LILONGWE 3
MALAWI

**Ref. No. BED/1/11**

19th February, 2015

Frank Mtemang'ombe
University of Malawi
Faculty of Education
P.O. Box 280
**Zomba**

Dear Sir,

## CLEARANCE TO CONDUCT RESEARCH IN PUBLIC PRIMARY SCHOOLS

Refer to your letter dated 10th February, 2015 in which you requested to conduct research in public primary schools as part of your Thesis in Doctoral Studies.

I am pleased to inform you that you are cleared and that you can proceed to conduct your research as planned. However, we believe that all ethical issues will be properly followed as you interact with various key informants.

We hope that the study will be of great importance to you, the education sector and the nation at large. We will also appreciate if you provide us with a copy of your Thesis after the research is done.

We wish you success as you carry out your research.
Yours faithfully,

J. Chimombo PhD.
For: **THE SECRETARY FOR EDUCATION, SCIENCE AND TECHNOLOGY**

# Appendix 3 - Participant Information Sheet – Teachers

University of
**Strathclyde**
Glasgow

## Participant Information Sheet - Teachers

**Title of the study**

ICT Integration into Teaching and Learning – Primary School Teachers' Context, Experiences and Practices

**Introduction**

You are invited to take part in a study about primary school teachers' context, experiences and practices in the use of information and communication technologies (ICTs) for teaching and learning in Malawi. This research is being carried out by Frank Mtemang'ombe, a doctoral student at the School of Education of The University of Strathclyde in Scotland under the supervision of Dr Lio Moscardini of the School of Education at the University of Strathclyde, Scotland and Dr Mercy Kazima Kishindo of the Faculty of Education at the University of Malawi.

Your contribution to the study will help in understanding more about how teachers use ICT innovations in their teaching and if the teachers' ICT practices are influenced by their context. Before you decide whether or not to take part, it is important for you to understand what participation in the study will involve for you. Please take time to read the following information carefully.

**What is the purpose of this investigation?**

This study seeks to investigate teachers' practices and experiences in the use of emerging ICTs in schools and seeks to understand teachers' objectives and expectations from the use of these interventions based on the context they operate in.

**Do you have to take part?**

Taking part is voluntary - you can decide whether or not you want to take part. If you don't want to take part, you do not have to give a reason and no pressure will be out on you to try and change your mind. If you do decide to take part, you are still free to withdraw at any time, up to the point of completion, without having to give a reason and without any consequences. If you exercise your right to withdraw and you do not want your data to be used, any data which have been collected from you will be securely destroyed.

**What will you do in the project?**

If you agree to participate, I will ask to observe any 2 of your lessons to learn about the way you use ICT for instruction in the classroom and shall later have an interview discussion with you. There are no any right or wrong answers – I just want to learn about your opinions and experiences. The interview should take no more than an hour.

Although I will be taking some notes during the interview, I will not possibly write fast enough to write down every part of the interview, so I will ask to audio-record the discussion so that I do not miss anything that you may share during the interview. However, you have a right to decline to be recorded and I shall only write notes during the interview.

**Why have you been invited to take part?**

You have been invited to take part in this study because of the active role you play in the use, the support services and provisions of ICT for teaching and learning in the school. I therefore believe that your participation will help me to get rich and in-depth information on the teachers' ICT activities and context.

Please note that the study will involve observing lessons and interviewing a total of seven teachers from your school and also interviews with the head teacher, the education advisor and the ICT provider for your school

**What are the potential risks to you in taking part?**
You shall never be exposed to any situation for the purposes of this study that may cause physical or psychological discomfort or injury. You have a right not to allow any observation of behaviour/practices or respond to question that you may consider sensitive, private or you are not comfortable with.

**What happens to the information in the project?**
All the information you provide will be confidential and used for the purposes of this study only. The data shall be given code names (pseudo-anonymised) and kept safe from unauthorised access or accidental loss. The information will be used in a way that will not allow you to be identified. In addition the results of this research will not be able to link any information provided to you personally or your school/educational services/department.

Please note that The University of Strathclyde is registered with the Information Commissioner's Office who implements the Data Protection Act 1998. All personal data on participants will be processed in accordance with the provisions of the Data Protection Act 1998 of the UK.

**Thank you for reading this information – please ask any questions if you are unsure about what is written here.**

**What happens next?**
If you agree to take part in this study, you will be asked to sign the Consent Form. You will be given a copy of both the Participant Information Sheet and the Consent Form to keep. If you decide not to participate, I would like to thank you for your time.

