

EDINBURGH NAPIER UNIVERSITY

Adoption of Information and Communication Technologies

for

Educational Purposes in Malawian Secondary Schools

by

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A thesis submitted to the

School of Computing

in fulfillment of the requirements for the degree of

Doctor of Philosophy in Information Systems

in the

Faculty of Engineering, Computing and Creative Industries

ABSTRACT

The adoption of Information and Communication Technologies (ICTs) in Least Developed Countries (LDCs) has often been motivated by ideas of bridging the digital divide and promoting socio-economic progress within these countries. For example, many LDCs within sub-Saharan Africa and development practitioners alike are enthusiastic about the prospects of socio-economic progress through the adoption and use of ICTs. In Malawi, this belief in ICT potential is widespread and it is presumed that the adoption of ICTs will provide a sufficient condition for socio-economic progress and will offer Malawi the opportunity to leapfrog stages of development and accelerate her progress in socio-economic spheres. In particular, the adoption of computer based ICTs for educational purposes in Malawian secondary schools is being widely promoted.

However, in many LDCs particularly those within sub-Saharan Africa, the realisation of such over-hyped technological gains has always remained elusive and literature suggests that the use of computer based ICTs in LDCs is constrained by a cross section of critical challenges (Mansell and Wehn, 1998; Kawooya, 2002; Heeks, 2002). Wade (2004) further explains that ICT initiatives in LDCs are "... biased towards the supply side and give scant attention to demand" (Wade, 2004,p191) and that the alleged stories of ICT adoptions within the region are generalised with "little attention to scaling up problems" (p.186). This suggests that ICT adoption processes can not be understood and explained by simply focusing on the perceived potential of ICTs and disregarding complex socio-technical influences which shape and are shaped by those adoption processes in LDC contexts.

This research focussed on the development of a socio-technical conceptualisation of ICT adoption processes in Malawian secondary schools based on empirical evidence. Methodologically, it uses both qualitative and quantitative approaches and focuses on three main notions of ICT choice, ICT use and ICT value in order to investigate ICT adoption processes. Socio-Technical Interaction Networks (STINs) technique is used in order to analyse research data. In particular, analytical affordances provided by the Social Actor Model (Lamb, 2006) are used to gain rich insights into ICT adoption processes in Malawian secondary schools and to generate an evidence based theoretical conceptualisation which appreciates the inextricable interrelationship between ICTs and the context within which they are embedded.

The developed framework illustrates the significance of a context specific

socio-technical approach when implementing ICT initiatives in Malawian secondary schools and the researcher argues that it deepens our theoretical understanding of the socio-technical nature of technologies and can facilitate the implementation of ICT solutions that are aligned and valuable to the adopting context in LDCs like Malawi.

DECLARATION

As the researcher in this research study, I, ANTHONY SINYA KAMPINGO ZIBA ,declare that the material contained herein is a presentation of my original piece of work and wherever contributions of others are involved, every effort is made to indicate this clearly, with due reference to the literature

NOV 2008

Date



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ACKNOWLEDGMENTS

I would like to express my gratitude to all the people who have helped me in so many ways throughout this research project. First and foremost, my supervisors Professor Elisabeth Davenport and Doctor Keith Horton deserve a lot of thanks for supervising me so well, for encouraging me, for motivating me and for their valuable comments during discussions which challenged and helped clarify my thinking on this research topic. Their friendly and professional collaboration helped me quite a lot throughout this research work.

I would also like to thank Doctor Jose Munoz, my panel chair, for his valuable comments and thoughtful views throughout the research process. I feel very much indebted.

During data collection, several relatives, friends and colleagues in Malawi were characteristically generous in so many ways. A number of them helped me in the distribution and collection of questionnaires, provided me with food and accommodation, and allowed me to use some of their resources to get to research sites which could have otherwise been inaccessible. In this regard, I am indebted to my sisters: Towera, Bertha and Tereza; my in-laws: Isaac, Kamoza, Ruth, Gerald, Tony, and my friends: Kondwani, Charles 'Bush' Nsaliwa, Chiukepo and Deous Kumwenda.

I am also grateful to the Malawi Government and the Ministry of Education in particular for endorsing this research study and for allowing me to conduct research in Malawian secondary schools. In particular, I would like to express my gratitude to all the participants for their support and participation in this research study.

Three years of residence as a PhD research student in Edinburgh have enabled me to bring this research work to its logical conclusion. Throughout this period of study, the School of Computing at Napier University, UK, funded and provided all the necessary conditions under which this research work took place. Special thanks to the University for this and many other things. During the same period of time, several relatives in Edinburgh assisted me in one way or the other. In this regard, I am deeply indebted to my twin-sister, Angela,

my cousins Isaac and Wezi, my aunt Tamala Mhura, and my in-laws, Vincent, Yakosa and Patronella for their patience and support throughout this research study.

Surviving in Edinburgh as a parent, husband and an international doctoral student - thousands of miles away from home - can sometimes be a big challenge, however with the help and understanding of various friends and colleagues, I have been able to feel at home and more importantly to accomplish this project on time. In this case, I would like to thank the following for their support both at critical and opportune times: David Edwards, Frank Dalo, Earnest Phiri, Elvin Phiri, Matthews Mtumbuka, Peter Mtika and Gracious Chihuri. To all these individuals, and to several colleagues whose names I cannot continue listing and who have assisted me in one way or another, I feel very much indebted.

I would also like to thank my parents, Alexander and Anna-Maria, who have been very supportive and inspiring throughout this research process. I am what I am because of their love and support. Their contributions, both directly or indirectly, meant a lot to me and I would like to express my profound gratitude for all that.

Lastly, but definitely not the least, I would like to thank - in a special way - my wife, Tamala, my son, Alex, and my little daughter, Elsie, for their patience, understanding, love, support and encouragement throughout this research process and above everything else, "Nisi Dominus frustra" (i.e Unless the LORD builds the house, those who build it labour in vain) - I thank God, the Almighty, for His love and guidance. '*...Eeee Kristu!!!*'

DEDICATION

... to my wife, Tamala
... to my son, Alexander
... to my daughter, Elsie
... to my parents Alexander and Anna Maria
... to the entire Malawi Nation

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Chapter 1

Introduction

This chapter introduces the research problem by outlining the research questions, the research's main objectives, the approach adopted by the researcher in order to achieve those objectives and the significance of conducting this research project.

The chapter is divided into six main sections. Section one introduces the research problem with special reference to concepts of ICTs, education and socio-economic progress (development) in LDCs like Malawi. Section two outlines the research scope and discusses the three major thematic areas of ICT choice, use and value upon which focus is concentrated in this research study. Section three outlines the research questions and objectives and section four of this chapter presents justification and motivation for investigating the research problem. Section five discusses the significance of this research study and, finally, section six gives an outline of the structure of this thesis.

1.1 The Research Problem

Technologies are not neutral (Bijker & Law, 1997). They are not objective tools that can be used anywhere in the world and be expected to yield uniform results. Instead, they are embedded in and form part of a broader social context in which they are used in order to achieve particular goals. This means that the achievement of anticipated technological goals in any society depends on the nature of the interdependent relationship between the technology and the social context within which it is embedded.

Government sectors and development practitioners all over the world are talking about technologies as an enabler for the attainment of their developmental goals. In Malawi, for instance, computer-based technologies are being implemented in secondary schools in order to contribute to the nation's socio-economic progress (Malawi Government, 2003). However, despite the current enthusiasm, hope and hype surrounding the idea of adopting ICTs for socio-economic progress, the anticipated developmental outcomes still remain elusive in LDCs like Malawi (Mansell and Wehn, 1998; Heeks, 2002c).

James (2004), in her baseline study of ICTs in sub-Saharan Africa outlines aggregate outcomes of ICT initiatives and reports that the attainment of such goals in LDCs is largely constrained by various social, political, economic and technical challenges. Several researchers on ICTs in LDCs have also made similar observations (Pigato, 2001; Adeya, 2002; Cawthera, 2002; Grace and Kenny, 2003; Kawooya, 2004; Cossa, 2004; Cunningham, 2004) and Mansell and Wehn's (1998) e-readiness indicators suggested that it will take more than a century for LDCs within this region to be ready for computer based ICTs. All these studies seem to agree that ICTs are key to

socio-economic progress in LDCs like Malawi and that they must be adopted and implemented as much as possible to achieve socio-economic progress. On the other hand, Duncombe and Heeks (1999) observe that such studies appear to suggest that ICTs are separate from their context of use and that ICT initiative "...failures are due to technical issues or to the inability of humans involved to appreciate and champion wonders of ICTs" (Duncombe and Heeks, 1999, p.2). Although these studies provide some evidence which suggest that technology adoption processes are not as straightforward as some policies and ideologies may suggest, they focus much on the technology itself and overlook critical socio-technical elements which influence and are influenced by ICT adoption processes in the LDCs. They perceive technology as neutral.

On the other hand, there are pieces of research work which demonstrate that technologies are not neutral and that ICT adoption processes in LDCs influence and are influenced by various socio-technical parameters. For instance, Heeks' (2002c) work on issues of success and failure of ICT initiatives in sub-Saharan Africa shows how 'expectation-reality gaps' may influence and be influenced by ICT adoption processes. He noted that promoters of ICT initiatives in LDCs usually have expectations that do not take into consideration the actual parameters within the adopting context and this significantly influences the outcomes of these ICT initiatives i.e. the bigger the 'expectation-reality' gap, the greater the chances of 'failure'. Similarly, Duncombe (2006) explains the role of change agents in ICT initiatives within LDCs and provides an example which demonstrate the socio-technical nature of ICT adoption processes and suggests that ICT adoption processes involve complex interactions among various stakeholders.

However, despite weak e-readiness indicators and some socio-technically rich stud-

ies which highlight the socio-technical nature of technologies, enthusiasm is high in Malawi among various practitioners who are tirelessly promoting the adoption and use of computer-based ICTs in secondary schools. If technology is not neutral (Bijker and Hughes, 1987; Bijker and Law, 1997) and the Malawian social context does not have a suitable environment to support effective adoption and sustainable use of these particular ICTs then why is the adoption of the same ICTs being pushed up the agenda?

Several technology choice and adoption models seem to provide some tentative explanations in relation to this situation. For example, it appears that the adoption processes in LDCs within the sub-Saharan region are based on concepts of bounded rationality (Rogers, 1995). However, one major weakness of these models is that they fail to acknowledge and appreciate the socio-technical nature of technology. These models look at ICTs as neutral and objective tools and not as existing in an inextricable relationship with the context in which they are implemented. However, in order to fully understand and explain processes of ICT adoption and use in LDCs like Malawi, a socio-technical perspective is required.

This study, therefore, investigates ICT adoption processes within Malawian secondary schools in order to generate an evidence-based socio-technical understanding for conceptualising those processes in Malawi.

This research contends that such a conceptual understanding has significant potential for enabling stakeholders to anticipate, explain, evaluate and understand various experiences, influences and consequences related to the adoption of ICTs for the achievement of particular goals in Malawi. Without such an understanding, “decisions about ICTs become merely reactive to the whims of current technology fads

and fashions” (Duncombe and Heeks,1999, p9).

1.2 Major Focus of the Research Study

Technology is always embedded in some kind of context within which it operates and the technology itself is 'society shaped and society shaping' (Bijker and Law, 1997; Kling, 1996; Kling, Sawyer and Lamb, 2000). These statements underline the significance of socio-technical influences in ICT adoption processes. In order to elaborate this concept, Willoughby (1990) uses the niche metaphor and observes that within a niche, the survival of particular species is based on how well it is adapted to particular ecological niches. Ecological niches consist of several factors (e.g. environmental conditions, climatic conditions, etc.) and the species' prospects of survival within that niche will depend on all these factors.

In relation to ICT adoption and use for the attainment of particular goals, there are various socio-technical parameters within the adopting context, the niche, that would influence and be influenced by adoption processes of the technology within a particular society. In the case of Malawian secondary schools, these contextual parameters may be social structure, culture, technology, politics, geography, economy etc.

The main unit of concentration in this research study are Malawian secondary schools. Collectively, these schools form a socio-technical context within which the technologies are embedded. Within such a context, the research focus started with three main interrelated facets of technology choice, use and value which were identified from the research's literature review(see fig 1.1).

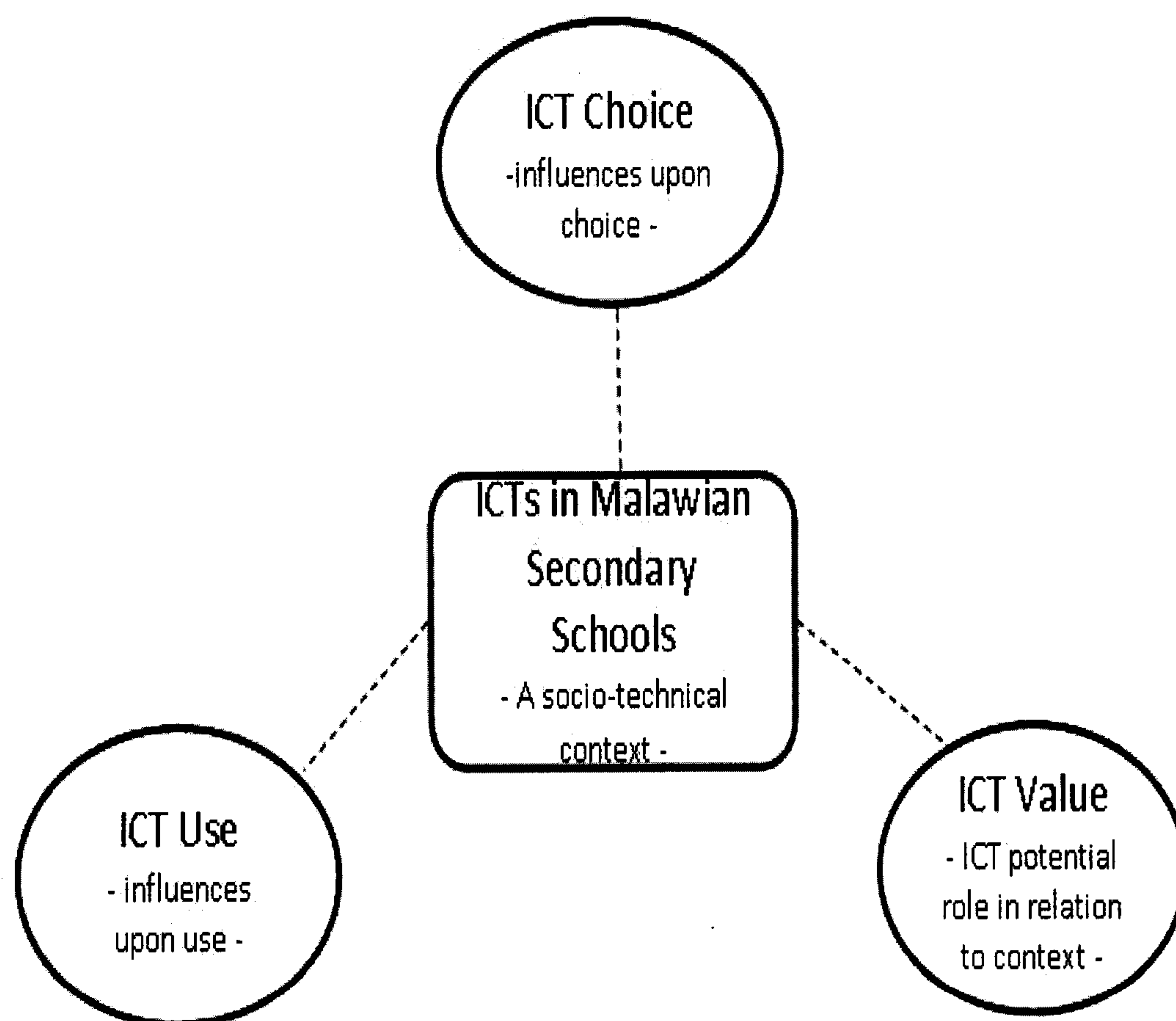


Figure 1.1 Research Focus: Initial Stage of the Research Framework.

The research facets presented in the initial framework, (fig.1.1), arose out of continuous interrogation of the literature and form the main initial part of the research project. These facets in the initial framework were subjected to an iterative process of continuous interrogation, analysis and further collection of data at different stages in order to further understand and to generate a theoretical conceptualisation of ICT adoption processes in Malawian secondary schools. The researcher moved back and forth between various sets of data - reflecting upon the data, analysing them and collecting further data in order to generate a socio-technical conceptualisation of ICT adoption processes in Malawian secondary schools. In this case, data from the initial framework were later amplified by the Literacy model and further developed using the Social Actor Model (Lamb,2006) in order to come up with the final framework (fig 5.7).

Fig 1.2 illustrates the linkage of all the subsequent stages of data collection and analysis leading to the development of the final framework for conceptualising ICT adoption processes in Malawian secondary schools. Sections within the thesis where these stages of framework development are discussed in great detail have also been indicated in this diagram.

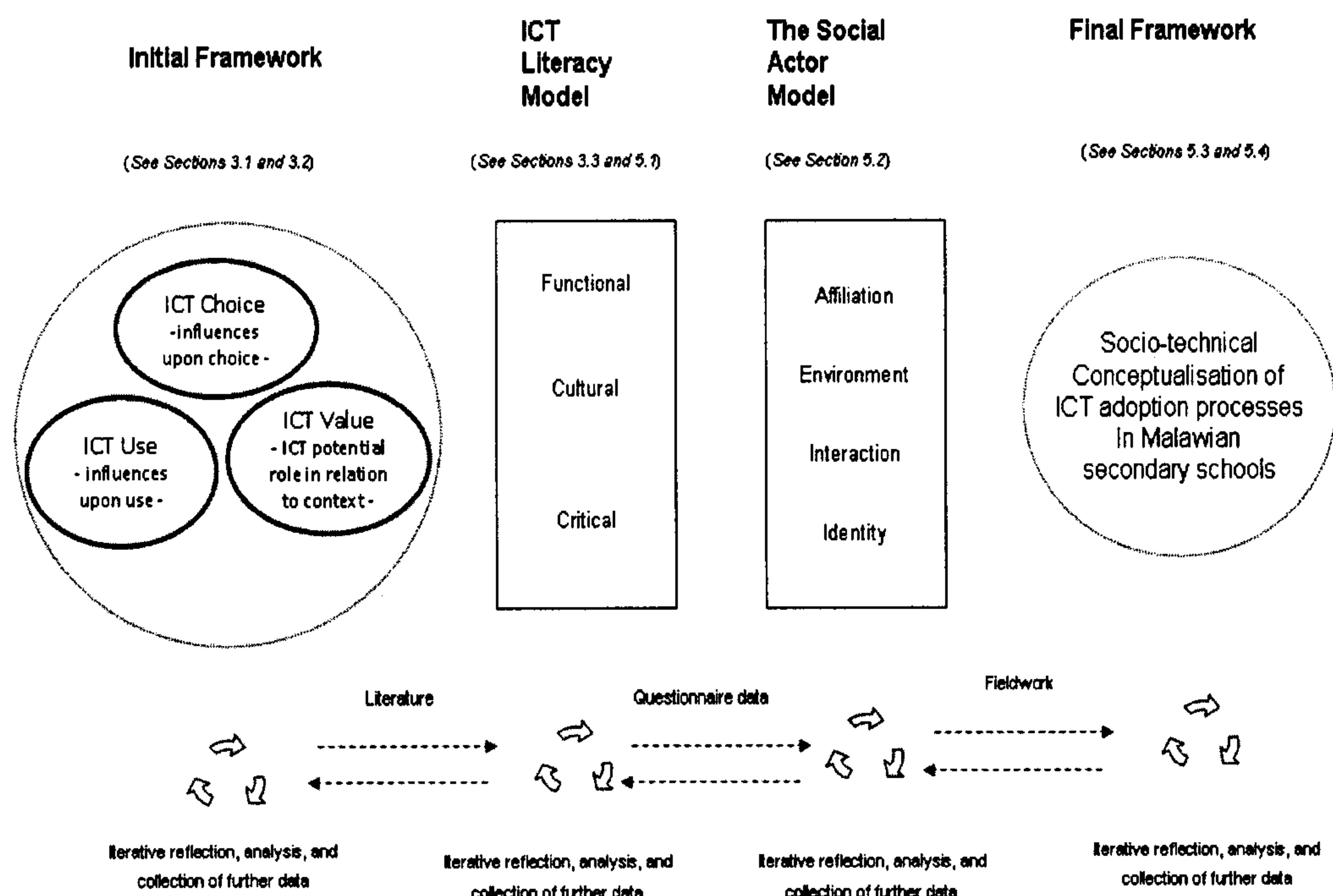


Figure 1.2 Data analysis and subsequent stages of framework development.

1.2.1 Technology Choice

Within these socio-technical contexts, the choice of technology is accompanied by the people's perception about the technology's status, meaning and value to human beings and their societies (Willoughby, 1990). In their book, Mansell and Wehn (1998) indicate that ICTs in the form of computer and Internet technologies offer great potential to Least Developed Countries (LDCs) for contributing towards socio-economic progress. Several authors agree with them (e.g. World Bank, 1998; James, 2004). In line with that, the Malawi government appears to be embroiled in the rhetoric and is promoting the implementation and use of Internet and computer technologies within secondary schools for the attainment of its developmental goals. However, there is also debate on whether LDCs like Malawi have the potential to benefit from the implementation of technologies like computer and the Internet.

In opposition, some observers have noted that LDCs do not have adequate infrastructures to sustainably use Internet and computer technologies for the attainment of their goals (Mansell and Wehn, 1998; Heeks, 2002). Mansell and Wehn (1998) also present some evidence which suggest that it will take close to a century for LDCs like Malawi to become ready to use and sustain such technologies for developmental goals. This appears to suggest that the implementation and use of Internet and computer technologies are possibly poorly matched to the parameters within the context of LDCs.

However, while such may be the case against this technological milieu, there is some evidence which also suggest that there could possibly be various technological options that may be more suitable for the LDCs context. Haddad (2003) talks of the potential of wireless technologies; Negroponte (2005) talks of the applicability of the 100 Dollar

laptop and Heeks (2006) commented on the potential applicability of mobile phones. These are some of the technological options which do not appear to be considered by the Malawi government (2003) based on the Malawi ICT policy. The case could be similar for other LDCs. This, therefore, suggests that Malawi and other LDCs could possibly have a number of neglected technological options which, if adopted and implemented, could possibly lead to the achievement of particular gains given the socio-technical conditions within these regions. However, the identification and adoption of such technologies can only be achieved if special attention, from a socio-technical point of view, is paid to the process of technology choice in relation to the adopting context. In this research study, the concept of technology choice will mainly focus on the underlying influences which shape and are shaped by ICT adoption processes (i.e. the push / pull influences) in Malawian secondary schools.

1.2.2 Technology Use

The rhetoric which accompanies the implementation of ICTs in forms of computer and Internet technologies for socio-economic progress in LDCs is overtly deterministic (Heeks, 2002c). For example there is a lot of literature which often talks about the potential of ICTs in leveraging socio-economic status of these countries without paying particular attention to the social context within which the technologies are to be embedded (e.g. World Bank, 1998; Malawi Government, 2003). However, when such technologies are introduced in any social group, there are numerous socio-technical elements which influence and are influenced by the way in which the adopted ICTs are used (Kling, 1983). For example, socio-technical influences like the type of technology introduced, the type of infrastructure that supports the technology, the

type of stakeholders involved in the adoption processes, socio-cultural routines within the adopting context etc have all been observed to play significant roles in this case (Kling, 1983; Kling, 1996; Lamb and Davidson, 2002b). This suggests that while computer and Internet technologies may possibly exhibit a good 'technological fit' (Willoughby, 1990) when the context in which they are made to operate has adequate resources to support those technologies, they can, on the other hand, exhibit poor technological fit if the context does not have adequate resources to support them. There are complex socio-technical influences which shape, and are shaped, by the ways in which the adopted ICTs are organised, used and the consequences that such use brings about within the adopting context (Kling, 1983). The same applies to the Malawian context. The type of technological options chosen for the Malawian context possibly influence, and are influenced, by various elements in the adopting context.

1.2.3 Technology Value - Local Focus

In LDCs like Malawi, local or regional focus when adopting and implementing technologies for various purposes is of significance importance (Heeks, 2002c; Willoughby, 1990; Mansell and Wehn, 1998). This suggests that parameters within actual local communities bear great significance on the issue of technological fit and hence the value of the technology within a society. In Malawi for instance, many of the socio-technical contexts vary in many aspects like geographical positioning, size, cultural makeup, location i.e. urban and non-urban, etc. With such variations, a technology which may be seen to exhibit a good fit in an urban location may not necessarily exhibit the same in a non-urban location and vice versa. This highlights the significance of local focus when making technology choices for particular purposes. Three main

areas of ICT value/ local focus have been identified from literature in relation to this research project and these are: economic or developmental value, socio-cultural value and pedagogical value.

1.3 Objectives of the study and research questions

With this research focus in mind, this project set out to answer the following main research question:

How can the current ICT adoption processes inform us about the socio-technical nature of technologies and its implications on ICT-for-development initiatives that tie technology adoption to socio-economic progress in Least Developed Countries like Malawi?

Based on themes identified in literature review, the research question above specifically aims at providing answers to the following three sub-questions:

1. How are technology choices made in Malawian secondary schools and why do the current patterns of technology choice processes happen in the way they do?
2. How are technologies used within Malawian secondary schools and why do the current patterns of use happen in the way they do?
3. What is the value of the adopted technologies in Malawian secondary schools and what implications does this have on the idea of contributing towards socio-economic progress in Malawi?

Answers to these questions are valuable in establishing and explaining the patterns of socio-technical interactions in relation to the idea of stimulating socio-economic progress in LDCs like Malawi through the use of ICTs. Such answers also offer a basis for understanding, interpreting and commenting on the current patterns of ICT

adoption processes and providing a new way of looking at technology choice processes in LCDs.

Specifically, the project's main objectives are:

1. To contribute to a deeper understanding of how and why the interdependent relationship between technology and the social context influences and has been influenced by particular patterns of technology adoption processes in Malawian secondary schools.
2. To identify the potential dangers or risks that could be associated with the current patterns of technology adoption processes in Malawi and other LDCs.
3. To contribute to the body of knowledge by generating a new socio-technical perspective on how technology adoption processes that are tied to socio-economic development in LDCs may be understood based on an empirically grounded socio-technical perspective.

Focussing on the three main facets of choice, use and value within ICT adopting contexts, the researcher collected data using two main data collection instruments: questionnaire based survey and face-to-face qualitative interviews. Data collected from the interviews were systematically analysed using Socio-Technical Interaction Network (STIN) modelling technique (Kling, McKim and King, 2001) in order to examine ICT adoption processes in relation to their context. STIN models have been used by various IS researchers for over 20 years as an analytical tool for explaining socio-technical processes which govern ICT adoption and use in various social groups (Davenport and Horton, 2005). In particular, Lamb and Kling's (2000) Social Actor Model (SAM) which perceives ICT adoption and use processes from a socio-technical

point of view has been used as an analytical tool in this research study in order to generate a theoretical conceptualisation of ICT adoption processes in Malawian secondary schools, to provide answers to the research questions and to achieve the research's objectives.

1.4 Justification and Motivation

While ICTs are now being promoted as vital for socio-economic progress of LDCs, there exists a considerable body of evidence which suggests that many of these LDCs face a catalogue of challenges which consequently affect aggregate outcomes of their ICT initiatives and constrain their socio-economic progress (Kawooya, 2004). For example, while Mansell and Wehn (1998) observe that “LDCs run very high risks of social and economic exclusion if they do not take steps to implement technologies for development purposes.” (page, 34), Duncombe and Heeks (1999) observe that a lot of work on ICTs in LDCs has focused on technologies themselves and appears to suggest that technology and context exist in isolation. They observe that a lot of such work appears to adopt a technologically deterministic stance which equates those undesirable ICT outcomes to characteristic problems with the adopting LDC contexts which fail to reap the magical ‘effectiveness’ of ICTs in order to stimulate their socio-economic progress in developmental areas like education, health, agricultural production, economy etc.

Moreover, Kling (1983) observes that the ‘effectiveness’ of technologies in any society cannot be prejudged. Instead there are numerous socio-technical influences which ‘shape and are shaped by’ the adopted ICTs in any society within which they are embedded. It is these socio-technical influences which account for the outcomes and hence the ‘effectiveness’ of any technological intervention in any society. Therefore, a deeper understanding of such socio-technical interactions is very important especially for LDCs like Malawi which are the poorest in the world and cannot afford to misallocate scarce resources through the adoption of ‘ineffective’ ICTs at the expense of other very compelling needs.

Malawi is currently struggling to alleviate its socio-economic status through the adoption and use of ICTs. For example, one of the strategies adopted by the Malawi Government in relation to this is the promotion of the adoption of computers in secondary schools (Malawi Government, 2003). However, the value of adopting and using such ICTs may possibly not always surpass the value of adopting and using other ICTs depending on the nature of socio-technical interactions within the adopting context. Furthermore, there is a dearth of empirically-grounded knowledge about various socio-technical interactions which may or may not lead to 'valuable' consequences of such adoption processes in Malawi, and how such influences may bear upon the idea of contributing towards socio-economic progress. This study seeks to make a contribution towards that body of knowledge.

With so many development organisations getting involved in the promotion of ICT adoption and use for developmental purposes in Malawi, this research has significant importance of generating an empirically grounded socio-technical understanding that could help practitioners in various ICT interventions in Malawi. However, at the moment, such a vital socio-technical understanding of ICT adoption processes in Malawian secondary schools based on empirical evidence is missing. This research study, therefore, finds it significantly motivating and relevant to, first of all, make a theoretical contribution by developing an evidence based socio-technical understanding of ICT adoption processes in Malawi and, secondly, to make a practical contribution by suggesting practical ways through which ICT interventions aimed at contributing towards socio-economic progress in Malawi may be implemented based on empirical evidence.

1.5 Significance of the Study

The significance of this research work is two-fold and can be observed at theoretical and practical levels. Theoretically, this research has significant implications for Information Systems research which seeks to understand and explain socio-technical processes surrounding the adoption of ICTs in various contexts. Since this research study sets out to investigate ICT adoption processes within a socio-technical context, its findings will be analysed to develop a deeper theoretical conceptualisation of ICT adoption processes in Least Developed Countries (LDCs) like Malawi.

Such an empirically grounded theoretical conceptualisation is, as already stated, largely missing and this, therefore, means that this research study has significant implications for academic research work on the socio-technical understanding of technologies in LDC contexts. This research study also has a lot of significance as it reinforces efforts by academic research bodies (e.g. Napier University Social Informatics Research Group, Information Society Technologies (IST - Demonet) and the International Federation for Information Processing (IFIP WG 9.4)) which all seek to develop a deeper and evidence based socio-technical understanding ICT adoption processes in this poorly-investigated, but significantly rich research field of Africa.

On the practical front, stakeholders, researchers and practitioners will be better positioned to implement and manage their ICT initiatives in LDCs if they understand the experiences and outcomes associated with the adoption and use of ICTs in these LDCs through an empirically- grounded theoretical conceptualisation which underpins such processes. This research, therefore, also has significant implications for practice as it complements practical efforts by various development stakeholders e.g. the European Union, the British Council, Department For International Development (DFID),

the Malawi-Scotland Partnership, the Scottish Government (previously known as the Scottish Executive), the World Bank, the Malawi Government, Schoolnet Africa, Computers for Africa, etc.

1.6 Structure of the thesis

This thesis is divided into six main chapters. The first chapter, the introduction, outlines the main aspects of the research problem, the research questions, objectives of the research study, motivations and justifications for studying the topic, and the significance of the research topic. The second chapter discusses relevant background issues about Malawi, a context in which this study's research sites are located. The third chapter, presents a critical review of relevant literature and ends with a synthesis of a framework of enquiry. Chapter four discusses the methodology adopted in this research study. Chapter five presents an analytical narrative of the research findings and ends with the development of a socio-technical conceptualisation of ICT adoption processes in Malawian secondary schools. Finally, chapter six of this thesis is the conclusion chapter which gives an overview of the whole research process and highlights the research's main contributions as well as suggestions for further research.

Chapter 2

Context Background

Introduction

The aim of this chapter is to present an overview of the country background in which secondary schools involved in this research study are located. It also discusses some of the contextual parameters within Malawi which are relevant to this research study.

The chapter is divided into four main sections. The first section describes the country background of Malawi in terms of its geography, demographic status and the economy. The second section presents an overview of the historical, socio-cultural and political background of Malawi. The third section describes the structure of the education system in Malawi and discusses some of the critically relevant educational issues within the education sector. Finally, section four of this chapter describes the nature of the technological infrastructure in Malawi and what it suggests in relation to the country's readiness to adopt various ICTs for use in various sectors like education.

2.1 Geography, Population and the Economy

Malawi is a small landlocked state located in the sub-Saharan region of Central Africa. It has a total area of 118, 484 square kilometres which constitutes a narrow mountainous strip of land measuring to about 900 kilometres in length and between 80 and 160 kilometres in width (Malawi Government, 2000). Lake Malawi covers about 29,600 square kilometres of the total area and measures 475 km in length and 75 km wide at its widest point (Malawi Government, 2000). The lake constitutes about 25 percent of the country's total area and forms Malawi's main border to the east with her neighbours.

The southern part of Malawi is bounded on all sides by Mozambique. Malawi also shares her borders with Zambia to the northwest and Tanzania to the north (fig. 2.1). The country is divided into three main administrative regions: north, central and southern and has a total of 28 districts. Six of these districts are in the northern region, nine in the central region and thirteen are in the southern region.

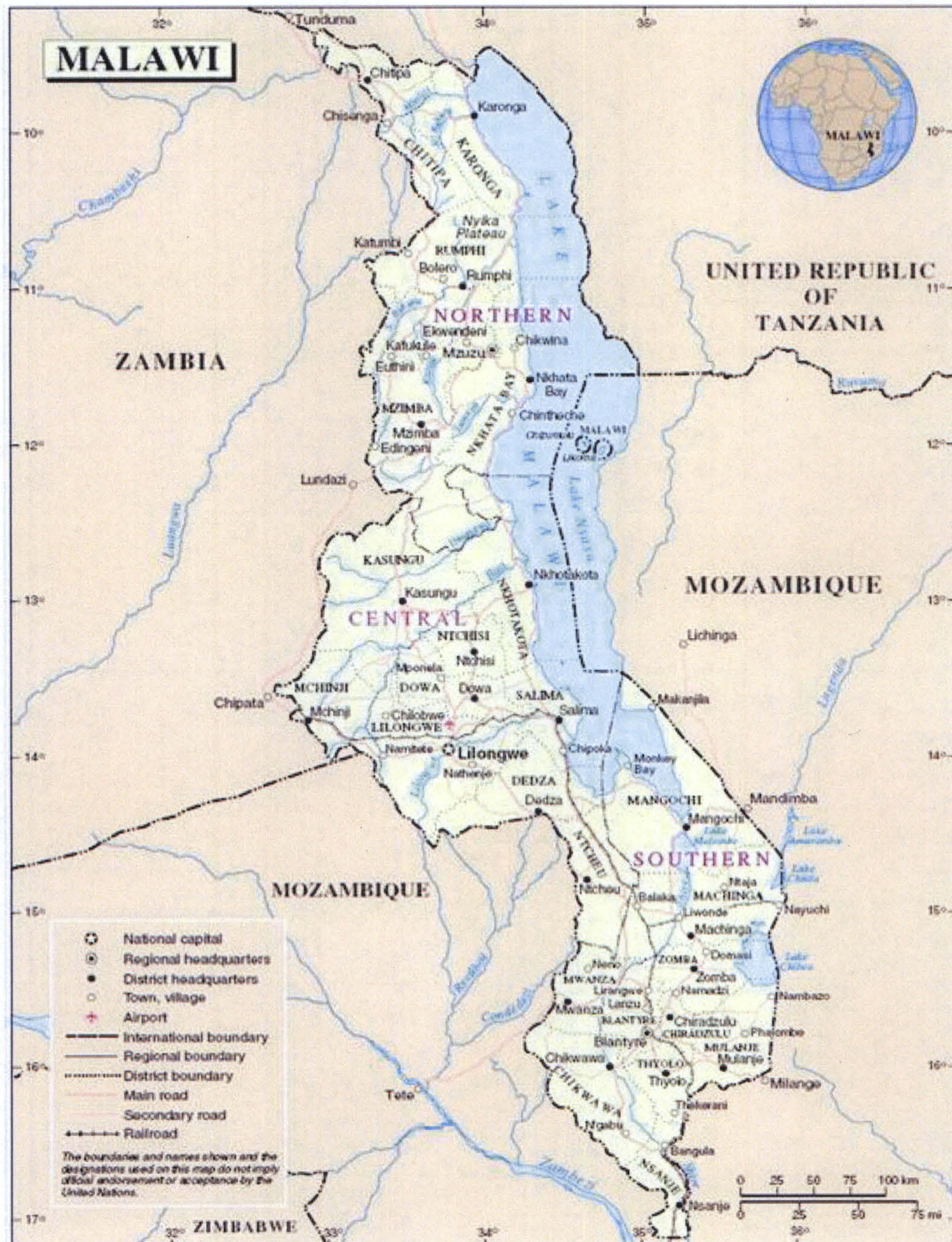


Figure 2.1 Map of Malawi.

Malawi has a population of approximately 12million (see table 2.1) and the age structure is in such a way that 0-14 year olds constitute 45percent; 15-64 year olds constitute 52percent and those above 65years form only 3percent of the total population (Malawi Government, 2000). Generally, secondary school pupils in Malawi occupy the age cohort between 13 to 20 years.

Malawi has several urban centres but the four major ones are Blantyre, Zomba, Lilongwe and Mzuzu. Statistics indicate that at the moment, less than 15percent of the total Malawian population lives in urban areas. This suggests that approximately 1.8 million Malawians live in urban areas and that over 10 million people (i.e. over 85percent of the total population) live in rural areas where access to basic services or amenities like electricity, transport, water etc is difficult, scarce or not available at all. As of 1999, while less than 20 percent of the total urban population were reported to have access to electricity, only 1 percent of the total rural population had access to electricity (Malawi Government, 2000).

Ethnically, Malawians are predominantly black Africans of Bantu origin. However, Malawians belong to different tribal groups e.g. Ngoni, Tonga, Lomwe, Yao, Sena, Chewa, Tumbuka. However, the northern region is predominantly occupied by the Tumbukas, the central region by the Chewas and the southern region is largely occupied by the Yaos. Linguistically, Malawi has close to 15 languages (see table 2.1). This means that Malawi has more than one spoken language and is linguistically categorised as heterogeneous. However, the majority of Malawians speak Chichewa which is also the national language for mass dissemination of information (Kayambazinthu, 2003) but in Malawian secondary schools, education is delivered in English which is also the official language of government administration and legislature.

Table 2.1 Malawian population by language/location/ region

Language Used	Total	Urban	Rural	Northern	Central	Southern
Chichewa	5,679,482	1,016,152	4,633,360	66,977	3,697,115	1,915,390
Chinyanja	1,272,205	94,225	1,777,980	10,647	34,253	1,227,305
Chiyao	999,024	77,319	921,709	9,915	112,087	877,022
Chitumbuka	939,109	126,179	812,930	793,610	120,350	25,149
Chilomwe	241,576	17,239	224,337	2,102	10,939	228,535
Chinkhonde	84,000	17,914	66,086	76,154	3,258	4,588
Chingoni	74,198	17,699	56,499	4,189	18,525	51,484
Chisena	264,172	21,526	242,646	543	5,742	257,887
Chitonga	165,654	17,302	148,352	128,296	28,739	8,619
Chinyakyusa	24,824	1,868	22,956	17,260	3,867	3,697
Chilambya	44,385	5,242	39,143	39,879	2,740	1,766
Chisenga	19,959	1,405	18,554	317	17,301	2,341
English	17,479	11,165	6,314	835	7,192	9,452
Portuguese	2,458	789	1,669	250	699	1,509
Other	105,343	9,412	95,931	82,586	3,533	19,224
Total	9,933,868	1,435,436	8,498,432	1,233,560	4,066,340	4,633,968

Source: Malawi Government, 2000

Available statistics indicate that overall, literacy (defined as the basic ability to read and write) of all Malawians aged over 5 years stands at 58 percent (Malawi Government, 2000). There is gender disparity attached to this level of literacy with the overall male literacy standing at 64 percent and 51 percent for females. In terms of regions, these statistics suggest that the Northern region has the highest literacy levels of 72 percent while the central and southern regions have 55 and 57 percent respectively. In terms of urban and rural areas, literacy levels stand at 79 percent in urban areas and 54 percent in rural areas. Table 2.2 shows that in Malawi, rural areas have the largest population of people who lack basic literacy skills (in a literal/traditional sense).

Table 2.2 Literacy levels by Malawian population and location

Literacy Status	Total	Urban	Rural	Northern	Central	Southern
Persons over 5yrs	8,273,478	1,220,388	7,053,090	1,024,480	3,358,250	3,890,748
Not literate	3,508,458	251,794	3,256,664	289,515	1,526,400	1,692,543
Literate	4,765,020	968,594	3,796,426	734,965	1,831,850	2,198,205

Source: *Malawi Government, 2000*

Economically, Malawi is categorised as one of the Least Developed Countries in the World. This means that Malawi is one of the highly disadvantaged countries with low income, weak human assets and high economic vulnerability and face the risk of failing to come out of her poverty due to a number of critical issues and hence require great attention from the international community (UNDP, 2001). Malawi's vulnerable situation is highlighted by a very low life expectancy of 37 years for males and 38 years for females (Malawi Government, 2002). Predominantly, Malawi has an agrarian economy. In this case tobacco, tea and sugar are the major export commodities and form the backbone of the Malawian economy (Malawi Government,

2002).

2.2 Historical Background

2.2.1 The Colonial Period

During the 19th century, Malawi was called Nyasaland and it was around this time that the British were also beginning to develop several interests in the Central Region of Africa (Kruger, 1989). In 1858, Dr David Livingstone, a Scottish Missionary and explorer, became the first Briton to enter Malawi. While there, David Livingstone acted against the Arab slave trade and the 'evil' consequences that it brought among the local inhabitants (Kruger, 1989). He established missions across the country and fought hard to introduce "civilising Christianity" and "legitimate commerce" (Kruger, 1989, p. 3) in the region. Soon afterwards, several British settlers and white hunters followed. In 1891, the 'Scramble for Africa' forced Britain to declare her interests in the region by securing Nyasaland against other claims from competing European powers. She defined Nyasaland boundaries regardless of local ethnic or geographical parameters and subsequently declared a British Protectorate over Nyasaland. In 1907, a Governor was appointed and the Executive and the Legislative Councils were set up.

During this time, missionaries were the major providers of social services like education and health. They built mission schools and clinics in the country. However, these services were largely concentrated in the northern region of Malawi where the weather conditions were relatively favourable for the white settlers (Kruger, 1989). These missionaries also acted as spokesmen for the local people to the government and this, together with the provision of education, has been seen to be one of the main factors which contributed to the stimulation of political awareness among the

local people in the northern part of Malawi. In line with this, Dr Hastings Banda, the first president of the Republic of Malawi, is reported to have once commented that the “nationalist movement in Malawi grew from the seed-bed of the Livingstonia Mission” (Kruger, 1989, p.5) which was established in the mountainous regions of the northern part of Malawi.

On the other hand, the colonial government also offered services in the education sector through the provision of vocational training. It also encouraged cash crop production especially in the southern and central regions of Nyasaland which had greater agricultural potential than the basically mountainous region of northern Nyasaland (Kruger, 1989).

Although the missionaries and the colonial government provided several educational services, Kruger (1989) observes that there was still a dearth of employment and economic opportunities within Nyasaland. As a result of this, many Nyasa workers, especially from the northern region and the least developed part of Nyasaland, decided to migrate and work outside Nyasaland. Several factors have been observed to have influenced the migration of many northerners to other territories outside Nyasaland. Firstly, local Nyasas were required to pay government imposed hut tax. While cash income was not a major problem among the locals in the southern and central regions who had better wage employment opportunities and cash crop production, such was not the case for Nyasas in the northern region where wage employment opportunities were limited. However, unlike Nyasas in the southern and central region, northerners had better access to a number of social services including education provided by the missionaries. On the other hand, recruiters from more prosperous territories of Central and Southern Africa preferred these Nyasa workers from the northern region to local labour because of their better education. It was during this time that

Nyasaland earned itself a reputation of being “the Ireland of Central Africa - poor, scenic and with a ready supply of exportable labour” (Kruger, 1989, p.4)

During this period, just like at present, economic development was largely confined to the agricultural sector, however, economic growth among the local Nyasas was seen to be hampered by general lack of technical knowledge of cultivation methods. It is reported that the colonial government, on one hand, was unwilling to impart such knowledge to the locals and, on the other hand, the white settlers from the surrounding territories opposed the provision of such knowledge to the locals for fear of losing their labour supply if Nyasas had their own source of cash income (Kruger, 1989).

2.2.2 The Federation

Several years after Nyasaland became a British protectorate, settlers in the Northern and Southern Rhodesia started mounting pressure on the British Government to form the Federation of Rhodesia and Nyasaland. However, the British government rejected the amalgamation because of the differences that existed in the policies of the three territories towards local Africans. In Northern Rhodesia (present day Zambia) just like in Nyasaland, policies followed what was called the ‘the twin principles of British Colonial Rule’ (Kruger, 1989). This meant that in these two territories, firstly the “paramountcy of African interests in any conflict of interests between expatriates and local Africans” (Kruger, 1989, p.7) was acknowledged and secondly, these territories upheld the trusteeship principle which “looked to the eventual devolution of power to the Africans” (p.7). In Southern Rhodesia (present day Zimbabwe), these twin principles did not apply. However, after some sustained pressure, the Federation of

Rhodesia and Nyasaland was formed in 1953.

2.2.3 The Independence Period and Beyond

The imposition of the federation received great opposition among the African population in Nyasaland and Northern Rhodesia who feared that the federation with the settler-ruled Southern Rhodesia would result in the abandonment of the 'trusteeship principle' and subsequent domination of the white settlers. In Nyasaland, the Nyasaland African Congress (NAC) led the campaign for resistance. In 1956, five members of the NAC were elected to the Legislative Council. However, the five felt that they needed somebody to lead them in the council (Pachai, 1972). Consequently, they contacted Dr Banda who around that time had just completed his medical studies at the University of Edinburgh, funded by the Church of Scotland. In 1958 Banda returned to Nyasaland where he gained popular support for the abolition of the federation. He reformed the NAC and renamed it as the Malawi Congress Party (MCP). Five years later, in 1963, the Federation of Rhodesia and Nyasaland was dissolved, "dead, cremated and thrown into the Indian Ocean" (Kruger, 1989, p 11). And a year later, on 6th July 1964, Malawi gained her independence under the leadership of Dr. Hastings Kamuzu Banda. However, soon after independence, Banda's autocratic leadership resulted into conflict with the younger men who were in control of the party (then NAC) prior to Banda's return. Banda considered them to be very inferior to him and Kruger (1989) reports that he often addressed them as 'my boys'. His views on how the country should be run did not tally with those of the pioneers. As these internal conflicts mounted, the pioneers attempted to reassert their position in the party and this led to disastrous socio-political consequences. Many people suspected

of harbouring anti-Banda views were assassinated and a lot more, fearing for their lives, were forced to flee the country (O'Malley, 1994).

2.2.4 Kamuzu Banda, education and the northern region of Malawi

During the Banda regime, the education system in Malawi underwent a series of government-induced crises whose effects continue to daunt the present day Malawi (Mhone, 1992; Lwanda, 1993). When Banda came into power, it was clear that the northern region had benefited quite a lot from the colonial and pre-colonial education system which built a number of learning institutions in the north. Although the northern region constituted only a very small percentage of the total Malawian population, many of the most senior positions in education and the civil service were occupied by northerners. In order to reverse this imbalance, the Banda government took a series of measures in the education sector. In 1969, the Banda government introduced a regional quota system which was aimed at restricting the number of northerners accessing university education (Mhone, 1992). This meant that each region was allocated equal number of places in the university of Malawi and secondary school pupils had to compete for those places at regional level (i.e. pupils of northern origin competing with fellow northerners etc).

In 1987, the Banda government, still trying to limit the number of northerners accessing university education, replaced the regional quota system with a district quota system. Although each district was allocated an equal number of places at the university, the total number of pupils from the northern region accessing university education was drastically reduced since the northern region only had 5 districts as compared to

9 in the central region and 10 in the southern region (Mhone, 1992). This led to wide spread discontent which saw a lot of northerners being dismissed from their senior positions, detained or exiled (O'Malley, 1994).

2.2.5 The '*Kwanu-nkwanu*' Crisis

Two years later, in 1989, the Banda government made an infamous directive that all secondary school teachers should be reassigned to teach in their regions or districts of origin (*Kwanu-nkwanu* - i.e. going back to one's roots). The basis of this directive was Banda's allegation that northern teachers who were teaching in regions other than the north were deliberately sabotaging the education system in those regions so that the northern region would continue to excel and access more of university education. Banda further alleged that when assigned to other regions, northern teachers were deliberately encouraging pupils to go for *Nyau* (masked dancers) initiation ceremonies and other cultural indoctrinations instead of concentrating on teaching.

The *Kwanu-nkwanu* crisis and the redeployment of northern teachers caused chaos in the education system and had some negative impacts on secondary schools in the southern and central regions. It is reported that almost three quarters of science teachers in the southern and central regions were northerners and, after the redeployment, the average pupil to teacher ratio in the southern region rose from 61:1 to 76:1 (Mhone, 1992). Moreover, this crisis amplified ethnic and regional tensions among Malawians whose effects are still being experienced in various sectors of the government today.

In the mid-1990s the worsening conditions in Malawi prompted international pres-

sure on Banda's dictatorial government to embrace democracy. In 1994 the first ever democratic elections were held in Malawi in which Dr. Banda lost his seat to Dr. Bakili Muluzi as the Malawian president. Unsurprisingly, during the elections, northerners voted overwhelmingly against the Banda regime. The next ten years of Bakili's rule had serious impacts in several sectors of the Malawi government and it was during this time that Malawi started talking of adopting a development strategy aimed at contributing towards socio-economic progress through the use of ICTs. At the moment, the Malawi government appears enthusiastic about this strategy and socio-economic progress through the use of ICTs still remains a major agenda in the current government led by Dr. Bingu wa Mutharika.

2.3 The Education System Overview

The education system in Malawi has eight years of primary education, four years of secondary education and an average of four years of tertiary education. The provision of education is also categorised into two: basic and non-basic education. Basic education comprises pre-school education, primary education and adult literacy programmes. According to the Educational Policy and Investment Framework (PIF) of the Malawi Ministry of Education, the main objective of basic education is to equip Malawians with relevant knowledge and skills that would enable them to “function as competent and productive citizens” (Malawi Government, 2001, p 5). On the other hand, non-basic education comprises secondary and tertiary education and they both have their own intended targets and objectives in the educational policy. The Malawi National Examinations Board (MANEB) is one of the four national institutions which support and manage the provision of education in Malawi. Its main role is to develop examination syllabi and to administer national examinations. Other institutions are the Malawi Institute of Education (MIE) which is responsible for the development and evaluation of the school curriculum. It is also responsible for the coordination of teacher training; the Malawi National Commission for UNESCO operates as a link between the Malawi government and the United Nations Educational, Scientific and Cultural Organisation (UNESCO); finally the Malawi National Library Service is a fourth national institution whose main responsibility is to promote the establishment and management of libraries in Malawi (Malawi Government, 2001).

2.3.1 Primary Education

There are over 4000 primary schools in Malawi enrolling over 3 million pupils (Malawi Government, 2001). Primary education in Malawi is free but not compulsory and the official minimum age for enrolment into standard one is 5 years. The primary school cycle is divided into three main levels: the infant level, the junior level and the senior level (Malawi Government, 2001). The infant level comprises standard one and standard two or the first two years of primary school education. The junior level comprises the next three to five standards i.e. three to five years of primary school education and finally the senior level comprises standards six, seven and eight. When pupils reach standard eight, they sit for the Primary School Leaving Certificate of Education (PSLCE) examinations which determine their entry into secondary school. The average age for leaving primary school in Malawi is 13 years (Malawi Government, 2001). In 1995, the Malawi government introduced Free Primary Education and this led to a sharp increase in primary school enrolment. For example, by the year 2000 primary schools had a Gross Enrolment Ratio, defined as the ratio of total primary enrollment, regardless of age, to the population of the age group that officially corresponds to the primary school level, of 132 (Malawi Government, 2001). However, free primary education has also led to some negative outcomes, most notably the lack of adequate teachers and other educational resources to cater for huge classes both in primary and secondary schools (Malawi Government, 2001).

2.3.2 Secondary Education

In Malawi, it is estimated that there are 978 secondary schools enrolling to approximately 183,854 pupils (ADF, 2006). The main objective of secondary education in Malawi is to

“ provide its recipients with the knowledge, skills and adaptability to enable them earn a living, contribute to national development goals, to survive in the non-work environment and to participate in national affairs”
(Malawi Government, 2001, p. 8).

After two years of secondary education, pupils sit for the Malawi Junior Certificate of Education (JCE) examinations which determine the pupils' progression into third year of secondary school education. Generally, one needs to at least have a JCE in order to secure employment in Malawi. However, recently there have been calls to abolish it due to its perceived lack of value in the Malawian employment sector. Finally, in form four, pupils also sit for the Malawi School Certificate of Education (MSCE) examinations which further determines their eligibility for selection into the university and other tertiary institutions.

Unlike, primary education, secondary education in Malawi is not free. Secondary education is provided by both the government and the private sectors but the government owns and runs the majority of secondary schools in Malawi. These schools exist either as co-educational institutions or single-sex institutions. However, the majority of government owned schools are co-educational while the majority of private schools, especially those owned by religious institutions, are predominantly single-sex institutions.

In total, it is estimated that there is a total of 8975 teachers in Malawian secondary schools. According to the survey conducted in 2005, approximately 72 percent of the teachers in these secondary schools are not qualified, either academically or professionally, to teach at secondary school level (ADF, 2006). The survey showed that in these secondary schools “the pupil teacher ratio is 20:1, but the pupil to qualified teacher ratio is approximately 73:1” (ADF,2006, p.4)

Secondary schools in Malawi are also reported to be dogged by planning and management issues. Corruption within the Ministry of Education is a major contributor to the ministry’s poor budgetary performance. In June, 2006, the then Minister of education made a statement in the press where she openly admitted that corruption was a big issue in her ministry and that she was experiencing a lot of problems trying to stamp it out. She made this statement after the previous education minister, Hon Yusuf Mwawa, was convicted and jailed for fraud and corruption (BBC online, 14 Feb 2006). At the moment, the Malawian ministry of education is embroiled in the infamous MK187 Million (Approximately GBP693,000) fraud case which has implicated very senior government officials including the then education secretary, Dr.Sam Safuli. At the time of writing, this corruption case was yet to be fully investigated.

The HIV and AIDS pandemic is also having a very serious impact on the education sector in Malawi. It is reported that in 2005 alone, over 166 secondary school teachers died of AIDS related illnesses (ADF, 2006). With an already overstretched human resource base in the education sector, the pandemic presents a very chilling view about the future of the education system in Malawi.

Above all, several observers have indicated that the relevance of secondary education in Malawi is questionable. For example, there are criticisms which suggest that the

current secondary education system is not adequately responsive to the needs of many Malawians who may not have an opportunity to proceed with their studies to the university of Malawi.

2.3.3 Tertiary Education

The University of Malawi, established in 1965, is the main provider of tertiary education in Malawi (Malawi Government, 2001). It comprises of five main constituent colleges: the Chancellor College, the College of Medicine, Bunda College of Agriculture, Kamuzu College of Nursing and the Polytechnic. There are also other providers like the Mzuzu university, the University of Livingstonia, the Catholic University, the Malawi teacher Training Colleges and several other technical and vocational training institutions.

2.3.4 Education Financing

In Malawi, the government is largely responsible for the financing of education. The government provides education funding through two main budgets: the recurrent budget and the development budget (Malawi Government, 2001). It is reported that about 80 percent of Malawi's development budget is met by the external aid agencies while the recurrent budget is met by local revenue. This shows that external donors play a significant role in financing the education sector in Malawi. According to the Malawi Government (2001), donors assist in education financing in two main ways: multilateral loans and bilateral grants. The major difference between these two is that multi-lateral loans appear in the budget while bilateral grants do not. In a coun-

try where there are reported instances of fiscal problems related to donor aid, such unbudgeted grants are likely to promote corruption and fraudulent activities. The Ministry of Finance, on the other hand, is responsible for all budgetary processes and activities in Malawi. It is the Ministry of Finance which gives ceilings to all the ministries in Malawi (Malawi Government, 2001). These ceilings indicate the budgetary limits for each ministry in a financial year. Once the Ministry of Education receives its ceiling, it requests all the institutions which fall under it to submit their Activity Based Budgets (ABBs). The Ministry of Education then forwards these ABBs to the Ministry of Finance for approval. Once approved, the government allocates funds directly to the institutions on a cash-budget basis. This process of funding, however, has been found to leave some 'essential educational services' (Malawi Government, 2001) heavily under-funded.

2.4 E-readiness and the ICT Diffusion Index

In terms of e-readiness, Malawi scores poorly according to the e-readiness/ICT diffusion index. The ICT Diffusion Index (ICTDI) was designed by the United Nations Conference on Trade and Development (UNCTAD) in conjunction with the Commission on Science and Technology for Development (CSTD) to provide a way of assessing and evaluating e-readiness in a country (UNCTAD, 2003). By using indicators of ICT diffusion, the index measures e-readiness from two main dimensions: connectivity and access.

In terms of connectivity, the index focuses on indicators like the physical infrastructure within a country, number of Internet hosts per capita, number of PCs per capita, number of telephone main lines per capita and number of mobile subscribers per capita. On the other hand, the access dimension looks at issues like the number of Internet users, literacy levels and language barriers, the cost of accessing and using ICTs and the country's GDP per capita.

The two dimensions of the ICTDI give measures of two important parameters. Firstly, the connectivity dimension measures the nature of the physical infrastructure in a particular country and the access dimension measures the capability of a particular country to take advantage of ICT use (UNCTAD, 2003). In order to calculate an index score for a particular access or connectivity aspect, the following formula:

$$\left(\frac{\textit{value achieved}}{\textit{maximum reference value}} \right)$$

is applied. An average index score of all the connectivity or access components gives rise to the connectivity or access index. An ICT Diffusion Index (ICTDI) of a particular country is the average of its connectivity and access indices.

According to the 2005 ICTDI report, Malawi has an access index of 0.398, a connectivity index of 0.006 and an ICTDI of 0.202 (see table 2.3). In terms of world rankings, Malawi is on 153 out of 180 countries. This means that Malawi is among countries which have a very poor e-readiness status in the world.

Table 2.3 ICTDIs for selected countries in relation to Malawi

Rank	Country	Access index	Connectivity index	ICT Diffusion Index
2	US	0.833	0.754	0.794
10	UK	0.804	0.557	0.680
84	S.Africa	0.512	0.145	0.328
115	Namibia	0.490	0.077	0.283
126	Zimbabwe	0.497	0.034	0.265
146	Tanzania	0.415	0.012	0.213
148	Zambia	0.415	0.010	0.213
153	Malawi	0.398	0.006	0.202
168	Mozambique	0.350	0.010	0.180
180	Niger	0.255	0.002	0.129

Source: *UNCTAD, 2006*

In Malawi, the provision of telecommunication services is regulated by the Malawi Communications Regulatory Authority (MACRA). This is an autonomous body which was established in 1998 under the Malawi Communications Act. This Act also paved way for the liberalisation of the communications sector in Malawi (Malawi Government, 2002). In 2004, MACRA conducted an ICT survey to find out the nature of ICT infrastructure in Malawi and the results of the survey are summarised in table 2:

Table 2.4 ICT diffusion trajectory in Malawi

Component	2004
Fixed Telephone Subscribers	88,737
Mobile Cellphone Subscribers	177,897
Internet/Email Subscribers	11,980
Fixed line Network Operators	1
Wireless Network Operators	2
VSAT (Satellite Communication) licences	50
Licensed Internet Service Providers (ISPs)	22
Active Internet Service Providers (ISPs)	9
Radio Stations	4
Community Broadcasting	9
Television Stations	2
National Post Office Service	1

Source: *Malawi Communications Regulatory Authority (MACRA), 2004*

The table suggests that in 2004 mobile cellphones had the highest penetration level in Malawi and according to a World Bank report, it is indicated that in 2003, there were 150,000 fixed line subscribers in Malawi (World Bank, 2006).

However, in 2004 (see table 2.4), the number of fixed line subscribers was, according to MACRA, 88737. This, therefore, suggests that while the number of mobile users is sharply increasing in Malawi, that of fixed line subscribers is falling. The nature of telephone connectivity (i.e. fixed line telephony) could perhaps suggest possible explanation for this penetration pattern. It is observed that these services (fixed lines) are mostly concentrated in urban centres and the majority of rural areas do not have these services and are less covered by both the electric and telecommunications

grid (MACRA, 2004). On the other hand, networks for mobile cellphones now cover all areas in Malawi.

This suggests that there could be possible implications on the appropriateness of some ICTs that depend on electricity and telephony in LDCs like Malawi. Instead of having a convergent effect, the use of some of these ICTs may possibly widen the gap between schools in urban areas and those in rural areas if technological choices are made regardless of the characteristics of the adopting context.

At the moment, the adoption of computer-based technologies in secondary schools has generated a lot of interest among various stakeholders in Malawi. For example, the Malawi ICT policy outlines the Malawi government's strategy to implement and integrate ICTs in its development activities. The policy argues that:

“Developing countries are confronting new additional challenges as a result of the globalization process and the emerging new information age. Without appropriate ICT policies and strategies, the developing countries risk worse socioeconomic status that can be promoted by the digital divide.” (Malawi Government, 2003, p.7)

This reflects a possibly common point of view among development practitioners who appear to believe that ICTs alone are an ‘almighty’ key to development and that those who do not adopt ICTs for development activities risk exclusion from the global economic society and development stagnation. Moreover, the policy also highlights the education sector as one of the priority areas for ICT investments in order to meet Malawi's national development goals. Therefore, in relation to education, the Malawi ICT policy's main objectives are stated as:

1. To transform Malawi into a technologically aware and technologically literate nation.
2. To improve access to education resources and to improve the quality of educational services and its relevance to the development objectives of Malawi.

In this regard, the ICT policy appears to stress on the promotion of the adoption of ICTs in form of computers and the Internet in the Malawian education sector particularly in secondary schools. Haddad (2003) observes that for developing countries in sub-Saharan Africa, secondary schools are given highest priority for the provision of ICTs because of three main reasons. Firstly it is observed that secondary schools in general have better resources in terms of infrastructure, telephony and electric grid to accommodate ICT implementation and use than primary schools. Secondly, it is observed that secondary schools generally have larger budgets to take care of running costs associated with ICT implementation and use than primary schools; and finally it is also observed that secondary school graduates are more likely to benefit from exposure to ICTs at this level because the majority of them are likely to join the labour force where IT (computer) literacy skills are believed to be crucial.

Chapter 3

Literature Review

Introduction

This chapter discusses relevant literature in relation to issues surrounding ICT adoption in LDCs. It brings into focus some of the critical issues related to ICTs, Education, Literacy and development in LDCs and it ends with a synthesis of a framework of inquiry based on a discussion of critical issues identified in literature. The chapter is divided into four main sections. The first section discusses literature pertaining to ICTs, education and development in LDCs. The second section discusses literature on ICT adoption and how it relates to LDC contexts. The third section reviews the concept of literacy and discusses how it relates to the concept of ICT adoption in LDC contexts with special reference to education and development. Finally, the chapter's final section discusses the development of a framework of enquiry based on a synthesis of core concepts and thematic ideas covered in literature.

3.1 ICTs, Education and Development in LDCs

The debate surrounding issues of technology and development activities within LDCs like Malawi is widespread. Chief among them is the link between ICTs and development (Mansell and Wehn, 1998). Although promises of technological benefits for those who adopt and use technology are plenty in literature, there are numerous situations which suggest that it is not a guarantee that any country which embraces ICTs will achieve their developmental goals (Wade, 2004). Such situations show again and again that technology does not have that kind of raw power on its own. Instead there are other parameters that influence and are influenced by technology adoption processes in order to achieve specific goals (Bijker and Law 1997).

3.1.1 Concepts of ICTs

Reported instances of ICT initiatives in LDCs suggest that the way these ICTs are implemented largely depends upon the way stakeholders perceive and understand technology. Heeks' (2002c) 'expectation-reality-gap' is an example which highlights the significance of ICT perceptions held by development stakeholders and how they influence the outcomes of various ICT initiatives in LDCs. To a large extent, the stakeholders' definitions and understanding of ICTs are based on two main perspectives: the tool perspective of ICTs and the socio-technical perspective of ICTs.

Tool perspective

The tool perspective emphasises an understanding of ICTs as neutral, discreet and objective tools that can be used to achieve specific goals in any context. Although such a definition and understanding of ICTs may, on the surface, succeed in providing some insights on what technologies are, it overlooks the social fabric in which these technologies are embedded. This understanding of technology is deterministic and hinges upon the belief that technology and context exist in isolation and are separable from each other.

In relation to reported instances of ICT initiatives in LDCs, this understanding of technology can be seen to understand technology as a “consistent and predictable cause of change” (Houston and Jackson, 2003, p.62) and to presuppose that the outcomes of ICT adoption processes can be planned and prejudged without considering the deeper socio-cultural edifice within the adopting contexts.

The tool perspective appears to be the most explicit stand point which underlies many ICT initiatives within LDCs where the majority of ICT for development initiatives appear to follow a ‘magic bullet’ model. In these initiatives, stakeholders embrace a one-way, pre-planned ICT adoption strategy and ICTs appear to be understood as having that kind of raw potential to produce technological gains in these poor underdeveloped countries regardless of other contextual parameters.

However, in line with this research project, technologies are not conceptualised as existing in isolation from the social context in which they are made to operate. This forms the basis upon which a socio-technical perspective of ICTs is built.

A socio-technical perspective

Unlike the tool perspective, the socio-technical perspective suggests that ICTs are part of a wider social context and they are embedded and used in social processes in order to achieve particular goals (Fleck and Howells, 2001). Both technology and context do not exist in isolation. Instead they are inextricably interrelated. Thus:

“Neither [technology nor context] is independent of nor prior to the other ... the two, in fact, are integrated as one entity. The implication is that there is no separate, objective ground or standpoint from which to perceive technology; rather, it is constructed continually anew as the material and social elements are integrated” (Houston and Jackson, 2003, p.63)

An example of work which illustrates a socio-technical perspective of technology is provided by Fleck and Howells (2001) who explored some of the socio-technical elements which form the basis of any definition of technology. They illustrated a socio-technical understanding of technology by analysing the technology of stone axes within the stone-age Aboriginal Society. In this society, the stone axes, the technological artefacts, were linked to the social context in which they were used in such a way that access and use of stone axes carried strong social, economic and cultural connotations. Thus:

“ the raw material for making axes existed in the South and it would be progressively exchanged through a network of tribes for goods and materials from the tropical North. The annual gatherings when exchange took place had ritual, quasi-religious significance as well as economic exchange significance.” (Fleck and Howells, 2001, p3)

This implies that the stone axes created and strengthened an interrelationship between artefacts, social structure and culture. However, when Western missionaries arrived and started indiscriminately distributing steel axe heads, this interrelationship was disrupted because although steel was preferred to stone because of its material strength, it did not have the same cultural attributes that stone possessed (Fleck and Howells, 2001).

This emphasizes a point that as a technology, the stone axe was not as simple as it looked on the surface but it embedded significant elements of the social society that were complex and crucial for the artefact's definition within its context of use. It also suggests that in every definition of technology, there is an artefactual component which is embedded into a specified pattern of human activity and organizational or social context (Fleck and Howells, 2001).

We cannot fully understand technologies just in terms of how they are used, human activity, neither can we understand them simply in terms of the nature of the social context in which they are used (Fleck and Howells, 2001; Bijker and Law 1997). Instead, both human activity and the social context in which these activities happen are very important for conceptualising technologies.

In LDCs context, this socio-technical perspective of technology has some implications. Firstly, for any technological artefact that is adopted for use within a particular context there must be some activity involved. Such activity could involve the ways in which the technological artefacts are adopted and used for various purposes. Moreover, activity entails a motive to attain a particular goal. This implies that the adopters always have some motives behind the adoption and use of these technologies (e.g. attainment of developmental goals). Finally, there must be knowledge of how

to use these technological artefacts in order to achieve the intended goals.

Like in the case of the Aboriginal Society, these three facets of knowledge, activity and artefacts interact with a lot of other parameters (e.g. social structure, values, beliefs etc) and may be seen to influence and be influenced by these facets. An understanding of technology which recognises that technology consists of an inextricable interrelationship between technological artefacts and the social context is what has been called a socio-technical perspective of technology (Fleck and Howells, 2001). This is the understanding of technology which is adopted in this research study and this chapter presents various incidents which underline the significance of this perspective in LDC contexts. For example, although various authors (e.g. Howell and Lundall, 2000; Cawthera, 2002; Cossa, 2004) have observed that many ICT initiatives have led to a number of undesirable outcomes in many LDC contexts, their work has fallen short of explaining why such outcomes prevail, possibly because a conceptualisation of ICTs from the tool-perspective does not provide rich ways of explicitly understanding the critical influences which lead to these undesirable outcomes. However, a socio-technical perspective has the potential to provide possible ways of understanding processes which underpin ICT adoption and offer new ways of thinking about various influences which interact with ICTs and lead to various technological outcomes in LDCs like Malawi.

3.1.2 ICTs and the discourse of development in LDCs

This section of the thesis focuses on literature surrounding the ICT for development discourse and discusses how such literature bears upon the adoption of ICTs for educational purposes within the context of LDCs.

Schech (2002) shows that the adoption and use of technology for developmental purposes in LDCs is centred on two main discourses: modernisation and dependency.

ICTs and the modernisation discourse of development

This discourse of development is based on the ‘hypodermic needle’ or ‘magic-bullet’ model which touts ICT gains in LDC contexts and holds that lack of ICTs and knowledge are the main cause of underdevelopment in LDCs. Thus, throughout this discourse, ICTs and development are always linked together on one hand while underdevelopment and lack of diffusion of ICTs from developed countries into LDCs are also linked together on the other hand (Pigato, 2001).

The modernisation discourse emerged in mid 1940s when development stakeholders perceived ICTs as having a direct causal link with modernity (Stover, 1984). The modernisation discourse of development appeared to “support the agenda to transfer not only technology to ‘traditional’ societies, but also the socio- political culture of modernity.” (Houston and Jackson, 2003, p.64)

Literature on the current ‘infusion’ of refurbished computers from developed countries into LDCs like Malawi reflects a reinforcement of this kind of thinking whereby such technologies are thought to be the solution to the development problems in these

LDCs. To a large extent, it can be seen that the Schoolnet models (see section 3.1.3 of this thesis) provide examples of the modernisation discourse of development whereby the schoolnet promoters appear to believe that the adoption and use of ICTs in African secondary schools will contribute to the acquisition of relevant ICT skills, empower the local people and enable them to leapfrog stages of development.

ICTs and the dependency discourse of development

On the other hand, the dependency discourse of development first emerged in the 1960s (Houston and Jackson, 2003). This discourse appears to focus on the developmental threats faced by LDCs if they do not adopt and use ICTs. The discourse holds that the promotion of ICT adoption and use for development purposes is based on the assumption that if LDCs do not embrace these technologies then they will be excluded from the global economy and their underdevelopment will worsen (Schech, 2002).

One can see that by presenting ICT adoption and use as an indispensable recipe for development, this dependency discourse reflects a continuation of the modernisation discourse of development from a different point of view. These two discourses, therefore, may be seen to be complementary to each other and the complementary nature of these two discourses is also highlighted by Mansell and Wehn (1998) when they write:

“The role of ICTs in stimulating development is a two-edged sword. On one hand, it allows countries to ‘leapfrog’ stages of economic growth and on the other hand, for those economies that are unable to adapt to the

new technological system, their retardation becomes cumulative” (p.28)

Although presented from different angles, both approaches advocate the adoption of ICTs for development purposes and stress the importance of doing so. This further highlights a possibly dominant position among development practitioners who appear to sideline socio-technical parameters of the context into which these ICTs (e.g. refurbished computers) are injected. It can, therefore, be seen that the modernisation and dependency discourses hold the view of technology as an objective and neutral tool which can be used in any context to achieve planned and consistent results.

ICTs and a socio-technical approach to development in LDCs

While the two discourses emphasize promoting the use of ICTs for development activities in a rather top-down ‘ivory tower’ approach, this thesis situates the processes of ICT adoption within the adopting contexts and holds that ICTs are not independent tools which can be separated from the context in which they are used. Instead, separation of the two is impossible since technologies are society shaped and society shaping (Bijker, Hughes and Pinch, 1987).

However, some development practitioners and aid agencies do not appear to appreciate the significance of the socio-technical nature of ICTs. Instead, they can still be seen maintaining principles of the modernisation and dependency discourses in many of their ICT for development initiatives within LDCs (e.g. Computers for Africa, Schoolnet Africa, etc)

3.1.3 ICTs and secondary education in LDCs

ICTs are now being adopted and used in many learning institutions world wide. This section, focusses on ICTs in form of computers and Internet technologies and discusses various issues related to reported outcomes of ICT adoption in LDCs across the sub-Saharan region of Africa which includes Malawi.

Schoolnets

The concept of schoolnet originated from Canada to refer to country-level programmes which have the objective of developing and supporting the use of ICTs in schools in a developmental rather than commercial way (James, 2004). In particular, schoolnets aim at connecting schools through wide area networks and promoting teaching and learning processes through the use of ICTs, particularly computers.

At its inception in Canada, schoolnet had two main objectives: national and international. The national objective aimed at connecting all the schools and libraries across Canada by the end of 1998 (James, 2004). On the international level, schoolnet aimed at connecting schools in the rest of the world to the Internet and create an international educational network. With so many different social contexts with varying goals and objectives worldwide, schoolnet's objective of creating an international educational network seems to presuppose that ICTs can easily be implemented in any context and that they have that kind of objective and universal potential to deliver uniform outcomes.

In sub-Saharan Africa, the schoolnet concept was first introduced in 1998 under the name of Schoolnet Africa (James, 2004). This was a direct result of the Memorandum

dum of Understanding that was signed between countries in this region and SchoolNet Canada. Although, the main objective was to help these countries in the provision of education services and consequently contribute towards development (James, 2004), schoolnet initiatives in sub-saharan africa have been accused of turning Africa into a dumping place for old computers (Castells, 2001). Specifically, SchoolNet Africa facilitates the provision of ICTs in form of refurbished computers in secondary schools to increase connectivity and collaborative practices among the secondary schools throughout the education system in LDCs and the world at large.

One of the major premises upon which Schoolnet Africa is built is that ICTs 'can deliver' developmental outcomes if they are adopted and used for educational purposes (Pigato, 2001). This suggests a decided opinion among the sponsors of Schoolnet Africa that ICTs have that kind of raw potential to solve problems of underdevelopment in Least Developed Countries like Malawi. For example, it is believed that within the education sector, ICTs can be used to provide access to information which can subsequently be used to generate knowledge (Pigato, 2001; UNESCO, 2004b; Malawi Governemnet, 2002). The promoters of such ICT-related ideas appear to believe that the adoption of ICTs will automatically lead to the generation of knowledge which, according to Mansell and Wehn (1998), is the most important and crucial resource upon which the economic well-being and social development of any society depend.

However, although the implementation of ICTs in the education system may be believed by its promoters to automatically contribute towards development by providing access to information and supporting knowledge creation within the adopting context, the value of accessed information and the value of generated knowledge varies from one context to another (Mansell and Wehn, 1998). From a socio-technical point

of view, such value is likely to depend on a number of various parameters within the adopting context e.g. culture, political structure, social arrangements.

In relation to this, Mansell and Wehn (1998) indicate that the potential of ICTs to contribute towards any country's economic growth and subsequent development is centred on two main aspects of ICT production and ICT consumption (i.e. investments in ICT infrastructure to enable the production of hardware and software; and the ability to use ICT products). However, they also observe that although production of ICT goods significantly contributes to economic growth, not many LDCs have the capability to invest in the production of ICT goods and can only benefit from these ICTs through consumption as opposed to production. Therefore, by targeting secondary schools and the education sector, schoolnets may be seen to be promoting ICT consumption skills which they appear to believe are vital for socio-economic progress.

Moreover, promoters of Schoolnets in Africa also envisaged that through the adoption and use of computers in secondary schools, the issue of inequalities in access to educational resources (e.g. information) would be addressed (Haddad and Jurich, 2003). One of their main objectives appears to be to 'bridge the gap' between the 'haves and have-nots'. However, Duncombe and Heeks (1999) suggest that this 'gap' between the haves and have-nots exists in several ways (e.g. technological capabilities, information access costs and relevance) and at different levels (e.g. national, international, local etc). Therefore, it can be seen that bridging the 'digital divide' and contributing to development through the adoption and use of ICTs in secondary schools is not as straightforward as it is usually portrayed by the promoters of ICT adoption in Africa (e.g. Schoolnet) who put much emphasis on the ICTs themselves and disregard other parameters and 'gaps' within the adopting context.

Models of Schoolnets in Africa

Reported instances of ICT initiatives in Africa suggest that initiatives like schoolnets work to achieve their objectives based on two main models : donor-led and champion-led models (Pigato, 2001). In the donor-led model, development organisations and aid agencies take direct control of the ICT initiative in a particular region or social context. In the champion-led model, the champions or 'hybrids' (Heeks, 2002, p19) are identified and given charge of the ICT implementation process. To a large extent, Heeks (2002) observe that in Africa, these hybrids or champions act as representatives of particular development organisations across the globe.

Donor-Led Model

In this model, the main donors (e.g. the World Bank, DFID etc) set their own goals for the ICT interventions and take control to make sure that their targets are achieved. James (2004) indicates that such donors manage their ICT initiatives either independently or in collaboration with other donors. Although collaboration has been seen as one way of limiting duplication of effort, it has also been seen to lead to conflicts among donors, especially in cases where conditions for collaboration are not clearly stated at the onset of the whole initiative (Heeks, 2002). On the other hand, interventions that solely rely on donors have also been reported to have very uncertain futures, especially when donors pull out for some reason. One can also see that this model is likely to suffer conflicts in cultural values and beliefs between the donors and the recipient countries if the interventions are not well aligned to the socio-cultural parameters of the adopting context.

Champion Led Model

In this model, 'champions' are usually indigenous people who have acquired some kind of educational training from the developed western countries and work as representatives of the donor agencies within their local communities (Wade, 2004). One possible reason for this model as some authors (e.g. Heeks, 2002) observe, is to ensure sustainability of the ICT interventions and promote ownership among the recipients. However, the identification of champions has been cited as crucial to the success of these ICT interventions and subsequent sustainability. Heeks (2002) observes that often times, these champions are viewed as 'Trojan horses' (Heeks, 2002) who usually serve and promote the interests of the donors themselves. Usually, these champions promote the interests and objectives of the donors and aid agencies themselves. Here again, since one of the main objectives of schoolnets is to facilitate development through the use of ICTs, it may be possible that the nature of ICT initiatives that they promote are driven by their own ideologies and interests which may possibly not be in line with the cultural values, interests and goals of the recipient communities. This suggests that when making ICT choices, many stakeholders possibly do not consider the value of those ICTs within the adopting context. Instead, they appear to base their adoption processes on utopian ideas and expectations about ICTs and what these ICTs can do to contribute towards development. In particular, there appears to be a decided opinion that regardless of context, mere adoption of ICTs would lead to 'effective' use of ICTs and subsequent developmental gains in adopting contexts (see fig 3.1)

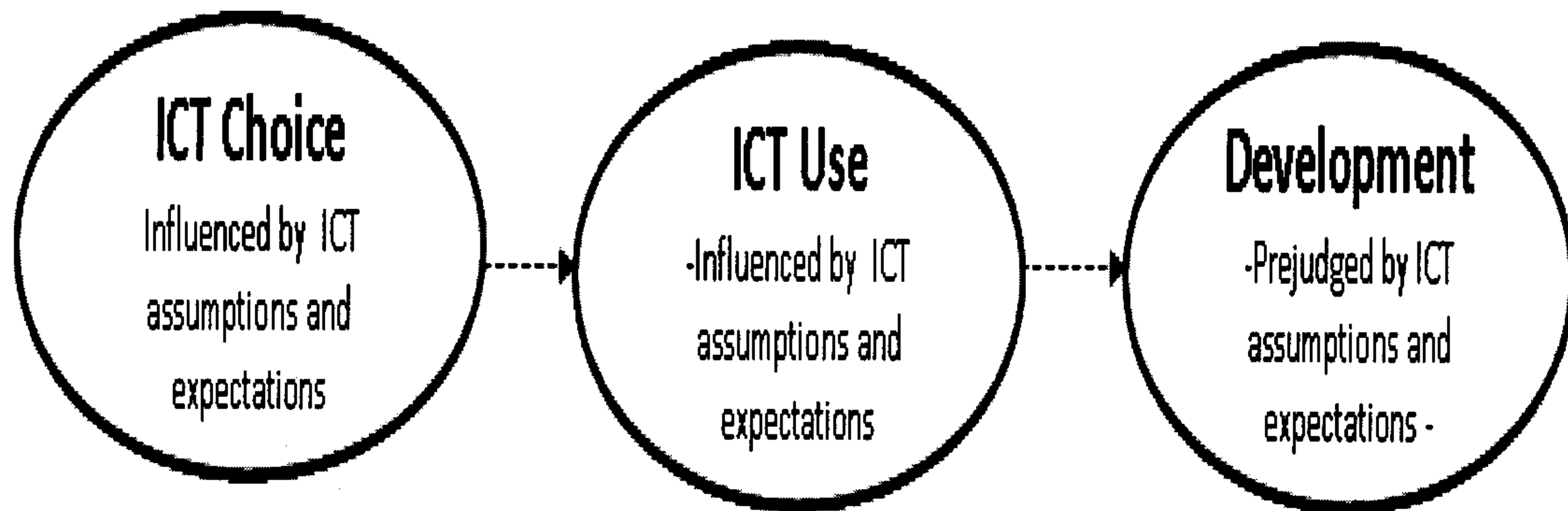


Figure 3.1 Utopian view of ICT adoption for development in LDCs.

As Heeks (2002) observed, such ICT expectations and assumptions seem to portray ICTs as having that kind of raw potential to promote development in LDCs like Malawi.

However, in reality, it appears that such ICT expectations do not always materialise and many ICT initiatives in LDCs within sub-Saharan Africa meet a lot of challenges (James, 2004).

3.1.4 Challenges facing ICT initiatives in LDC schools

It is reported that Schoolnet Africa has grown and has actively promoted the development of national level schoolnets in African developing countries across the sub-Saharan region (James, 2004). However, in trying to implement ICTs for educational use, schoolnets have also experienced a number of social, technical, economic and political challenges in these regions. Although James' (2004) work outlines the main factors that hinder the adoption and use of ICTs for teaching and learning purposes in secondary schools within sub-Saharan Africa (e.g. lack of literacy skills to use ICTs, lack of competence to integrate ICTs into current teaching and learning methods, infrastructural problems, financial factors etc), it falls short of articulating the underlying influences which lead to such outcomes in LDC contexts. Clearly, James' (2004) work illustrates the shortfalls of a tool-perspective approach which appears to be adopted by some development stakeholders when implementing and analysing ICT initiatives in LDCs. Such an approach may be seen to be associated with a number of various unprecedented outcomes in the education systems of many LDCs across sub-Saharan Africa. The sub-sections which follow, discuss some of the reported critical challenges faced by ICT initiatives in LDCs across Africa.

Changing Educational Practices

Integrating the ICTs into the curriculum is one of the major goals of many ICT interventions in sub-Saharan Africa (James, 2004). However, looking at some of the reported cases in Africa, it becomes clear that this is not a simple objective. For example the reported cases of lack of human capabilities to use ICTs, poor infrastructure and other cultural practices, values and beliefs both at national and institutional level

indicate that changing teaching and learning practices to accommodate ICTs meets a lot of challenges in sub-Saharan Africa. In many LDCs, the majority of secondary school teachers are not trained to use ICTs for teaching and learning purposes and, in this case, most of them are likely to encounter problems using these ICTs in the classroom (James, 2004).

On the other hand, James' (2004) work indicates that these teachers usually prefer their traditional approaches to teaching. These are the methods that they have been taught to follow and have been using for a long time before the introduction of these ICTs. Therefore, one can see that reports of failed attempts at integrating these ICTs into the curriculum in LDC do not come as a surprise because some teachers want to stick to the practices which they already know and value.

The issue of indigenous knowledge and local literacies stands out here. Drawing on the observation that technology is society shaping and society shaped (Bijker, Hughes and Pinch 1987), it can be seen that the interaction between the technological artefacts and the social context is crucial and needs to be appreciated. This suggests that if ICTs are to be effectively integrated into the local context then they have to be seen to be aligned to the social processes within the adopting context.

ICTs Pedagogical Value

The current curriculum in many secondary schools in Africa has been seen to support what Freire (1995) has termed the "banking mode" of education whereby teachers are seen as the providers of what is supposed to be learnt by pupils. Pupils appear to be seen as 'repositories' where knowledge can be 'deposited' bit by bit by their teachers. However, the use of ICTs - especially in the machine-as-human, toolkit and

tutorial constructs (Jurema and O'Rourke, 1997) which seem to overlook the role of the teachers - is likely to result in undesirable consequences. In these constructs, it is the learners or pupils who have to assume a more responsible role in searching for information and generating knowledge based upon their needs. In relation to LDCs like Malawi, local culture does not support this kind of learning because in such regions learners always look up to their teachers, who are socially and culturally above them in the hierarchy, for knowledge. Therefore, the introduction of ICTs in schools is likely to cause some discontinuities and problems. However, this does not serve to invalidate the potential role of ICTs in education with sub-Saharan Africa. Instead, it stresses the significance of the socio-technical nature of technologies.

Meeting Needs of Diverse Stakeholders

Whether it is a champion-led or donor-led model of ICT intervention, it is likely that there will always be several interest groups that are involved in the process of ICT adoption, implementation and use. Teachers, pupils, governments, NGOs, consultants, administrators and many other stakeholders are involved, and all of them are likely to have their own goals, beliefs, values and visions of a 'successful' implementation of these ICTs. If these stakeholders differ greatly on what they perceive to be a 'successful' implementation based on their goals, values and beliefs, one can see that these ICTs interventions are likely to face a lot of problems.

Human Technological Capabilities

In general terms, lack of basic literacy has been singled out as a fundamental barrier for ICT use within the sub-Saharan region (Mansell and Wehn, 1998). In relation

to ICT use for teaching and learning activities, lack of literacy has been underlined. It is observed that sub-Saharan Africa lacks people with adequate levels of skills to sustain the adopted technologies (Mansell and Wehn, 1998).

Culture

It would be a mistake to expect that mere infusion of ICTs in secondary schools in sub-Saharan Africa would automatically solve the problems and improve the delivery of teaching and learning services in the education system. Learning and teaching activities occur in social contexts (Jurema and O'Rourke, 1997), therefore, it can be seen that ICTs can possibly play an effective role in these processes if they are perceived to have social meaning and value among the users. It is local culture which is likely to determine the receptivity of these technologies by influencing the way in which they are adopted and used in particular social contexts. It is observed that ICTs that support local culture and indigenous knowledge are more likely to be accepted into a society than those which do not (Orlikowski and Gash, 1994).