**Researcher contact details:**

Frank Mtemang'ombe
Doctoral Student - School of Education
Faculty of Humanities and Social Sciences
Lord Hope Building
141 St James Road
Glasgow
G4 0LT
Tel. +447467614089; +265993450115
Email frank.mtemang-ombe@strath.ac.uk

**Chief Investigator details:**

Dr Lio Moscardini - Senior Lecturer
School of Education
Faculty of Humanities and Social Sciences
Lord Hope Building
141 St James Road
Glasgow
G4 0LT
Tel. +44(0)141 444 8074
Email l.moscardini@strath.ac.uk

**Who to contact for more information**
This investigation was granted ethical approval by the University of Strathclyde Ethics Committee. If you have any questions/concerns, during or after the investigation, or wish to contact an independent person to whom any questions may be directed or further information may be sought from, please contact:

Dr Eleni Karagiannidou
School of Education Ethics Committee Chair
University of Strathclyde
Lord Hope Building
141 St James Road
Glasgow
G4 0LT

Telephone: +44 (0)141 444 8107
Email: eleni.karagiannidou@strath.ac.uk

# Appendix 4 - Consent Form for Teachers



## Consent Form for Teachers

**Name of department**

School of Education
Faculty of Humanities and Social Sciences
University of Strathclyde

**Title of the study**

ICT Integration into Teaching and Learning – Primary School Teachers' Context, Experiences and Practices

- I confirm that I have read and understood the information sheet for the above project and the researcher has answered any queries to my satisfaction.
- I understand that my participation is voluntary and that I am free to withdraw from the project at any time, up to the point of completion, without having to give a reason and without any consequences. If I exercise my right to withdraw and I don't want my data to be used, any data which have been collected from me will be destroyed.
- I understand that I can withdraw from the study any personal data (i.e. data which identify me personally) at any time.
- I understand that anonymised data (i.e. data which do not identify me personally) cannot be withdrawn once they have been included in the study.
- I understand that any information recorded in the investigation will remain confidential and no information that identifies me will be made publicly available.
- I consent to being a participant in the project.
- I consent to be observed during my lesson delivery.
- I consent to being audio recorded as part of the project – YES / NO

| (PRINT NAME) | |
|---|---|
| Signature of Participant: | Date: |

# Appendix 5 – Lesson Observation Schedule

| General Information | Date | |
| :--- | :--- | :--- |
| | Time (Duration) | |
| | Number of learners (Approx) | |
| | Class (level) | |
| | Subject | |
| | Topic | |
| | Objectives | |
| **Classroom Environment** | How does the classroom environment / atmosphere accommodate the use of ICT? | |
| | How relevant is the use of ICT to the teaching and learning environment? | |
| **Teaching methods and strategies** | Learners' interaction with ICT within the lesson | |
| | Learners' tasks and instructional activities that are supported by ICT | |
| | Relevance of the ICT to the teaching strategy | |
| **Teacher's use of ICT** | How does the teacher interact with learners with learners using ICT? | |

| | What pedagogical purposes did the use of ICT serve? | |
|---|---|---|
| | | 244 |
| | What other purposes did the use of ICT serve? | |
| Any other key observation | | |

# Appendix 6 – Interview Schedule for Teachers

**Introduction**

Thank you for deciding to take part in this research project through this interview and for taking the time to meet with me today. My name is FRANK MTEMANG'OMBE and as indicated in the Participant Information Sheet, I would like to talk to you about your experiences from the role you play in the use of ICTs for teaching and learning in primary schools. I shall also commonly refer to the lesson I have observed.

The interview should take not more than an hour. Although I will be taking some notes during the session, I cannot possibly write fast enough to get it all down so I will be audio-recording the session because I do not want to miss any of your comments. Remember, you do not have to talk about anything you do not want to and you may end the interview at any time.

Are there any questions about what I have just explained?

### A. Background information
1. When did you join Primary Education as a teacher?
2. How could you describe your level of competence in general ICT use? And for teaching and learning?
3. Have you ever been trained in any ICT use during your initial teacher training? Explain

### B. Personal understanding and interaction with ICT
1. What type of ICTs are available in the school?
2. Which of these ICTs are available / accessible for teaching and learning? Why?
3. What are your views on the use of ICT for teaching and learning? Why?
4. Do these views influence the way you use ICT for teaching and learning? How?
5. How often do you use the available ICTs for teaching and learning? Why?
6. How has your teaching practice been influenced/affected by the use of the ICTs? Why?
7. What challenges are you encountering as you implement the use of ICT in the classroom in terms of;
      i. Lesson preparation?
      ii. Lesson delivery?
      iii. Learner assessment?
8. Were any of these experienced during the lesson that was observed?
9. How do you deal with these challenges or how are you resolving them?
10. How have the following affected the way you use ICTs for teaching and learning;
      i. ICTs accessibility?
      ii. Availability of technical support?
      iii. The curriculum demands - objectives?
      iv. School management?
      v. Your ICT competence?
11. Did any of these influence the way you used the ICTs during the lesson?