Myers and Tan (2002) distinguish two main categories of culture and these are organisational and national culture. As something which defines the way in which people live in a particular society, culture can be seen to be a complex thing involving beliefs, values, knowledge, assumptions, customs, law, morality, etc that people acquire as members of a particular social group.

Within secondary schools, organisational culture can be seen to be portrayed in any of the three main forms (Myers and Tan, 2002): surface manifestation which mainly involves norms, artefacts, symbols and rituals; espoused values and beliefs which include the values and beliefs of the schools; and basic underlying assumptions which

take into account all the aspects and things that the schools take for granted as being the right way of doing things.

At national level, culture is usually acquired in early childhood and is nurtured in families (Myers and Tan, 2002). As people grow, they already have mental configurations that are based on a particular national culture. For instance in Malawian national culture, male folk appear to dominate decision making processes in many communities and women are only expected to 'submit' to whatever has been decided upon. This suggests that women possibly do not have much say on issues that could greatly affect them. On a similar point, in some cultures, females are not allowed to touch or share anything that is for public use during certain periods (see section 2 of chapter 5 of this thesis). In such cultural societies, therefore, women cannot use shared computers to access information during that period and a few days after. This national culture may possibly influence what happens in secondary schools when ICTs are adopted for use.

It may possibly be that when ICTs are introduced in secondary schools, they will influence, and be influenced, by both the organisational and national culture. Therefore, being aware of these cultural prescriptions and how they interact with a particular social context is likely to help in the alignment of ICT interventions to match the local environment.

Technology Use

Although ICTs are being adopted for use in many LDCs in sub-Saharan Africa, there are reported problems associated with the nature of the technologies and the local environment in which they are being used. Mansell and Wehn (1998) report that the

technological infrastructure in sub-Saharan Africa is not ready to accommodate the use of technologies that depend on electricity and telephone networks. In Malawi, many areas, especially those in the rural parts, are not covered by the electric grid and consequently do not have telecommunication networks (Malawi Government, 2002). However, schools in urban areas are most likely to be at an advantage since they may possibly be covered by the electric grid and have access to telecommunication networks. On the other hand, Hawkins (2002) adds that most of these urban schools with computers connect to the Internet through “old lines and antiquated telephone exchanges” (Hawkins, 2002, p.39) leading to very poor connectivity which has been likened to “a fire hose dangling over a thirsty traveller in the desert that releases only drops of water into his parched mouth” (Hawkins, 2002, p.39). In such contexts, it is possible that the introduction of some ICTs for educational purposes may possibly lead to a further ‘divide’ between these urban schools which have electricity and telecommunication networks and those in rural areas which may not have anything at all.

In addition to this, the majority of ICTs, particularly the refurbished computers, that are being adopted for use in many secondary schools within sub-Saharan Africa are reported to be based on designs that were made to suit the characteristics of the countries in which they were developed (Heeks, 2002). However, once they are in sub-Saharan Africa, several researchers have reported that they are made to operate in a relatively very hot and dusty environments where electricity blackouts are common and breakdowns in telecommunication networks are frequent (Hawkins, 2002; Haddad and Jurich, 2003). In a situation like this, the use of ICTs for education purposes may possibly be disturbed, and this may consequently lead to disruptions in the way education services are delivered. This may also be made worse by the frequent

blackouts which may possibly lead to machine breakdowns due to power surges.

With the reported lack of technical skills to maintain ICTs, the well-intended ICT interventions may possibly end up yielding unprecedented outcomes. Some critics have observed these problems and concluded that these aid-donated refurbished computers are not really matched to the characteristics of the African context in which they are adopted and used (Wade, 2004; Amutabi and Oketch, 2003). Such initiatives portray Africa as a “dumping ground” (Castells, 1998, p.95) for huge volumes of ICTs that have become obsolete in the western countries because of the fast pace at which technological revolutions are taking place. On the same point, although it is observed that wireless technologies offer a possible solution to telecommunications infrastructure problems in sub-Saharan Africa (Mansell and Wehn, 1998), the adoption of obsolete refurbished machines that can not handle wireless technology in this region may possibly be seen to be blurring these hopes.

Another issue surrounding the use of ICTs in secondary schools within sub-Saharan Africa is the relevance of the educational resources that these ICTs provide access to. Based on the development discourses, the main idea of introducing ICTs in schools appears to be the provision of access to information that could consequently be used to create relevant knowledge for particular social groups. This can be seen to mainly hinge on the use of the Internet. However, there seems to be a disjoint between the content carried on the web and its relevance to the information needs and the way of life in many countries within sub-Saharan Africa (Heeks, 2002). This means that it is not only the promotion of ICTs that is required. Instead it is the promotion of relevant ICTs that matters most, i.e. ICTs that offer meaning and value to the adopting context.

Institutionalisation

The process which governs the way in which ICTs are implemented for educational use in sub-Saharan Africa is one reason behind the reported cases of unintended outcomes of many ICT interventions (Hawkins, 2002). It is observed that although many countries in sub-Saharan Africa are implementing ICTs for educational purposes, not many of them have realistic and clear policies that are driven by local needs to govern such implementations. For instance, in Malawi, despite showing great commitment to use computers in schools, the Malawi ICT policy and the education policy can be seen to lack a clear and focussed strategy that would be followed to integrate ICTs into Malawian classrooms.

On the other hand, being predominantly agrarian economies and poverty-stricken countries, many LDCs like Malawi depend heavily on donor aid. This may have several implications in the way that ICTs are implemented for educational use. As indicated in the modernisation discourse of development (see section 2.3), these donors may play a huge role in pushing the idea of adopting ICTs for development and in the process they may possibly impose policies based on what they think is the right way of doing things, their ideologies. As for the receiving countries, it could be like a case of “virgins marrying Casanova” (Heeks, 2002, p.2) whereby developing countries just accept whatever has been imposed on them as being the doctrinal truths.

3.2 ICT Adoption and Development in LDCs

This section discusses some literature in relation to the interactive relationship between technological artefacts and the social context. The section is divided into five sub-sections. The first sub-section discusses literature related to the ways in which technologies are adopted for particular purposes within a society. The second sub-section presents a discussion of issues related to the concept of technological choices in development initiatives and then the other sub-sections discuss these issues in relation to LDCs contexts.

3.2.1 Socio-Technical Perspectives on ICT adoption and implementation process

The notion of ICT adoption has been discussed by several authors and researchers in various fields for so many years and throughout these discussions, two main perceptions about ICTs can be identified. For example, while Cooper's and Zmud's (1990) diffusion model and the traditional Roger's (1995) diffusion model, appear to lean towards the tool perspective, Kling's STIN models support a socio-technical perspective of technology.

According to Cooper's (1990) and Roger's (1995) one-way tool-perspective diffusion models, there are six stages in the implementation process of ICTs: initiation, adoption, adaptation, acceptance, routinisation, and infusion. In all these stages, the models presuppose linearity and gradual transition from one stage to another in the implementation process. These models appear to suggest that, no matter what, technologies will always follow predetermined paths and deliver uniform results in any

context. However, in any ICT initiative, there are stakeholders who introduce the idea of implementing particular technologies for particular reasons. This means that stakeholders make decisions on what technologies to use and why. Moreover, this also suggests that there are likely to be a number of technological options which the decision makers choose from. Thus, justifications have to be made for choosing a particular technology. In so doing, there are likely to be so many parameters which could possibly influence and be influenced by the outcome of any ICT initiative. For example, during the model's adaptation phase - whereby some aspects of the technology and the social context appear to interact (Cooper and Zmud,1990) - issues of culture, politics, religious beliefs, etc may possibly have a significant influence on the outcomes of the whole ICT initiative. Contrary to these utopian one direction diffusion models, ICT adoption processes do not follow predetermined paths. Instead, they shape and are shaped by numerous socio-technical influences. Kling's Socio-Technical Interaction Networks provide a potentially rich model upon which a deeper socio-technical understanding of ICT adoption processes in any context may be built.

Socio-technical Interaction Networks

From the above discussion, it can be seen that there are so many ways in which ICTs may be adopted within any social group and in whatever way that these ICTs are adopted, there are always interactions between various socio-technical elements within the adopting society(Bijker, Hughes and Pinch 1987). Processes governing ICT adoption and use are embedded in contexts where issues related to people, physical surroundings, societies or institutions, procedures, techniques, regulatory regimes, software, data etc matter. Specifically, these interact in particular ways which lead to socio-technical interaction networks (Kling, 2000).

Kling (2001) explains that a STIN is:

“ a network that includes people (including organisations), equipment, data, diverse resources (money, skills, status), documents, messages, legal arrangements and enforcement mechanisms, and resource flows. The elements of a STIN are heterogeneous. The network of relationships between these elements include: social, economic and political interactions”
(Kling,McKim and King 2001, p.3)

From this explanation we can see that STINs do not allow for the practical separation of technological artefacts from the context within which they are embedded and emphasize on the socio-technical nature of ICTs in society.

Socio-technical Interaction Networks (STINs) have been explored in various IS studies by experienced researchers like Rob Kling who, for more than 20 years, studied the socio-technical nature of ICTs and how ICTs influence and are influenced by the social context within which they are embedded (Kling and Lamb, 2000). We can see that it is through these socio-technical interaction networks that processes of ICT adoption occur. These are the interactions which influence and are influenced by the way in which ICTs are adopted within a social group (Kling, 2001).

For example, Orlikowski and Gash (1994) observed that when people decide on what technologies to adopt, they refer to their own understanding and perceptions about technology. Thus, ICT adoption process is not a stand-alone process whose direction and path can be predetermined. Instead, it occurs in complex networks of interacting socio-technical elements. This, therefore, means that investigating ICT adoption processes in a particular society also involves an investigation into a milieu of

socio-technical influences (e.g. the adopters' technological assumptions, expectations, interpretations etc). Wade (2004) indicates that in LDCs, many of the technological assumptions and expectations are overtly deterministic. To a large extent, many LDCs appear to believe that computer-based technologies hold the 'almighty' key to their socio-economic progress.

Such technological expectations and deterministic assumptions can, on one hand, possibly have a constraining effect in a society when they:

“reinforce unreflective reliance on established assumptions and knowledge, distort information to make it fit existing cognitive structure and inhibit creative problem solving” (Orlikowski and Gash, 1994, p177).

Such naive assumptions act as 'psychic prisons' which prevent people from looking at the existing problems from a different perspective and solving them using other possibly more powerful alternative means. On the other hand, perceptions about technology can possibly have a facilitating effect when they help in providing an explanation and a clear interpretation of a complex or problematic situation and provide a way forward as a means of solving an existing problem.

This suggests that the technological interpretations that people have may strongly influence the technological choices that they make, and the way in which they use the chosen technologies. However, technological artefacts also embody the values and objectives of those who sponsored or designed the artefacts (Orlikowski and Gash, 1994). These sponsors may consciously or unconsciously also dictate the way in which technological artefacts should be adopted and used in a particular society.

This implies that it is possible for a particular technological artefact to be (consciously

or unconsciously) imposed upon a society based on the assumptions and expectations of its sponsors or designers, and not necessarily on those of the adopting society.

Once a technology has been implemented in a society, it is likely to force society members to follow certain plans or to re-arrange themselves in order to use it (Bijker and Law, 1997). In relation to this research project, therefore, it may possibly be that the Malawian society has technological interpretations that could possibly influence the ways in which these technologies are adopted. For example, Wade (2004) suggests that many stakeholders perceive technologies as key to LDCs' development. Such perceptions of technology may possibly influence and be influenced by ICT adoption processes in these LDCs.

Technological Realism and ICT choices in LDCs

In relation to LDCs, there are several perceptions about the status, meaning and value of the technology to local societies which underlie ICT choices. For example, LDCs are characterised by significant social, political, economic and technical problems, and literature portrays a view that the choice of technology in these countries is largely implicated in diagnoses of these problems (Wade, 2004). Malawi for instance is reported to have problems like poverty, high population levels, disease, illiteracy etc which could possibly lead to the choice of a particular technology as a possible means of addressing such a constellation of problems. Accordingly, technologies have also become a central focus among various development stakeholders and have increasingly grown in importance as potential sources of solutions to these problems.

For example, in its ICT policy, the Malawi Government clearly admits that she has "...
recognized and accepted the importance and role of ICT in Malawi's socio-economic

development ” (Malawi Government, 2003, p6). As a way of showing such conviction in the role of ICTs and its commitment to use ICTs for development, the Malawi government has since removed import duty on all computer sets entering Malawi. Considering the nature of various socio-technical parameters in Malawi, it becomes difficult to envisage as to how these computers may possibly contribute towards socio-economic progress in Malawi. To a large extent, policy measures taken by the Malawi government in relation to ICTs appear to suggest a tool perspective approach and the existence of an ideological mentality which perceives computers as ‘almighty and objective tools’.

Many strategy papers that have been designed to guide Malawi’s efforts in solving its social problems appear to share the perception of technologies as having that raw potential to stimulate socio-economic progress in Malawi. For instance, in sectoral policies like the *Vision 2020*, the *Malawi Poverty Reduction Strategy Paper* and the *Malawi Science and Technology Policy*, the Malawi Government has outlined several objectives whose attainment hinges on the use of technology. As far as socio-economic development is concerned, all these papers seem to agree on the point that ICTs are “an engine for: accelerated sustainable development and economic growth; social and cultural development; national prosperity; and global competitiveness.” (Malawi Government, 2003, p7).

Although this may sound good to a lot of Malawians, it is overtly deterministic and may be seen to border heavily on the naive. Technology on its own does not have that kind of raw potential. Instead it is the synchronisation of the interdependent relationship among socio-technical elements which matters most (Bijker, Hughes and Pinch 1987; Kling, 2000).

Therefore, although Malawi's objectives for using ICTs as a key towards the attainment of its developmental goals may be plausible, a tool-perspective approach may possibly lead to a mismatch between the ICTs themselves and the Malawian context. For instance Malawi's objectives

“ to transform the Malawian educational system using ICTs with the aim of improving accessibility to educational resources and facilities, the quality of education, the relevance of the educational services and output to development needs of Malawi; To transform Malawi into an ICT aware and literate nation and to improve the information and communications infrastructure of Malawi, especially for the rural areas.” (Malawi Government, 2003, p8)

are all positive steps towards socio-economic progress. Precisely, in order to achieve these objectives, the Malawi government has indicated its plans to promote basic literacy and ICT literacy among its citizens and to facilitate the provision of wider access to information and ICT services to the underprivileged (Malawi Government, 2003). However, these objectives are likely to be a pipedream if the type of the adopted technologies do not appreciate the socio-technical parameters within the Malawian context.

Moreover, it is indicated that as a strategy towards achieving the objective of promoting basic literacy and ICT literacy, the Malawi government will “introduce computer lessons in education, especially primary and secondary education” (Malawi Government, 2003, p16). However, for a country where access and connectivity indices (see chapter 2, context background) indicate inadequate resources for running and supporting computers, Malawi may possibly have jumped on the bandwagon without

really knowing where it is heading. While Malawian policies acknowledge the important role of technologies, they may possibly be seen to be less focussed in the understanding of the socio-technical complexities of Malawian societies.

In relation to ICT adoption, we can therefore see that technology choice processes and how they bear upon the adopting context are very important concepts. For LDCs to possibly make useful steps towards alleviating some of the reported developmental problems, technology choice needs to be considered as a cardinal concept where ICTs are understood from a socio-technical viewpoint as opposed to a collection of neutral tools. ICT adoption processes need to be characterised by the stakeholders critical reflection over the technological choices which they make in order to yield ICT initiatives that are aligned to the socio-technical parameters within the adopting context.

This suggests that ICT adoption processes in LDCs may possibly need to involve a critical analysis of the value of the chosen technological option within the adopting local context.

3.2.2 ICT value, Local Focus and LDC contexts

Heeks (2002c) observes that local or regional focus is crucial when adopting or making technological choices. Parameters within actual adopting context bear great significance on the way the technologies are used and their consequences. In Malawi for instance, it may be said that secondary schools vary in many aspects like geographical positioning and context i.e. urban and non-urban. This suggests that the socio-technical conditions among these secondary schools or niches are also likely to vary.

Therefore, a technology which may be seen to exhibit a 'good fit' in an urban location may not necessarily exhibit the same in a non-urban location and vice versa. This serves to highlight the significance of local focus or technological value when making technology choices. Issues of technological value have been discussed by Willoughby (1990) who defines value as the technology's potential role in a society. In this research study, ICT value in relation to education and the idea of contributing towards socio-economic progress in Malawi can be looked at from three main viewpoints: economic or developmental value, socio-cultural value and pedagogical value.

Economic or Developmental value

The current trend of ICT adoption and implementation in LDCs may possibly be viewed as a response to the perceived socio-economic problems within these countries. To a larger extent, the adoption of Internet and computer technologies has been shown to be promulgated by governments and organisations which acknowledge the existence of these problems and strongly believe that such technologies have the

potential to solve these problems. For example, the enthusiasm expressed by the Malawi government to adopt and use computer and Internet technologies for socio-economic development (Malawi Government, 2003) may be seen to support this view. However, in relation to economic or developmental value within Malawian communities, the dominant trend of adopting and using ICTs may possibly be problematic in two main ways: sustainability and self-reliance.

Firstly, the question of sustainability runs throughout the literature on ICT for development (Mansell and Wehn, 1998; James, 2004; Wade, 2004). It has been shown over and over again that efforts to contribute towards socio-economic progress through the use of ICTs are likely to stall if there are no adequate resources to sustain such efforts. These resources may include: human skills base, infrastructure e.g. telecommunications, financial capacity etc. For LDCs like Malawi, these resources in relation to computer and Internet technologies, have been reported to be very poor especially in the non-urban areas (Mansell and Wehn, 1998). As a technological option, therefore, the choice of such technologies against this resource-base suggests a tool-perspective approach and a possible existence of a poor technological fit within these countries. From this perspective, it may be seen that for ICTs to be sustainably used for specific purposes in LDCs then they need to be focused on or aligned to the nature of the adopting local context. Sustainability may possibly be achieved through the employment and mobilisation of locally affordable resources within the adopting context. This, therefore, means that the ability of the adopting context to mobilise local resources that may be employed to achieve sustainable use of ICTs is a crucial aspect when making technological choices. There is no point in adopting ICTs which cannot at all be sustained by the adopting context.

Secondly, although the literature indicates that computer and Internet technologies

have a significant role to play in the socio-economic development of LDCs (Mansell and Wehn, 1998), the value of such technologies within LDC local communities may be seen to be questionable. As a strategy aimed at stimulating socio-economic development, the adoption and use of such technologies may be seen to undermine the promotion of economic self-reliance. For instance the idea of promoting ICT literacy through the use of computers in secondary schools may possibly lead to the production of pupils who have skills that can not make them economically viable and self-reliant within the LDC context.

Moreover, in LDCs, it is possible that computer technologies may be more suitable in some contexts than others e.g. urban or non-urban. While some communities may be unable, or may not afford to obtain resources for the running of computer technologies, others may manage to do so. Such a scenario may possibly have two main effects on the development of a nation. It may firstly exacerbate the gap between the 'haves' and 'have-nots' (Heeks, 2000) and it may secondly encourage dependence of the 'have-nots' upon the 'haves'. These effects may be observed at many levels of society i.e. global, national, regional, local community, local organisation (e.g. school), individual etc (Willoughby, 1990).

It is observed that self reliance at any one of these levels may possibly reinforce self reliance at the other levels (Willoughby, 1990). This suggests that self-reliant individuals within a community may potentially help that community to become self-reliant as a whole. It has also been argued that self-reliant local communities are vital for the achievement of self-reliance by individuals within those communities. Moreover, it has been observed that national self-reliance provides an important condition for self-reliant communities within nations (Willoughby, 1990). For the case of LDCs like Malawi, it may possibly be said that the choice of technologies based on economic

or developmental value as in the promotion of self-reliance is possibly a necessary condition for contributing towards socio-economic progress.

socio-cultural value

Another theme that has emerged from the literature review is that of technology's socio-cultural value within particular local communities. Many of the currently adopted technologies within LDCs have been said to be more urban than rural oriented (Heeks, 2002). This suggests a possible lack of understanding of the socio-technical nature of technology and a belief that what works in the urban centres will eventually trickle down to the rural communities. Moreover, it also highlights failure on the part of the practitioners to acknowledge differences in contextual parameters within various socio-cultural settings in LDCs.

To a large extent, reports on many ICT initiatives in LDCs seem to suggest that any technology that benefits the one context will also benefit the other communities. However, in many LDCs, various contexts (particularly urban and rural) have different cultures and follow different cultural inscriptions. Therefore, it would be naive to think that what works for one context will also work for the other context. From a socio-technical point of view, the significance of issues related to cultural values and belief systems within particular communities need to be taken into consideration when making technological choices. It may possibly be said that a socio-technical approach which considers the socio-cultural parameters within local communities (urban and non-urban) may potentially offer some ICT socio-cultural value and relevance to classes of people who would otherwise be bypassed by a holistic and technologically deterministic tool-perspective approach.

Pedagogical value

Education is one of the potential sectors through which socio-economic progress of any nation can be achieved. In relation to ICTs, the use of technologies in classrooms can be based on four main theoretical perspectives: tutorial construct, machine-as-human construct, toolkit construct and catalyst construct (Jurema and O'Rourke, 1997). In the tutorial construct, technological artefacts (e.g. computers) play the role of a tutor and they facilitate learning by providing exercises where pupils respond to standardized challenges or questions that are arranged in levels of ascending difficulty (Jurema and O'Rourke, 1997). In this construct, pupils are trained to learn by memorising the challenges and their respective answers and their responses are usually designed to match the traditional pedagogy. We can see that if blindly employed (i.e. without considering socio-technical parameters) in secondary schools, this kind of construct may possibly provide almost no room for creativity among the learners.

In secondary schools within the LDCs, the traditional approach requires pupils to remember what they have been taught and to be able to reproduce it during examinations (Haddad, 2003). Therefore, one can see that while the tutorial construct is likely to promote this traditional approach to learning, it is also likely to encourage memorisation of facts at the expense of understanding. In relation to ICT pedagogical value, one can also therefore see here that this construct may possibly run the risk of producing pupils who acquire information but are not able to understand and use that information to create useful knowledge which they can apply and use in contributing towards socio-economic progress of their own societies.

In the machine-as-human construct the technological artefacts are looked at as intelligent machines and these machines are used to substitute the role of a teacher with the

teaching and learning processes (Jurema and O'Rourke, 1997). At the centre of this construct are notions of Artificial Intelligence which look at several aspects of human cognition (e.g. a teacher) and programs them into a computer to enable it behave in a cognitive way that is similar to a human being. The tutorial and the machine-as-human constructs can be seen to be based on the assumptions that knowledge is given and that it is the teacher who is in ultimate control of providing this knowledge to the learners. Thus these two constructs follow the 'banking mode of education' (Freire, 1995) and recognise that teachers can be substituted by intelligent machines.

In Malawi where the teacher to student ratio is very low (see chapter 2), this construct may possibly have some value, however, the cost of creating and maintaining a teacher-like machine in a region where poverty and illiteracy are common may pose a great challenge. Moreover, substituting a teacher with a machine may not be a welcome idea in a society where unemployment and poverty levels are already high.

Unlike in the above two constructs, the tool-kit construct is learner centred. It brings into light the idea of 'constructivism' which proposes that learning occurs through a process of personal inquiry and discovery and that technology only acts as a helper in the process. In this construct, technology is only there to assist the learner in searching for and gaining access to thought provoking information that will later help in knowledge building. This construct looks at learning as an individualised process whereby the learner uses ICTs to access and acquire knowledge (Jurema and O'Rourke, 1997).

Although this construct may sound attractive for LDCs which may possibly use it for distance education, the tool-kit construct may possibly fall short of providing motivation to learners. Moreover, by turning learning into an individualised process,

this construct may also possibly lead to the production of citizens who may hardly fit in social groups to interact with the wider society and use their knowledge to contribute effectively towards socio-economic progress.

On the other hand, technological artefacts can be used in classrooms based on the catalyst construct. This construct, unlike the other three, includes the aspect of social interaction as a fundamental ingredient for learning to occur (Jurema and O'Rourke, 1997). The role of technology is to facilitate and enhance this interaction among various stakeholders in the learning process. The role of teachers in this construct is not overlooked or substituted. Instead teachers assume an additional role of building a favourable environment for collaborative learning where technology can be used to support it.

This construct underlines a socio-technical understanding of technology and could possibly be appropriate for various social settings in LDCs like Malawi because by incorporating the role of teachers in the learning process, this construct may be seen to have the potential of supporting indigenous knowledge and culture through the use of teachers who may act as 'cultural brokers' between the ICTs and the local context, while at the same time facilitating teaching and learning.

It may be said that the adopted technologies are likely to have some pedagogical value within particular contexts if they are seen to promote indigenous practices and vice versa. However, the introduction of ICTs in any society is also likely to cause some discontinuities in the way business is conducted within the society. This stresses the significance of considering the value of these technologies not only within secondary schools but also in the surrounding communities (see fig. 3.2).

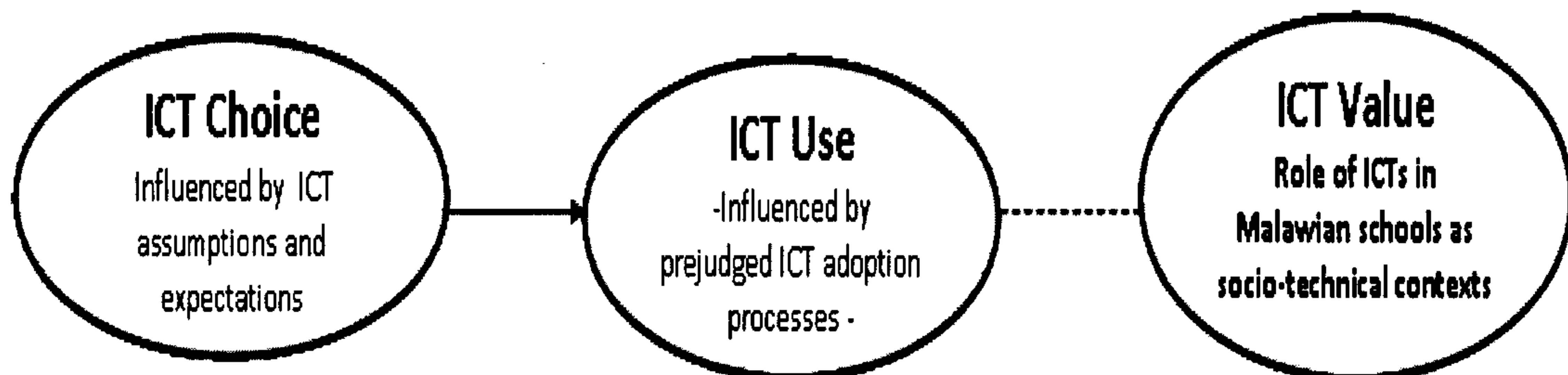


Figure 3.2 ICT local focus: Attaching ICT value to choices and use.

3.2.3 Summary: ICT Adoption in LDCs

The above discussion suggests that ICT adoption processes demand particular skills among those who want to adopt and use technologies for various purposes within their context. The adopters need to be aware of, and understand, technological options and their potential value within the adopting context. This means that when making technological choices, the ability to understand the technology is essential if people are to actively participate in the processes that govern technological choices for use in their societies (Jurema and O'Rourke, 1997). Particularly it is important to :

“understand the role that technology plays in society, questioning the purposes for which it is used, understanding how it intervenes in our lives and in our relations with others, and being able to choose when and which technological tools are appropriate for a task or problem at hand” (Jurema and O'Rourke, 1997, p23)

Without such an understanding, one can see that technological choices are likely to be made without sufficient appreciation of and potential alignment with the context

of use.

Freire (1993) talks about the role of literacy in enabling people to understand and become aware of their situation. He observes that literacy has the potential to help people achieve 'conscious awakening' and hence a 'critical consciousness' which is crucial in making choices about the way in which people adopt and use technologies in their societies to achieve certain goals. Heeks (2002) observes that one reason through which many technological initiatives fall short of delivering the expected outcomes in LDCs is the mismatch between what may be called the 'intentional future' and the 'reality future' of the innovation process (Heeks, 2002) i.e. the expectation-reality gap.

In terms of ICT initiatives which are donor-sponsored - like those which support the adoption and use of ICT for educational purposes in LDCs - this misalignment could possibly occur if the adoption and use processes are based on assumptions that are detached from a critical awareness about the characteristics of the intended users and their social context. These could be in terms of the user's skills, culture, activities, goals, objectives, values, social structure and technological infrastructure (Orlikowski and Gash, 1994).

Moreover, Kling (2000) also observes that when deciding on which technology to adopt and use for a particular purpose, decision makers and other stakeholders use their ideologies to justify their choices. They take account of their past experiences with technologies and decide on which technology would be suitable based on those experiences. In LDCs like Malawi, such ideologies are likely to trap stakeholders into 'technological determinism' believing that technology can solve all their developmental problems.

A statement by the World Bank brings to the fore some of the possible deterministic ideologies which may possibly underpin ICT adoption processes in LDCs:

“new technology greatly facilitates the acquisition and absorption of knowledge, offering developing countries unprecedented opportunities to enhance educational systems, improve policy formation and execution, and widen the range of opportunities for business and the poor.” (World Bank, 1998, p9)

Although examples of technological potential in enhancing educational systems can be cited in literature (e.g. James, 2004), it is naive to assume that technologies will always deliver uniform and ‘unprecedented opportunities’ anywhere in the world. Different contexts require different approaches and ‘Freirean’ literacy may be seen to have the potential of making stakeholders aware of such traps of ‘technological determinism’ and all the ideologies that may be attached to various ICT adoption processes. In relation to this research study, literacy may possibly offer a guarantee against technological determinism and may ensure “technological realism” (Kling, 2000, p. 6) by providing a vehicle through which dominant ideologies may potentially be challenged in order to achieve technological realism through critical reflection and analysis.

3.3 Placing Literacies and ICTs in the development context of LDCs

The previous section ended by mentioning the possible role which literacy might play in ICT adoption processes. Throughout the literature, illiteracy is mentioned again and again as a major influence upon the adoption and use of ICTs in LDCs and their anticipated contribution towards socio-economic progress. In this section, the concept of literacy and its relationship to ICT adoption processes and development in LDCs are discussed.

3.3.1 Literacy, ICTs and Development

Traditionally, literacy is understood as the ability to read and write (Malawi Government, 2001). This understanding conceptualises literacy as a 'context free' skill which can easily be acquired by people in any society and lead to numerous socio-economic gains. Such a context-free definition of literacy appears to resonate a tool-perspective understanding of ICTs discussed earlier on in subsection 3.1.1 of this chapter.

However, literacy is a social practice (Barton and Hamilton, 1998; Street, 1993) which cannot be conceptualised as something singular like a particular skill or some kind of a universal phenomenon e.g. skill to read script, skill to print using computers, skill to operate computer technologies etc. Instead, literacy must be understood as an integration of "social and socially constructed forms" (McLaren and Lankshear, 1991, 15). This suggests that literacy has to be understood in relation to specific social practices within particular communities and on the ways in which these forms of

literacy are used within those communities. McLaren and Lankshear (1991) observe that literacy is entirely a matter of how it is “conceived and practised within particular social contexts: and this varies markedly” (p.13). When we are talking of literacy, we need to understand it in terms of literacies (plural) as opposed to literacy (singular). This understanding highlights Graddol, Maybin and Stierer’s (2001) point that a literacy essence does not exist and extends the context based understanding of literacy and how it relates to various socio-technical parameters within a particular society.

They observe that literacy is made up of three major dimensions: functional, cultural and critical.

The literacy framework and ICT adoption processes

Graddol, Maybin and Stierer (2001) observe that acquiring literacy on its own is not enough unless it offers some value to its context of use. By enabling people to read, write, understand, interpret and express reality through critical thinking, literacy opens the door to knowledge and hence its value in the society. However, in order to achieve this value within a society, there are three main dimensions of literacy which must be considered and promoted simultaneously: functional, cultural and critical (Graddol, Maybin and Stierer 2001).

Functional Literacy

As the name suggests, functional literacy refers to the ability to ‘function’ or participate in a literate society in order to achieve particular goals (Graddol, Maybin and Stierer 2001). This means acquiring necessary skills which enable a member of a social group or culture to participate in activities which demand literacy. For example

if people in Malawi are equipped with the skills on how to access and use the Internet then they would be said to be literate in a functional sense i.e. they can now 'function' in a 'literate world'. It is perhaps for this reason that illiteracy in the sense of not having the skills to participate in the 'literate world' has been said to be a barrier to development because it is believed to hinder participation and to promote exclusion of 'illiterate' community members in developmental activities (UNDP, 2001; Mansell and Wehn, 1998).

However, this understanding of literacy seems to suggest the existence of a 'literacy essence' which, as discussed earlier on, does not exist. Literacy is not universal. Instead it is a social construct which is context specific (Graddol, Maybin and Stierer, 2001). While it is acknowledged that participatory skills acquired through the acquisition of functional literacy are an important dimension of literacy, functional literacy does not constitute literacy on its own. The skills that are acquired through functional literacy need to be in line with the context within which literacy is to be used.

As already observed, there are reasons behind the promotion and acquisition of particular forms of literacy in particular societies. In relation to this, Barton and Hamilton (1998) observe that in any society, literacy serves as a means to a particular end or objective. Literacy practices are "purposeful and embedded in broader social goals" (p12). Therefore, it can be said that it is important to first of all understand the nature of the context and to clearly investigate how, and the reasons why, literacy relates to the context within which it is employed. This implies that acquiring functional literacy alone does not make one literate. Instead there is also a need to acquire the ability to understand the nature of the society and to be critically aware of the appropriateness of literacy for the achievement of particular goals within a particular context. This emphasises the significance of a second dimension of literacy, critical

literacy.

Critical Literacy

There are factors which underlie the promotion and acquisition of literacy in any social context. This suggests that in any society, literacy is there to serve particular purposes. Literature has shown that literacy as a social construct consists of forms or dimensions that are constructed within political contexts i.e. contexts that have varying or unequally structured access to economic, political, cultural and institutional power (Mclaren and Lankshear, 1991). This, therefore, suggests that literacy may serve and promote the interests of those who have the power to shape it and control it in relation to their own interests i.e. the promotion of literacy may be based on ideologies of the powerful.

Issues of ideologies in relation to technological choices were studied by Kling who observed that ideologies play a significant role in technological choices (Kling, 2000). When deciding on which technology to adopt and use, decision-makers usually base their choices on what they already know about the technologies. In most cases, these stakeholders link their technological choices to some form of ideological social progress regardless of the social parameters within the adopting context of use (Kling, 2000).

The same possibly may be seen in the choice of technologies for the Malawian context where ideologies may possibly have a significant role to play in serving the interests of the 'powerful'. The ideological conceptions held by the powerful of what counts as being literate and what they see as being the applicability of particular forms of literacy may possibly be pushed up the agenda in order to advance their own interests.

Maclaren and Lankshear (1993) observe that these ideological conceptions "reflect and

promote values, beliefs, assumptions, and practices which shape the way life is lived within a given social milieu” (p18). By influencing the way of life, these ideological conceptions may also be seen to influence the type of interests which are promoted or undermined within a society. Critical literacy acknowledges that those with power are likely to dominate and control the course of actions in any social group (Graddol, Maybin and Stierer, 2001). However, ideological conceptions of the powerful may not always reflect an accurate picture of the ‘real world’. Therefore, in order to be literate, the critical dimension of literacy is required to question and challenge the dominant discourse of events that may not be in line with and may not reflect the reality of the social context.

In relation to this research project, it is well known that in order to use computer and Internet technologies, functional literacy in terms of technical skills need to be acquired to enable the users know how to implement, use and maintain these ICTs in a particular context. However, despite it being well documented that there are inadequate resources in many LDCs to support such technologies, many stakeholders are still advocating the promotion of these Internet and computer technologies in LDCs (Heeks, 2002). As a discourse, this could be seen as a possible dominant trend of events whereby the powerful just dictate what they ideologically view as being useful and important for these LDCs (the powerless). This highlights the significance of critical literacy as a means through which some dominant discourses may be challenged through a conscious and critical analysis of events e.g. the adoption of technologies in relation to the adopting context.

Precisely in order to decide on which technological option to choose and implement for development purposes, the applicability of critical literacy can not be over-emphasized. It can be seen therefore that, as a model, critical literacy is a very im-

portant dimension of literacy. In relation to technology choices this dimension may be seen to have the potential to enable decision makers to come up with informed decisions and choose technologies that are appropriate for specific contexts.

Critical literacy offers a possibility of 'reading the world' in a more adequate and accurate manner so that people can 'rewrite' the world in a manner which fully and more equally presents their interests, identities, and aspirations. This dimension of literacy emphasises the point that in order to be literate, people need to have the ability to 'read the world', analyse it and 'rewrite' it in a way that is appropriate for their context.

Mclaren and Lankshear (1991) write that :

“the value of writing should not be seen as access to a refined culture or to life skills for our allotted places in the paid and unpaid labour market, but as a crucial means to gain power and control over our entire lives. Our aim should be to create not functional literacy but critical literacy which enables the growth of genuine understanding and control of all of the spheres of social life in which we participate.” (p. 263)

Similarly, when choosing technologies, it is important that LDCs should consider the value of the adopted technologies in relation to their specific contexts.

However even after acquiring functional and critical forms of literacy, it is observed that literacy cannot be simply mandated and then be expected to flourish in a particular context (Mclaren and Lankshear, 1991). Literacy acquisition and maintenance are dependent on the cultural values, beliefs, practices, and history within which it

resides (Wagner, Day and Sun, 2004). This perspective may be seen to put constraints on the possible generalisations on literacy acquisition by many stakeholders and introduces yet a third dimension of literacy: cultural literacy.

Cultural Literacy

The acquisition of literacy is not a process that happens in isolation (Graddol, Maybin and Stierer, 2001). Instead, it is embedded in particular social contexts that embody cultural values, beliefs, language and knowledge. Cultural literacy acknowledges that people acquiring literacy already have their own cultural background. Barton and Hamilton (1998) describe domains of life or discourse communities as “groups of people held together by their characteristic ways of talking, acting, valuing, interpreting and using” (p11) literacy. They observe that distinct practices exist within these domains of life or discourse communities in which people participate. In this research study, Malawian secondary schools could be possible examples of these discourse communities. This means that people who adopt and use technologies in these schools could possibly have their own characteristic ways of valuing, interpreting, and using the adopted technologies.

However, Barton and Hamilton (1998) also observe that boundaries between domains and discourse communities associated with them are not clear cut. There are questions regarding the permeability of these boundaries. There are also questions regarding leakages and movement between boundaries and the existence of overlaps between or among domains. In this case, some domains which may appear to be similar may in fact be distinct in many ways and vice versa. This means that in this research study the extent to which a domain is distinct with its own practices and whether these practices originate within the same domain or are transferred to other

domains needs to be clarified (e.g. urban and rural communities). This is one of the concepts which this study bears in mind when looking at Malawian secondary schools as domains or as discourse communities.

Within literacy domains, there are particular configurations of literacy practices which exist and these include regular ways in which people act when participating in literacy events. This also means that the activities which occur within domains do not happen by accident and neither do they happen at random. Domains are “structured, patterned contexts within which literacy is learned and used” (Barton and Hamilton, 1998, p11). Barton and Hamilton (1998) point out that while some domains in particular institutions may be formally structured with institutional rules for procedures and penalties for infringement, other domains may be informally regulated by “pressure of social conventions and attitudes” (Barton and Hamilton, 1998, p12). This implies that literacies within particular domains have been created and that they are structured, governed and sustained by the very institutions which created them. One of the interests of the work started in this research study is also to understand the ways and patterns through which particular literacy practices are created, supported and governed within literacy domains and how these patterns relate to the literacy domains themselves. In relation to this, Barton and Hamilton (1998) have observed that institutions which are socially powerful (e.g. education) usually support dominant literacies and that these dominant literacies form part of “whole discourse formations, institutionalised configurations of power and knowledge which are embodied in social relationships” (p12) within these institutions. It is also in these institutions where local or non-dominant literacies (i.e. those literacies which exist in local people’s daily lives) are demeaned, suppressed and less supported. This implies that literacy practices are patterned by social institutions and power rela-

tionships; and that “some literacies are more dominant, visible and influential than others” (Barton and Hamilton, 1998, p12). Related to this study could also be a focus on how some literacy practices are created, supported, sustained, and impeded within the Malawian context.

3.3.2 ICT user skills, LDCs and the Literacy model

Related to the above discussion and in relation to ICT adoption processes in LDCs like Malawi, Mansell and Wehn (1998) highlight three main categories of skills bases that are necessary for ICT users in developing countries: facilitating skills, control skills and participatory skills.

Participatory skills mainly refer to the ability to participate in a ‘literate society’ in order to achieve particular goals. Within secondary schools, these skills may be seen to be focused on enabling users to share information in the process of generating and acquiring knowledge. It could possibly be for this reason that participatory skills have been said to be crucial for socio-economic progress. However, in order to participate meaningfully, users need to know what they are doing and why they are doing it. Therefore, participatory skills appear to be inextricably linked to functional, critical and cultural dimensions of literacy.

Jurema and O’Rourke’s (1997) work on practical levels of literacy is relevant here. They observe that in order to use technology, specific know-how skills need to be acquired. This forms part of the process through which people become technologically literate. However, as already discussed earlier, this is not enough on its own. The skills that are acquired at this level need to be in line with the context of the experienced

problems that need to be solved using a particular technology. Therefore, it can be said that it is important to first of all understand the nature of the problem at hand, and to clearly investigate how and the reason why the problem exists. This implies that besides knowing how to use the technology or acquiring functional literacy, it is also essential that people should be able to understand the nature of the society and to employ 'critical consciousness' in deciding which technology is appropriate for a particular problem within their context.

Mansell and Wehn (1998) also observe that in order to adopt and use ICTs for development purposes, technical skills (e.g. installation, troubleshooting, maintenance, software engineering etc) need to be acquired to enable the users know how to implement, use and maintain ICTs in a particular context. These are the skills which have been reported to be scarce in many LDCs (Heeks, 2002).

While participatory skills enable users in the practical use of a particular technological artefact, lack of facilitating skills can be seen to pose one of the greatest constraints. For example, in a region where the harsh conditions in terms of climate and telecommunications infrastructure have been reported to lead to frequent breakdowns of the refurbished computers (Adam and Wood, 1999), lack of facilitating skills is likely to have a significant impact. For example, it is reported that secondary schools in Namibia were faced with an acute shortage of facilitating skills particularly because, among other factors, the acquisition of these skills also demanded a knowledge of English language when Namibia is predominantly an Afrikaans speaking country (Hawkins, 2002). In order to solve this problem, schools introduced the "Kids-on-the-block" initiative (Hawkins, 2002, p.40) whereby competent school pupils were locally trained to troubleshoot and maintain the school computers. This can be related to the functional model of literacy the acquisition of which enables users to be able to

use ICTs and hence participate in the 'knowledge-based society'.

This highlights the significance of functional and critical models of literacy as a means through which some technological choices may be critically analysed or challenged through a conscious and critical analysis of the adopting context and relevant solutions may be devised towards a particular problem.

On the other hand, Mansell and Wehn (1998) talk about control skills. These are skills which enable the adopters to make technology choices that are matched to the needs of the local environment. In order to decide on which technology to implement for development purposes, decision makers require control skills (Mansell and Wehn, 1998). It can be seen that these skills are likely to enable these decision makers to come up with informed decisions and acquire ICTs that are appropriate for the needs of the local environment. However, it can also be seen here that control skills are very likely to be associated with power. It is possible that those with social power may possibly control decisions about which technological options to choose. In such a situation, the cultural and critical dimensions of literacy may be seen to be very relevant in ensuring that technological choices are made in the interest of the adopting context.