### C. Participation in in-service training program and support systems

1. Have you ever participated in any in-service training programme in readiness of ICT use for teaching and learning?
2. If yes, how has your participation in the in-service training programmes played a part in shaping how you use ICTs for teaching?
3. Do you think the programmes adequately prepared you for demands and challenges of using ICT for teaching and learning?
4. If you did not participate in any in-service training programmes in readiness for ICT use for instruction, how do you feel being left out? Has this situation placed you at a disadvantage as a teacher? What do you think should be done?
5. What kind support are you getting from your colleagues, the school leadership and the Ministry of Education to help you use the available ICTs for teaching and learning?
6. Do you think this support is adequate? Explain
7. Do you have any opportunities to experiment with the available ICTs? Explain

**D. Attitudes and feelings towards the introduction of ICTs in the schools**
1. Describe or express:
   i. The feelings, fears, concerns or excitement you experienced when you first heard of the introduction of ICTs for teaching and learning into schools – why?
   ii. Your teaching experience when you first taught your class using the available ICTs – why?
   iii. Your present attitude towards the use of ICT innovations for teaching and learning – why?

**E. Issues from the Lesson Observations**
1. Why was a specific ICT used for the lesson?
2. How do you usually decide on the following?
   i. When to use ICT for teaching
   ii. How to use ICT for instruction
   iii. Which of the available ICTs to use for instruction?
3. Does the use of ICT go along with your teaching philosophy? Why?
4. How often do you consider the expectations of the following on how you use the ICTs in the classroom; and why?
   i. Learners
   ii. The head teacher
   iii. The primary education advisors
   iv. The ICT resources providers
5. What type of support would you want to get towards your use of ICT for instruction?

**F. General observations**
1. Is there anything else, related to the use of ICT for teaching and learning, you would want to share with me?

**G. Closure**
Thank you for the valuable information you have shared with me. I will be analysing the information that you and others have given me within the next couple of months and shall present them through a doctoral thesis report. I will be happy to send you my

initial findings to review, if you are interested. I will also communicate to you, through a newsletter, my final findings at the end of the study. Thank you for your time.

# Appendix 7 - Interview Schedule for Key Informants – Education Officers

### A.  Introductions

Thank you for deciding to take part in this research project through this interview and for taking the time to meet with me today. My name is FRANK MTEMANG'OMBE and as indicated in the Participant Information Sheet, I would like to talk to you about your experiences from the role you play in the use of ICTs for teaching and learning in primary schools.

The interview should take not more than an hour. Although I will be taking some notes during the session, I cannot possibly write fast enough to get it all down so I will be audio-recording the session because I do not want to miss any of your comments. Remember, you do not have to talk about anything you do not want to and you may end the interview at any time.

Are there any questions about what I have just explained?

### B.  Roles and Responsibilities

1.  What role do you play in the provision/use of ICT for instruction in primary schools?
2.  What are the plans of your school/office for ICT in primary education – ICT Goals and Rationale?
3.  What are the activities/ programmes that are being implemented by your school/office to achieve these goals?
4.  What are the Strengths, Weaknesses, Opportunities and Threats of ICT integration into teaching and learning from your perspective?

### C.  School Context

5.  Who are your collaborating partners and what are their roles?
6.  How are these roles synchronised in the primary schools?
    - i.    Are there any contradictions?
    - ii.    How are they resolved?
7.  How are schools prepared for ICT uptake for teaching and learning?
8.  Are teachers adequately prepared to use ICT as expected? Explain
9.  What are the teachers' concerns about the use of ICT for teaching?
10. What factors do you think would influence teachers to use or not to use the available ICTs for instruction? Explain
11. What do you think should be done to help teachers effectively use the available ICTs for instruction?

### D.  Implementation Guidelines

12. Are there any policy guidelines that you follow in the provision if ICT interventions in schools? Explain

13. What do the schools and teachers use to guide their use of the available ICTs? Explain
14. How is the provision of ICTs into primary schools by the Non-Governmental ICT Providers regulated?
     i. Are there any specific documents I can refer to?
     ii. How could I access them?

## E. General Observations

15. What are your general observation about the use of ICT for instruction in primary schools?
16. Is there anything else you would want to add to what we have discussed?
17. Are there any documents that you would recommend that I should read? How can I access them?

## F. Closure

Thank you for the valuable information you have shared with me. I will be analysing the information that you and others have given me within the next couple of months and shall present them through a doctoral thesis report. I will be happy to send you my initial findings to review, if you are interested. I will also communicate to you, through a newsletter, my final findings at the end of the study.

Thank you for your time.