3.3.3 Functional, Cultural, Critical Literacies and ICT adoption processes

Findings from a study commissioned by the Department for International Development's (DFID) *Imfuno* initiative, suggest that ICT literacy is usually considered as the acquisition of basic computer skills like "...the use of e-mail and the Internet, software for word processing, spreadsheets, presentations..." (James, 2003, p1). However, these skills only represent one form of literacy, functional literacy. This one-dimension conceptualisation of literacy appears to overlook or undervalue the significance of cultural and critical forms of ICT literacy. It puts emphasis on the technology itself at the expense of other crucial parameters in the context within which it is adopted for use. This 'one-dimensional' approach to the promotion of ICT literacy in LDCs within sub-Saharan Africa has been linked to a number of problems and challenges which negatively affect ICT literacy initiatives in the region (see section 3.1.4 of this chapter). For example, the DFID report presents perspectives from a Namibian teacher who outlined his experiences and how he feels about such ICT literacy initiatives as follows:

"...ICT literacy training does not necessarily need to be like this, my experience is that these programs primarily fail along the lines that a) they provide entirely too much information, b) they're boring, c) they do nothing to encourage learners to think about how the technology can be useful, d) they discourage new users from developing the skills and perspectives they need to understand how to learn new technologies on their own, e)- (particularly in the case of teachers) they encourage people to see the technology as something to be learned about, not something to

be learned to use creatively, and f) it's too difficult to do it in a learner-centred fashion (this is particularly damning for tools that are hailed as great learner-centred technologies)..." (James, 2003, p5)

In addition to that, the Namibian teacher also expresses views on what is particularly missing in the majority of ICT literacy initiatives within sub-Saharan Africa as follows:

"...The primary outcome of the course is to ... learn a great deal of computer literacy, but, even more important to me, is the question 'How can this technology be used to enhance teaching and learning?' rather than 'What is a monitor?' or 'What does http//: mean?'..." (James, 2003, p5)

This suggests that while ICT literacy initiatives focus on functional ICT literacy, they sideline other equally important dimensions of ICT literacy (cultural and critical) which may possibly offer more ICT value to the adopters and their contemporary societies (see fig 3.3)

It has also been discussed in this thesis that adoption and use of ICTs in classrooms can be based on four main constructs: tutorial, machine-as-human, toolkit, and catalyst (see section 3.2 , pages 82-85 of the thesis). These constructs highlight a link between ICT adoption processes in schools and elements of the Social Actor Model (i.e. 'affiliations - environments - interactions - identities') based on the perceptions of ICTs which underpin them. For example, while the tutorial, machine-as-human, and toolkit constructs are based on the understanding of ICTs as existing in isolation from their context of use, the catalyst construct is based on the understanding of ICTs as existing in Socio-technical Interaction Networks (STINs). This is the basis of

the Social Actor Model and it may be said that Social Actor Model's STIN elements are all elements of 'catalyst' mechanisms which appreciate the socio-technical nature of ICTs.

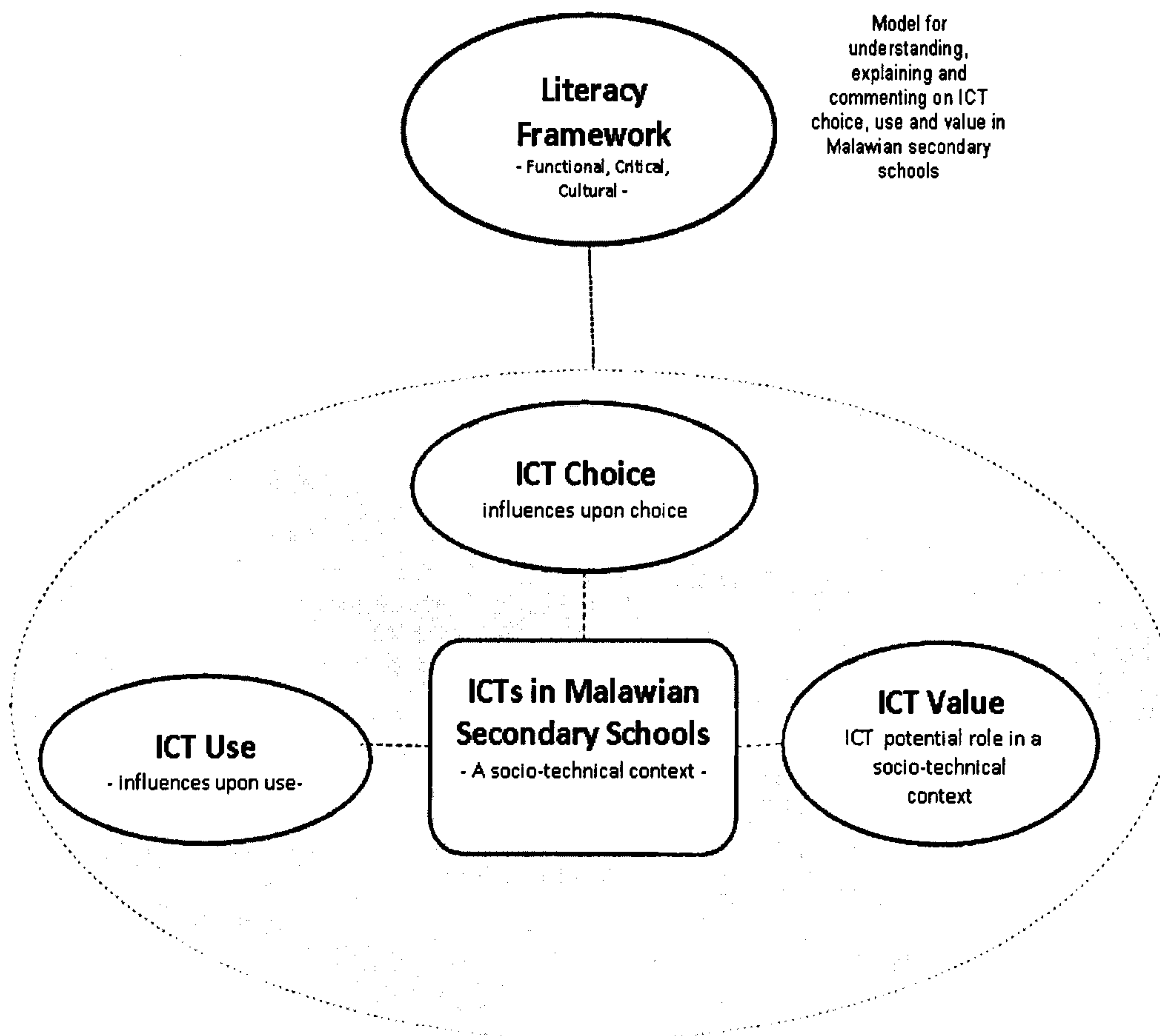


Figure 3.3 ICT Adoption processes and the Literacy Model.

3.3.4 Social Actor Model and the situated nature of Literacy

This means that, just like technology, literacy is not something which can be separated from the context within which it is acquired and used. Barton and Hamilton's (1998) work provides a good illustration of the situated nature of literacy by linking literacy to the social structures within which it is embedded. They observe that literacy involves literacy practices, texts and literacy events which are interrelated to the social context within which literacy is acquired and used.

Literacy practices have been described as “general cultural ways of utilising written language which people draw upon in their lives” (Barton and Hamilton, 1998 p.7). In relation to this research study, these literacy practices may be understood as the underlying push factors, influences and justifications which people have for adopting and using technological artefacts within any social context. As Street (1993) indicates, literacy practices involve feelings, attitudes, values and social relationships. Moreover, literacy practices may be said to include units of general cultural understandings and perceptions which people have. Thus: “...people’s awareness of literacy, constructions of literacy and discourses of literacy, how people talk about and make sense of literacy” (Barton and Hamilton, 1998, p.7)

In the above, although literacy practices appear to be made up of processes that are internal to the individual (e.g. feelings, values, awareness, talk etc), they also at the same time:

“connect people with one another, and they include shared cognitions represented in ideologies and social identities. Practices are shaped by social rules which regulate the use and distribution of texts, prescribing who may produce and have access to them. They straddle the distinction between the individual and social worlds, and literacy practices are more fully understood as existing in the relations between people, within groups and communities, rather than as a set of properties residing in individuals” (Barton and Hamilton, 1998, p.8).

As abstract aspects, literacy practices can be deduced from literacy events (Barton and Hamilton, 1998). These are observable tasks and “activities where literacy has a role” (Barton and Hamilton, 1998, p.8)

On the other hand, as episodes which can be observed, literacy events are shaped by and arise from literacy practices (Barton and Hamilton, 1998). This means that the concept of literacy events underlines the view of literacy as being always embedded in social contexts and hence its situated nature. Moreover, Barton and Hamilton (1998) also observe that usually literacy events are regular and repeated activities. This suggests that literacy events are usually part of routine sequences and may belong to or exist as part of “formal procedures and expectations of social institutions like work places, schools and welfare agencies” (Barton and Hamilton, 1998, p9).

On the other hand, literacy events may also be structured by expectations and pressures from sources that are informal e.g. peer pressure, home etc. More importantly, in any literacy event, texts are produced or constructed. Since texts can be read, referred to or analysed, it is possible for texts to influence the type of literacy practices held by people in a particular society where literacy is acquired and used. Therefore, the most important concept about the notion of texts in relation to this study is that in any text, “the reader is constructed” (Barton and Hamilton, 1998 p.60). This means that any text assumes certain knowledge, values, beliefs etc in the reader and consequently offers only a particular range of possible options which the reader can take up. Text presents “limited subject positions for a reader” (Barton and Hamilton, 1998, p.60).

This means that in any form of ICT literacy (e.g. functional, cultural, or critical), ICT literacy practices underpin ICT literacy events. However, both practices and events do not occur in isolation of the context within which they are embedded. Instead, there are various influences which shape and are shaped by these practices and events within a context. For example, Lamb(2006) developed a multi-dimensional conceptualisation of a social actor (the Social Actor Model) in order to further un-

derstand the socio-technical nature of the interrelationships among various elements in ICT adoption processes. She observed that in any socio-technical network, there are four main dimensions (i.e. Affiliations, Environments, Interactions and Identities) of a social actor which play a role in influencing the way ICT related processes occur in social contexts. This suggests that affiliations, environments, interactions and identities possibly shape and are shaped by ICT literacy practices and ICT literacy events.

3.4 Discussion

Literature related to various areas of this research project has been discussed in this chapter. It has been seen that for LDC contexts (e.g Malawi), there may possibly be a wide spectrum of technological options available like the radio, television, mobile phones, etc which may possibly be suitable for the attainment of developmental goals within the Malawian context. However, the level of suitability of each option may vary depending on its value within a particular context of use.

The discussion in this chapter has also unveiled three main themes that have been identified to be critical in relation to this research study: technology (ICT) choice, technology (ICT) use and technology (ICT) value. These are concepts that the enquiry in this research study iteratively expands upon and reacts to in order to develop a deeper and evidence based socio-technical understanding of ICT adoption processes in LDCs.

This section of the thesis articulates a framework of enquiry based upon a synthesis of ideas and concepts already covered in the previous sections. The main focus of this section is to highlight the relevance of the issues identified in literature to this research project, and their theoretical bearing in informing empirical investigation and the direction of this research study.

The underlying element of this framework is the understanding of technology from a socio-technical perspective (Kling, 2000). Unlike the view of technology as a neutral tool which may be seen to be suggested by the development rhetoric, this framework adopts a socio-technical understanding of technology as consisting of activity (i.e. "...strategic actions of groups of people in particular social institutions and struc-

tures which constitute the main fabric of their social life” (Willoughby, 1990, p.36)); knowledge (i.e. “factors related to the experiences of people within a particular society, particularly in relation to their capacity to use technological artefacts in their social life” (Willoughby, 1990, p. 36)); and artefact (i.e. technological artefacts).

Wade (2004) suggests that many LDCs have adopted technologies with emphasis on the technologies themselves and without paying closer attention to the social parameters in which the technology is to be embedded. Many of such ICT adoption processes have ended up delivering unintended or undesirable outcomes. For example, in Kenya, the implementation of the African Virtual University has finally stalled due to unavailability of adequate resources within the local context to keep it running (Adam and Wood, 1999). Another example of this could be the introduction of computers in secondary schools in Mozambique which was based on the understanding of computers as having that kind of potential to stimulate socio-economic development (Cossa, 2004). However, in practical terms, these computers did not live up to the expectations. Many schools did not have an adequate skills-base to run and maintain computers, the telecommunication infrastructure was poor and the computers did not support the existing pedagogy in the schools, or the technology was not seen to have value within the context of use (Cossa, 2004). This suggests that the socio-technical nature of technology (i.e. involving these three dimensions) needs to be taken seriously when making technological choices for particular purposes. It also highlights the chief claim of this framework that technology can only be relevant to a particular social context if it is conceptualised from a socio-technical point of view. This socio-technical understanding of technology is a necessary and distinctive feature of this framework of inquiry.

In the preceding sections, the concept of technology choice has also been discussed.

It has been seen that different societies will choose particular technological options depending on what they want to achieve and what their perception about that technology is. In relation to Malawi, it may be said that the rhetoric surrounding technology choice may possibly revolve around the idea of socio-economic progress. However, such rhetoric has the potential to possibly bring about uncritical acceptance of some technological options or an uncritical rejection of other options within the Malawian society.

On the other hand, the review of the literature has also shown that in many LDCs like Malawi, the adoption of computer and the Internet for educational purposes is faced with a number of critical challenges like lack of adequate skills base, insufficient telecommunications infrastructure and lack of financial resources (James, 2004). It may possibly be that ICT adoption processes which guide technology choice in these LDCs undergird these post-implementation challenges and unfavourable outcomes.

A solid record of evidence has also shown that technology is society shaping and society shaped (Bijker, Hughes and Pinch, 1987). Technologies that are currently touted to be relevant for developmental purposes in LDCs may possibly not be automatically relevant for the same purposes within all the LDCs contexts. This suggests need for consideration of socio-technical influences in the ICT adoption processes of particular technological options for specific purposes or situations in LDCs.

In relation to this research project therefore, while some technologies in Malawi may possibly achieve a good technological fit in one context, they may not necessarily achieve the same in the other context. This points to the concept of value.

In terms of literacy practices, this research may be seen as an attempt to understand

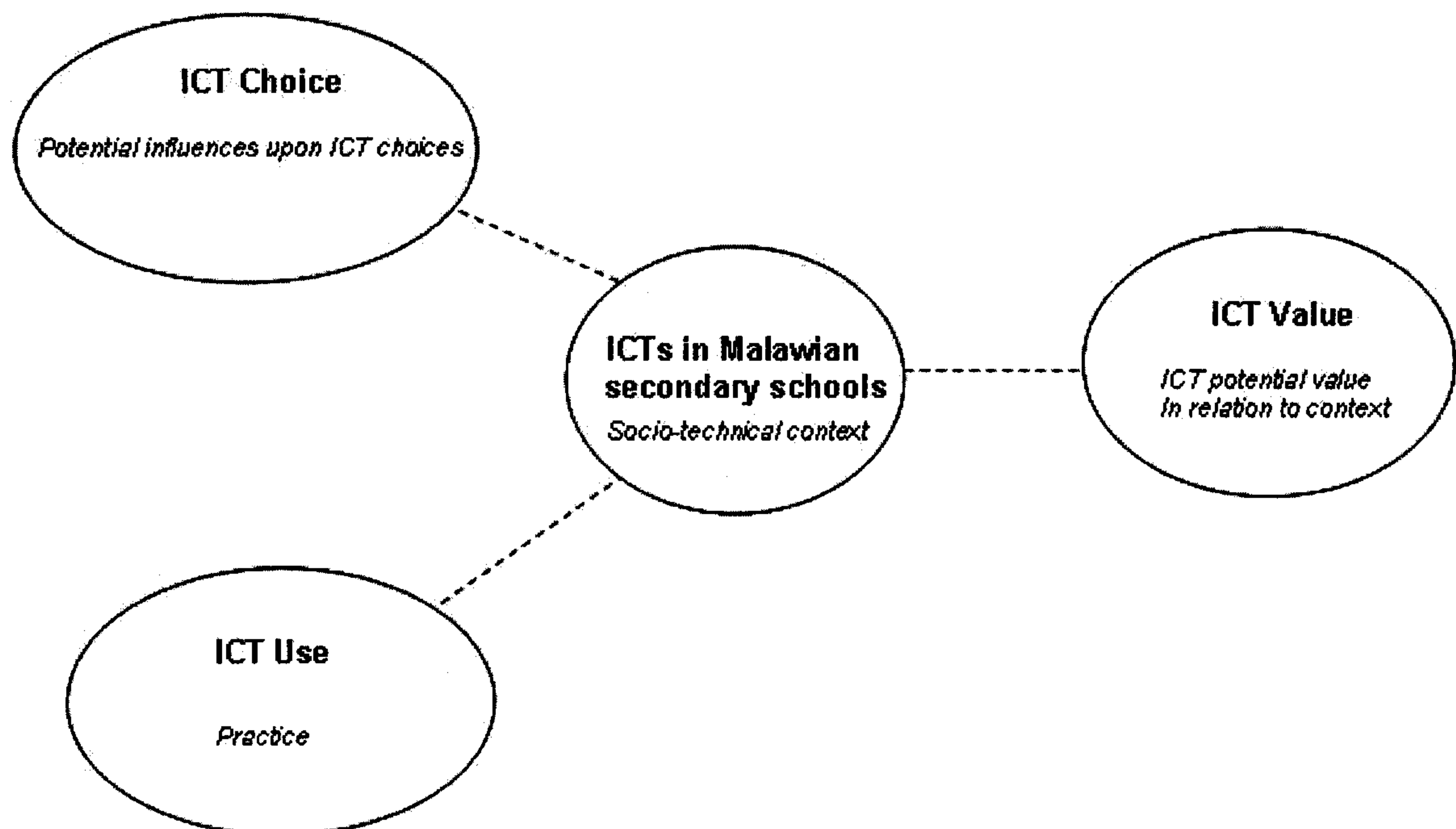


Figure 3.4 Framework of Enquiry synthesised from literature review

the underlying computer literacy practices which influence and are influenced by ICT adoption processes in LDCs like Malawi and how such computer literacy practices bear upon ICT value within the adopting context.

This research situates its main research facets of technology choice, use and value in broader Malawian social contexts by examining the socio-technical influences which shape and are shaped by ICT adoption processes within Malawian secondary schools. For instance, looking at technology use as a literacy event, it may possibly be seen that the process of adopting ICTs is incorporated into a broader set of social practices that could possibly be associated with broader socio-technical influences like stimulating socio-economic development, empowering the local masses, bridging the digital divide, alleviating poverty.

Chapter 4

Research Methodology

Introduction

There are several methods of conducting research and each method has its own advantages and disadvantages depending on what the researcher wants to investigate, the level of the researcher's control over events under investigation and the significance of contemporary phenomenon within some real life situation as opposed to historical events in the study (Bryman, 2004; Yin, 2003). In this chapter, the methodological approach adopted in this research study is discussed.

4.1 The Research Strategy

The first thing that the researcher did in relation to methodology was to design a research method. In designing this research method, and in line with good research practice, the researcher firstly sought to identify and characterise the nature of the link between theory and the research topic under study by considering two main things: the form of theory involved and whether data collected in this research would be used to test hypotheses or build theoretical conceptualisations (Bryman, 2004).

In this research study, a critical review of literature stimulated the theoretical sensitivity of the research topic and enabled the researcher to identify various theoretical concepts related to the topic and also led to the development of the framework of inquiry. This means that the background literature covered in this research study's literature review phase, and the resulting framework of enquiry, may well be said to implicitly contain theory. It is this framework of enquiry that fuelled the focus of, and informed, the whole research study. However, although this background literature together with the framework of enquiry acted as the equivalent of a theory, the theory was only implicit within the literature itself and had no obvious connection with the research facets in the synthesised framework of enquiry. The research employs what Bryman (2004) calls 'publication-as-theory' strategy whereby the researcher begins with no obvious connections to any theory. Instead the researcher uses literature which was covered in the literature review as a spur to empirical enquiry and subsequent data analysis. Therefore, the relationship between theory and empirical findings would only emerge after iterative processes of critical reflection, induction and deduction (Bryman, 2004).

For LDCs like Malawi, where little research has been conducted and little is known

about ICT adoption processes, this strategy enables the researcher to start doing research without necessarily focusing on the development of hypotheses to be tested from the already existing theories. In this case, Bryman (2004) indicates that:

“such research is conditioned by and directed towards research questions that arise out of an interrogation of the literature. The data collection and analysis are subsequently geared to the illumination or resolution of the research issue or problem that has been identified at the outset. The literature acts as a proxy for theory. In many instances theory is latent or implicit in the literature.” (Bryman, 2004, p.8)

This means that the researcher in this research study continuously reflects upon empirical findings to what is reported in the literature about the adoption and use of ICTs and their consequences in LDCs (see questionnaire design section of this chapter and section 5.5 in Chapter 5). Moreover, the researcher illuminates these findings by drawing on the concepts that form part of the framework of inquiry. However, it does not mean that the framework (and the theory implicit in it) guides and influences data collection and analysis in this study. Instead, it only informs the research process and the researcher iteratively weaves back and forth between empirical data and the background literature. This means that the researcher does not let any existing literature (and its implicit theory) stop or guide the direction of the emerging theoretical conceptualisation of ICT adoption processes in Malawian secondary schools (from the collected empirical data).

In this case therefore, one can see that there is no clear cut distinction between induction and deduction processes throughout this research study because the researcher

iteratively moves between theoretical reflection on several sets of data and the collection of further data in order to identify conditions from which a theoretical conceptualisation could emerge. Unlike the research-before-theory or theory-before-research approach, this research study adopts a methodology that allows the researcher to iteratively move between theory and data, and to maintain a critical reflection between theory and data (Alvesson and Skoldberg, 2000).

The research focuses on the adoption and use of technologies in Malawian secondary schools as a socio-technical context involving people, technological artefacts, institutions, policies, rules, regulations. The research aims at developing a socio-technical understanding of ICT adoption processes in Malawian secondary schools in order to arrive at theoretical conceptualisations of those processes and their observed consequences. As such, one can see that socio-technical action is at the centre of this research i.e. looking at how societies understand, interpret and make use of ICTs in secondary schools.

Philosophically, therefore, the research sets out with an understanding that ICT adoption processes in Malawian secondary schools have meanings for local Malawians, and that the existent patterns of ICT adoption in Malawi are based on those meanings. This research sets out with an orientation that social reality has meaning for Malawians and therefore their actions are also meaningful. This means that the job of the researcher in this study is to gain access to these meanings held by Malawians (i.e. the way Malawians understand and interpret ICTs) and hence to interpret their actions as they relate to the Malawian social world (or social reality) based on the Malawians' point of view. This epistemological orientation means that the researcher "will almost certainly be aiming to place the interpretations that have been elicited into a social scientific form." (Bryman, 2004, p15). The researcher will "effect an

epistemological break with the actor level” (Alvesson and Skoldberg, 2000, p.34) and interpret Malawians interpretations of their social world in order to “account for the deep structure and the substantive theory for the surface structure, upon which [the emerging theoretical conceptualisation] is based” (Alvesson and Skoldberg, 2000, p34)

This research study also set out with an understanding that processes of ICT adoption in Malawi are embedded in socio-technical contexts. This means that the meanings and understandings that Malawians have about ICT adoption and use (i.e. their social world) are constructed in and through interaction. Berg (1995) observes that “what humans say and do are the results of how they interpret their social world” (p8). In relation to this research study, the way Malawians talk about, adopt and use technologies is based on the meanings that these technologies have for them e.g. the perceived value. On the other hand, Blumer (1969) observes that meanings emanate from social process of people or groups of people interacting. Such ‘interactionism’ (Blumer, 1969) suggests that meanings and interpretations held by Malawians derive from the social patterns of interaction. Such meanings could possibly have allowed Malawians to construct their social realities i.e. the way they adopt ICTs. Thus, the researcher does not take for granted “the availability of a pre-constructed world of phenomena for investigation” (Walsh, 1972, p19). Instead the researcher recognises the possible existence of processes through which the Malawian social world might have been constructed.

4.2 The Research Approach

This research idea was first conceived through the researcher's experiences as a secondary school teacher in Malawi. However, at that stage, the idea was very rough and unclear. In order to further develop this rough idea, an extensive literature review was conducted. Therefore, a review of literature was done to stimulate deeper theoretical sensitivity of the research topic and enable the researcher to critically and creatively think about the research idea. Initially, keywords related to the rough research idea were used to search for literature in various databases. A critical review of such literature generated more keywords which were then used to search for further literature surrounding the research topic. It was through such iterative process of searching and interrogating the literature which gradually led to the refinement of the original research idea and the formulation of research questions.

In order to systematically organise reviewed literature, the researcher used a number of techniques and software tools. For example, a literature grid (see Appendix A) was used to keep records on all the pieces of literature that were covered and the corresponding notes about the researcher's critical reaction in relation to the research topic. The grid contained categories of thematic concepts each piece of literature. On the other hand, references to all the pieces of literature covered were also recorded in a bibliography management software application, EndNote.

Throughout the literature review process, the researcher continuously discussed issues emerging from the literature with the supervisors, friends and fellow researchers e.g through conferences, informal discussions. Such discussions helped the researcher to make refinements to the original research idea, research questions and the framework of enquiry. The conduct of this research study largely depended upon the refined re-

search questions and research framework formulated from critical review of literature. It can be seen that a critical review of literature enabled the researcher to identify critical issues and to come up with a framework of enquiry through a synthesis of research concepts identified in literature. It is this framework that 'informs' the rest of the research study.

While still maintaining critical reflection over the concepts in the literature, the researcher started designing the research approach. This involved thinking about ways of undertaking the research study. As discussed later on in section 4.2.1, the researcher focused on issues like the types of data to be collected, the techniques for collecting such data and their appropriateness, the costs for collecting such data in terms of time and money, the types of data sources and the way the collected data would be organised and analysed (Silverman, 2000). Moreover, ethical considerations related to research practice were also focused upon and these included issues like honesty and openness of intent, respect for research subjects, issues of privacy, anonymity and confidentiality; the intent of the research and the willingness of the subjects to voluntarily participate in this research study (See Appendix E).

4.2.1 Research Design

As a starting point, the researcher sketched out the research project in order to identify possible problems that could arise in the course of the project. The first issue that needed to be considered was the nature of the data being sought and the possible sources of that data (Silverman, 2000). Since the main unit of focus in this research study are on secondary schools as socio-technical contexts where processes of ICT adoption take place, the researcher had to decide firstly on what types of data would be sought in those contexts and which sources would be relevant in order to generate meaningful data.

Since the study is about the adoption of ICTs in secondary schools, it was decided that data related to the adoption would be sought from sources that are involved in ICT adoption processes within the schools (e.g. principals, head-teachers, local educational authorities, policy documents etc). However, the researcher also observed that in Malawi there are over 600 secondary schools, and that collecting data from such a large number of schools would be too expensive (i.e. in terms of money) and practically impossible within the timeframe of this research study. On the other hand, not all secondary schools in Malawi have adopted ICTs, and data related to the extent of ICT presence within these schools and their frequencies of use were found to be inadequate. Therefore, in order to select a subset of schools from the entire pool of Malawian schools which have adopted and are using these ICTs, an exploratory survey was conducted (Yin, 2003). This survey was also necessary in order to establish the nature and extent of ICT presence and use within these secondary schools. This implies that the main objectives of this exploratory survey were to assess the presence and use of ICTs in secondary schools and then to consequently provide a basis for

the generation of a subset of secondary schools on which focus would be concentrated during empirical investigations.

In this survey a data collection tool - a questionnaire - was designed (see Appendix C) in order to identify issues related to ICT presence and use in schools e.g. types of ICTs in terms of software and hardware, types of connectivity; ICT use in terms of the way the ICTs are being used both by teachers and pupils and finally the ICT context i.e. the context in which these ICTs are managed, the levels of teachers' preparedness to use ICTs in their teaching and the interactions among different stakeholders involved in the ICT adoption, implementation and use processes.

The first step in the design of the questionnaire was to identify specific questions/themes that could provide concrete indicators about the research concepts (Silverman, 2000). This was largely informed by concepts in the research's framework of enquiry which emerged from the literature review. Various dimensions of concepts in the framework were identified. For each identified dimension of a concept, indicators were developed. The three main identified concepts were the technology context, the technology use and the technology itself. For each of these three concepts, different dimensions were identified and their corresponding indicators were developed to come up with the questionnaire (Appendix C).

Questionnaire design

The questionnaire was systematically categorised into three sections. Section A contained questions about the school, section B contained questions about the technology, and section C contained questions about use.

The questionnaire mainly asked for facts as opposed to opinions because, as stated earlier on, the main purpose was to generate a subset of secondary schools for empirical investigation. The generation of this preliminary subset was considered necessary in order to ensure feasibility of the empirical investigation with respect to cost, time and data quality (Silverman, 2000).

Literature was iteratively interrogated in order to come up with relevant questions which were aimed at probing the nature of technologies available in Malawian secondary schools and generating meaningful data in the survey. For example, while the Malawi government appeared to encourage the adoption of computer based ICTs (Malawi Governemnt, 2003), data on the presence of these computers and their extent of use within Least Developed Countries like Malawi appeared to be inadequate, scanty and inconsistent. Wade (2004) observes that such literature on ICTs in LDC contexts “is biased towards the supply side and gives scant attention to demand” (p191). Moreover, while some sources suggest that computers are greatly facilitating and offering ‘unprecedented opportunities to enhance educational systems’ within LDCs (World Bank, 1998), other sources suggest otherwise and indicate that the use of computer based ICTs in this region is hampered by a cross section of critical challenges (Mansell and Wehn, 1998; Kawooya, 2002; Heeks, 2002). Wade (2004) further explains that these contradictions in the ICT for development literature are largely due to biased evidence from some ICT for development initiatives whose “alleged suc-

cess is generalised with little attention to scaling up problems” (p.186). Effectively, evidence supporting the presence and extent of ICT use in secondary schools within LDCs appears to be largely anecdotal and confusing.

With these observations in mind, section B of the questionnaire included several questions on the extent of ICT presence in Malawian secondary schools. Question 1 in this section of the questionnaire, B1, was aimed at exploring the number of computers owned by each of the secondary schools involved in the survey.

The questionnaire also sought to explore the sources of these computers. In Chapter 3, literature review showed that due to the hype and hope created by ICTs, various stakeholders have “altered their funding priorities and pushed ICTs up the development agenda” (Heeks, 2002, p1). It is also reported that within LDCs, there are various stakeholders who are involved in the supply of ICTs to secondary schools. Question B2 of the questionnaire asked the respondents to provide the sources of computers which they have within their institutions.

Wade (2004) indicated that hardware and software versions which are being used in LDCs are usually old and do not support “versions of new software that can only run on latest generation of chip” (p.193). Data on the type of the software versions used in secondary schools within LDCs are scarce and rarely documented. For example, while there is huge talk about the promotion of ICT uptake for educational purposes in LDCs, the nature and type of operating systems being promoted are largely disguised. Question B5 of the questionnaire was aimed at exploring the type of operating systems available within Malawian secondary schools.

Another theme which the questionnaire wanted to investigate was the type of software

packages used in these secondary schools. In relation to this, Schech (2002) observed that although LDCs are enthusiastically embracing computer based ICTs, the relevance of such ICTs and their associated applications to LDC users is questionable. This suggests that although some secondary schools are also adopting these ICTs for educational purposes, the nature and type of software packages that are being used to achieve the overhyped educational gains are scarcely documented and are hardly supported by empirical evidence. In view of this, question B6 of the questionnaire was also aimed at exploring the type of software applications that are available for use on the adopted computers within Malawian secondary schools.

The questionnaire also aimed at exploring the availability of Internet services within Malawian secondary schools. Hawkins (2002) suggested that most schools in sub-Saharan Africa can hardly afford reliable Internet connections. Grace and Kenny (2003) appear to share this observation when they indicate that "... Internet access is difficult and expensive especially for the majority of people in LDCs who live far from the nearest telephone line or electricity connection" (p.631). Ironically, one of the assumptions in ICT for development literature is that computers in secondary schools could provide wider access to educational resources in LDCs through the use of the Internet. Questions B7 and B8 of the questionnaire, asked the respondents to provide data for the extent and nature of Internet connectivity within their secondary school institutions respectively.

Jagger and Lokman (1999) observed that within secondary schools, ICTs can be used in four main ways : ICT as object (i.e. learning about ICT); ICT as an assisting tool; ICT as a medium of teaching and learning ; ICT as a tool for organisation and management in schools. Question B10 of the questionnaire was aimed at exploring the type of educational uses which are supported by the adopted computers within

secondary schools.

In terms of use, Hawkins (2002) indicated that in LDCs it is relatively easy for secondary schools to acquire computers but it is a greater challenge for these schools to make use of and to sustain these computers. This, he suggests, is due to a myriad of socio-technical challenges that characterise these LDCs. This means that as secondary schools within LDCs attempt to use the adopted ICTs within the school's sphere, there are various parameters which influence the use patterns. However, much of what is written in literature on ICTs use in secondary schools within LDCs appears to disguise more than it reveals. To a large extent, such literature appears to focus more on the aggregate outcomes of ICT use in secondary schools and rarely on how and why these ICTs are used within these contexts. Section C of the questionnaire was aimed at exploring the nature of ICT use (i.e. the 'how' part) in Malawian schools.

In relation to ICT use in schools, Hawkins (2002) also indicated that while many LDCs like Malawi are committed to adopting computers for use in secondary schools, very few, if any, have put in place realistic and coherent strategies to use computers as pedagogical tools in the classroom. In reaction to this, question C1 of the questionnaire intended to explore the subjects in the Malawian secondary school curriculum which are supported by ICTs.

On the other hand, it is also indicated that secondary school teachers within LDCs are not used to teaching using computers and "are comfortable with their own [traditional] teaching styles" (Hawkins, 2002, p42). Moreover, while there is high global enthusiasm to equip secondary schools with computers, the competence of secondary school teachers within LDCs to integrate the use of these ICTs into the curriculum is

crucial (Mansell and Wehn, 1998). Question C2 was constructed in order to explore teachers use of ICTs in Malawian secondary schools and the type of such use.

Grace and Kenny (2003) observed that in LDCs, access to computers within secondary schools is very low and that this suggests problems for the attractiveness of computers for teaching and learning purposes. In an environment where secondary schools have high enrolment numbers of pupils, these access problems could be magnified. In view of this, question C3 was aimed at exploring access to and use of ICTs by pupils.

Mansell and Wehn (1998) also warn that LDCs that do not embrace and make use of Internet technologies are likely to be excluded from the 'global system'. However, it is also observed that within these LDCs, Internet access is very difficult and expensive (Grace and Kenny, 2003; Amutabi and Oketchi, 2003). In an environment where there is low average expenditure on education, Internet access in secondary schools is likely to be problematic. Question C4 was aimed at exploring the nature of Internet access by each pupil in Malawian secondary schools.

Moreover, in societies where information is culturally controlled, the adoption and use of Internet based technologies in secondary schools may be seen to be alarming. Such societies may view Internet adoption and use as a threat to cultural values. For example, it is reported that in Uganda, society members forced SchoolNet to monitor Internet access and filter out some content after some users were found accessing pornographic material on the computers (Kawooya, 2004). Similarly, in Malawian secondary schools, Internet use may possibly provide access to some information that is often taboo in Malawian culture. In reaction to this, the survey contained question C6 which was aimed at exploring the supervision of Internet access within Malawian schools.

Adam and Wood (1999) observed that the adoption and use of ICTs in LDCs could exacerbate 'social stratification' especially in areas where access to those ICTs is limited only to a few privileged members of the society. Question C5 explored the use of computers outside class hours. The question was aimed at exploring the provision of access to other members of the Malawian local community outside class hours.

It is observed that "giving illiterate people cheap books does not solve illiteracy" (Wade, 2004, p185). Although it is suggested that the push for ICT adoption and use is high within LDCs, there are also numerous reports which suggest that mere adoption and use of ICTs within secondary schools will not automatically solve the problems within the education system in LDCs. There are mounting ICT maintenance and support problems within the region. As such, good knowledge of ICTs and relevant skills to make these ICTs work to meet local educational needs are crucial. In reaction to this, the questionnaire also aimed at exploring issues related to ICT training arrangements and maintenance support within Malawian secondary schools. As such, question A7 of the questionnaire explored the availability of ICT support staff within secondary schools.

In relation to the education system and the availability of ICT staff in LDCs, Mansell and Wehn (1998) write that once undergraduates are trained in ICTs, "there is a risk of brain drain which places additional pressure on the educational infrastructure" (p111). Hawkins (2002) appears to agree with this observation when he states that within LDCs, "most schools lack the funds for a full time computer technician, and when one is hired and trained, he is often lured away to a more lucrative job elsewhere, leaving the school to start the search over again" (p39). In this regard, question A8 was aimed at exploring the availability of ICT trained staff within secondary schools. On the other hand, question A9 was aimed at exploring where ICT staff acquired

their training.

Mansell and Wehn (1998) observed that the relevance of computing programmes offered by many LDCs to undergraduates does not focus sufficiently on how to use the technologies in order to meet local needs. Hawkins (2002) also reported that many teachers within LDCs are not formally trained on how to use ICTs in the classroom. He observes that while many schools in LDCs are provided with computers, very few are provided with support for teachers' training on how to use them for teaching and learning purposes. Question A11 of the questionnaire was aimed at exploring the aspects which these teaching staff are trained to do.

Mansell and Wehn (1998) indicate that LDCs "face the most stringent requirements in justifying investments in their ICT infrastructures" (p41). In relation to the education system, LDCs are reported to be facing huge challenges to fund their education sectors. Amidst these challenges, question A10 of the questionnaire was aimed at exploring who funds ICT training for teachers in Malawian secondary schools.

Moreover, when computers are introduced in any social context, maintenance support needs to be provided. However, Hawkins (2002) reported that in LDCs "most ministries of education are ill equipped to effectively service a large number of schools. Most schools are therefore left with very little technical support when inevitable technical glitches arise" (p40). On the other hand, he indicates that some schools in LDCs come up with initiatives where local people are trained on how to fix or repair their own computers e.g. the Kids on the Block initiative in Namibia. In order to explore the nature of ICT maintenance and support within Malawian secondary schools, questions B3 and B4 were constructed. While B3 explored what is covered by the school budget as far as computer maintenance is concerned, B4 aimed at exploring who pays

for that budget.

The location of secondary schools in Malawi is categorised into urban and rural. Effectively, the lifestyle and the nature of technological infrastructure in many of LDCs urban areas greatly differ from that in rural areas. To a large extent rural areas in many LDCs have limited or no access to telecommunications infrastructure and the livelihood is mainly agro-based. On the other hand, livelihood in urban locations is generally characterised by the availability of the telecommunications network, supply of electricity and safe water, and access to a variety of social amenities. With these location differences in mind, the researcher found it important to identify a subset of schools that involved both urban and rural schools which could be investigated within a particular period of time and provide 'quality' empirical data for meaningful analysis, interpretation and comment. In order to do this, section A was constructed and included in the questionnaire.

Pilot testing

The questionnaire was then pilot-tested among various individuals who had prior knowledge about the Malawian context. These individuals included former secondary school teachers and other Malawians living in Edinburgh. The researcher also used the telephone to contact some Malawian schools whose telephone numbers were available on the Malawi Schoolnet website. During the telephone conversations, the researcher asked some of the questions in the questionnaire as a way of pilot testing the data collection instrument. Pilot testing was done in order to eliminate cases of ambiguity, irrelevance and invalidity, and also to improve response rate (Silverman, 2000). In this phase of the research study, the researcher was trying to ensure that respondents

would read and understand the questions constantly on different occasions and that all the questions in the questionnaire had some significance in this research project.

In addition to these schools, the researcher also used the online Malawian Schools Database to get an additional list of Malawian secondary schools (see Appendix B) to which the questionnaires would be sent. This was done to maximise the number of responses and hence provide the researcher with a wider subset of potential schools to work with.

200 copies of the questionnaire were produced and 120 of them were sent by post to various secondary schools in Malawi. The remaining 80 questionnaires were hand delivered and personally collected by the researcher's relatives in Malawi. Respondents were asked by the researcher to sign and rubber stamp their completed questionnaires before returning them. Out of the 200 questionnaires sent out, 101 were returned.

4.2.2 Selection of Research Sites

Based on the results obtained from the survey the researcher identified 60 potential research sites in Malawi. These were schools which claimed to have implemented ICTs in their institutions. However, although these schools claimed to have these ICTs, the extent of ICT presence and use in their institutions varied. For example, some schools indicated that they only had one computer which was being used by only one individual at the entire school. Others indicated that they had computers but were only being used for setting examination papers and writing official letters. With such variations, therefore, the researcher used theoretical sampling techniques (Glaser and Strauss, 1967), in order to select a pool of schools that could lead to the generation of meaningful data. As such, each of the 60 potential schools was analysed and particular attention was paid to the school's theoretical relevance and purpose of the research study (Glaser and Strauss, 1967). In terms of theoretical relevance, the researcher aimed at selecting secondary schools that claimed to have adopted ICTs and had indicated that their use of such ICTs involved teaching and learning. This means that the selection of research sites in this study was based on the school's likelihood to provide data that are rich and hence facilitate the emergence of a theoretical conceptualisation of ICT adoption processes (Glaser and Strauss, 1967). As a result, out of the 60 schools, 39 were found to be relevant i.e. claimed to have adopted and implemented ICTs and that their ICT use involved teaching and learning. On the other hand, the research's main aim was to develop a theoretical understanding which explains socio-technical processes in LDCs like Malawi. However, within these LDCs, ICTs are adopted across a range of various socio-technical parameters like geographical location, technological infrastructure, culture, the type of technology etc. Therefore, in order to generate a theory that would be applicable to all these

contextual conditions, the selected schools also had to incorporate some differences based on these dimensions. Moreover, the researcher's approach of maintaining critical reflection between theory and data meant that once empirical investigations were underway, some issues would emerge which would require further probing within the identified subset of potential research sites. As a starting point therefore, the researcher randomly selected 17 from the 39 secondary schools. These were categorised into urban and non-urban contexts (See fig 4.1). These categories exhibited various differences that were found to be of particular interest in this research study. Moreover, these differences would possibly allow the researcher to make useful contrasts at the data analysis stage and hence provide a basis through which the emerging theoretical conceptualisation could be challenged or elaborated (Glaser and Strauss, 1967). Further interrogation of the emerging empirical data and background data, led to a generation of a further subset of schools based on issues which emerged during the field visits.

Having identified the research sites where data related to ICT adoption and use would be sought, the researcher then started thinking about the possible options for collecting such data. Semi-structured qualitative interviews (Silverman, 2000) were chosen because of their likely potential to generate substantially valid and reliable data about the Malawian social context in relation to ICTs. Moreover, semi-structured interviews allowed the researcher to involve both fixed questions and informal discussions. This made semi-structured qualitative interviews suitable for possible generation of a wide range of responses in this research project. Since data was sought from a variety of interviewees over a range of various social contexts, another reason for choosing semi-structured qualitative interviews as a data collection tool was their flexibility and compatibility to a number of data analysis tools (Silverman, 2000). This was

quite advantageous for the researcher because at this time, although the researcher had initially planned to use QSR software as a data analysis tool, he also had a chance of using other tools at any time during the analysis process.

In order to come up with some interview questions, findings from the questionnaire were firstly analysed in relation to themes identified in literature. Out of those findings, interview questions were generated to address critical issues in the framework of enquiry and hence the research question. As opposed to the questionnaire which sought facts about the presence and use of ICTs in schools, the interview questions were designed to address issues related to ICT adoption processes. The interviews also involved open ended questions in order to allow the respondent more freedom to express themselves in their own words (Silverman, 2000). Moreover, since the researcher sought to gain access into the respondents' interpretations of their ICT adoption processes (their social world), these open ended questions were potentially useful because of their ability to offer respondents more freedom to relate their own experiences to the adoption processes in question (Silverman, 2000). This was done in order to generate data that are based on respondent's experience and not on what is reported in literature (Silverman, 2000; Alvesson and Skoldberg, 2000)

4.2.3 Data Collection

In this research study, data collection techniques included semi-structured interviews, observations and review of documents. Data collection process focused on three broad categories of technology choice, technology use and the consequences of using adopted technologies within a particular social context. Data collection aimed at generating data related to issues like: the nature of the adopted technologies; reasons for adopting the technology; the processes of adopting the technologies; strategies for implementing and maintaining the technologies; the uses of technologies within the adopting context and reasons related to technology use; the consequences of adopting and using the technologies.

In total, 31 secondary schools were visited (Appendices F and G) and in all these institutions, interviews lasting to an average of one and a half hours were conducted with several participants. These included senior officers at secondary school level (i.e. head teachers), heads of ICT departments, teachers of ICT related subjects, technical staff, members from the local community and pupils. Interviews were also conducted with senior officers from the national educational authority and the ministry of education and human resources. In addition to these, observations were also done in some of these schools and photos were taken as part of the data collection process. A total of 12 pupils and 8 individuals from the local community were also interviewed on issues related to ICT use and notes about these interviews were taken. Another interview also involved the Director of Secondary Schools in Malawi and in this interview, the researcher sought to collect some more data related to technology adoption and another similar interview was also conducted with a senior representative from one of the ICT suppliers in Malawi.

The map below indicates the locations of all secondary schools that were visited during the field work. The numbers on the map correspond to the research site (RS) numbers used in Appendix G: description of reseach sites.

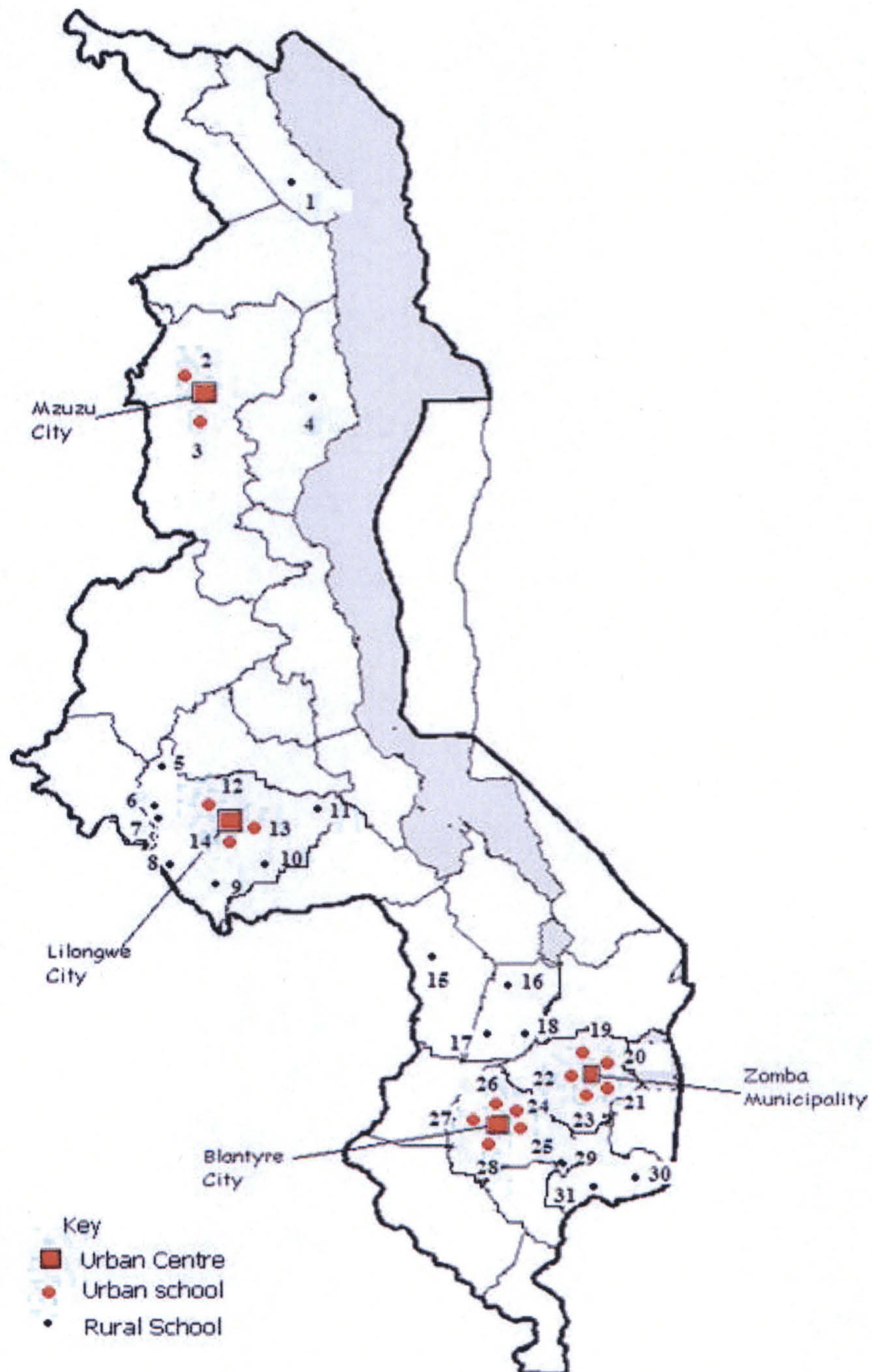


Figure 4.1 Map of Malawi showing corresponding locations of visited secondary schools

4.2.4 Validity and Reliability of data

Reliability and validity assume various definitions and meanings depending on the way they are used by researchers in different fields and types of studies (Silverman, 2000). Although some researchers have argued that unlike validity, reliability has no relevance to qualitative research (Stenbacka, 2001), other researchers argue that there can be no validity without reliability and that reliability is a result of validity (Patton, 2001; Lincoln and Guba, 1985). In this research study, data collection was meant to generate an understanding of ICT adoption processes in Malawian secondary schools based on experiences of those who adopt ICTs for use within their secondary schools. In order to ensure that collected data were valid, the research approach and data collection tools were thoughtfully designed and carefully formulated. This involved conducting data collection in two phases and using of a combination of data collection tools and techniques.

In the first phase, an exploratory survey was conducted (see section 4.2.1 of this thesis) in which a postal questionnaire was used to remotely collect data from various secondary schools in Malawi. The questions on this data collection tool underwent a series of refinements to ensure clarity and to eliminate all ambiguities. In this case, the questionnaire was tested on ex-Malawian secondary school teachers residing in the UK . The questionnaire was also pilot tested on other Malawian nationals who had acquired secondary school education in Malawi to make sure that it was comprehensive, unambiguous and ready for use in Malawian secondary schools.

In the second phase, field visits were conducted whereby the researcher visited and collected further data from selected secondary schools which were involved in the exploratory survey. In this phase, the researcher used interviews, document reviews,

class observations and photographs to collect further data in addition to what was collected during the exploratory survey. In this phase of research, the researcher compared various sets of collected data to ensure credibility and trustworthiness. For example, questionnaire responses from research site 14 (RS14) suggested a positive view of ICT presence and use within the school. In particular, responses from this site suggested that ICTs were being used consistently in all classes to deliver lessons in all subjects. Moreover, questionnaire data suggested that the school had qualified teachers and ICT personnel who were able to deliver lessons and provide maintenance support. However, field visits suggested a different picture of ICTs at the school. In particular, a visit to the research site suggested that the school was experiencing critical environmental pressures which negatively influenced the use of the adopted ICTs for educational purposes at the school. This observation was consistent with the views of the headmaster at the school who explained that the school was not able to use the adopted ICTs due to a number of critical challenges (See interview quotes from RS 14 on pages 158, 180, and 185 of this thesis). Moreover, this was also consistent with the photographs of the adopted ICTs in situ which were taken during the visit (see pages 17 and 18 of Appendix G).

A visit to research site 4 (RS4), suggested that affiliation demands influenced the school to adopt ICTs even though the adopters themselves did not see the relevance of the adopted ICTs to the school's values and demands. At this school, the deputy headteacher said that the adopted ICTs were simply imposed upon the school without any consultation and felt that the adopted ICTs offered no positive value and were not helpful to the school (see interview quotes from RS4 on pages 159 and 168 of the thesis). This was consistent with the ICT teacher's views (see page 183) and was also consistent with the photographs which showed the nature of donated ICTs

'dumped' in a classroom (see page 11 of Appendix G). Similarly, an interview with the headmaster at research site 10 (RS10) suggested that cultural identities influenced and were influenced by ICT adoption processes by creating and exaggerating social tension between members of the school and people from the surrounding communities (see quotes from RS10 on page 202). This was also consistent with the views of ICT teacher and the pupils (see page 203).

Additionally, questionnaire responses from research site 26 (RS26) suggested frequent use of ICTs to deliver lessons on a consistent basis in all classes at the school. Such data also suggested the presence of ICT maintenance unit and provision of ICT support. A visit to the school portrayed a similar view and this was consistent with the ICT teacher's observations (see quotes from RS26 on page 176 of the thesis) and those of the pupils at the school. Moreover, this was also consistent with the photos of the technology in situ which were taken by the researcher during the visit (see page 5 of Appendix G).

This means that in order to ensure data validity and as part of good research practice, what participants said during the interviews was compared to what they had said earlier on in their questionnaire responses and was also compared to what was seen during observations, the photographs of adopted ICTs in situ which were taken during field visits and the literature. Wherever sets of data showed some discrepancies, the researcher asked relevant participants for clarifications.

The researcher also took extensive quotations and subjected collected data to participant checking to ensure data quality and hence validity. The main idea for doing this was to ensure that what the researcher collected as data was based on what the research participants meant to say and not otherwise. For example, during field

visits, all interviews were audio recorded and transcribed. Such transcriptions were later assembled with other sets of data (e.g. photos and field notes) and presented to research participants for them to verify that what was collected as data for their secondary school was exactly what they meant to say. Where participants did not agree with some of the data, clarifications were sought and misconstructions from the collected data were subsequently replaced. Most importantly, most participants in this second phase of data collection were happy that what the researcher had collected and assembled correctly reflected their views and experiences as far ICT adoption processes were concerned in their schools. This means that throughout the data collection phase, the researcher maintained a critical engagement with various sets of data and continuously worked with research participants in order to ensure validity and reliability of collected data. Although some data collected in the questionnaire survey suffered some quality limitations (see section 5.5 of this thesis), the methodological approach and the use of a combination of data collection techniques and tools in this research study enabled the researcher to collect various sets of data from various sources about ICT adoption processes in Malawian secondary schools. As a result, this also enabled triangulation of data and subsequently ensured data quality and validity.

4.2.5 Data Analysis

In this research study, data collection, coding and analysis were conducted iteratively (Glaser and Strauss, 1967) and at different stages throughout the research process. In this case, while the initial stage of the research process was more open-ended, the later stages were more informed and guided by the emerging concepts (see fig 1.2 on page 9 of the thesis).

In the first stage, data were collected from a critical review of the literature on ICT adoption processes in LDCs. During this phase, open-coding technique (Strauss and Corbin, 1990) was employed to examine data and sort it into initial concepts. Data collected in this phase covered a wide range of areas and generated a lot of concepts related to ICT adoption and use in LDCs (see Chapter 3). However, through iterative processes of data analysis and coding, all the concepts gathered in this phase were synthesised and reduced into three main concepts of ICT Choice, ICT Use, and ICT Value (see section 3.4 of the thesis).

These three concepts further informed and guided the next phase of data collection and further analysis in the questionnaire survey that followed and allowed it to be more targeted (see questionnaire design in section 4.2.1, Appendix C and fig 1.2). Data collected in this survey and the analysis that accompanied it suggested that the adoption processes of ICTs in Malawian secondary schools appeared to be based on the promotion of particular forms of ICT literacy. This informed further analysis of the collected data and guided a collection of more interrelated data in order to generate a deeper understanding of ICT adoption processes in Malawian secondary schools.

In reaction to the survey data, additional literature on literacy was reviewed, analysed and coded in relation to the emerging concept (i.e. ICT literacy). The analysis and coding at this stage, came up with three main categories of functional, cultural and critical forms of ICT literacy and further suggested that ICT literacy is situated in nature (see section 3.3) and that there are various contextual influences which underpin the adoption and promotion of particular forms of ICT literacy at the expense of others in any literacy domain. In particular, this phase also highlighted Socio-technical Interaction Networks (STINs) concepts which had been covered in the initial stage of the research study and suggested some links to ICT adoption processes. For example, chapter 3 of this thesis reviewed a large body of evidence which suggested that interactions which occur during ICT adoption processes are often more complex than anticipated by many practitioners in the ICT for development arena and cannot be fully and deeply explained or accounted for by traditional ICT adoption models and theories (e.g. Rogers Diffusion Model). Unlike other ICT adoption models which perceive ICT and context as existing in isolation, STIN models conceptualise ICTs from a socio-technical perspective. STIN models, therefore, enabled the researcher to analyse key influences which shape and are shaped by ICT adoption processes in Malawian secondary schools. Such elements included technologies, relationships, infrastructures, people, resources, ICT policies etc. Thus, STINs concepts appeared to have high salience to this research study as they appeared to offer a possible way for examining, analysing and deeply understanding ICT adoption processes in Malawian secondary schools.

This further informed data collection and guided its analysis at the next level (i.e. field visits and face-to-face qualitative interviews). For example, STIN heuristics (Table 4.1) informed and guided iterative data collection and analysis during field

visits. In this case, various forms of data were iteratively collected, analysed and coded using STIN heuristics in order to generate relevant data which would enable the researcher to further understand ICT adoption processes in Malawian secondary schools.

Through such iterative analysis and coding of data collected during field visits, further concepts of affiliations, environments, interactions, and identities emerged and were found to influence and be influenced by ICT adoption processes in Malawian secondary schools. The emerging concepts were elements of the Social Actor Model (Lamb, 2006) - see table 4.2.

As a result of iterative analysis, data collection and coding, all research data on ICT adoption in Malawian secondary schools were now categorised into core sets of ICT Choice, ICT Use, ICT Value, ICT literacy, STINs and the Social Actor Model. Once this was achieved, a framework was synthesised to explain the properties and dimensions of these core categories and the circumstances under which they are connected. This explanation is the developed theoretical framework for conceptualising ICT adoption processes in Malawian secondary schools based on empirical data (see Chapter 5, sections 5.3, 5.4, and fig 5.7).

Table 4.1 STIN heuristics

Step	Activity	Objective
1	Identify relevant population of interactors	Identification of likely stakeholders, their roles, interests etc, in the ICT adoption processes within secondary schools
2	Identify core interactor groups	Interactors identified in step 1 are categorised into groups based on their roles in the ICT adoption processes. Such groups may be overlapping and may have conflicting roles.
3	Identify incentives	Identification of incentive structures in the ICT adoption process i.e. why did schools adopt ICTs? What are the influences for ICT adoption?
4	Identify excluded actors and undesirable interactions	Identification of interactions which the adopters don't want to have in the ICT adoption process e.g. biting the hand that feeds them (avoidance of aggravation)
5	Identify existing relationships / interactions	Identification of relationships which already exist among interactors and attempt to understand the influence of such relationships on ICT adoption processes.
6	Identify resource flows	Understanding how resources flow throughout the ICT adoption process and how such resource flows influence the adoption process.
7	Identify ICT choice points	Identification of who chooses what and why. Involves identification of social arrangement(s) through which the adopters select from a list of possible technological options.
8	Map ICT choice points to socio-technical characteristics	Development of a socio-technical understanding of ICT adoption. Map out STIN configurations which are compatible, viable and sustainable in LDC contexts like Malawi.

Source Adapted from Kling, McKim and King, 2001

Table 4.2 The Social Actor Model

Analytical Affordance	Description
Affiliation	organizational and professional relationships that connect an organization member to industry, national and international networks.
Environment	stabilized, regulated and/or institutionalized practices, associations and locations that circumscribe organizational action
Interaction	information, resources and media of exchange that organization members mobilize as they engage with members of affiliated organizations
Identities	avowed presentations of the "self" and ascribed profiles of organization members as individual and collective entities

Source: *Lamb, 2006*

Chapter 5

Research Findings

This chapter of the thesis discusses research findings with particular reference to data obtained in two phases from Malawian secondary schools. In the first phase, postal questionnaires were used to collect data about the extent of ICT presence and use within Malawian secondary schools and the second phase involved visits (field work) to secondary school institutions in Malawi where interviews were conducted with various participants (see Methodology chapter).

The discussion in this chapter derives from the researchers findings from the two data collection techniques. As such, the first section of this chapter discusses data obtained from the postal questionnaire and the second section discusses data obtained from the field work. This research finds that there were some discrepancies between these two sets of data i.e. between what the schools indicated in response to the questionnaires and what the researcher observed and experienced during field work (school visits). Section three of this chapter discusses these discrepancies and their implications on research methods in LDC contexts like Malawi.

5.1 ICTs in Malawian Secondary Schools: questionnaire survey findings

The main purpose of the questionnaire (see Appendix C) was to explore the nature and extent of ICT presence and use in Malawian secondary schools. The discussion in this section draws on what the respondents apparently said in relation to ICT presence and use within their secondary school institutions. The findings are presented under three subsections (i.e. Technology, Use, School) which align with the categories in the questionnaire.

5.1.1 Technology

Questions in section B of the questionnaire explored the nature and extent of ICT presence in Malawian secondary schools. These questions generated a range of responses which were collated manually to provide an initial view of ICT presence in Malawian secondary schools.

The first question in this section of the questionnaire, B1, asked the respondents to indicate the number of computers which are owned by their secondary school institutions. In response, out of the thirty one secondary schools which were involved in this survey, four indicated that they had between one and five computers. Five schools indicated that they had between six and ten computers. Seventeen of the thirty one secondary schools indicated that they had between eleven and twenty computers. Apparently, three schools said that they had between twenty and thirty computers and two schools indicated that they had more than thirty computers.

The questionnaire also sought to explore the sources of these computers and in order to do this, question B2 asked the respondents to indicate the sources of computers which they have within their institutions. In response, schools indicated that they had acquired computers from a cross section of sources. Eight secondary schools indicated that some of their computers were purchased by the school from local vendors. Seventeen schools responded that some of their computers were acquired from Schoolnet Malawi and seventeen schools also indicated that some of the computers were acquired through donations. These statistics apparently suggest that a secondary school in Malawi can acquire computers from a number of sources. For example, some schools which indicated that they had purchased some of their computers also indicated that they obtained some from Schoolnet Malawi and acquired some as donations from various sources like the British Council, the World Bank and the Beit Trust.

Responses to question B2 which asked the schools to indicate the sources of their computers, bring to the fore some surprising aspects of the computer adoption processes in Malawian secondary schools. Considering the sky-high enthusiasm for ICTs shown by the Malawi government in numerous policy papers, one would expect the Malawi government, through the Ministry of Education, to be proactive in the provision of ICTs to these secondary schools. Surprisingly, none of the schools involved in this survey indicated that they acquired their computers from the Malawi government.

In question B5 of the questionnaire, respondents were asked to indicate the type of operating systems that are installed on their computers. All schools involved in this survey indicated that their computers were based on the Windows operating system.

However, the more interesting data emerge from the versions of the Windows oper-

ating system running on these computers as indicated by the respondents. Out of the thirty one schools involved in this research study, twenty schools indicated that they had some computers which were running on Windows 95; twenty-two schools indicated that they had some computers which were running on Windows 98 and nine schools indicated that they had some computers which were running on later versions of the Windows Operating System i.e. Windows 2000, XP or ME.

The questionnaire data apparently suggest that the majority of schools in Malawian secondary schools have computers that are based on either Windows 95 or 98. However, according to Microsoft Ltd, Windows 95 and 98 operating systems are no longer supported by their manufacturers (see www.microsoft.com). This means that the manufacturers no longer provide software updates for these versions and any new vulnerabilities which may surface in these operating systems will go unpatched. As such, questionnaire data apparently imply that computers in the majority of secondary schools involved in this survey are based on operating systems with limited security and are vulnerable to a number of threats e.g. viruses and worms.

Question B6 of the questionnaire explored the type of software applications that are available for use on the adopted computers within Malawian secondary schools. Twenty-nine secondary schools indicated that they had Microsoft Office packages e.g. MS Word, Excel, Access, Powerpoint etc on their computers. Two secondary schools indicated that they had drill and practice programs on their machines (these are software packages that are designed to be used in the delivery of specific lessons in subjects like Mathematics, Physical Science, Biology etc.); nineteen secondary schools indicated that their computers had software packages that could support e-mail and eighteen secondary schools indicated that their computers had an Internet browser. Data collated from this question apparently suggest that Microsoft Office packages

are available to the majority of Malawian secondary schools that are involved in this research study. In contrast, these responses also apparently suggest that very few Malawian secondary schools involved in this survey have drill and practice programs on their computers.

The questionnaire also aimed at exploring the availability of Internet services within Malawian secondary schools and questions B7 and B8 asked the respondents to provide data for the extent and nature of Internet connectivity within their secondary school institutions respectively. Eight secondary schools indicated that they had computers which were connected to the Internet and that their Internet connections were through dial-up. Interestingly, responses to this question apparently showed a relationship between the location of the school and Internet connectivity. All schools which apparently indicated to be connected to the Internet had also indicated to be located in an urban area.

Question B10 of the questionnaire invited responses on the type of educational uses which are supported by the adopted computers within secondary schools. In response, thirty one secondary schools indicated that they use the computers to support teaching and learning while twenty seven secondary schools indicated that they also use the computers for administrative purposes like record keeping and management. Apparently, questionnaire data on this question would suggest that the majority of Malawian secondary schools involved in this survey use their adopted computers for three main purposes : teaching, learning and administration.

5.1.2 Use

Question C1 of the questionnaire explored the type of subjects in the Malawian secondary school curriculum which are supported by the adopted computers. Respondents were asked to provide the names of subjects where the adopted computers are used as part of the teaching and learning process. Out of the thirty one secondary schools, twenty-four indicated that they had at least one subject in the curriculum that was supported by the adopted ICTs. Analysis of responses to this question surfaces some insights. For example, the responses apparently show that in twenty of the Malawian secondary schools in this survey, Computer Studies is the only subject in the curriculum which is supported by the adopted computers.

The overall picture which apparently emerges from the questionnaire responses to question C2 is a positive one. The question explored teachers use of ICTs in Malawian secondary schools and the type of such use. The respondents from twenty schools indicated that teachers within those secondary school institutions use ICTs for teaching support and independent learning. Apparently, this suggests that the majority of teachers in Malawian secondary schools which are involved in this survey, use the adopted computers for teaching and learning purposes.

Pupils' access to computers was investigated by question C3 which asked the respondents to indicate which pupils access computers and how often they access those computers. In response, twenty-three respondents indicated that all pupils within their secondary schools had access to computers at least once a week.

On the other hand, question C4 aimed at exploring the nature of Internet access by each pupil in Malawian secondary schools. From the questionnaire data, only five

secondary schools indicated that they provided Internet access to their pupils at least once a week and the remaining twenty six schools indicated that they did not provide Internet access to their pupils.

Apparently, responses to question C6 which explored the supervision of Internet access within Malawian secondary schools, indicate that the provision of Internet access to pupils in all the five secondary schools is done under the supervision of at least one member of staff.

Question C5 explored the use of computers outside class hours within Malawian secondary schools. The question asked the respondents to indicate if other members of the Malawian local community were allowed access to computers outside class hours. In response, fourteen secondary schools indicated that apart from pupils and teachers, they also provided computer access to members from the local community. On the other hand, twelve schools indicated that they provide access to staff members only. One school indicated that outside class hours computer access is restricted to pupils only and three schools indicated that they do not provide computer access to anybody outside class hours.

The availability of ICT support staff within Malawian secondary schools was explored in question A7 of the questionnaire which asked the respondents to indicate the presence of technical support staff within their institutions. Eighteen secondary schools indicated that they had at least one member of staff providing IT specialist support. Apparently, this would suggest that more than half of the secondary schools involved in this survey have ICT personnel to provide specialist technical support in their institutions.

Question A8 was aimed at exploring the availability of ICT trained staff within Malawian secondary schools. This question asked the respondents to indicate the number of Malawian teachers within their institutions who were formally trained to use ICTs for teaching and learning purposes. In response, respondents from seven secondary schools indicated that they did not have a single ICT trained member of staff and respondents from twenty four secondary schools indicated that they had at least one ICT trained member of staff. Apparently, this would also suggest that the majority of secondary schools involved in this survey have teachers who are formally trained to use computers for teaching and learning purposes.

In relation to question A8, question A9 sought to explore where the ICT trained members of staff acquired their training. The view portrayed by data from this question apparently implies that ICT teachers in Malawian schools acquire their ICT training from various training providers and that the University of Malawi is the main provider for such training to these teachers. Respondents from eight secondary schools indicated that their ICT staff trained themselves (i.e. self training) on some aspects of using computers for teaching and learning purposes. Nine schools indicated that their ICT staff acquired some of their ICT knowledge through in house ICT training organised by the school, sixteen schools indicated that their staff acquired some of their ICT training from the University of Malawi and five schools indicated that their staff acquired some of their ICT training at the Teachers Training College.

Question A11 of the questionnaire was aimed at exploring the aspects which the ICT teaching staff are trained to do in Malawian secondary schools. In response, thirteen schools indicated that their staff had acquire training which involved using computers as a teaching tool; fifteen schools indicated that their staff had acquired training which involved using computers for information sharing; thirteen schools indicated

that their staff had acquired training which involved the use of computers for online learning; twenty five schools indicated that their staff had acquired training on how to use word processing applications and four schools indicated that their staff had acquired training on how to provide specialist ICT support. These questionnaire data apparently suggest that many teachers in Malawian secondary schools are trained in a cross section of ICT aspects. The questionnaire data apparently suggest that the majority of Malawian secondary schools involved in this survey have teachers who are trained in more than one aspect of using ICTs for educational purposes.

The sources of funding for the teachers ICT training in Malawian secondary schools were investigated by question A10. The question asked the respondents to indicate the providers of funding for the training of teachers in ICTs. Respondents from five secondary schools indicated that such training was funded by the school itself, sixteen secondary schools indicated that training was funded by individual teachers and four schools indicated that training was funded by the Malawi Government.

In order to explore the nature of ICT maintenance and support within Malawian secondary schools, questions B3 and B4 were constructed. While B3 explored what is covered by the school budget as far as computer maintenance is concerned, B4 aimed at exploring who pays for that budget. In response to question B3, twenty seven secondary schools indicated that computer maintenance and support are both covered in the budget and three secondary schools indicated that their budgets do not cover computer maintenance and support.

On the other hand, in response to question B4, twenty schools indicated that the budget is funded by the school itself; three schools indicated that the budget is funded by the Malawi government; one school indicated that the budget is funded by individual

sponsors and no school indicated that maintenance is funded by Schoolnet Malawi and three schools did not indicate the sponsors of their budgets.

5.1.3 The School

The location of secondary schools in Malawi is categorised into urban and rural. This categorisation is based on the general nature of telecommunications infrastructure and the type of lifestyle. Effectively, the lifestyle and the nature of technological infrastructure in Malawian urban areas greatly differ from that in rural areas. With limited or no access to telecommunications infrastructure, livelihood in Malawian rural areas is mainly agro-based. The majority of people in these areas live in grass thatched huts with no electricity or safe water supply. On the other hand, livelihood in urban locations is generally characterised by the availability of the telecommunications network, supply of electricity and safe water, and access to a variety of social amenities. To a large extent, secondary schools in these locations also share the characteristics of the local environment. Based on the responses to question A1 of the questionnaire, data discussed in this section was obtained from 15 urban secondary schools and 16 rural secondary schools.

5.2 ICT Adoption in Malawian Secondary Schools: The view from the ground

The previous section of this chapter presented data from the questionnaire survey. However, it must be stressed that the purpose of the survey was to provide information on local conditions in each school as a preliminary to identifying sites for interview work to support the qualitative work that is the primary mode of analysis in this thesis. The survey data were thus not subjected to substantial quantitative analysis. Given the sample size, and the discrepancy between survey data and the field work observations and interview data which were observed in this research study (see section 5.5 of this chapter), a full quantitative analysis would have been misleading.

This section analyses data collected from the follow up qualitative interviews within Malawian secondary schools. The research argues that ICT adoption processes in these secondary schools can best be conceptualised from a socio-technical perspective. The analysis in this section, therefore, uses STIN analysis technique (see methodology chapter) to analyse empirical data and to generate rich insights which inform a socio-technical conceptualisation of ICT adoption processes in Malawian secondary schools. In particular, the analysis uses the Social Actor Model (Lamb, 2006) (see methodology chapter) and focuses on the model's four major dimensions of affiliations, environments, interactions and identities.

This means that the thematic analysis of interview data in this section is organised into four main subsections. The first subsection presents an analysis of data on how ICT adoption processes 'shape and are shaped' by institutional relationships and networks of affiliations which involve these secondary schools and various socio-technical

elements. The analysis in subsection two analyses how the environment in these secondary schools influences and is influenced by ICT adoption processes. Subsection three analyses how ICT adoption processes ‘shape and are shaped’ by interactions among various affiliates within the adopting secondary schools. Subsection four uses the Social Actor Model’s dimension of identity as an analytical affordance in order to analyse how ICT adoption processes shape and are shaped by the ‘social construction of reality’ (identities) within the adopting secondary schools.

Throughout this analytical narrative, themes are illustrated with material from the interview transcripts. The results of applying STINs analysis on transcript data obtained from all secondary schools which were involved in this research study are outlined in appendices H, I, J and K. A sample transcript, with the relevant coding table which illustrates the mechanics of such an analysis, has also been provided in Appendix L. This section of the chapter ends with a discussion of the research findings with respect to a social theory of literacy as its theoretical lens for conceptualising ICT adoption processes in these secondary schools.

5.2.1 Affiliations

Analysis of research data shows how ICT adoption processes in the investigated secondary schools shape and are shaped by affiliations which involve these schools. STIN analysis focusing on the level, nature, demands and type of these affiliations, illustrates how networks of affiliations influence and are influenced by ICT adoption processes in these secondary schools. As shown in appendix H, affiliations in these secondary schools can be at individual level, local level, national level or global level.

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At local level, all schools have various affiliations with the local environment in which they are located. Such affiliations involve relationships with neighbouring schools, the local community, members of staff, pupils, and other elements in the local environment. At national level, all schools are affiliated to and have relationships with organisations which operate at national level e.g. the Malawi ministry of education. At regional level, schools are affiliated to, and have relationships with, regional organisations like Schoolnets (i.e. SchoolNet Malawi which is a sub-branch of SchoolNet Africa) and at global level, secondary schools are affiliated to global organisations like the World Bank. In all these affiliations, schools can also have members who are individually affiliated to national, regional or global affiliations. Such individuals act as representatives of national, regional or global organisations within the local network of affiliations to which the local schools are related.

Networks of affiliations between these secondary schools and organisations involve resource flows which depend on the level of institutional affiliations. For example, although all secondary schools have networks of affiliations both at local and national levels (see appendix H), this research finds that the relationships within such type of networks of affiliations do not involve high levels of ICT resource flows and do not constitute a major source of technological artefacts in form of computers which are adopted for use within these secondary schools. Instead, relationships in networks of institutional affiliations which exist at regional and global levels constitute major sources of computers or ICTs which are adopted for use in these secondary schools.

Although ICTs (e.g. computers) can be locally acquired from local vendors who sell various technological artefacts and provide back-up services to their customers within Malawi, such local relationships in these local networks of affiliations are not a major source of ICTs which are adopted in these secondary schools. Instead, schools rely

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on regional or global affiliations as their sources of technological artefacts as one head-teacher indicated:

“...if you look at the number of schools, those which own computers is just very few. The percentage is very minimal err may be less than two percent. It’s sad but the major problem is poverty, my friend. A school on its own cannot afford to buy a computer and if anything, we just rely on these donations...” [RS14 : 188 - 191]

“ I see that the ministry of education is not very much involved in this process because most of the computers that are in secondary schools are acquired through donations and not through the effort of the ministry of education. The ministry is just an observer. If donations are not there then schools will not have computers ” [RS 10 : 140 - 144]

“ the government should also provide a hand. We should not only rely on donations but the government should also help in providing computers. And also they should not just provide computers, they should also give us support” [RS 29 : 66 - 68]

Since such type of resource flows happen within networks of affiliations either at regional or global level in these secondary schools, the number of relationships in a school’s network of affiliations at these two levels influences the source of the adopted ICTs in these secondary schools. For example, secondary schools which have networks of affiliations with regional and global organisations (e.g. Schoolnet Malawi, the British Council, the World Bank, Beit Trust and Church Organisations) acquire their ICTs from any of those organisations. In Malawi, these organisations have some historical, developmental, political or other links with the recipient schools and the

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more the number of relationships a school has, the more the number of possible sources a school can acquire computers from as one ICT teacher indicated:

“ We have two sources. The first source was the Marianist missionaries. They gave us computers, these were second hand computers from the United States. The second source was schoolnet Malawi. They had also acquired some comps from the UK I understand and from there the school net had to distribute to certain schools and our school was chosen to be one of them so they sent us 20 computers. However, later on the school purchased one computer after seeing that the computers we were given were not reliable since they were second hand ones. For example, the Marianist who gave us some computers, the ones from the USA, said that the computers were to be destroyed in the USA and then he said if I can ship them to Malawi then they would definitely be useful because people in Malawi hear of the computers but don't have knowledge of how to use them. So he managed to get some money and he shipped them to us.” [RS4: 13-25]

Similarly, networks of affiliations which connect recipient schools to organisations at regional or global levels via individual members also provide sources of computers within secondary schools in Malawi. For example, schools which have individual members of staff who are affiliated to or associated with potential 'ICT supplying organisations' are more likely to acquire some of their computers from those organisations or relationships to which their individual members are connected:

“This was a donation. We had a lady missionary from Canada who was

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here and she was the one who contacted donors in Canada who then gave us a consignment of 12 computers She was a Scarborough Missionary.”

[RS2: 24- 27]

These personal or individual relationships are also linked to or embedded in the relationships which the recipient schools already have with particular organisations in their regional or global networks of affiliations as one interviewee explains:

“Yes there is a connection between [RS26] and errrr errr obviously [RS26] is owned by CCAP but it’s a government school and we can’t deny that it’s a government school but the school proprietors are CCAP Blantyre synod. So the Presbyterian church in Ireland and CCAP are partners. So one of the schools obviously which CCAP are looking after is [RS26] so we’ve had a long connection between the Presbyterian church in Ireland and [RS26] in an educational way. We are involved in Malawi in some hospitals like Mulanje Mission Hospital and Ekwendeni Hospital in the north and so on, but in schooling we are involved with [RS26] generally. So if there is a link and we have some members of staff who work here from Ireland and there have been some two, three or four members of staff before me and then I am just next in that series of staff. So my role here is computer teaching and also developing and generating the school and trying to encourage further educational atmosphereactivities for students, facilities development and maintenance and so on.” [RS26: 63-77]

ICT adoption processes within these Malawian secondary schools are part of networks of affiliations at local, national, regional, individual and global levels. However, it is

regional, individual or global affiliations which largely account for the resource flows involving computers in these secondary schools. This research finds that within these networks of affiliations, there are various demands which shape the ways in which ICTs are adopted.

Affiliation demands

For example, in secondary schools which were involved in this research study, networks of affiliations have their own demands which influence and are influenced by ICT adoption processes. Research data demonstrate that these demands can be regulative (or prescriptive), normative or mimetic (or empowering) (Kling and Lamb, 2002).

While all networks of affiliations have normative demands (see Appendix H), this research finds that secondary schools which have affiliations at individual level (and in continuous relationships) also have mimetic or empowering demands. Individual members who are affiliated and represent other organisations act as trainers of local school members within the local network of affiliations on how to implement and use ICTs within the local institutions. Individual affiliates share their ICT knowledge with local school members and thereby empowering them. The research finds that through these individual affiliations, the relationships between local secondary schools and affiliated organisations become more dialogical (empowering) and increases mimetic demands within the network by making local schools active participants in ICT adoption processes within their institutions as one interviewee indicated:

“... you know Malawian people, the local people can teach computers no problem. You know they don't need me here in particular, I am here to

simply assist them. To help, to train and encourage, to help lift up the teachers so as to fulfil their potential. But I am only here on a temporary measure you know and that's my role here to train people up and then to step aside and go away back to my home country Errr so you know you don't want to become dependent and dependency for a society is not good and that's why our church and I believe that I am here on a partnership role and it's not about me coming and err..saying I know everything and I am going to tell you the way to do things. It's not like that you know. It's a partnership role where we are working together as fellow Christians as fellow teachers and we are seeking to help each other through err. I hope in the near future to pass on the computer notes and the keys and let somebody else take it on because that's empowerment of people and that's the way it should be. And I am glad to say that we have some people coming from Malawi to Ireland to do training with us. So it's partnership, its true partnership you know- the CCAP send people to Ireland and the PCI, the Presbyterian in Ireland, send people here. So it's two way its not just us sending but they send also so we learn things from people from Malawi as well." [RS26: 364-384]

On the other hand, secondary schools which have affiliations at regional or global levels but not at individual level have strong regulative or coercive demands (see appendix H). Within these global and regional networks of affiliations, there are established practices of donating computers to LDCs like Malawi and computer adoption in secondary schools is touted as key to socio-economic progress. In particular, the nature of relationships in these networks of affiliations is that of a 'helper' on one hand and the 'helped' on the other (e.g. World Bank / Malawi, SchoolNet / Local

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schools).

This research finds that such networks of affiliations and their associated relationships come with regulative or coercive demands and bypass local consultation. They remove local school autonomy in ICT adoption processes and are characterised by low level of local school participation in the identification and selection of technological options that could be chosen for use within their institutions. For example, the memorandum of understanding involving SchoolNet, the Malawi Government and Microsoft Ltd appears to have led to high dependency on Microsoft products within these secondary schools despite the existence of other numerous ICT options (e.g. mobile phones, open source software, etc). Research data indicates that the majority of secondary schools in this research study are in networks of affiliations with SchoolNet and all computers that are adopted in these secondary schools are products of Microsoft Ltd. This research finds that it is these regional or global organisations which are autonomous and accountable for the selection and choice of particular technologies for these secondary schools :

“The schoolnet Malawi wants to promote ICT skills in secondary schools ...” [RS 12 : 14 - 14]

“... It was actually a decision by Schoolnet Malawi”[RS14: 145-146)

“the idea came from the British Council ” [RS7: 10-10)

“This was part of their program” [RS9, 19-19]

In these networks of affiliations, regulative or coercive demands on recipient secondary schools influence ICT adoption processes by dictating what technologies must be adopted and what must be done with the adopted technologies. Although schools

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might possibly have the potential to come up with alternative ways of using the prescribed technologies within their institutions, the regulative demands within these regional or global networks of affiliations shape the way in which secondary schools adopt their ICTs as several head teachers explained:

“We do it that way because that is what schoolnet told us to do” [RS 7: 12 -13]

“they told us to introduce computer classes immediately and then let the communities around especially those pupils who have finished their form four here to have access to computers.” [RS 12: 23 -25]

This research finds that although these schools have the freedom to accept or reject the prescribed technological choices, the normative demands in the global and regional networks of affiliations also influence the recipient secondary schools and their members to accept the prescribed technological choices. For example, secondary schools which would have otherwise not thought of acquiring computers for use within their institutions tend to accept the prescribed choices simply because the code of conduct or the normative demands within these networks of affiliations involve the donation or ‘flow’ of free computers to local secondary schools. Schools in these networks of affiliations are influenced to adopt computers simply because they are free donations and not because they necessarily see any rationality in acquiring such technologies:

“ this idea of adopting computers is almost meaningless at this school where the possibility of having the Internet is not even there” [RS 14 : 10 - 12]

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“These computers are quite old I would say. You can’t even use some of them for e-mail and Internet, they do not have adequate space on them. They can barely take some e-mail and the Internet. Barely, barely!! They are outdated and not suitable” [RS 2 : 181 - 183]

Similarly, regional or global networks of affiliations which involve relationships between the Malawi government and international aid agencies also influence ICT adoption processes in local Malawian secondary schools. For example, this research finds that secondary schools which are built by international organisations like the World Bank through its bilateral loan agreements with the Malawi government do not have the autonomy to select, choose or reject various technological options. Instead, the normative and regulative demands which underlie these bilateral agreements between the Malawi government and the regional or global aid organisations influence the imposition of technological options among local secondary schools even if those secondary schools upon which these ICTs (e.g. computers) are imposed, lack critical resources for computer use (e.g. not covered by the national electric grid and have no electricity supply) as several head teachers explain:

“They built the computer room and provided everything that is in this computer room everything including all these computers. Whatever you see around here was given to us by the World Bank. It’s their project ...”
[RS8 : 37 - 39]

“ We have about ten computers but with the absence of electricity we haven’t started using all of them yet... We have a generator which we hire from town and we often times hire that one since we do not have any

other reliable source of power. Of course we have solar panels but we only use it for lighting. The power is just too small... [RS9: 15-18]

Nature of affiliation and associated relationships

In these networks of affiliations, secondary schools also have various types of relationships with various network affiliates. The nature of relationships within networks of affiliations in these secondary schools can either be contingent or continuous (see Appendix H). This research finds that the nature of networks of affiliations is related to the type of resource flows and that the nature of networks of affiliations particularly at global and regional levels influences ICT adoption processes in the recipient secondary schools. This research finds that continuous networks of affiliations involve more context specific (or more locally focused) flow of resources than contingent networks of affiliations. On the other hand, contingent networks of affiliations are less stable than continuous ones and as these contingent affiliations change, resource flows also change. When this happens, ICT adoption processes in secondary schools which were involved in these contingent networks of affiliations become affected. For example, STIN analysis (Appendix H) shows that the majority of secondary schools in this research study exist in contingent networks of affiliations and when these affiliations change and resource flows cease, their ICT adoption processes also become affected as one head teacher explains:

“...when this happens, we don’t know where to start from. We know the ministry of education officials are also reluctant to help us especially on issues like these... there is much reluctance at the ministry of education.

We are not succeeding really. Yeahh. ” [RS 12 : 37 - 48]



Figure 5.1 Prescribed computers

“The computers were just brought here with all the equipment that you see around here to be used along with these computers in this school. So we can say it is the World Bank doing everything.” [RS 9 : 8 - 10]

On the other hand, schools that are in networks of affiliations which are continuous also involve relationships at individual level and have higher mimetic affiliation demands than those schools in contingent relationships and which do not have affiliations at individual level and less mimetic or empowering demands. This research finds that these mimetic affiliation demands have an empowering effect among local secondary schools. Schools which are in continuous affiliations with regional or global organisations and have affiliations at individual level have adoption processes that are deeper than those in secondary schools in contingent networks of affiliations. This research finds that even when relationships in these networks of affiliations are to change, the mimetic or empowering demands which were facilitated by the individual networks of affiliations tend to provide a source of alternative ways through which the recipient schools can adopt alternative ICTs depending on their situation or context as one head-teacher explained:

“...The other problem is that the number of computers we were given is not adequate for all students to use. For example, they gave us about fifteen to twenty computers when we have over 200 students. So in a class if we have 50 students and may be 15 computers, how many students then will have access to those computers when you are teaching them? This means that some students will dominate and others will just be looking at what is happening we then thought that the computers were not helping us and we have decided to have satellite tv which we will be using to teach some subjects. At the moment, we will be sitting down to allocate time for lessons delivered through the television We know that the our school is in the bush but should our minds and the minds of our students be in the bush as well? No, that’s why we decided to buy the TV.” [RS4: 71-81]

Type of affiliation

Although these networks of affiliations involve relationships which are characterised by resource flows, this research finds that there are two types of affiliations which influence the type of resource flows among network affiliates: multi-valent or mono-valent. Multi-valent affiliations involve resource flows which are context specific and take into consideration various other socio-technical parameters within the recipient schools. On the other hand, mono-valent affiliations only involve a flow of technological artefacts to the recipient secondary schools regardless of other socio-technical parameters within the recipient schools. These types of affiliations influence ICT adoption processes in these secondary schools in so many ways. For example, multi-valent relationships or networks of affiliations which facilitate resource flows that are focussed on specific school contexts enable ICT adoption processes in those secondary schools. This research finds that schools which are in multi-valent networks of affiliations (e.g. those which consider socio-technical makeup of the recipient institutions and supply relevant resources like technological artefacts, human and financial resources to the recipient secondary schools) have higher levels of ICT use within their institutions. In these multi-valent networks of affiliations, there is a continuous appraisal of local socio-technical parameters as they relate to ICT adoption processes within the local schools as one ICT head-teacher explained:

“...people in Ireland have a connection with [this school] because they know that I am here and they know that [the church] in Ireland is sponsoring a school in Malawi. So people do send donations to places they know. Because there are so many places in the world they can send things to but they do not know anything about those places but they know I am here

representing them and they know how these computers are being used I give them feedback and write letters back and things like those.” [RS 26 : 78-84]

On the other hand, mono-valent networks of affiliations and their associated relationships do not base their resource flows on the socio-technical environment within the recipient secondary schools. Instead, ICT adoption processes in mono-valent networks of affiliations are characterised by an understanding of ICTs as objective tools which will deliver uniform outcomes anywhere in the world. Such networks of affiliations have resource flows which only involve the supply of technological artefacts (refurbished computers) and overlook all the other socio-technical elements. This study finds that the majority of secondary schools in this research exist in mono-valent networks of affiliations (see Appendix H) and have relationships which only facilitate a supply of computers and not of other resources which are critical in the adoption process within the recipient schools as one head teacher explained:

“ We have had a lot of challenges. One of the challenges is that these computers would have helped us better if we had printers and other necessary equipment. How do they give us computers without printers... Another challenge is that of continuous breakdowns. These machines keep on breaking down and we are not able to trace where the problems are because we do not have people who know these things...” [RS 29 :55-60]

This research also finds that at national level, the type of network of affiliation between the Malawi government and secondary schools is also mono-valent and this influences ICT adoption processes in these secondary school. For example, although the Malawi

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government has endorsed the promotion of ICT adoption in schools, research data demonstrate that it has not been proactive in creating multi-valent networks of affiliations which involve context-specific flow of resources necessary for sustainable ICT adoption processes in local schools. This mono-valent network of affiliation between the Malawi Ministry of education and the local Malawian secondary schools does not involve a consideration of ICT adoption processes from a socio-technical viewpoint and hence does not include adequate flow of capital, human and other resources to facilitate ICT use and support in Malawian secondary schools as several head teachers explain:

“...we get very little funding from the ministry of education. The funding that we get from the ministry is not even adequate enough to pay for utilities and other things so we sort of prioritise between computers and other needs ” [RS 11 : 107 - 109]

“ ... the government should not just talk about providing computers but they should also train the teachers ... teachers should be trained on how to handle and use those computers. So that if they do” [RS 12 : 30-32]

“these are the notes which I made up ...unfortunately the Malawi government hasn't provided a text book there is nothing available so we are working with limited resources ... There is no text book written for the syllabus... ” [RS 26 : 151 - 194]

“...And also another challenge is teaching materials. We do not have standard books that we can use so it all depends on the teacher to be resourceful and look for books or search from the Internet for important points...” [RS 21 : 86 - 89]

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This type of relationship between secondary schools and the Malawi government is one of the major influences upon ICT adoption processes in these schools.

5.2.2 Environment

These networks of affiliations exist in environments which exert various forms of demands or pressures and influence ICT adoption processes in secondary schools. This research finds that these pressures can be in form of institutional demands (e.g. government policies, institutional culture, school regulations, sanctioned practices and other forms of standardized behaviour) or technical demands (e.g. nature of ICTs, ICT Skills base, Availability of ICT resources, location) which enable or constrain ICT adoption processes (see Appendix I). ICT adoption processes in these secondary schools are part and parcel of the environment in which they are embedded.

Malawi government policies which equate socio-economic progress to ICTs and endorse a 'free flow' of technological artefacts from all over the world are a major institutional pressure which the environment exerts upon these secondary schools in Malawi. For example, as part of government policy, computer studies have been introduced into the secondary school syllabus and ICT adoption in these schools is encouraged by the government. The Malawi ICT policy, for example, talks about the advantages of adopting ICTs in schools and the threats for not doing so. The policy highlights ICT adoption in secondary schools and the teaching of ICT skills as strategic ways forward. This research finds that such policies and strategies exert pressure on and influence ICT adoption processes in these secondary schools which draw upon those policies as one ICT teacher explained:

"...Well we see that the world is changing nowadays. We see that all around us there is information technology advancing so in line with globalisation policies we saw that if we don't introduce our pupils to computer

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technology then they may be left behind. We want them to be at par with the way things are going in the world. ” [RS 30: 31-36]

In these secondary schools, ICTs are also part of the environment where politics exert various demands and influence ICT adoption processes. For example, in adoption processes where political leaders (e.g. the education minister or local MPs) are involved and praise or recommend specific donations of technological artefacts to local secondary schools, it becomes difficult for those local schools to assume local autonomy and become actively involved in the whole adoption process even if they know that the donated artefacts are not appropriate within their local environment for fear of contradicting those politicians:

“...As I said, this is a British Council initiative so they just went to the Ministry to introduce the initiative to them that they are about to bring computers into our secondary school so that students should benefit from that program ... we did not have any consultation or communication from the ministry of education or the British Council. All we knew was that the Minister and some officials were coming to receive donations from British Council to our school.” [RS30: 31-37]

On the other hand, the environment also exerts technical pressures and influence ICT adoption processes in local secondary schools. The level of infrastructural richness in terms of the nature of ICTs, ICT skills base, availability of technical resources and institutional location in relation to the national telecommunications grid either constrain or enable ICT adoption processes in these secondary schools (see Appendix I).

Nature of ICTs

ICTs which are adopted for use within these secondary schools are not simple isolated pieces of equipment. Instead, they are embedded in the adopting school's context and, as part of a broader school environment, the nature of the adopted artefacts promote or constrain adoption processes within the adopting secondary schools. For example, secondary schools which adopt refurbished second hand computers running on Windows 95 or 98 operating systems experience a lot of constraining technical pressures. These are the most common types of operating systems in the majority of secondary schools which were involved in this research study. These are the types of operating systems which are no longer supported by their manufacturers, Microsoft Ltd. As discussed in chapter 2 of this thesis, this means that these operating systems or computers no longer have system updates (e.g. security patches) developed for them. This makes them vulnerable to a variety of threats and are, therefore, prone to frequent breakdowns. Interviewees reported how the nature of these computers influences adoption processes in their institutions:

"... And the computers which we are using now are old, very old ones, windows 95,98 errr... we don't have windows 2000 or the latest ones. Errr... errr... only 95 and 98 so they are just slow when doing your work." [RS 17 : 91 - 93]

"we teach things based on the syllabus. But we don't cover much because some features that are in the syllabus cannot be performed on these machines because our machines are very old. " [RS 21 : 42 - 44]

"... Another challenge is that these versions of machines that we are using, are very outdated. They are very old so they give us a lot of problems.

Sometimes we encounter problems to store information, sometimes they don't even accept diskettes... ” [RS 10 : 109 - 112]

“ Moreover, we did not use these machines for so long. They all broke down and are not working.” [RS 4 : 92 - 93]

“... You know most of the machines that we are using are second hand computers and they do not last long and we have so many problems” [RS 31 : 49 - 50]

“ That is when we feel that these things are out of fashion, we should phase out those things and bring in the relevant materials, the ones that we can effectively use” [RS 12 : 235 - 238]

On the other hand, schools which adopt computers operating on later versions of operating systems and with relatively better technical specifications (e.g. Windows XP), experience weaker technical pressures than other schools which adopt rather old machines with lower technical specifications:

“We have 20 computers in the computer suite and then we have a couple in the headmistress' office and the accounts department. But for teaching and student access we have 20 PCs all in full working order. We have completely phased out windows 98 and we have now upgraded them all to Windows XP” [RS 26 : 4-8]

“ what we have here are laptops. They are all laptops running Windows XP So for those teachers who know how to operate it and who have the right material, they get the pupils together and show them something for example in geography or science and that kind of things even in literature

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Figure 5.2 Computers at some secondary schools

“The problem here is that our machines are outdated. They are not the modern ones

” [RS 5 : 67 - 67]

at the moment we don't do it like in the past. So it is used for all sorts of subjects like preparing my quiz with some games on it so that we keep the school going we give them something to make the lessons live." [RS 18 : 46 -52]

The nature of software applications installed on the computers which are used in these secondary schools also exert pressure on adopting schools and influence ICT adoption processes. For example, while the majority of functioning computers in these secondary schools have Internet explorer and Microsoft Office applications installed on them, none of the computers in these secondary schools have special software applications to support the teaching of specific subjects in the curriculum like Agriculture, Mathematics, Biology, Physics, English etc. In contrast, all schools have Microsoft word processing packages and other drill and practice software applications for typing lessons installed on their computers (e.g. the Typing Tutor).

A comprehensive picture of the relationship between the nature of computers available in these secondary schools and the nature of their networks of affiliations at regional or global level has emerged. This research finds that schools which adopt ICTs through contingent networks of affiliations have ICTs of poorer specifications than schools which adopt ICTs through continuous networks of affiliations.

ICT skills base

As part of a broader institutional environment, ICT adoption processes in the majority of these secondary schools face strong technical pressures in terms of ICT skills base. In relation to the level of the nature of the school's network of affiliations, this



Figure 5.3 Broken computers bundled at the back of a classroom

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research finds that adoption processes which happen in affiliations that are multi-valent (or socio-technical in nature) face weaker technical pressures in terms of ICT skills base than those which occur in mono-valent affiliations. On its own, a supply of technological artefacts to these secondary schools does not guarantee effective use within the recipient schools. For example, secondary schools which adopt or acquire computers in the absence of trained ICT teachers experience strong environmental pressures when they attempt to use the adopted computers as several ICT teachers explained:

“another biggest challenge is that we are errerr we are not fully trained so when we are teaching our pupils we are also learning the subject. In fact in my case, despite being involved in such teaching I only did 8 days course on how to use computers so I can say that I am not properly trained to use these machines.” [RS 10 : 88 - 93]

“we are much behind, yes, and it’s a problem because even at this school we have teachers who can hardly operate the computer. Right here [laughter]. Of course” [RS 14 : 181 - 182]

“another challenge is that most of the teachers do not know also how to use the computers...” [RS 6 : 173 - 174]

On the other hand, as part of the school environment, ICTs also put pressure on the adopting environment to provide relevant technical support skills in order to facilitate maintenance and sustainability of computer use within these institutions. Several interviewees explained their experiences on the significance of such skills and how those skills influence ICT adoption processes within their institutions:

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“although some of us may know how to use the computers, we do not know much on the technical part of it. So when the computer is not working properly, it gives us a lot of headache to repair that particular computer because we do not have the skills to repair these computers” [RS 12 : 130 - 133]

“ Another challenge is that we are not technically trained so we cannot repair computers. So when they break down we can't do anything and the students can't do anything either. As you can see those broken computers are just there, dumped. When I was coming I found those machines down and they are still down up to now” [RS 6 : 43-47]

“ These machines keep on breaking down and we are not able to trace where the problems are.” [RS 29 : 58 - 59]

In these secondary schools, the adopted computers are not only part of the local school environment. Instead, they are also part of the national environment. An acute shortage of teachers across the Malawi nation is another major environmental pressure on ICT adoption processes. While these schools already operate with inadequate staff and an overstretched human resource base, the adoption of computers and introduction of computer subjects mean that these schools have to handle an additional subject with the same constrained human resources. Interviewees explain how such environmental pressures constrain ICT adoption in their schools:

“Another challenge is the number of teachers which we have here, we are few and as such to be given another lesson, a computer lesson to teach, we feel it's a burden. So we decide not to teach computer subjects so number of teachers here is a limiting factor” [RS 8 : 87 - 93]

“About 330 pupils access these computers. However, at the moment they are not accessing them because we do not have a computer science teacher.”[RS 11 : 5 - 6]

“ This subject is supposed to be on the time-table but since we do not have a computer teacher, that is why we don't use these computers to train pupils it is only few teachers who can access these computers using the little knowledge that they have. So that's the whole thing” [RS 11 : 31 - 39]

As an environmental demand or pressure, the unavailability or inadequacy of qualified and skilled teachers in these secondary schools is also compounded by the effects of the HIV and AIDS pandemic on the Malawian education sector and secondary schools in particular. Although not a major focus of this research study, this research finds that in all these secondary schools teacher attrition due to prolonged illnesses and AIDS related deaths create several vacancies and are a serious national environmental pressure which influences ICT adoption processes within these secondary schools.

As part of the local school environment, the adopted ICTs also exert financial pressures on the adopting secondary schools in Malawi and influence ICT adoption processes. The majority of secondary schools in this research study operate on budgets which do not meet the costs of running and maintaining their computers. Although all secondary schools submit their annual budgets to the Malawian Ministry of Education which include the cost of running and maintaining computers within their institutions, the amount of funding which the ministry allocates to them is usually less than the requested amount. In the face of such financial pressures, these secondary schools are forced to allocate the meagre financial resources based on their

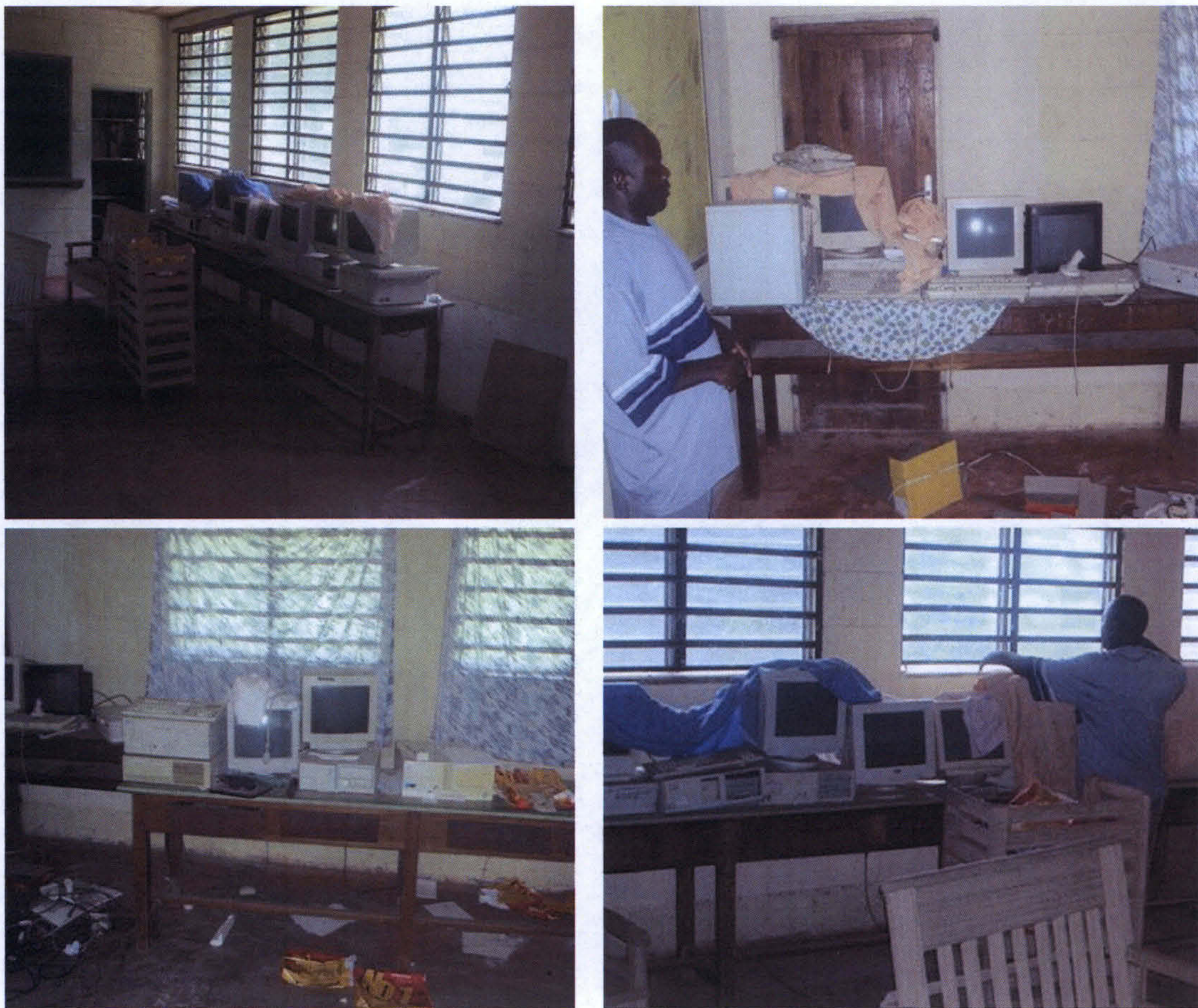


Figure 5.4 Dumped Computers

“As for me, I am not trained on how to do repairs so I don’t know how to repair them when they break down. So we just keep them.” [RS 4 : 63 - 64]

perceived priorities and their local needs. When this happens, computers usually come at the bottom on the ladder of priorities as several ICT head teachers explain:

“our budgets cover the expenses for the computers. However, we are not given the amount of money we request it’s always less than what we need yeah!” [RS 8 : 131 - 132]

“the money we receive is not adequate enough to pay for utilities and other things so we sort of prioritise. Out of the meagre finances that we are given we decide on which things should be given a priority. So it definitely cannot be a computer which has broken down compared to electricity bills. So financial constraints is another problem” [RS 11 : 109 - 113]

“ Some of them[computers] require repairs to be fixed so we are looking at the cost, we are looking at the money which we don’t have. So we just keep them aside until money is available or ” [RS 10 : 120 - 122]

“when these machines break down, we pack them and then wait for technicians to come. But it really depends now on the coffers of the school. It may take two to three months because we first of all look into the coffers of the school. So if we don’t have finances then we don’t even bother to call the technician because we get very little funding” [RS 11 : 103 - 107]

“As of now they are just there. We just keep them in the store-room, yeah.” [RS 8 : 121 - 121]

Faced with some regulative or coercive demands of networks of affiliations, some schools attempt to surmount the financial pressure exerted by ICTs within the school environment by offering commercial computer courses to members of the local commu-

5.2 ICT Adoption in Malawian Secondary Schools: The view from the ground 184

nity as an income generating activity. This research shows that the financial pressure exerted by these ICTs upon the schools can not be contained in this way:

“we do try to have our broken computers fixed but it is expensive. So that’s another challenge, maintenance costs are very very high. They are very high. Moreover, these costs have to be covered by the school and not the government so we have problems” [RS 29 : 66 - 68]

“we had somebody who used to service our computers but he used to charge us a lot of money so errrrrrerr it has been very difficult for us to manage with these things, yeah” [RS7 : 62 - 63]

Similarly, financial pressures also influence ICT adoption processes in these secondary schools by constraining computer use. For example, this research finds that one of the main objectives for adopting computers in these secondary schools is to facilitate access to information and knowledge resources via the Internet. However, the majority of these secondary schools are not able to provide Internet services within their institutions because within the Malawian environment, such services exert very high financial pressure upon the adopting secondary schools as several head teachers explained:

“Unfortunately, Internet is very expensive in Malawi looking at the bills which come with the use of computers connected to the phones errr very expensive. Schools cannot afford ” [RS 14 : 16 - 18]

“we tried to get the Internet but errr we couldn’t manage to pay the bills eerrr... there were some bills coming so errit was disconnected.” [RS 5 :

76 - 77]

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“ we are supposed to teach them Internet but we do not have the Internet because it’s costly. But it must be taught” [RS 10 : 112 - 114]

As part of the local environment, the adopted computers also exert pressure on the local institutions to alter their cultural ways in which they deliver lessons in their classes. In terms of institutional culture, all secondary schools have their own ways of delivering their lessons in the classroom. However, this research finds that ICTs demand that they adjust those ways as part of the adoption process. For example, secondary schools which have inadequate numbers of computers and high numbers of pupils experience strong pressure, and find it hard to adjust their teaching practices in order to accommodate ICTs as several ICT teachers explain:

“if you look at it you see that the number of computers is too small. If you look at the ratio of the number of computers to the pupils, it is just too small” [RS 14 : 37 - 38]

“when we want to teach for example, we have to call the whole group of pupils and they are crowded around one computer. And you know the environment here is very hot and humid and others cannot see because they are so far behind the computer and the teacher” [RS 6 : 169 - 171]

“ these computers get broken because of over-use or improper handling. You see we are talking of one computer for over fifty pupils ” [RS 14 : 132 - 133]

“ we cannot afford offering computer studies with only five computers besides we have a lot of computer breakdowns. As a result, our pupils do not use these computers. Even the local community is not involved in the

5.2 ICT Adoption in Malawian Secondary Schools: The view from the ground 186

use of these computers because the numbers are very few.” [RS 29 : 44 - 49]

“Actually as you can see the number of students and the number of computers do not match. Therefore it becomes difficult to teach with such limited resources.” [RS 28 : 47 - 49]

One head teacher summarised the whole situation by indicating that ICT adoption processes in secondary schools are constrained because the majority of these schools *“ have so many students and one simple lab and very few old fashioned computers. ”* [RS 6 : 79 - 80]

In some secondary schools, the environment also exerts pressures that are related to local culture within the adopting context. For example, cultural aspects in terms of masked dancers (*gule wamkulu, nyau or zirombo*) among the Chewa in the Central Region and other Malawian cultural prescriptions particularly in rural areas of Malawi constitute strong environmental pressures which influence and are influenced by ICT adoption processes in these secondary schools. For example, among the Chewa, masked dancers (*Nyau*) have very significant cultural depth. In these societies, young men are initiated into adulthood by (*Nyau*) members and this is the only way through which they can become members of the *Nyau* brotherhood. Being a *Nyau* member has very significant cultural connotations among the matrilineal Chewa societies because it offers Chewa men an opportunity to establish solidarity among themselves regardless of which village they come from. Moreover, it also offers the only culturally acceptable way through which the Chewa men are allowed to access restricted information affecting their lives and their societies. Accessing such information in an unrestricted manner (i.e. outside the initiation ceremony) is

a taboo (*malaulo*) in these societies.

Moreover, in these environments, there are cultural prescriptions which are associated with female sexuality. For example, females are culturally considered impure when undergoing some of their sexual processes e.g. menstruation. During this period, they are not supposed to carry out household chores for the community (e.g. cooking, putting salt into any communal dish etc) and they are also not allowed to handle shared commodities or communal artefacts within the society for fear of *mdulo* (a fatal illness which is culturally believed to be caused by contamination from menstrual blood)

This research finds that these environmental pressures have influenced and have been influenced by ICT adoption processes particularly in rural areas where such pressures are strong (see Appendix I). For example, in these areas, ICT adoption processes whose regulative demands prescribe a one-to-one ratio of male to female pupils in schools and equal access to technological artefacts regardless of cultural prescriptions which prevent female pupils from using shared artefacts like computers at particular times have led to shallow adoptions. Similarly, ICT adoption processes which do not consider the cultural value and restrictions attached to some type of information within local cultures (e.g. the type of information which can only be accessed if one undergoes the *Nyau* initiation ceremony among the Chewa of Malawi) have also yielded shallow adoptions.

Location

The school environment in terms of its location relative to the Malawian telecommunication infrastructure also influences ICT adoption processes in local Malawian secondary schools. For example, this research finds that while all urban schools are covered by and have easier access to the Malawian telecommunications grid and the electricity grid, there are some schools in rural and remote locations which do not have electricity at all.

The telecommunications infrastructure in urban locations exerts less pressure upon the school environment and is more enabling in ICT adoption processes than it is in rural areas of Malawi. Schools in these rural locations experience strong technical pressure in this regard and struggle in their ICT adoption processes due to poor telecommunications infrastructure as several head teachers explained:

“We have ten computers. However, in the absence of electricity we haven’t started using them yet. ” [RS 9 : 2 - 3]

“our school doesn’t have electricity so although computers are provided, they can’t be used, we are out here in the rural areas.” [RS 5: 87 - 88]

On the other hand, in locations where secondary schools are connected to the telecommunication infrastructure, the nature of the underlying telecommunications infrastructure also shapes ICT adoption processes within the adopting secondary schools. For example, schools which are located in places with unstable electricity supply suffer frequent power blackouts which lead to power surges and frequent machine breakdowns as explained by several ICT teachers:

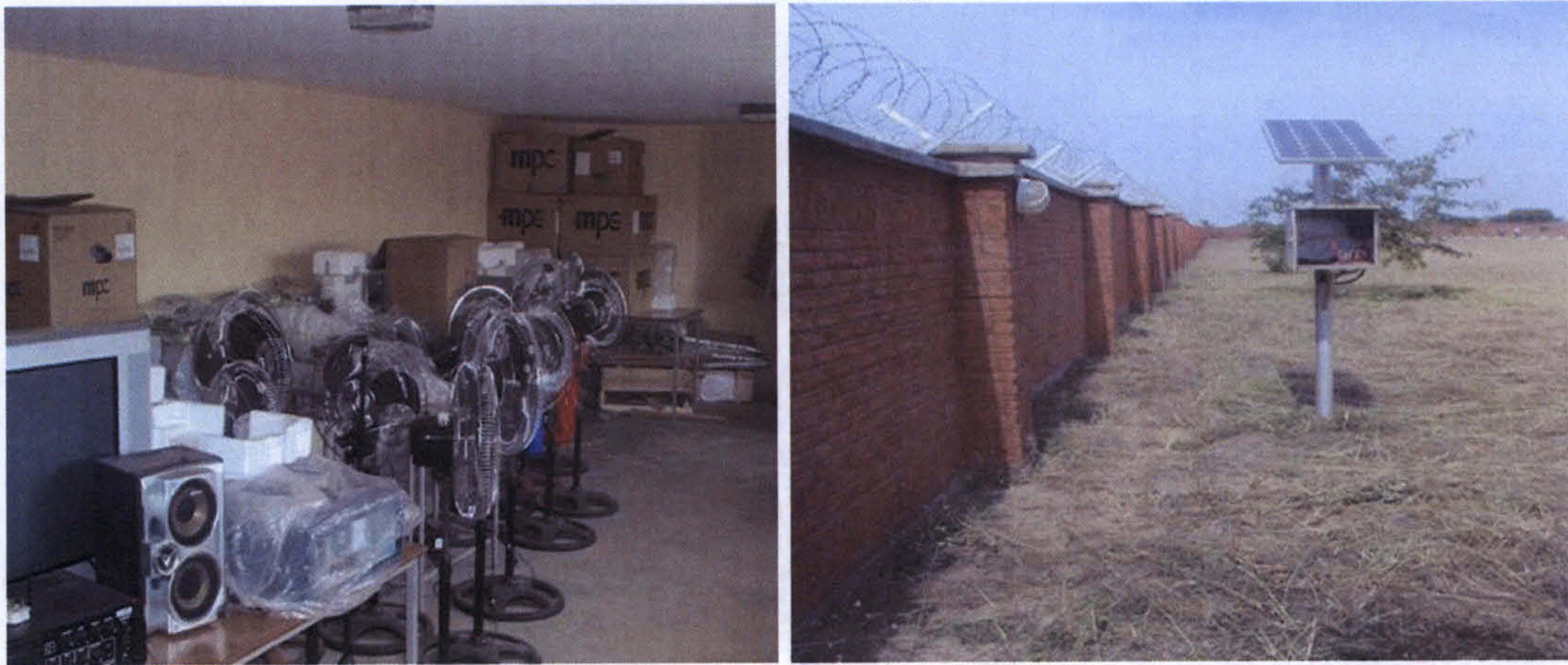


Figure 5.5 Computers at a rural school

“ we do not have any other source of power. We generate solar energy but we only use it for lighting. The power is just too small. ” [RS 9 : 34 - 35]

“another big challenge to us is that we have frequent blackouts and unfortunately we also don't have UPS. This gives us the major problem of frequent breakdowns of these computers.” [RS 24 : 67 - 69]

“even if we try to teach using these ICTs, we find that there is a blackout and that means nothing will happen” [RS 31 : 65 - 66]

5.2.3 Interactions

Within these environments, various network affiliates interact in various ways and at various levels (e.g. ICT suppliers, donors, education authorities, local community, neighbouring schools, pupils, teachers etc) as they adopt particular ICTs. It is through these interactions that secondary schools enact their networks of affiliations amidst various pressures exerted by their environment. This research finds that within secondary schools involved in this research study, interactions shape and are shaped by ICT adoption processes.

For example, as members of particular networks of affiliations within environments, secondary schools are constrained by cultural rules, social routines, regulations etc and they seek to interact in ways that are legitimate throughout the ICT adoption process (Appendix J). For example, this research finds that secondary schools seek to interact in ways that are acceptable and legitimate within their networks of affiliations. Although secondary schools may be aware of, and perceive, the contextual problems which make some prescribed technological options inappropriate within their institutions, they still adopt those technologies in accordance with some rules and regulations within their networks of affiliations. For example, policy documents, the secondary education syllabus and other regulative network demands put emphasis on the importance of adopting and using computers in secondary schools and recipient schools seek to abide by those documents at the expense of their own 'rational' decisions not to have those technologies as some ICT head-teachers explained:

"In the first instance those computers were rejected because we did not have enough room and we did not need them. However, we realised that this decision was a sad development...It was actually a decision by the

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Schoolnet to donate those computers to us and we rejected them...then we said no, such thing cannot be. We need this technology so we had to contact them again. Of course in the first place the donors said no, your school rejected these computers therefore why do you need them now. And we said no, this is new administration and we strongly feel the need to have these computers around and they gave us.” [RS 14 : 152-159]

“...these computers were just being kept in their cartons and when the donor came to visit she asked: why are the computers sitting idle and nobody had an explanation. The donor at that point was kind of disappointed- she felt she had wasted her time... we then quickly set the computers up in this room and ... She was happy... I do not know why they were just sitting idle, but my belief is that nobody was interested in using the computers...”

[RS 2: 128 - 134]

Similarly, regulations and institutional routines which circumscribe the ways in which the adopted ICTs should be used in these secondary schools also influence ICT adoption processes. For example, within these networks of affiliations the use of computers in these secondary schools stresses on equipping pupils with word processing skills (i.e. typing) using the computer. These are skills which are outlined in the syllabus (see Appendix L) and the pupils are examined by the Malawi National Examinations Board (MANEB) on their mastery of these skills both in theory and practice (see Appendix M). On the other hand, uses of computers which focus on supporting teaching and learning processes in view of the existent problems in the Malawian education system receive very low priority. Rules and regulations which govern ICT adoption processes shape and are shaped by interactions within these networks of affiliations as several teachers explained:

Anthony Ziba

November, 2008

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“There is a syllabus for computer lessons and these pupils are taught how to efficiently use computers and how beneficial these computers are in their lives” [RS 30 : 27 - 28]

“...we teach students packages only. That is word processing, excel and access because these are the packages which are on the syllabus...” [RS 12 : 56 - 57]

A view of the nature of the influence of such interactions upon ICT use in these adoption processes within these secondary schools (see fig 5.6) is presented by several interviewees:

“...We teach them things like Microsoft Word and from there we go on to other subjects like Excel and Power-point. We emphasise on word processing and we also teach them keyboard skills. We also have a manual which helps these students on word processing...” [RS 24 : 41 - 44]

“...We teach them computer applications. When we are talking of computer applications software we teach them word processing, spreadsheet and databases. In word processing they mainly are taught how to type, how to write letters using the computer, how to create charts, and so many...” [RS 21 : 38 - 41]

“...we give them exercises where they type word after word. Now the intention is that as soon as they know how to type these words then they will get used to the keyboard and then we start giving them some texts to type and edit” [RS 6 : 98 - 100]

“...word processing is the main one... and pupils have to learn how to use a keyboard and how to use computers.” [RS 17 : 41 - 44]

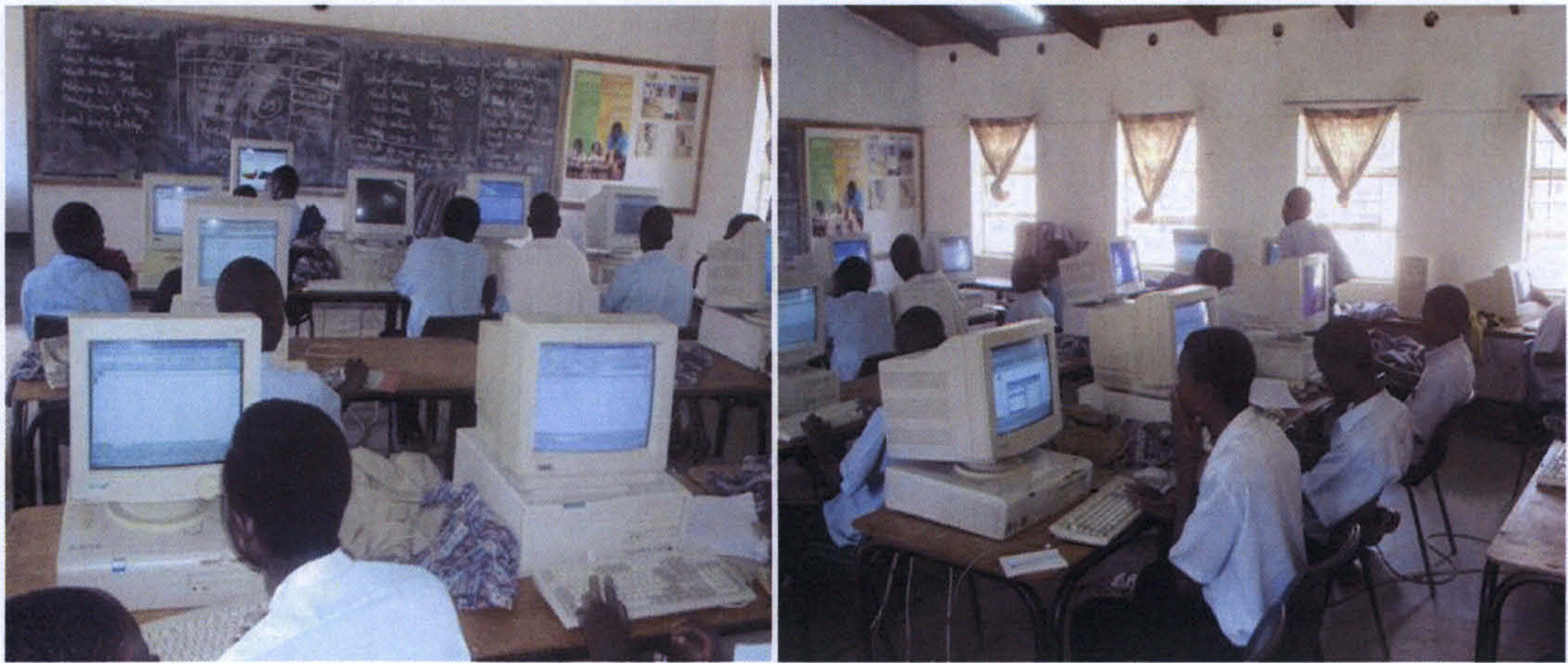


Figure 5.6 Typing lesson in session

“... So that’s all. It’s all about basic skills, how to type letters using the computer.” [RS 10 : 48 - 49]

“...Well if you go anywhere nowadays, you see that computers are involved so pupils need to be trained on how to use those computers... Like here we have typing tutorials which we use and some of the programs are in form of exercises...” [RS 31 : 30 - 32]

Drill and practice software programmes which assist pupils in the acquisition of computer typing skills are installed on computers in some of the secondary schools involved in this research study. Interviewees indicate that they use such packages in order to train pupils on how to type using computers as demanded by the syllabus.

Moreover, regulations within networks of affiliations demand the involvement of the local community in ICT skills training. For example, secondary schools which acquire computers from organisations like Schoolnet Malawi and the British Council

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are advised to involve people from the local community and train them on how to use computers. However, such training must be provided at a fee of MK2500 (approximately GBP10 or USD20) per package.

“Those who want to train from outside the schools are welcome but they have to pay for the lessons ...that’s what we were told by school net. That’s how these courses are run...” [RS 5 : 59 - 59]

Although research data reveals that this is not a viable strategy for sustainability within these environments which have very high financial pressures, some schools seek to act in legitimate ways and struggle to involve the local community.

Research data also emphasize that within their networks of affiliations, secondary schools desire to interact in ways which enable them build or design relationships that facilitate flow of resources. For example, during ICT adoption processes (e.g. donation of ICTs in form of refurbished computers) secondary schools do not want to appear to be *“...looking a gift horse in the mouth...”*. Instead, they strategically accept the technological prescriptions and try to design relationships that could increase their chances of getting more and possibly better technological gifts from the network affiliates:

“ I hope that computers that will be given to schools in future will be those that are in good shape, not those that are out of use. At the moment, we have computers that are no longer used in many places and we teach our pupils on those computers. Now when these pupils go out there they meet different computers altogether so it doesn’t really help. They are treating

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our schools like dumping ground, but we say half a loaf is better than none so we better have them than not .” [RS 11 : 115- 122]

However, although secondary schools seek to use ICTs in legitimate or prescribed ways within their environment and networks of affiliations, they also find it necessary to use the adopted ICTs in other ways in order to accomplish various goals and objectives. For example, when adopting ICTs, some schools interact with their administrative frameworks and find it necessary to implement the adopted ICTs in ways that improve the institution’s administrative efficiency:

“we also compile our grades using computers. We even set our exams on the computer and it is very fast that way unlike using the typewriter.” [RS 31 : 36 - 37]

Traditionally, activities like exam setting, grading and record keeping are done manually in the majority of Malawian secondary schools. For example, in an activity like exam setting, subject teachers set the exams using pen and paper and hand them over to the school secretary who then cuts the stencil using a typewriter. However, after acquiring computers, some schools involved in this research study use computers to excute such tasks:

“Generally, these computers have helped us quite a lot on things like the typing of exams. Because we have actually reduced the workload on the secretary” [RS 11 : 21 - 22]

“ when they want to set exams, instead of giving them to the secretary, teachers do the typing themselves using these computers.” [RS 21 : 73 -

74]

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“We use them for record keeping and for exam printing” [RS 8 : 53 - 53]

“And we also store some information on these computers like enrolment records” [RS 11 : 54 - 58]

As they do this, some of these secondary schools rely on and interact with the institution's regulations and social routines within their environment in order to come up with assemblages of the adopted ICTs which will support the achievement of their local goals and objectives. ICTs become part and parcel of these interactions which shape and are shaped by various socio-technical elements throughout the adoption process.

5.2.4 Identities

This research finds that there are identities (e.g. presentation, culture, multiple identities and profiling - see Appendix K) which influence and are influenced by ICT adoption processes in various ways. For example, in terms of presentation, some secondary schools adopt ICTs in order to construct an identity which presents them as a 'modern' institution among other local secondary schools within the environment. Computers and the Internet are perceived as symbols of modernity and secondary schools which have computers are generally considered 'modern'. This form of presentation influences ICT adoption processes within secondary schools which adopt computers in order to construct their own identity of modernity as some interviewees explained:

"we want to be in line with the events of modern days. Technology is modern, so that's why we had to get it here we want to be modern" [RS 21 : 24 - 25]

"We have to be part of the world technology... to join the highway to knowledge, to gain access to information, to employment and to almost everything. That's why we must have these computers. It's a must nowadays to have these technologies! It's surely a must." [RS 18 : 26 - 28]

Similarly, secondary schools also use ICTs to construct identities which characterize particular aspects about their institutions. For example, secondary schools use ICTs to highlight their level of ability to use computers and present their schools and their members of staff as technologically competent and advanced. Such an identity shapes, and is shaped, by the way in which ICTs are used within the adopting secondary

5.2 ICT Adoption in Malawian Secondary Schools: The view from the ground 198

schools. For example, secondary schools in this research study - particularly those which are privately owned - use ICTs in order to construct identities which give them competitive advantage over other secondary schools. These schools use computers to appear more technologically competent and advanced than other schools which do not do the same. Having such an identity is beneficial to these secondary schools in terms of enrolment numbers and subsequent revenue to the school itself:

“This is an international school so using computers is part of advertisement. We want people to know that this is a very good school. We have two categories of streams here. One stream sits for IGCEs and the other stream sits for local exams so normally we use computers for IGCEs to teach them because they sit for international exams. So we use them much for those taking IGCEs than the local ones.”[RS 28 : 20 - 23]

As affiliates within various networks of affiliations, secondary schools and their members have multiple identities which influence ICT adoption processes in these secondary schools. For example, at local and national level, secondary schools and their members also draw upon social and professional identities within Malawi and this research finds that such identities influence adoption processes in these secondary schools. For example, in Malawi, the acquisition of ICT skills and the ability to use computers are associated with the elite (*mabwana or azungu*). Usually, these are people who have the potential to secure, or have already secured, office jobs (or white collar jobs) which, to a large extent, require the ability to use computers. On the other hand, lack of ICT skills or inability to use computers is associated with people who do jobs in line with manual labour. Locally, such people are perceived as the ‘unrecognised commons’ (*anthu wamba or azimwale*). Secondary schools and their

members draw upon these identities when adopting computers:

“People that are computer literate are very marketable after completing secondary school as opposed to those who do not. Most of them were also aware that after school it would be very difficult for them to learn computer because in private colleges these courses are very expensive they could not afford them. So we thought it wise not to deny them that chance now.”

[RS29: 35-40]

“...jobs nowadays require computer skills. So if they have some computer skills then they have a big advantage securing good jobs...” [RS 27 : 44 - 45]

This emphasizes that within Malawi, ICTs have components of various forms of identities for individual pupils and schools which shape and are shaped by ICT adoption processes.

On the other hand, identities also heighten socio-cultural tensions within the adopting secondary schools, and shape ICT adoption processes. For example, this research finds that some of these secondary schools associate the acquisition and use of computers with elitism and perceive the use of computers as alien and not aligned to their own culture and way of life as one head teacher explains:

“ there are some teachers and students who are not interested and they say ahhhh no these things are for ‘azungu’ [the elite] and we don’t need them” [RS 4 : 42 - 43]

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Similarly, some local secondary schools resist this 'elitist' identity. Instead, they seek to maintain or safeguard their socio-cultural identity and protect their cultural values. For example, some schools view computer use and the provision of Internet access as a threat to their culture and contrary to the socio-cultural demands within their environment. Such schools express fear that the Internet contains a lot of information some of which may not be culturally suitable for secondary school pupils and that if pupils are allowed to access the Internet through the use of computers then their cultural values would be compromised. In relation to this, one head-teacher described the challenges which his school faces in the adoption of computers as a blessing in disguise:

“ On the use of the Internet errr errr our main advantage is poverty. Not many people can afford to sit and go on the Internet...especially for the youth if they are not guided properly, yeah they can go for the wrong things on the Internet. So I would say, it's okay that we don't have it ”

[RS 2 : 202 - 212]

This research finds that, secondary schools which face strong cultural pressures from their environment are located in rural areas. These areas have a largest percentage of people who are functionally illiterate. In Malawi, such people are regarded as common, poor, uncivilised and backward - (*anthu wamba*). The majority of them lack basic functional literacy skills and belong to the most miserable class of Malawians. On the other hand, people who have attained secondary school education are generally considered civilised and belong to the affluent category of the society, the elite (*ophunzira*). They can read and write, they can speak and understand English (see country background - chapter 2).

5.2 ICT Adoption in Malawian Secondary Schools: The view from the ground 201

In such environments, and contrary to some regulative affiliation demands which perceive computers as key to modernity, ICT adoption processes in these secondary schools have shaken the local social edifice in many ways and have led to tensions between various communities and classes of people. For example, computer use within these contexts has led to the amplification and exaggeration of the social gap between common people (*'anthu wamba'*) and the elite (*'ophunzira'*) as some teachers indicated:

"Errr sometimes when the community looks at people who have gone to school, they tend to have a negative attitude towards them. They regard them as arrogant people and people who are not compatible with them in the society. That's how the local community around here regards people like us" [RS 10 : 64 - 67]

" people from the local community errr they are not literate. They are computer illiterate we can't allow them to use our computers. Moreover we have not received a request from them" [RS 11 : 80 - 81]

In addition to this, the adoption of these computers has also led to the invention of other differences between secondary schools and the surrounding communities. There are cases of souring relationships between schools that have adopted computers and the surrounding villages. For example, instances in rural areas where masked dancers (*nyau dancers or zirombo*) are part and parcel of the local cultural fabric (see Appendix K) reveal that the adopted ICTs have invented extra differences between the surrounding villages who uphold masked dancers (*nyau / zirombo*) and secondary schools which take pride in computers and their associated skills:

5.2 ICT Adoption in Malawian Secondary Schools: The view from the ground 202

“ Moreover, around this area, the relationship between the local community and the school is sour and in a situation like this one, it becomes very hard to involve the local community. ” [RS 10 : 57 - 59]

Thus, computers are like symbols of modernity and social superiority whereas masked dancers are looked at as symbols of backwardness and lack of modernity.

5.3 Conceptualising ICT adoption processes in Malawian secondary schools

The analysis of research findings presented in the previous section demonstrates that ICT adoption processes in Malawian secondary schools do not occur in isolation. Instead, they are embedded in a complex mesh of socio-technical networks which influence and are influenced by these ICT adoption processes. The findings illustrate how affiliations, environments, interactions and identities shape and are shaped by these ICT adoption processes (see section 5.2) and present a clear view that ICT adoption in these secondary schools can not be sufficiently understood from any 'one-size-fits-all' model which perceives ICTs as isolated from their context of use.

Concepts from the social theory of literacy help in developing a socio-technical understanding of ICT adoption processes in these secondary schools. In this section, research findings are discussed from a socio-technical perspective in order to conceptualise how affiliations, environments, interactions and identities shape and are shaped by ICT adoption processes in these secondary schools.

5.3.1 Affiliations, Environments, Interactions and Identities and ICT adoption processes in Malawian secondary schools

ICT adoption processes in these secondary schools are part of networks of affiliations which have various forms of affiliation demands. Just like literacy, ICT adoption processes are situated in broader social contexts which have socially constructed rules and

regulations that shape and are shaped by those processes. The concept of discourse in literacy theory helps to explain how affiliation demands influence ICT adoption processes in these secondary schools. Research findings demonstrate that regulative and normative demands in these networks of affiliations play two significant roles of constructing network affiliates (i.e. making them conform to the discourse surrounding computer literacy) and limiting the range of possible options (or degrees of freedom) available to those network affiliates. In all networks of affiliations involving secondary schools in this research study, there is discourse (talk or text) surrounding computer literacy which assumes certain knowledge, values and beliefs in the reader and consequently offers only a particular range of possible options which the reader can take up. For example, in the majority of secondary schools involved in this research study, discourse surrounding ICTs assumes particular attributes in the adopters and offers limited range of possibilities based on those assumptions. Thus, discourse can be seen to present limited technological options to local secondary schools by simply focussing on and promoting the adoption of refurbished computers. Although there are potentially various other technological options which can be adopted for use within these secondary schools, the adoption of computers is continuously being pushed up the agenda in many networks of affiliations involving these secondary schools.

Moreover, this research finds that within these networks of affiliations, discourse is carefully aimed. For example, in these secondary schools, discourse attempts to exhaust all potential objections in advance by justifying the adoption of computers and citing threats associated with lack of computer adoption within these secondary schools. Such attempts are also seen in numerous policy papers (*e.g. Malawi ICT Policy Document, Poverty Reduction Strategy Paper*) which link particular ICTs to socio-economic development and lack of it to underdevelopment in LDCs like Malawi. In

these documents, various members in these networks of affiliations attempt to pack or mobilise as many believers, supporters or links (e.g. head-teachers, secondary schools, local authorities, success stories etc) inside the discourse. The concept of 'positive modalities' (Latour, 1987) as it relates to discourse helps explain how this happens within networks of affiliations which involve local secondary schools in Malawi. Discourse draws upon experiences from other contexts which have adopted ICTs and are perceived to be making incredible socio-economic progress by various network affiliates and

“...build a little story in which something incredible (the hero) becomes gradually more credible because it withstands more and more terrible trials”

(Latour, 1987, p. 53) within these networks of affiliations.

This research finds that discourse which circumscribes the majority of ICT adoption processes in these secondary schools assume the nature of prescriptive affiliation demands. Such prescriptive discourse makes it difficult for recipient schools to critically engage with the underlying influences which shape and are shaped by these ICT adoption processes because doing so does

“...not only mean courageously fighting masses of references, but also unravelling endless new links that tie instruments, figures and [discourses] together...” (Latour, 1987, p 49)

in these networks of affiliations. As such, the prescriptive discourse influences local schools to naively accept the adoption and use of computers as necessary. Thus

demeaning and suppressing cultural and critical forms of ICT literacy.

Within these networks of affiliations, discourse forms a backbone of how local schools conceptualise ICTs and how they are part and parcel of ICT adoption processes which can not be isolated from the social context within which they are embedded. The concept of literacy practices helps explain how such perceptions shape, and are shaped by, ICT adoption processes by providing a link between these ICT adoption processes and the discourse which underpins them within the social structures which embed those adoption processes. In these secondary schools, ICT literacy practices are a result of discourse within networks of affiliations. This means that in these networks of affiliations, local secondary schools draw upon various discourses in order to come up with particular perceptions which they employ in their ICT adoption processes. Thus ICT literacy practices include the adopters' awareness of discourse and constructions of ICT literacy, how they talk about and make sense of ICTs.

As an ICT literacy process, technology adoption processes in these secondary schools involve motivations, attitudes, values and expectations which are all constructions of various ICT for development discourse e.g. how local schools and other network affiliates talk or feel about their ICT adoption processes.

This research finds that the way in which these secondary schools make sense of their ICT adoption processes is also part of the local school environment and that values, motivations and beliefs which underlie their adoption processes shape and are also shaped by various pressures within the school environment (see Appendix I). The concept of 'discourse community' (Barton and Hamilton, 1998) illustrates how various environmental pressures shape and are shaped by ICT adoption processes in different secondary schools. As discourse communities, these schools exist as

“groups of [network affiliates] who have [discourses] and practices in common ... can refer to several overlapping groups e.g. [affiliates] a [discourse] is aimed at, [affiliates] who read [the discourse], or [affiliates] who participate in a set of discourse practices both by reading and writing [them]” (Barton and Hamilton, 1998, p.57).

In these discourse communities, people have cultural norms, ways of life, social routines etc which constitute some of the environmental pressures in their ICT adoption process. This research finds that not all secondary schools in this research study face or experience uniform pressures. Instead, different environments or discourse communities face different degrees and types of pressures which shape and are shaped by ICT adoption processes in many different ways. For example, discourse communities which draw upon particular forms of discourse and generate literacy practices that perceive computers as ‘objective and almighty tools’ which can be used in any discourse community anywhere in the world to achieve technological gains, experience more severe environmental pressures than those which perceive ICTs from a socio-technical perspective.

Technology adoption processes in these secondary schools or discourse communities, just like computer literacy processes, shape and are shaped by literacy practices which influence the interactions that happen among network affiliates throughout the adoption processes within a discourse community. The concept of literacy events helps explain these interactions which occur in these secondary schools. As activities where discourse plays a role, literacy events arise from literacy practices and are one way through which the underlying motivations, values, beliefs and perceptions which people have about computer literacy discourse are revealed.

In this research study, interactions which shape and are shaped by ICT adoption processes in these secondary school institutions are usually part of routine sequences and belong to or exist as part of social routines, regulations (Appendix J). This means that interactions which shape and are shaped by ICT adoption processes in these secondary schools do not happen in isolation. Instead, they influence and they are influenced by cultural rules, social routines, regulations, expectations and other forms of socio-technical elements within the adopting context or discourse community.

This research finds that discourse communities or secondary schools which adopt computers as a result of prescriptive discourses or affiliation demands which do not appreciate the socio-technical nature of ICTs have literacy events which are not aligned to the discourse community itself and face a lot of environmental pressures within the adopting context. Such pressures adversely influence the adoption process within the adopting discourse community:

“...I do not know where they get these things. They just distribute them to schools but they do not make an effort to make a follow up err...errr...they don't know what is happening...but they should be asking themselves ‘are we assisting or not?’ otherwise they are just taking this as a dumping place...it would be better for them to make a follow up and if they find that they are not being useful then find out what's the problem ... ” [RS 4 : 89 - 93]

On the other hand, discourse communities which adopt ICTs as a result of a critical analysis of socio-technical influences which shape and are shaped by ICT adoption processes, have literacy events which are more aligned to the discourse community itself and face less environmental pressures.

5.3.2 Literacies, Thin STINs, Rich STINs and ICT adoption processes in Malawian secondary schools

Therefore, as socio-technical processes, this research finds that ICT adoption processes in these secondary schools or discourse communities occur in Socio-Technical Interaction Networks (STINs) which can either be thin STINs or rich STINs (Lamb and Kling, 2002). This research finds that rich STINs involve analysis of literacy practices and their underlying discourse with respect to the ICT adopting context. Thus, rich STINs appreciate that ICT adoption processes in adopting secondary schools shape and are shaped by various socio-technical influences. Just like any literacy process, ICT adoption processes in rich STINs are conceptualised as comprising of three main dimensions: critical, cultural and functional. Although the three dimensions have different characteristics and roles in these adoption processes, they are inextricably interlocked and none of them is more superior than the other. In this research study, ICT adoption processes within rich STINs take into consideration all these three dimensions of computer literacy simultaneously.

For example, when adopting technologies for use in their institutions, network affiliates make use of discourse and their associated literacy practices. However, these literacy practices are socially constructed and serve the interests of particular affiliates in these networks. The critical dimension of the literacy framework in rich STINs enables network affiliates to critically engage with those socially constructed literacy practices that underlie their technology adoption processes. By involving networks of affiliations at individual level, and by facilitating relationships which are both continuous and multi-valent, rich STINs provide ICT adoption processes where "...men and women deal critically and creatively with reality and discover how to participate

in the transformation of their [own] world” (Freire, 1993, p.16).

This research finds that individual networks of affiliations which exist in rich STINs provide an empowering element and enable deep adoption processes by providing local secondary schools with the autonomy to actively participate in their own ICT adoption processes and influence those adoption processes in ways that offer value to the recipient schools. For example, this research finds that in rich STINs the decision to implement computer based technologies is a result of a dialogical process among various network affiliates (e.g. head teachers, technicians, suppliers of the technologies, ICT teachers etc) within the adopting school. Largely, the suppliers of these technologies are members of various aid or charitable organisations who are directly linked to, and form part and parcel of, the adopting institution (i.e. affiliates of individual networks of affiliations).

In rich STINs, the adoption processes are shaped by discourse which focuses on ‘empowering’ local secondary schools with relevant skills to adopt, use and sustain particular technological. The critical dimension of literacy, therefore, forms the basis for ensuring that recipient Malawian secondary schools are not mere participants or passive spectators in these adoption processes but become active participants in reading, understanding, writing and re-writing discourses in a manner which is relevant to their own situation:

“But I am only here on a temporary measure you know and that’s my role here to train people up and then to step aside and go away back to my home country ...I believe that I am here on a partnership role ... and we are seeking to help each other through. I hope in the near future to pass on the computer notes and the keys and let somebody else take it on because

that's empowerment of people and that's the way it should be..." [RS 26
368-381]

Moreover, rich STINs also appreciate that in order to employ the critical dimension of literacy, the ICT adopting secondary schools also need to possess the ability to understand how various ICT options operate and their corresponding technical requirements. As such, rich STINs employ the functional dimension of literacy in order to address issues related to institutional capacity to use a particular technological option. This research finds that rich STINs enable local secondary schools to consider their competencies in terms of human, financial and technical capacities in order to effectively support deep adoption processes and sustainable use of a particular technological options. For example, this research study shows that in rich STINs, secondary schools analysed the availability of human resources and their skills base, financial resources and their technical infrastructure in their adoption processes.

While considering the capabilities and competencies to adopt and use ICTs, rich STINs also employ the literacy framework in order to provide recipient secondary schools with the ability to assess the value of adopting and using those technologies within their institutions. As adopting secondary schools critique the underlying literacy practices or discourses and assess their capabilities to adopt and use ICTs (using functional and critical dimensions of literacy), rich STINs provide them with the cultural dimension of literacy which further enables them to consider the value of the adopted ICTs in their institutions and local contexts.

Rich STINs in these secondary schools consider the value aspect of ICT adoption and use. They appreciate that as a socio-technical process, it is not just a matter of adopting and using ICTs but of adopting and using ICTs with regard to the

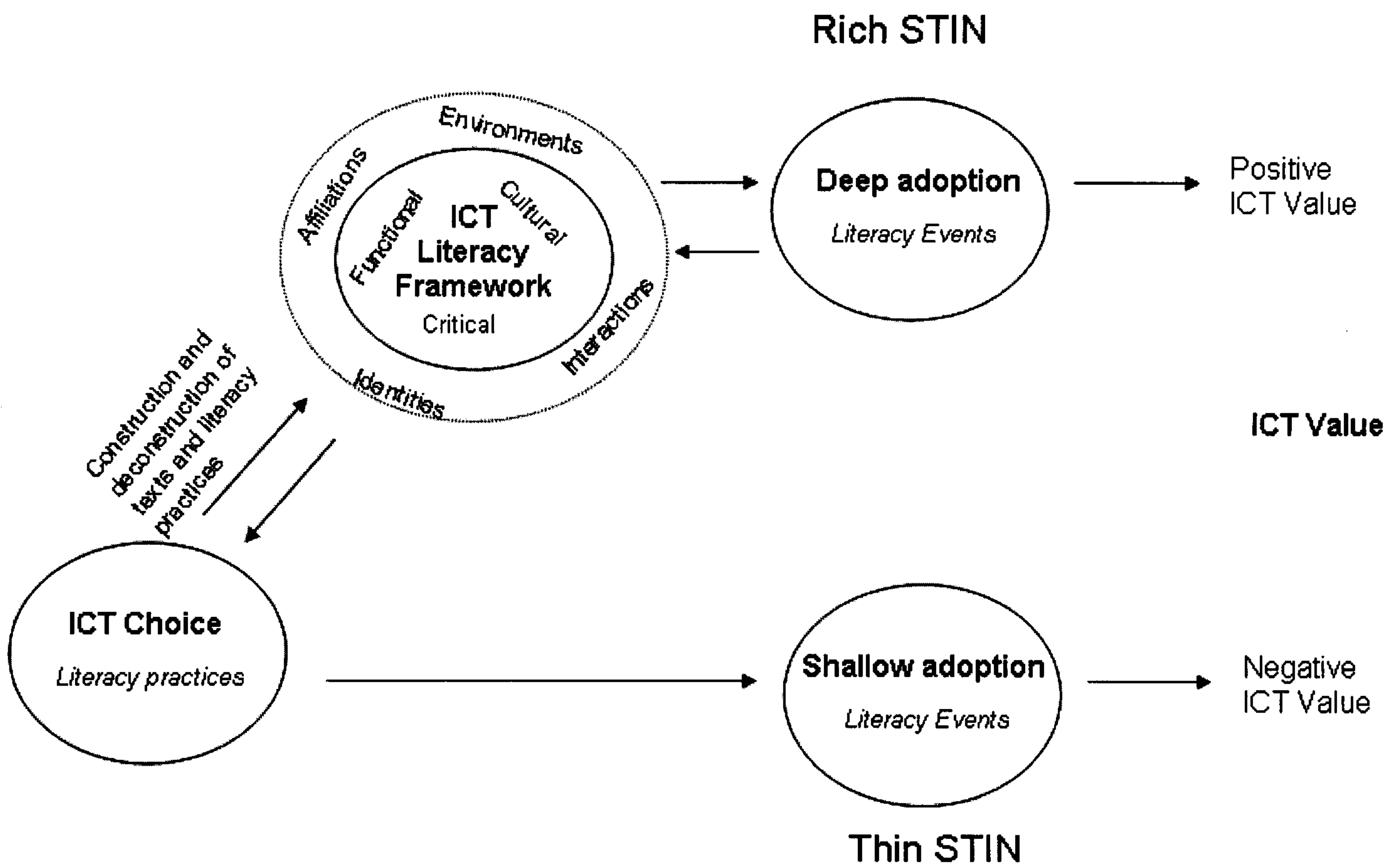


Figure 5.7 ICT adoption processes in Malawian secondary schools

meaning they make within the adopting context. In order to be appropriate, the adopted ICTs need to have some positive meaning or value. The cultural dimension of literacy enables the adopting secondary schools to assess the adopting contexts and unravel critical elements which makes for appropriateness or inappropriateness of particular technological options.

This research finds that when the ICT adoption process is deprived of any of these literacy dimensions, the other dimensions suffer as well and the whole process leads to thin STINs and shallow adoption.

On the other hand, thin STINs have high prescriptive demands or discourses which remove local autonomy and bypass active involvement of local secondary schools (e.g. headteachers, ICT teachers, administrators etc) in the adoption processes (e.g. selection and choice of ICTs). In thin STINs, ICT adoption processes are based on a tool-perspective understanding of ICTs and do not appreciate socio-technical parameters within the adopting schools:

“we did not have any consultation or communication from the ministry of education or the British Council...” [RS10: 43-44]

“ the idea came from the British Council ...” (RS 7, 10-10)

“ it was actually a decision by Schoolnet Malawi ” (RS 14, 145 - 146)

This research finds that in thin STINs, ICT adoption processes are mono-valent and only focus on technological artefacts themselves without paying attention to other socio-technical parameters within the adopting context. For example, in the majority of secondary schools involved in this research study, adoption processes emphasise

the adoption and use of ICTs in order to promote functional literacy among recipient secondary schools regardless of the socio-technical context within which those ICTs are embedded. This is done at the expense of cultural and critical dimensions of computer literacy. Instead of socio-technically analysing their technological options and choices, secondary schools in thin STINs are simply prescribed technological artefacts in form of computers together with some prescriptive demands on how those computers must be used within the adopting institutions.

This means that ICT adoption processes in thin STINs do not involve active involvement of the recipient secondary schools for whom ICT choices are made. Instead, emphasis is put on simple 'supply' of refurbished computers based on non-participatory top-down approaches in these secondary schools. This research finds that adoption processes which are based on thin STINs experience a lot of pressures and lead to shallow adoptions which pose various risks upon the adopting secondary schools. For example, this research finds that in these secondary schools, thin STINs do not allow for critical reflection or action in their adoption processes and do not make positive contributions within the adopting local schools. And as Freire (1993) observed:

“... When a word is deprived of its dimension of action, reflection automatically suffers as well; and the word is changed into idle chatter, into verbalism, into an alienated and alienating blah. It becomes an empty word, one which cannot denounce the world, for denunciation is impossible without a commitment to transform, and there is no transformation without action...” (p68)

This means that instead of contributing positively towards socio-economic progress, thin STINs and shallow adoptions act as breeding grounds for more socio-economic

problems within these schools.

Moreover, in the absence of a socio-technically based critical reflection over ICT adoption processes in Malawian secondary schools, various 'limit situations' (Freire, 1993) become more pronounced. For example, ICT discourse which equates lack of computers in Malawian secondary schools to underdevelopment present a 'limit situation' whereby the adopters become trapped in a technological lock-in which perceives computers as the only ICT option and the only key to socio-economic progress. Such situations pose a risk of preventing local secondary schools in Malawi from critically engaging with their situation and acting upon it in order to transcend these limit situations and explore other technological options (the untested feasibility) which might be more relevant and reflective of their own actual situation.

The conceptualisation of ICT adoption processes in these secondary schools based on theoretical concepts from literacy and STINs, illustrate that ICT adoptions are not isolated processes and can not be conceptualised from the one dimensional 'autonomous' or 'tool-perspective' point of view. Instead, these processes occur in a complex mesh of socio-technical elements which interact in so many complex ways. Such a conceptualisation offers great opportunity for various network affiliates to reflect on their ICT related initiatives and those of people around them and to "become more aware of [those initiatives], in order to understand and, if necessary, resist, challenge and change them." (p.49).

5.4 Summary of the developed socio-technical framework

The context based definition of literacy suggests that what counts as a valuable form of literacy in one context may not necessarily be valuable literacy in another context. Moreover, it has also been discussed that the promotion of literacy in any particular context is linked to social relationships that are characterised by influences of social power. Within these social contexts, therefore, literacy practices may possibly be promoted to meet the ideas and objectives of the ‘powerful’. Within social contexts some literacy practices (and literacies) are supported and promoted while others are demeaned and suppressed (Maclaren and Lankshear, 1993).

However, in order to have some meaningful value, Freire (1993) argues that literacy should be looked at as a means of empowering people through a conscious context specific approach and not simply through a desire to impose technological or literacy skills and socio-economic progress. Literacy is there to “change people from objects to subjects within their own history and, ultimately, to transform all structures of oppression” (Graddol, Maybin and Stierer 1999, p.101). In this regard, he suggests that those who embrace the socially constructed literacy practices should also be able to perceive the social, political and economic contradictions associated with embracing particular literacy practices within their local context. This is what Freire (1993) has termed the deconstruction process of literacy practices.

For the deconstruction phase to yield valuable outcomes, critical reflection and action among the adopters are crucial. Freire (1993) suggests that through critical reflection, societies begin to perceive alternative ways and options of addressing the shortfalls

associated with their ICT literacy initiatives and acquire the ability to stand back and rewrite their 'world'.

The developed framework highlights that ICT adoption processes that employ all the three forms of cultural, critical and functional literacies in order to construct and deconstruct ICT literacy practices and texts which underlie ICT choices in Malawian secondary schools are more likely to engage rich STINs that would result in deep ICT adoption processes and more positive ICT value for the adopting context. ICT adoption processes that involve such constructions and deconstructions of texts and literacy practices are more likely to perceive ICTs as being inextricably interrelated to the context within which they are adopted for use i.e. ICTs as being social shaping and socially shaped. Through these constructions and deconstructions, adopters become aware of the situated nature of ICTs and perceive their adoption processes as occurring in networks of affiliations which are embedded in environments with various types of pressures and involving complex interactions among so many stakeholders who have or share various identities. Research data suggest that such socio-technically rich ICT perceptions underpin ICT adoption processes in rich STINs and subsequent positive value of the adopted ICTs in the adopting context.

There is also a very strong link between lack of construction and deconstruction of ICT literacy practices based on all three forms of literacy and negative ICT value within the adopting context. Almost two thirds of the schools indicated that their ICT adoption processes did not include construction and deconstruction of literacy practices and texts. Their engagement of thin STINs and the resulting shallow adoptions and negative ICT value are consistent with a 'tool-perspective' understanding of ICTs as opposed to a socio-technical understanding of ICTs as 'society shaped and society shaping'. Such ICT adoption processes are usually underpinned by 'off-the-

shelf' ICT literacy practices and rhetoric surrounding ICT adoption for development in LDCs and are more likely to promote adoption of ICTs that are not well aligned to the adopting context. Hence, such adoption processes pose a real conflict between the idea of promoting development through the adoption of ICTs and the negative ICT value resulting from these rhetoric-based shallow ICT adoptions within the adopting secondary schools.

The majority of the schools involved in this research study had ICT adoption processes that did not involve iterative construction and deconstruction of ICT literacy practices and texts. These schools typically had shallow ICT adoptions in thin STINs and their adoption processes resulted in negative ICT value. Their ICTs (re-furnished computers) were commonly adopted to be used as tools for teaching word processing skills regardless of whether the adopting context (schools) had relevant contextual parameters to justify an appropriate technological fit. Both adopters and suppliers (donors in most cases) base their ICT expectations on deterministically perceived opportunities presented by ICTs, computers in particular. These computers are perceived as a 'must-have' tool which are very effective when used to stimulate socio-economic development.

5.4.1 Meeting the Malawian challenge of adopting ICTs for educational purposes

This research has revealed that in Malawi, one of the major challenges as far as ICT adoption processes are concerned is lack of local deconstruction and construction of ICT literacy practices and texts which underpin adoption processes i.e. local focus.

Secondary schools are faced with the challenge of interpreting global and national

level ICT policies to best serve their own school's agenda and value objectives. For example, the school's interpretation of ICT value in relation to education, cultural inscriptions, social values and community life differs markedly in various geographical and regional locations across Malawi. However, the national ICT policy in Malawi does not appear to appreciate these critical variations by advocating a wholesale 'one-size-fits-all' approach in the adoption of ICTs for educational purposes e.g. promotion of the adoption of refurbished computers in all secondary schools.

The framework developed in this research study proposes the deconstruction and construction of literacy practices through the use of the literacy model. The practical application of this framework in any secondary school, involves a 'what', 'why' and 'how' approach in order to understand and appreciate the ways in which the adoption of particular ICTs and their subsequent use may be well aligned and appropriate in the context of an individual school.

5.5 The Gap

It is noted in this chapter that the view presented by data obtained from the questionnaire survey has some differences from the view which emerges from the field work. This section of the thesis presents a discussion of those differences and attempts to contribute to an understanding of the strengths and weaknesses of data collection techniques in research studies of this nature within LDC contexts e.g. Malawi.

With respect to the nature of computer use in Malawian secondary schools, responses from the questionnaire present a view that in the majority of these secondary schools, the acquired computers are used for teaching and learning purposes. When asked to indicate the frequency of use and the type of pupils who have access to these computers, most of the survey respondents indicated that pupils in junior classes (i.e. form 1 and form 2) access these computers at least once a week and that pupils in senior classes (form 3 and form 4) access the computers more than once a week. From the questionnaire responses, a positive picture emerges that there is a substantial number of secondary schools which have acquired computers in Malawi and are able to use those computers for teaching and learning purposes in all the classes. However, interviews and observations present a view that the majority of secondary schools which have acquired computers in Malawi meet a lot of challenges which influence the way in which they use their computers. While questionnaire data suggested frequent computer use across all the classes, interviews and observations reveal a relatively polarised and rather disappointing picture which indicates that access to these computers is mainly given to senior pupils (i.e. those in form 3 and form 4) who often use these computers in an unpredictable pattern due to a cross section of socio-technical influences which prohibit use. Moreover, while some

questionnaire responses indicated that people from the local community are allowed to use the acquired computers, interviews report that such use is problematic and is hampered by a cross section of socio-cultural challenges.

A somewhat perplexing set of data concerns some schools whose questionnaire responses indicated that they use their computers for teaching and learning in all the classes within their institution. However, field visits and interviews showed that these schools do not use those computers at all. They just keep them.

With respect to the availability of qualified ICT personnel in these secondary schools, questionnaire responses present a view that the majority of secondary schools which have acquired computers in Malawi also have qualified personnel to use, support and maintain computers in an educational setting. However, field work brings to the fore a clear view of acute shortage of qualified ICT personnel with relevant skills and knowledge to use, support and maintain computers in these secondary schools.

The view on the machine to pupil ratios portrayed by the questionnaire data shows some differences from the ratios observed during the field visits. While the majority of schools had earlier on provided data which suggested that they had adequate machines and machine to pupil ratios of as high as 1:15, observations showed that the majority of schools in Malawi have few computers and very low machine to pupil ratios. To a large extent, empirical data reveal that the machine to pupil ratios in these secondary schools range between 1:30 and 1: 120. This translates to an average of 1 machine for every 75 pupils. Moreover, although 9 secondary schools claimed to have computers which were running on later versions of the Windows operating system in their questionnaire responses, school visits showed that only two of those secondary schools actually had computers running on Windows XP.

The researcher's personal experience and research observations confirm that there are underlying influences within Malawian secondary schools which account for such discrepancies between questionnaire data and field data. To a large extent mail in Malawian secondary schools is handled and managed by secretaries. When questionnaires are sent to these schools, it is secretaries who usually provide responses on behalf of head teachers. Although the questionnaire in this survey clearly asked for responses from relevant IT personnel or key decision makers, interviews indicated that although some questionnaires were signed off by head teachers or other key decision makers, the actual responses were filled in by secretaries. Largely, secretaries in these schools did not have adequate knowledge and information to respond to some of the questions. For example, when asked about the type of operating systems on their machines, some respondents indicated that their schools had machines running on versions of the Windows operating system which do not exist at all.

Moreover, Malawian secondary schools have a tendency to present a positive view of progress within their institutions and the whole Malawian education system even if such is not the case. Since the questionnaire carried an endorsement from the Malawi Ministry of Education, some schools appeared to be attempting to portray a progressive image to the national educational authorities.

Although not clearly established in this research study, there is a possible historical link between this tendency to give positive feedback and the 30-year-dictatorial rule of Dr Hastings Kamuzu Banda whose legacy still lives on in Malawi. During his rule (1964-1994), any comment which carried negative connotations about Malawian development was viewed as a direct attack on his leadership and invited punitive consequences. Secondary schools also had a fair share of such politically motivated problems. In early 90s the 'Kwanu-Nkwanu' events (see chapter 2: Country Back-

ground) instilled fear among a lot of Malawian secondary school teachers. During school visits, such fear could still be perceived among various respondents. For example, interviewees in some schools asked the researcher to produce further documents to prove that the information being sought was not for political reasons and to assure them that they will not be in trouble for participating in this research study. On the other hand, this also highlighted the significance of the researcher's understanding of the local context. Being a local national with background knowledge about Malawi and a former secondary school teacher in Malawi, enabled the researcher to build trust among the interviewees. The researcher observed that when conducting research in LDC contexts like this one, such trust enabled and facilitated the collection of data which would have otherwise been difficult to access.

Some generally accepted limitations associated with the survey instrument could also have played a role in contributing to some discrepancies between survey and field data. For example in light of limited respondents base for conducting pilot tests, the questionnaire design phase missed out on the opportunity to eliminate some not-so-obvious communication problems in the questionnaire. The differences between questionnaire responses and field data show that some respondents in Malawian secondary schools did not get a clear meaning of some of the words that were used in the questionnaire. For example, some respondents did not have a clear idea of an IT specialist and the majority of them had various meanings and conceptions of an IT specialist. School visits revealed that some of those who were being referred to as IT specialists in questionnaire responses were teachers who simply had basic knowledge of how to switch on the computer and use it for typing.

These research findings in relation to the discrepancies between the two views emerging from questionnaire data and the field data, highlight the significance of mixed

methods research approach when conducting research which investigates ICT adoption processes in LDC contexts. In this research study, such an approach ensured data quality and validity by enabling the researcher to compare various sets of data through triangulation (see section 4.2.4 of this thesis).

Chapter 6

Conclusion

Introduction

The main objective of this research study was to develop a deeper socio-technical conceptualisation of ICT adoption processes in Malawian secondary schools. In order to generate such an understanding, the research focused on three main research facets of ICT choice, use and, value in these secondary schools.

Methodologically, the research employed questionnaire survey, qualitative interviews, observations, review of documents and photographs as its data collection tools. The analysis of collected data involved a form of content analysis and used STIN models in order to systematically analyse collected data and generate a socio-technical conceptualisation of ICT adoption processes in Malawian secondary schools. This means that the research employed both qualitative and quantitative methods and hence adopted a mixed-methods approach. The research argues that ICT initiatives in Malawian secondary schools are more likely to yield valuable outcomes if their

adoption processes are based on rich STINs which appreciate the socio-technical nature of ICTs and the significance of various socio-technical parameters within the adopting secondary school.

This chapter of the thesis is aimed at concluding this research project and it is divided into five main sections. Section one reviews the thesis chapters and analyses the significance of each chapter in relation to the research questions, aims and objectives. Section two analyses the research's main contributions in three main aspects: theory, method and practice. Section three of this chapter revisits the research questions. Section four analyses some of the research limitations as observed by the researcher and, section five provides suggestions for further research work in relation to this research study.

6.1 Research Overview

The research topic has been introduced and outlined in chapter one of this thesis, the introduction. The chapter begins by discussing the nature of the research problem and establishing the research scope and main focus. Despite a huge volume of literature which talks about numerous socio-technical challenges facing LDCs in trying to implement ICTs in various sectors, many LDCs and development stakeholders have embarked on a campaign to promote the adoption and use of ICTs in order to contribute towards socio-economic progress of these LDCs. Education is one major area of development where the promotion of such ICT uptake is emphasised in these LDCs. Chapter one, therefore, discusses literature surrounding the research scope which covers three main subject areas: ICTs, Development, and Education.

The chapter goes further to discuss the thematic areas within this research scope: technology choice, technology use and, technology value. These are the themes identified in literature review and upon which the research is mainly focussed. The research focuses on various socio-technical influences within LDCs as they relate to ICT adoption processes. On the theme of technology choice, the research's main focus is on the potential influences underlying ICT choices in LDCs. The theme of technology use focuses on the nature of ICT use within LDCs. The outcomes of choice and use constitute a basis upon which technology value may be determined within these LDCs and these are covered in the theme of technology value. Chapter one also discusses the significance of this research study to academic research bodies, LDCs and ICT-for-development practitioners.

Chapter two of the thesis gives an overview of the context background of the country in which the research study takes place. The chapter presents data available in literature about Malawi in terms of its geography, population, economy, history, education system and the status of its telecommunications infrastructure. Malawi is classified as one of the Least Developed Countries with a very low ICT diffusion index. However, despite having low ICT access and connectivity indices, the Malawi government is encouraging the adoption and use of computer based ICTs in all its secondary schools. This chapter forms a basis for discussion of literature in chapter 3 as it gives an overview picture of Malawi and other LDC contexts similar to it.

Chapter three of this thesis was dedicated to a critical review of literature surrounding ICT adoption in LDC contexts and the articulation of a framework of enquiry through a synthesis of critical issues which emerged from the literature review. In this chapter, literature surrounding ICTs and the development discourse was reviewed. The chapter discusses literature on how ICTs and development have been framed

over the years with special reference to LDCs and it emerged that there are two main ICT perspectives which underpin ICT related developmental initiatives in LDCs i.e. the tool perspective and the socio-technical perspective. The chapter continued with a discussion of what is reported in literature about the adoption of ICTs in secondary schools within LDC contexts. Many ICT implementation efforts in these schools are characterised by a lot of socio-technical challenges which make the realisation of anticipated gains hard to achieve. In reaction to this, the chapter continued to review literature surrounding main concepts and ideas identified in the development discourse and their possible implications on ICT adoption processes in LDC contexts. The literature review showed that one major push objective for ICT adoption within LDCs is the promotion of ICT literacy as the main driver for inclusion and socio-economic progress of LDCs i.e. 'bridging the digital divide'. The chapter then continued with a review of concepts and ideas surrounding the notion of literacy and its possible implications on ICT adoption processes in LDCs. A review of literature also showed that literacy is a social practice which consists of texts or discourse, practices and events and that it exists in a network of social relations. This suggested that in any society particular forms of literacy are promoted to serve specific interests held by particular members of a discourse community. However, such interests are not always aligned to the context in which a particular form of literacy is promoted. In the final section, the chapter ends by articulating a framework of enquiry based on a synthesis of ideas and concepts covered in literature review. The framework focussed on three main facets of ICT choice, ICT use and, ICT value and forms a basis of the investigation and analysis of ICT adoption processes in Malawian secondary schools.

The fourth chapter of this thesis presented the research methodology and the underlying philosophical assumptions. In order to meet the research objectives, a mixed

methods approach was adopted. The approach involved the use of both qualitative and quantitative methods in order to gain deeper insights into how and why ICT adoption processes happen in the way they do within Malawian secondary schools. Questionnaire survey was conducted and this was followed by a field visit to Malawi where qualitative face-to-face interviews were also conducted in secondary schools which had adopted ICTs for use within their institutions. The chapter also discussed the salience of the STIN model as an analytical tool in this research study and proposed the application of the Social Actor Model in the analysis of research data.

Chapter five presents an analytical narrative of the research findings. The first section of this chapter presented data from the questionnaire survey and discussed the general image that such data portrayed about the extent of ICT presence and use in Malawian secondary schools. On the other hand, the second section presented an analytical narrative of data obtained from the empirical investigations based on the Social Actor Model. This section of the chapter uses four analytical affordances provided by the Social Actor Model (i.e. affiliations, environment, interactions and identities) in order to understand ICT adoption processes in Malawian secondary schools (e.g. how and why are these ICTs adopted within the local schools, how are these ICTs used and why are they used like that etc). This chapter aimed at generating a deeper socio-technical understanding of ICT adoption processes in Malawian secondary schools based on empirical data. The chapter discussed how discourse, literacy practices, events and discourse communities shape and are shaped by ICT adoption processes in Malawian secondary schools. The chapter also discussed how the value of chosen ICTs within Malawian secondary schools depends on the adopting context's success in deconstructing and reconstructing (reading and re-writing) the underlying texts and literacy practices using the 3D literacy framework (functional,

critical, cultural). In relation to the initial framework of inquiry which was synthesised from literature review and discussed in chapter three, the chapter ends with a discussion of a refined framework which articulates a socio-technical conceptualisation of ICT adoption processes in Malawian secondary schools based on what emerged from empirical investigations.

Finally, chapter six of the thesis is the conclusion chapter which gives a complete overview of the whole research project and its major contributions. This, therefore, means that all these chapters have served to contribute significantly towards the development of a deeper socio-technical understanding of ICT adoption processes in Malawian secondary schools.

6.2 Research Contributions

This research's major contributions can be grouped into three major categories: theoretical, methodological and, practical. This section of the conclusion chapter gives a detailed outline of those contributions as reflected by the findings of this research study.

6.2.1 Theoretical

The findings of this research contribute significantly towards our understanding of ICT adoption processes in Malawian secondary schools. They highlight how and why ICT adoption processes influence and are influenced by the secondary school's socio-technical context within which those processes are embedded.

Currently, there is a body of literature which documents successes and failures of ICT initiatives in LDCs within sub-Saharan Africa (e.g. Pigato, 2001; Hawkins, 2002; Ngulube, 2004; Grace and Kenny, 2003). However much of such work is done at regional level (i.e sub-saharan Africa) and suggests that all countries within this region have similar characteristics and face uniform socio-technical influences in their ICT initiatives. However, there are numerous socio-technical differences among and within LDCs in sub-Saharan Africa. Moreover, although such work succeeds in highlighting some challenges facing ICT initiatives in LDCs like Malawi, they appear to focus too much on aggregate outcomes of those ICT initiatives and appear to suggest that ICTs are objective tools and that countries like Malawi fail to reap the technological gains of those ICTs because of extreme technical pressures which they face.

However, as socio-technical processes, ICT adoption processes occur in a mesh of complex networks of interactions which cannot be fully accounted for in such simplistic and deterministic ways. There is need for a deeper understanding of socio-technical influences which shape and are shaped by ICT adoption processes in this region. In this region, very little research has been done to understand those socio-technical influences and Heeks (2002c) observed that to a large extent, the reported influences underpinning ICT initiatives in LDCs are anecdotal and not evidenced by empirical data.

In Malawi, there is no empirically grounded socio-technical conceptualisation of how those influences shape and are shaped by ICT adoption processes. Therefore, the first major theoretical contribution by this research study is the development of an evidence based socio-technical conceptualisation of ICT adoption processes in secondary schools which benefits from a successful application of various theoretical constructs which were identified in literature review.

For example, constructs from a social theory of literacy helps to develop a theoretical conceptualisation of ICT adoption processes in these secondary schools from a socio-technical perspective. The research's findings illustrate how adoption processes influence and are influenced by literacy practices, discourses and literacy events within secondary schools as discourse communities. The concept of literacy events helps illustrate how the use of adopted ICTs influences and is influenced by discourses and literacy practices held by various network affiliates throughout the adoption process.

The developed socio-technical conceptualisation illustrates that ICT adoption processes in these secondary schools yield more favourable outcomes when they are embedded in rich STINs. On the other hand, ICT adoption processes which are based on

thin STINs lead to shallow adoption and have less positive value within the adopting context.

Although some work has been done by various researchers on the adoption of ICTs in educational settings (e.g. Cossa, 2004; Cawthera, 2002; Amutabi and Oketch, 2003), the conceptualisation of ICT adoption processes in Malawian secondary schools using an empirically grounded literacy framework is a novel theoretical contribution to the existing body of knowledge. Much of the work done so far has focused on articulating challenges faced by ICT initiatives in LDCs and listing some 'lessons learnt' from those initiatives. However, they do not provide a socio-technical conceptualisation to explain the complex underlying influences leading to those 'lessons learnt'. This research, on the other hand, investigates ICT adoption processes in Malawian secondary schools and comes up with such a theoretical understanding. The generation of this empirically grounded theoretical conceptualisation of ICT adoption processes which appreciates the significance of socio-technical influences in educational institutions within LDCs like Malawi is a key theoretical contribution from this research study.

6.2.2 Methodological

A significant methodological contribution by this research study has been the successful application of various research methods in order to investigate ICT adoption processes in an LDC context. In the first phase of data collection, the research conducted a preliminary postal questionnaire survey in order to investigate the extent of ICT presence in Malawian secondary schools. In the second phase of the data collection phase, field work, the research used face-to-face qualitative interviews, ob-

servations and documentary reviews in order to collect more data in addition to questionnaire data. This research finds that such a combination of research methods enables the researcher to compare various sets of collected data and improves data validity. For example, a comparison of data sets from the questionnaire survey and other data collection instruments in this research study has shown that what respondents indicated in the questionnaires did not actually reflect the situation within the adopting secondary schools. To a large extent, questionnaire data presented a more positive picture of ICT presence and use within these secondary schools than what the researcher observed and found out during field visits. However, a lot of work which has been done by various researchers and practitioners on ICTs in LDCs appears to have based its findings on similar questionnaire surveys (e.g. UNESCO, 2004; James, 2004; Cossa, 2004; Cawthera, 2002; IICD, 2004).

This research finds that in countries like Malawi, questionnaire respondents are influenced by a milieu of socio-political issues. Such influences may compromise data quality and lead to conclusions that are not representative of the actual situation in the adopting context. The research finds that a combination of various data collection instruments and research methods in LDC contexts like that of Malawi improves data quality by enabling the researcher to compare various sets of data and validate them. This suggests that work on ICTs in LDCs which base their methods on questionnaire surveys run the risk of generating data that does not reflect the actual situation in LDC contexts. In Malawi, where very little is known about ICT adoption processes, the successful application of various research methods is a significant methodological contribution which would enable researchers to conduct quality research work and draw conclusions that are valid.

Another methodological contribution made by this research work can be seen in the

successful application of STIN models in order to systematically analyse ICT adoption processes in LDC contexts like Malawi. Work on ICTs in LDCs like Malawi has fallen short of tackling deeper socio-technical elements which influence and are influenced by ICT adoption processes. Instead, it has focussed on simply narrating the challenges faced by ICT initiatives and 'lessons learnt' through those initiatives. The successful application of STIN models, particularly the Social Actor Model, in this research contributes a significant analytical approach which may enable a deeper investigation of ICT issues in LDCs like Malawi and provide a way of looking beyond simplistic aggregate outcomes of ICT initiatives within LDCs like Malawi.

This research uses the STIN model, particularly the Social Actor Model, to gain a deeper understanding of ICT adoption processes through a detailed analysis of empirical data. Although the application of analytical affordances provided by the Social Actor Model (i.e. affiliations, environment, interactions and identities) helped in the analysis, this research study illustrates the significance of the time dimension within relationships which exists among various network affiliates. This research makes a significant contribution towards this analytical tool by demonstrating the significance of contingent, intermittent and continuous relationships in ICT adoption processes within these secondary schools.

6.2.3 Practical

A major practical contribution by this research study is illustrated by a detailed insight of the patterns and outcomes of ICT adoption processes in Malawian secondary school. These patterns reveal that an uncritical acceptance of the rhetoric or discourse which links ICT adoption to socio-economic progress does not favour deep ICT adop-

tion processes in local secondary schools. Instead, it is ICT adoption processes that involve a critical understanding and appreciation of various socio-technical elements which shape and are shaped by ICT adoption processes in these adopting contexts that lead to deep adoptions. The 'one-size-fits-all' centralised ICT adoption approach does not work for all secondary schools in Malawi. ICT adoption processes should have a local focus and the adopting secondary schools should be given some autonomy and be actively involved in the adoption processes in order to ensure deep adoption processes which offer more ICT value to the adopting context. This means that ICT adoption processes within networks of affiliations should involve dialogue and consultation among network affiliates particularly those within the adopting secondary schools.

The significance of continuous relationships and multi-valent networks between secondary schools and global or regional network affiliates is another major practical contribution made by this research. Regional or global affiliates should not simply supply technological artefacts to secondary schools and then disappear. Instead, they should maintain their relationships with the adopting schools and promote active participation of all stakeholders within the network in order to facilitate deep ICT adoptions. This research finds that the presence of individual affiliates within the adopting schools (i.e. affiliates who represent regional or global network affiliates) is favourable for deep adoptions and local school empowerment.

The generated framework for conceptualising ICT adoption processes in Malawian secondary schools is another major practical contribution by this research study. The framework enables various practitioners to understand the outcomes of various ICT initiatives and offers them a solid basis for the implementation of ICT initiatives which have more value within the adopting context.

The findings suggest that ICT adoption processes within these secondary schools yield more favourable outcomes when they are embedded in rich socio-technical interaction networks (STINs). Within these rich STINs, ICT adoption processes involve consultation and active participation of various local network affiliates within the adopting secondary schools.

6.3 Revisiting Research Questions

Based on the research findings, the questions which the research set out to answer have been addressed as follows:

1. How are technology choices made in Malawi and why do the current patterns of technology choice processes in Malawi happen in the way they do?
2. How are technologies used within the social context in Malawi and why do the current patterns of use happen in the way they do?
3. What is the value of the adopted technologies in Malawi and what implications does this have on technology choice, use and its consequences.

Answers to these research questions have been sought throughout this research project and in this thesis, these questions have been specifically addressed in chapter 5. In this chapter, an analysis of empirical data illustrates how and why ICT adoption processes happen in the way they do within these secondary schools. In the final section of chapter 5, a socio-technical conceptualisation of ICT adoption processes in Malawian secondary schools is discussed and helps in gaining a deeper conceptualisation of these processes within secondary schools in Malawi.

On the other hand, this research has shown that ICT adoption processes the majority of these secondary schools are characterised by low level of local school autonomy. To a large extent, these local schools are not involved in the identification and selection of technological options. Instead, technologies are chosen for and imposed upon them by regional or global network affiliates based on the traditional one-way or tool-perspective ICT adoption models.

Such technologically naive and deterministically conceived top-down approach overlooks the existential socio-technical influences within the local Malawian context which shape and are shaped by ICT adoption processes. Without respect and appreciation of these socio-technical influences within the adopting context, the majority of these ICT initiatives run the risk of yielding less valuable outcomes within the adopting Malawian secondary schools.

On the other hand, in the absence of praxis in relation to the way computers are adopted and used in Malawian secondary schools, various 'limit situations' (Freire, 1993) stand out. For example, computer literacy practices which equate lack of computers in Malawian secondary schools to underdevelopment present a 'limit situation' whereby the adopters become trapped in a technological lock-in which perceives computers and the knowledge of how to operate those computers as the only ICT option and key to development. Such situations pose a risk of preventing Malawians from critically engaging with their situation and acting upon it in order to transcend these limit situations and explore other technological options (i.e. the untested feasibility). Instead of contributing towards socio-economic progress, such limit situations may possibly be a bedrock for more socio-economic retardation by preventing local Malawians from reading, understanding, and rewriting the discourse in a manner which reflects their own actual situation.

This suggests that, as literacy processes, the adoption of computers in Malawian secondary schools need not be conceptualised from the one dimensional 'autonomous' or 'domesticating' point of view because these processes have literacy practices and literacy events which are socio-technical in nature. This research study, therefore, generates a socio-technical conceptualisation of ICT adoption processes in Malawian secondary schools which offers great opportunity for various practitioners and development stakeholders so that they can reflect on their own ICT related activities and those of people around them and "become more aware of [those activities], in order to understand and, if necessary, resist, challenge and change them." (p.49). The framework facilitates the deconstruction of text and enables its rewriting or reconstruction within Malawi and other similar LDC contexts.

6.4 Research Limitations and suggestions for further research

Although this research study has successfully developed a novel socio-technical conceptualisation of ICT adoption processes in Malawian secondary schools, it has to be acknowledged that, just like any type of academic research, this study has some limitations that have implications for further research.

The assessment of ICT value in Malawian secondary schools has been made in the context of 31 secondary schools which were selected for interviews. Although these schools were selected based on their theoretical relevance to the research study (see chapters 1 and 4), it is important to indicate that the value assessment in this research study is restricted to and should be viewed in line with empirical evidence gathered from these selected schools. However, this is only a representation of over 600 secondary schools in Malawi with various cultural, regional and geographical differences among them. Thus what may constitute value in one context (e.g. central region of Malawi or urban areas), may not necessarily constitute ICT value in other contexts because depending on these differences, different schools experience different environmental and cultural pressures which consequently shape and are shaped by adoption processes. This means that difficulties in assessing ICT value in the broader context of Malawian secondary schools is perhaps one of the limitations suffered by this research study. For example, although the research has looked at the concept of value with special emphasis on those schools which have adopted computers, it is possible that there are other ICT options which might possibly offer greater value to the broader context of secondary schools in Malawi regardless of their cultural or geographical differences. As such, although research findings in this study show that

societal value of ICTs is more positive in secondary schools which base their adoption processes on literacy framework than those which do not, further work is required to assess what would constitute ICT value in the broader context of secondary education in Malawi.

Moreover, this research has found that the majority of adoption processes in secondary schools which were involved in this research study are based on thin STINs. However, it is rich STINs which have been found to favour deep ICT adoptions and offer more positive contributions to the adopting context. This means that if secondary schools are to make positive contributions towards socio-economic progress in Malawi through ICTs, then their adoption processes need to be based on rich STINs. Given that the majority of these ICT adoption processes are embedded in thin STINs, further research work needs to be done to investigate possible ways of translating these thin STINs into rich STINs across secondary schools in Malawi. Related to this is the observation that ICT adoption processes in these secondary schools are not a one-off occurrence or static processes. Instead, as time goes by, so many contextual parameters change (e.g. ICTs, socio-technical influences, network affiliates, relationships among stakeholders etc). For example, research findings show that relationships among network affiliates can be intermittent, contingent or continuous. Although continuous relationships have been found to favour deep adoption processes, this research also finds out that the majority of secondary schools in Malawi have adopted their ICTs through contingent relationships. However, such relationships cannot just surface from nowhere and there is need to further unravel the underlying influences which lead to these types of relationships among secondary schools and suppliers of ICTs (e.g. regional or global affiliates) within these networks of affiliations. Therefore, further research could be done on relevant processes within organisations which supply those

ICTs to African secondary schools (e.g. Computers for Africa UK) in order to further understand other socio-technical influences upon ICT adoption from the supplier side.

Finally, the framework for conceptualising ICT adoption processes is based on empirical evidence gathered from secondary schools within Malawi. Although Malawi is one of the LDCs in sub-Saharan Africa, it is not identical to all LDCs in this region. There are various disparities among and within these country contexts across the region. This suggests that the developed framework for conceptualising ICT adoption processes is based on evidence from socio-technical contexts in Malawi, it may not be fully applicable in other contexts within the region. Therefore, it would be interesting to expand ICT adoption research to other LDC contexts within the region in order to further our understanding of complex socio-technical influences which shape and are shaped by ICT adoption processes in this region. For example, a comparative research study might be conducted to investigate ICT adoption processes in two or more countries within the region in order to understand various socio-technical influences within the region.

By acknowledging the need for such further work to be conducted, the researcher realises that there is more research work on ICT adoption yet to be conducted in this region of Africa. However, since this research work was meant to be done within time and cost constraints, research boundaries had to be drawn and the research had to be concluded.

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Appendix A

Literature Review - Issue Matrix

Source	Economic factors	Organisational factors	Socio-cultural factors	Technical factors	Other Factors/ comments	Citations
1.	<p>'... The socio-economic shaping of technology reveals the socio-economic factors that mould and form the shape and content of technology itself...' (p124).</p>	<p>Whenever technology and organisation interact, discontinuities emerge. Technology triggers organisational transformation and this could be in form of "...a radical break in terms of the continuity of the economic, social and political order as a whole." (p 2)</p>	<p>There is broad debate whether it is technology that influences social change or it is the social factors that influence technological innovation. Social change can sometimes be seen to be driven by technology innovation through "...the collective development of the new language of expression..." that help to put the story across in cinemas (p3)</p>	<p>Technology innovation is likely to fail if it is not properly aligned to the local needs of the environment in which it is meant to perform because "...innovation is a two sided or coupling activity requiring a matching of technological developments to market requirements." (p12?)</p>	<p>No clear-cut relationship to a possible understanding upon which the adoption of ICTs in developing countries seems to be based.</p>	<p>Kling Latour Freeman Perez Tidd</p>
2.	<p>'... The ICT for development literature is biased towards the supply side and gives scant attention to demand...' (p191)</p>	<p>'... The ICT campaign also rests on the assumption that ICT has some inherent quality that enables it to leapfrog institutional obstacles...the evidence, if any, typically comes from pilot projects where the alleged success is generalised with little attention to the scaling up problems....' (p 186)</p>	<p>'...the effort to make people change their business practices to fit the technology often fails...' (p190) An illustration of how culture may influence technological change</p>		<p>Although ICTs may be seen to help raise real economic returns to investments, the idea of ICTs as a 'magic bullet' is evident where '...(ICTs) are being touted in the development community as though they can leapfrog over the more familiar development problems...' (p185) '...The campaign to promote the uptake of ICT in developing countries needs devil's advocates ...to challenge the deep slumber of a decided opinion...' (p185)</p>	<p>Zuboff Orlikowski Grint Woolgar Hill</p>

Appendix B

Malawian Secondary School database

LIST OF SECONDARY SCHOOLS in MALAWI

SCHOOL NAME	ADDRESS	LOCATION
Aim High (Pvt) Secondary School	P.O. Box 819	Zomba
ALMA (Pvt) Secondary School	P.O. Box 217	Mzimba.
ARMY Secondary School	P/Bag 91	Lunzu
ASTEPI (Pvt) Secondary School	P.O. Box 152	Luchenza.
Bakhita DEC	P.O. Box 62	Balaka.
Balaka Secondary School	P.O. Box 222	Balaka.
Balamanja DEC	P.O. Box 30	Masaula, Chingale, Zomba
Bambino (Pvt) Secondary School	P.O. Box 1614	Lilongwe.
Bandawe Secondary School	P/Bag 1	Chintheche, Nkhata Bay.
Bangula Secondary School	P/Bag 2	Chiromo.
Bangwe (Pvt) Secondary School	P.O. Box 90307	Bangwe, Blantyre
Bangwe Catholic DEC	P.O. Box 90246	Bangwe Blantyre 9
Baptist (Pvt) Secondary School	P.O. Box 292	Lilongwe.
Bembeke CDSS	P/A Bembeke	Dedza
Berelin (Pvt) Secondary School	P.O. Box 144	Bvumbwe.
Bethel (Pvt) Secondary School	P/Bag 368	Blantyre 3.
Bilila CDSS	P.O. Box 41	Bilila.
Biwi DEC	P.O. Box 1064	Lilongwe
Blantyre Islamic	P.O. Box 1	Mbame, Blantyre
Blantyre Secondary School	P/Bag 10	Blantyre.
Bolero Secondary School	P.O. Box 138	Bolero, Rumphi
Bvumbwe (Pvt) Secondary School	P/Bag 5	Bvumbwe.
Bvumbwe CDSS	P.O. Box 43	Thyolo.
Bwaila Secondary School	P.O. Box 410	Lilongwe.
Bwengu CDSS	P.O. Box 3	Bwengu, Mzimba
Cathie (Pvt) Secondary School	P.O. Box 171	Nchalo.
Central College of Commerce	P.O. Box 864	Lilongwe.
Chadza CDSS	P.O. Box 1 6	Nathenje, Lilongwe
Chamakala DEC	P/Bag 1	Chamakala, Kasungu

Chambe CDSS	P.O. Box 510	Mulanje
Chambe Secondary School	P.O. Box 2	Chambe
Chaminade Secondary School	P.O. Box 100	Karonga.
Champhira CDSS	P.O. Box 83	Champhira, Mzimba
Chankhomi CDSS	P.O. Box 217	Rumphi
Changali CDSS	P/Bag 23	Mangochi
Chankhanga DEC	P.O. Box 209	Kasungu.
Charles Lwanga CDSS	P.O. Box 482	Balaka
Chawa CDSS	P.O. Box 44	Lobi, Dedza
Chayamba Secondary School	P/Bag 1	Kasungu.
Chibavi CDSS	P.O. Box 110	Mzuzu
Chichiri Secondary School	P/Bag 304	Chichiri, Blantyre 3
Chididi CDSS	P.O. Box 8	Chididi, Nsanje
Chigodi CDSS	P.A. Santhe	Kasungu.
Chikhutu CDSS	P.O. Box 144	Lumbadzi
Chikhwaza CDSS	P.O. Box 196	Luchenza.
Chikuli CDSS	P/A Chikowa	P.O. Chileka, Blantyre
Chikwawa Secondary School	P.O. Box 5	Chikwawa.
Chikweo CDSS	P.O. Box 1	Chikweo.
Chilambula CDSS	P.O. Box 1093	Lilongwe.
Chilanga CDSS	P.O. Box 36	Kasungu.
Chilangoma DEC	P.O. Box 49	Chileka, Blantyre
Chilipa CDSS	P.O. Box 80	Mtobwa, Balaka
Chilomoni (Pvt) Secondary School	P.O. Box 2855	Blantyre.
Chilumba Secondary School	P/Bag 2	Chilumba.
Chimaliro (Pvt) Secondary School	P.O. Box 20204	Luwinga, Mzuzu2
Chimbale (Pvt) Secondary School	P.O. Box 2586	Blantyre.
Chimkwezule CDSS	P.O. Box 33	Machinga
Chimphalika DEC	P.O. Box 25	Chimoto, Dedza
Chimutu II	P.O. Box 30011	Lilongwe 3
Chimwalira Secondary School (Nasawa Sec. Sch.)	P.O. Box 10	Magomero, Chiradzulu
Chimwankhunda DEC	P.O. Box 2575	Blantyre
Chinamwali (Pvt) Secondary School	P/Bag 37	Zomba

Chinkhuti DEC	P.O. Box 29	Lumbadzi, Lilongwe
Chinkwenzule CDSS	P.O. Box 29	Lumbadzi, Lilongwe
Chintheche CDSS	P.O. Chintheche	Nkhata Bay
Chinunkha CDSS	P.O. Box 7	Ifumbo, Chitipa
Chipala (Pvt) Secondary School	P.O. Box 40020	Kanengo, Lilongwe 4
Chipasula Secondary School	P/Bag 71	Lilongwe.
Chipoka Secondary School	P.O. Box 43	Chipoka, Salima
Chipyela CDSS	P.O. Box 100	Likoma
Chiradzulu Secondary School	P/Bag 3	Chiradzulu.
Chirimba CDSS	P/Bag 91	Blantyre
Chiringa CDSS	P.O. Box 46	Chiringa, Mulanje
Chisamba CDSS	P.O. Box 20147	Kawale Lilongwe 2
Chisenga CDSS	P/A Chisenga	Chitipa
Chisenga Secondary School	P/A Chisenga	Chitipa.
Chisomo (Pvt) Secondary School	P.O. Box 20412	Kawale, Lilongwe2
Chitipa CDSS	P.O. Box 91	Chitipa
Chitipa Secondary School	P.O. Box 99	Chitipa.
Chiwoko CDSS	P/Bag 256	Kawale
Chiyambi (Pvt) Secondary School	P.O. Box 60	Mwanza.
Chowo CDSS	P.O. Box 74	Nkhoma
Chulu CDSS	P/A Chulu	Kasungu
Davy Boys (Pvt) Secondary School	P/Bag 91	Kasungu
Davy Girls (Pvt) Secondary School	P/Bag 91	Kasungu
DDK and N Girls (Pvt)	P.O. Box 237	Chikwawa.
Debora (Pvt) Secretary School	P.O. Box 874	Blantyre.
Dedza Secondary School	P.O. Box 48	Dedza
Denis (Pvt) Secondary School	P.O. Box 1239	Blantyre
Domasi (Pvt) Secondary School	P.O. Box 11	Domasi.
Dombole Secondary School	P.O. Box 375	Ntcheu
Dowa Secondary School	P/Bag 1	Mponela.
Dwambazi CDSS	P/Bag 1	Dwambazi, Nkhotakota

Dzenje CDSS	P.O. Box 57	Mbiza Luchenza
Dzenza Secondary School	P.O. Box 136	Kanengo, Lilongwe 4
Dzoole CDSS	P/Bag 14	Mponela
Dzuka Girls (Pvt) Secondary School	P.O. Box 86	Nathenje.
Eden Academy (Pvt) Secondary School		
Edingeni CDSS	P.A. M'mbelwa	P.O. Mzimba.
Ehehleni DEC	P.O. Box 88	Champhira, Mzimba
Ekwendeni DEC	P.O. Box 18	Ekwendeni.
Ekwendeni Girls Secondary School	P.O. Box 2	Ekwendeni.
Embangweni CDSS	P.O. Box 60	Embangweni.
Emfeni CDSS	P/Bag 1	Mabulabo, Mzimba
Enukweni CDSS	P/A Enukweni	P.O. Ekwendeni
Enyezini Secondary School	Po Box 45	Enyezini, Mzimba
Euthini DEC	P.O. Box 6	Euthini.
Euthini Secondary School	P.O. Box 21	Euthini.
Fundani (Pvt) Secondary School	P.O. Box 20664	Luwinga, Mzuzu
Golong'ozzi CDSS	P.O. Box 154	Dowa
Good Maganizo (Pvt) Secondary School	P.O. Box 225	Thyolo.
Gowa Dec	P.O. Box 47	Mulangeni, Ntcheu
HHI Secondary School	P.O. Box 65	Blantyre.
Indaba (Pvt) Secondary School	P.O. Box 40338	Kanengo Lilongwe 4
Jamia Islamia (Pvt) Secondary School	P.O. Box 51182	Limbe.
Johnstone (Pvt) Secondary School	P.O. Box 5793	Limbe.
Joyce Banda Foundation (Pvt) Sec. School		
Kabichi DEC	P.O. Box 72	Mimosa, Mulanje
Kabula Modern High School	P/Bag 5130	Limbe.
Kabwabwa DEC	P.O. Box 40638	Kanengo, Lilongwe
Kabwazi CDSS	P/A Bawi	Ntcheu
Kachingwe DEC	P.O. Box 17	Njuli.
Kachokolo CDSS	P/Bag 3	Mtunthama, Kasungu

Kafukule CDSS	P.O. Box 78	Kafukule, Mzimba
Kalaka CDSS	P.O. Box 17	Kandeu, Ntcheu
Kaluluma CDSS	P.O. Box 41	Nkhamenya
Kamacha (Pvt) Secondary School	P/Bag 351	Blantyre 3.
Kameme CDSS	P/A Kameme	Chitipa
Kamilaza CDSS	P.O. Box 54	Mzimba
Kanjiwa CDSS	P/A Kansonga	Ntchisi
Kapalamula CDSS	P/A Mphepozinai	Ntcheu
Kapando CDSS	P/A Kapando	P.O. Euthini, Mzimba
Kapelula CDSS	P.O. Box 48	Ndonda, Kasungu
Kaphuka (Pvt) Secondary School	P.O. Box 30823	Blantyre 3.
Kapire DEC	P.O. Box 48	Ndonda, Kasungu
Kapirintiwa CDSS	P.O. Box 41	Chitala, Salima
Kaporo (Pvt) Secondary School	P.O. Box 49	Kaporo, Karonga
Karonga DEC	P.O. Box 102	Karonga
Karonga Foundation for Education	P.O. Box 132	Karonga.
Karonga TTC Night Secondary School	P.O. Box 222	Karonga.
Kasamba CDSS	P/Bag 8	Nkhotakota
Kasitu DEC	P.O. Box 2	Nkhotakota
Kasiya CDSS	P/Bag 1	Kasiya, Lilongwe
Kasungu Secondary School	P.O. Box 316	Kasungu.
Katamba DEC	P.O. Box 5	Sakata, Zomba
Katewe CDSS	P/A Katewe	Dedza
Katoto Secondary School	P/Bag 36	Mzuzu.
Katowo CDSS	P/A Katumbi	Rumphi
Katsekaminga CDSS	P.O. Box 266	Dedza
Kayoyo CDSS	P.O. Box 35	Ntchisi
Khola CDSS	P.O. Box 72	Kasinje, Ntcheu
Khungulu Sec. School	P/Bag 5129	Limbe
Khwawa CDSS	P/A Khwawa	Karonga
Kings Foundation (Pvt) Secondary School	P.O. Box 361	Ntcheu.
Kirk Range (Pvt) Secondary School	P/Bag 12	Balaka.

Kochilira CDSS	P/Bag 5	Magawa, Mchinji
Kondwani (Pvt) Sec. School	P/Bag 30	Ntchisi
Kwakupokera (Pvt) Sec. School	P.O. Box 451	Mzuzu
Lake View DEC	P.O. Box 48	Mulangeni, Ntcheu
Liberty (Pvt) Sec. School	P.O. Box 30247	Lilongwe 3
Ligowe Secondary School	P.O. Box 124	Bvumbwe
Likanani CDSS	P.O. Box 21	Sukasanje, Mulanje
Likangala Secondary School	P/Bag 16	Zomba
Likoma Secondary School	P/Bag 1	Likoma
Likudzi CDSS	P.O. Box 133	Senzani, Ntcheu
Likuni Boys Sec. School	P.O. Box 50	Likuni
Likuni Girls Sec. School	P.O. Box 43	Likuni
Lilongwe Girls Secondary School	P.O. Box 186	Lilongwe.
Limbani (Pvt) Secondary School	P.O. Box 59	Liwonde.
Limbe DEC	P.O. Box 5378	Limbe
Linga CDSS	P/Bag 1	Nkhotakota
Linthipe Secondary School	P/Bag 3	Linthipe.
Lirangwe CDSS	P.O. Box 140	Blantyre
Lisumbwi Secondary School	P/Bag 3	Monkey Bay.
Litchenza CDSS	P.A. Chimwawa	P.O. Luchenza
Livimbo CDSS	P.O. Box 323	Lilongwe
Livingstonia CDSS	P.O. Box 40	Livingstonia
Livingstonia Secondary School	P.O. Box 4	Livingstonia.
Livulezi CDSS	P.O. Kandeu	Ntcheu
Livunzu CDSS	P/A Makhwila	Chikwawa
Liwaladzi Secondary School	P.O. Box 43	Liwaladzi.
Liwonde (Pvt) Secondary School	P.O. Box 143	Liwonde.
Liwonde Secondary School	P/Bag 18	Liwonde.
Lizulu CDSS	P.O. Box 4	Lizulu, Ntcheu
Liwonde DEC	P.O. Box 130	Liwonde
Luchenza (Pvt) Secondary School	P.O. Box 195	Luchenza.
Luchenza CDSS	P.O. Box 38	Luchenza
Luchenza Secondary School	P.O. Box 84	Luchenza.

Ludzi Girls Secondary School	P.O. Box 43	Mchinji.
Lumbira CDSS	P.O. Box 70023	Chilomoni Blantyre 7
Lunjika Secondary School	P/Bag 2	Eswazini, Mzimba
Lunzu Night Secondary School	P.O. Box 130	Lunzu
Lunzu Secondary School	P.O. Box 130	Lunzu.
Luwazi DEC	P/Bag 63	Mzuzu
Luwerezi CDSS	P.O. Box 2	Luwerezi, Mzimba
Macey Williams (Pvt) Sec. School	P.O. Box 471	Dedza
Madalo (Pvt) Secondary School	P/Bag 1	Soche, Blantyre 4
Madisi Secondary School	P.O. Box 160	Madisi.
Maera CDSS	P.O. Box 62	Namadzi, Chiradzulu
Magawa Secondary School	P/Bag 17	Magawa, Mchinji
Magisa (Pvt) Secondary School	P.O. Box 479	Salima.
Magomero DEC	P.O. Box 39	Magomero, Zomba
Magoti CDSS	P.O. Box 43	Sorgin, Chiromo
Magwero DEC	P.O. Box 40859	Kanengo, Lilongwe 4
Makalanga (Pvt) Secondary School	P.O. Box 51794	Limbe.
Makande CDSS	P.O. Box 18	Ngabu, Chikwawa
Makapwa CDSS	P.O. Box 24	Sandama
Makhanga CDSS	P.O. Box 68	Chiromo, Nsanje
Malamulo Secondary School	P/Bag 3	Makwasa.
Malepera CDSS	P/Bag 151	Kasungu
Malikha DEC	P.O. Box 40623	Kanengo, Lilongwe 4
Malingunde DEC	P.O. Box 79	Sinyala, Lilongwe
Malombe Secondary School	P/Bag 1	Malombe, Mangochi
Malomo CDSS	P/Bag 141	Malomo, Ntchisi
Malosa Secondary School	P/Bag 3	Chilema, Zomba
Malowa CDSS	P.O. Box 11	Chipoka
Mangochi (Pvt) Secondary School	P.O. Box 31	Mangochi.
Mangochi Secondary School	P/Bag 1	Mangochi.
Mapanga CDSS	P/Bag 19	Bvumbwe
Mapazi CDSS	P.O. Box 150	Njuli

Marist Secondary School	P.O. Box 46	Malirana, Dedza
Marymount Secondary School	P.O. Box 137	Mzuzu.
Masasa DEC	P.O. Box 572	Mzuzu
Masongola Secondary School	P.O. Box 283	Zomba.
Mast Day (Pvt) Secondary School	P/Bag 108	Kasungu.
Matandani Secondary School	P.O. Box 60	Neno, Mwanza
Matenje CDSS	P.O. Box 27	Khombeza, Salima
Mathandani CDSS	P.O. Box 190	NKhamenya
Matindi (Pvt) Secondary School	P.O. Box 235	Lunzu.
Matope DEC	P.O. Box 16	Matope
Mawiri CDSS	P/Bag 37	Ntcheu
Mayaka CDSS	P.O. Box 49	Mayaka
Mayani Secondary School	P.O. Box 131	Mayani, Dedza
Mbapapi (Pvt) Secondary School	P.O. Box 55	Nkhamenya
Mbawa CDSS	P.O. Box 190	Embangweni, Mzimba
Mbinzi CDSS	P.O. Box 862	Lilongwe
Mbomba Secondary School	P/Bag 16	Malomo, Ntchisi
Mbvunguti DEC	P.O. Box 40241	Kanengo, Lilongwe 4
Mchinji Girls DEC	P.O. Box 198	Mchinji
Mchinji Secondary School	P/Bag 4	Mchinji.
Mchisu CDSS	P.O. Box 126	Dedza
Mdeka CDSS	P.O. Box 60	Mdeka, Blantyre
Mdika CDSS	P.O. Box 48	Nambuma
Mdinde DEC	P/A Katuli	Namwera
Mendulo CDSS	P.O. Box 297	Luchenza
Michiru View (Pvt) Secondary School	P/Bag 406	Chichiri, Blantyre 3
Midlands (Pvt) Secondary School	P.O. Box 1393	Lilongwe.
Migowi CDSS	P.O. Box 10	Migowi
Mikundi DEC	P.O. Box 14	Msanama, Lilongwe
Milonde CDSS	P.O. Box 24	Milonde, Mulanje
Misale CDSS	P.O. Box 15	Tembwe, Mchinji
Misuku CDSS	P.O. Box 5	Misiku, Chitipa
Mitsidi CDSS	P.O. Box 1084	Blantyre
Mitundu DEC	P.O. Box 79	Sinyala

Mitundu Secondary School	P/Bag 10	Mitundu, Lilongwe
Mkhota CDSS	P.O. Box 9	Mkhota, Kasungu
Mkomachi CDSS	P.O. Box 40103	Kanengo, Lilongwe 4
Mkwichi DEC	P.O. Box 30676	Lilongwe 3
Mkwichi Secondary School	P/Bag 249	Lilongwe.
Mlale Seminary	P.O. Box 8	Mitundu, Lilongwe
Mlanda Secondary School	P/Bag 1	Lizulu, Ntcheu
Mlare Day Secondary School	P.O. Box 32	Mlare,
Mlodza DEC	P.O. Box 20106	Kawale, Lilongwe 2
Mlowe DEC	P.O. Box 33	Mlowe, Karonga
Mnjiri CDSS	P.O. Box 221	Mzimba
Moma Girls (Pvt) Secondary School	P.O. Box 90	Nathenje.
Monkey Bay CDSS	P.O. Box 132	Monkey Bay
Mountain View Secondary School	P/Bag 12	Bvumbwe.
Mpando CDSS	P/Bag 3	Nsalu, Lilongwe
Mpasa CDSS	P.O. Box 24	Phalombe
Mpatsa DEC	P.O. Box 48	Tengani, Nsanje
Mphande CDSS	P.O. Box 11	Mwanza
Mpherembe CDSS	P.O. Box 44	Mpherembe, Mzimba
Mpherere DEC	P.O. Box 38	Ntchisi
Mpingu CDSS	P/Bag 6	Lilongwe
Mpingwe CDSS	P.O. Box 90524	Bangwe, Blantyre 9
Mpinji DEC	P.O. Box 230	Thyolo
Mpita (Pvt) Secondary School	P.O. Box 558	Lilongwe.
Mpondagaga CDSS	P/Bag 16	Nkhotakota
Mpondas CDSS	P.O. Box 505	Mangochi
Mpumbe CDSS	P.O. Box 18	Njuli
Msalula CDSS	P.O. Box 443	Salima
Msambanjati CDSS	P.O. Box 10	Masambanjati
Msonkhamanja Secondary School	P.O. Box 183	Lilongwe
Mtakataka CDSS	P.O. Box 42	Mtakataka, Dedza
Mtemambalame	P.O. Box 7	Mteza, Lilongwe

Mtendere Secondary School	P.O. Box 25	Malirana, Dedza
Mtentera CDSS	P.O. Box 37	Mbuna, Lilongwe
Mtetete DEC	P.O. Box 70	Nkhata Bay
Mthumba CDSS	P.O. Box 136	Chikwawa
Mthunzi Secondary School	P/Bag 34	Mchinji.
Mtunthama Saints CDSS	P/Bag 4	Mtunthama
Muhasuwa DEC	P.O. Box 27	Namitambo, Chiradzulu
Mulanje Mission CDSS	P.O. Box 309	Mulanje
Mulanje Secondary School	P.O. Box 61	Mulanje.
Mulinda (Pvt) Secondary School	P.O. Box 172	Mzuzu.
Mulomba CDSS	P.O. Box 18	Mulomba
Muloza CDSS	P.O. Box 46	Muloza, Mulanje
Mulunguzi DEC	P/Bag 204	Blantyre
Mulunguzi Secondary School	P.O. Box 138	Zomba.
Muona DEC	P.O. Box 77	Muona, Nsanje
Mvera CDSS	P.O. Box 40	Mvera, Dowa
Mvera Girls (Pvt) Secondary	P.O. Box 115	Mvera.
Mwalawanyenje CDSS	P.O. Box 38	Kasungu
Mwansambo Secondary School	P/Bag 8	Mwansambo.
Mwanza Secondary School	P/Bag 2	Mwanza.
Mwatibu CDSS	P.O. Box 120	Nathenje, Lilongwe
Mzalangwe DEC	P/A Mzalangwe	Mzimba
Mzama CDSS	P.A. Kaloga	Ntcheu
Mzamba CDSS	P.O. Box 221	Mzimba
Mzimba Secondary School	P.O. Box 28	Mzimba.
Mzimu Oyera Seminary	P.O. Box 63	Chikwawa.
Mzuzu Secondary School	P/Bag 3	Mzuzu.
Namadzi CDSS	P/Bag 6	Namadzi, Chiradzulu
Namandanje CDSS	P/Bag 20	Ntaja
Nambuma DEC	P.O. Box 38	Nambuma
Namisonga CDSS	P/Bag 2	Jali
Namitembo DEC	P.O. Box 11	Chingale
Namitete Secondary School	P.O. Box 138	Namitete.

Namitete Technical College	P/Bag 5	Namitete.
Namiwawa CDSS	P.O. Box 1471	Blantyre
Namulenga CDSS	P.O. Box 42	Thuchila, Mulanje
Namwera (Pvt) Secondary School	P.O. Box 64	Namwera.
Namwera DEC	P/Bag 15	Namwera
Namwera Girls DEC	P/Bag 20	Namwera
Nanjiriri CDSS	P.O. Box 5536	Limbe
Nankhunda Seminary	P.O. Box 498	Zomba.
Nankhundi CDSS	P.O. Box 112	Chiradzulu
Nankumba CDSS	P.O. Box 29	Mbane, Blantyre
Nanthomba CDSS	P.O. Box 146	Dowa
Natola CDSS	P.O. Box 168	Madisi, Dowa
Nazarene Mission Secondary School	P.O. Box 51073	Limbe.
Nchalo DEC	P.O. Box 145	Nchalo.
Neno CDSS	P.O. Box 14	Neno, Mwanza
New Era Boys (Pvt) Secondary School	P.O. Box 122	Ntcheu
New Era Girls (Pvt) Secondary School	P/Bag 2	Ntcheu.
Ngabu Secondary School	P/Bag 6	Ngabu.
Ng'ombechinga CDSS	P/A Khosolo	Champhira, Mzimba
Nguludi Secondary School	P.O. Box 90336	Bangwe, Blantyre 9
Ngumbe CDSS	P.O. Box 46	Chlleka, Blantyre
Njamba DEC	P.O. Box 19	Chileka, Blantyre
Njamba Secondary School	P/Bag 392	Chichiri, Blantyre 3
Njerenjere Secondary School	P.O. Box 641	Mzuzu
Njolomole CDSS	P.O. Box 45	Mlangeni, Ntcheu
Nkhamenya (Pvt) Secondary School	P.O. Box 241	Nkhamenya.
Nkhamenya Girls Secondary School	P/Bag 1	Chisemphe, Kasungu
Nkhata Bay Secondary School	P/Bag 6	Nkhata Bay.
Nkhoma CDSS	P.O. Box 46	Nkhoma
Nkhotakota Institute of Education	P.O. Box 48	Nkhotakota.
Nkhotakota Secondary School	P.O. Box 136	Nkhotakota.

Nkhunga CDSS	P/Bag 4	Dwangwa
Nkula CDSS	P.O. Box 42	Nkula
Nsala CDSS	P.O. Box 467	Zomba
Nsanje CDSS	P.O. Box 41	Nsanje.
Nsanje Secondary School	P.O. Box 40	Nsanje.
Nsipe CDSS	P.O. Box 35	Kampepuza, Ntcheu
Nsondole CDSS	P.O. Box 137	Domasi
Nsoni CDSS	P.O. Box 64	Namitambo
Ntaja DEC	P/B 1	Ntaja
Ntambanyama CDSS	P.O. Box 3	Mtambanyama, Thyolo
Ntcheu CDSS	P/Baga 8	Ntcheu
Ntcheu Secondary School	P.O. Box 42	Ntcheu.
Ntchisi Secondary School	P.O. Box 36	Ntchisi
Nthalire DEC	P.O. Box 37	Nthalire, Chitipa
Nthumbo DEC	P.O. Box 1 2	Ntcheu
Ntonda CDSS	P A Matale	Ntcheu
Ntonya (Pvt) Secondary School	P.O. Box 30754	Chichiri, Blantyre 3
Nyachilenda DEC	P.O. Box 66	Marka, Nsanje
Nyambadwe CDSS	P.O. Box 1914	Blantyre
Nyika (Pvt) Sec. School	P/Bag A20	Lilongwe
Nyungwe CDSS	P.O. Box 58	Namadzi
Our Future (Pvt) Secondary School	P.O. Box 161	Rumphi.
Our Lady of Wisdom	P.O. Box 5696	Limbe.
Perkins Girls (Pvt) Secondary School	P.O. Box 180	Manjawira, Ntcheu
Phalombe Secondary School	P.O. Box 142	Phalombe.
Phalula CDSS	P.O. Box 84	Phalula
Phanda DEC	P.O. Box 94	Ngabu.
Phwadzi CDSS	P/Bag 4	Chikwawa
Phwezi Boys (Pvt) Secondary School	P.O. Box 2	Rumphi.
Phwezi Girls (Pvt) Secondary School	P.O. Box 2	Rumphi.
PIM CDSS	P.O. Box 13	Chisombezi
Pirimiti CDSS	P/Bag 1	Jali
Pius X11 Seminary	P.O. Box 5603	Limbe.

Police Secondary School	P.O. Box 41	Zomba.
Precious (Pvt) Secondary School	P.O. Box 51 744	Limbe.
Providence Secondary School	P.O. Box 136	Mulanje
Puteya (Pvt) Secondary School	P.O. Box 177	Chilema.
Radson (Pvt) Secondary School	P.O. Box 30539	Blantyre 3.
Radson Boys (Pvt) Secondary School	P.O. Box 30539	Blantyre 3.
Robert Blake Secondary School	P/Bag 1	Dowa.
Robert Laws Secondary School	P.O. Box 44	Embangweni
Rukuru (Pvt) Secondary School	P.O. Box 264	Rumphi.
Rumphi Secondary School	P.O. Box 1 33	Rumphi.
Sacred Heart CDSS	P.O. Box 566	Zomba
Sakata (Pvt) Secondary School	P.O. Box 235	Luchenza.
Salima Secondary School	P.O. Box 85	Salima.
Santhe (Pvt) Secondary School	P.O. Box 159	Kapiri, Mchinji
Sevec (Pvt) Secondary School	P/Bag 2	Lilongwe.
Sharpevalle CDSS	P.O. Bwanje	Ntcheu
Soche Hill Secondary School	P.O. Box 5692	Limbe.
Soche Progressive (Pvt) Secondary School	P.O. Box 634	Blantyre.
Songani CDSS	P/Bag 1	Domasi
SOS Herman G. Meiner (Pvt) Secondary School	P.O. Box 20522	Lilongwe 2.
South Lunzu DEC	P.O. Box 643	Blantyre
St Anthony CDSS	P/Bag 2	Thondwe
St Augustine CDSS	P.O. Box 88	Nkhata Bay
St Bapton (Pvt) Secondary School	P.O. Box 1542	Lilongwe.
St Dominics (Pvt) Secondary School	P.O. Box 30038	Lilongwe 3.
St John Bosco Secondary School	P/Bag 2	Champhira, Mzimba
St Johns Secondary School	P.O. Box 191	Lilongwe.
St Kizito CDSS	P.O. Box 5541	Limbe
St Louis Montfort DEC	P.O. Box 420	Balaka
St Marys CDSS	P/Bag 19	Ntaja

St Mary's Secondary School	P.O. Box 149	Zomba.
St Michaels CDSS	P/Bag 24	Zomba
St Michael's Girls Secondary School	P/Bag 3	Mangochi.
St Monica DEC	P.O. Box 424	Mangochi.
St Patricks Secondary School	P.O. Box 5450	Limbe.
St Patricks Seminary	P.O. Box 20	Rumphhi.
St Paul the Apostle Seminary	P.O. Box 315	Mangochi.
St Pauls CDSS	P.O. Box 18	Soche, Blantyre 4
St Pius DEC	P.O. Box 18	Soche, Blantyre 4
Stella Maris Secondary	P/Bag 42	Blantyre.
Swama (Pvt) Secondary School	P.O. Box 76	Namwera.
Thambani DEC	P.O. Box 34	Thambani, Mwanza
Thandizo (Pvt) Secondary School	P/Bag 7	Soche, Blantyre 4
Thekerani DEC	P.O. Box 47	Thekerani
Thuchila DEC	P.O. Box 44	Thuchila
Thunga CDSS	P.O. Box 58	Bvumbwe
Thyolo Secondary School	P.O. Box 34	Thyolo.
Tiwale (Pvt) Secondary School	P.O. Box 108	Lumbadzi.
Tsabango CDSS	P.O. Box 909	Lilongwe
Tsokankanansi DEC	P/Bag B-370	Lilongwe 3
Tukombo Girls Secondary School	P/Bag Khande	Nkhata Bay
Twanda (Pvt) Secondary School	P/Bag 5	Chitipa.
Ulemu kwa Atate (Pvt) Private Secondary School	P.O. Box 2237	Lilongwe.
Ulongwe DEC	P.O Box 43	Ulongwe, Machinga
Umbwi Secondary School	P.O. Box 22	Dedza.
Umodzi (Pvt) Secondary School	P.O. Box 1208	Blantyre.
Usisya DEC	P.O. Box 41	Usisya, Nkhata Bay
Utale DEC	P/Bag 25	Nkaya Balaka
Viphya (Pvt) Secondary School	P/Bag 65	Mzuzu.
Vonken CDSS	P.O. Box 15	Mimosa, Mulanje
Walani (Pvt) Secondary School	P.O. Box 30023	Lilongwe 3.
Waliranji CDSS	P.O. Box 372	Namitete
Wanda CDSS	P.O. Box 208	Mkanda

Wilberforce (Pvt) Secondary School	P.O. Box 1282	Blantyre.
William Murray Secondary School	P.O. Box 44	Nkhoma.
Zingwangwa Secondary School	P/Bag 46	Soche, Blantyre 4
Zomba Catholic Secondary School	P.O. Box 2	Zomba.
Zomba CCAP DEC	P.O. Box 460	Zomba
Zomba CDSS	P.O. Box 460	Zomba

(source: www.sdn.org.mw)

Appendix C

The Questionnaire

The Presence and Use of Information and Communication Technologies (ICTs) in Malawian Secondary Schools : Survey Questionnaire

(APPROVED BY THE MINISTRY OF EDUCATION & HUMAN RESOURCES)

Please Return before the 20th February, 2006

Introduction

The purpose of this questionnaire is to obtain data on the presence and use of Information and Communication Technologies (ICTs) in secondary schools within Malawi. This survey has been approved by the Malawian Ministry of Education and Human Resources and is part of PhD research work being conducted by Anthony Ziba, a Malawian citizen under the sponsorship of Napier University in Scotland.

The questions in this survey relate to facts, they do not ask for opinions. In order to provide valuable data on the understanding of ICT presence and use in Malawian secondary schools, it is important that you respond to this questionnaire even if your school does not have or use ICTs. By participating, you will provide very important information on the current trend of ICT use in relation to the development objectives of the Malawi nation.

How to participate

Please complete the questionnaire and remember to sign and rubber stamp the authentication section below. Please, mail the completed questionnaire as soon as possible and before the 20th of February, 2006 using the supplied return envelop. In order to provide the best possible answers to some questions, you may wish to solicit input from different members of your school like technical support staff or teachers wherever necessary.

For any enquiries contact the researcher on a.ziba@napier.ac.uk or phone 08333449

Name of school: _____
 Address: _____
 District: _____ Contact Telephone Number: _____

Your role within the school' (tick all that apply)

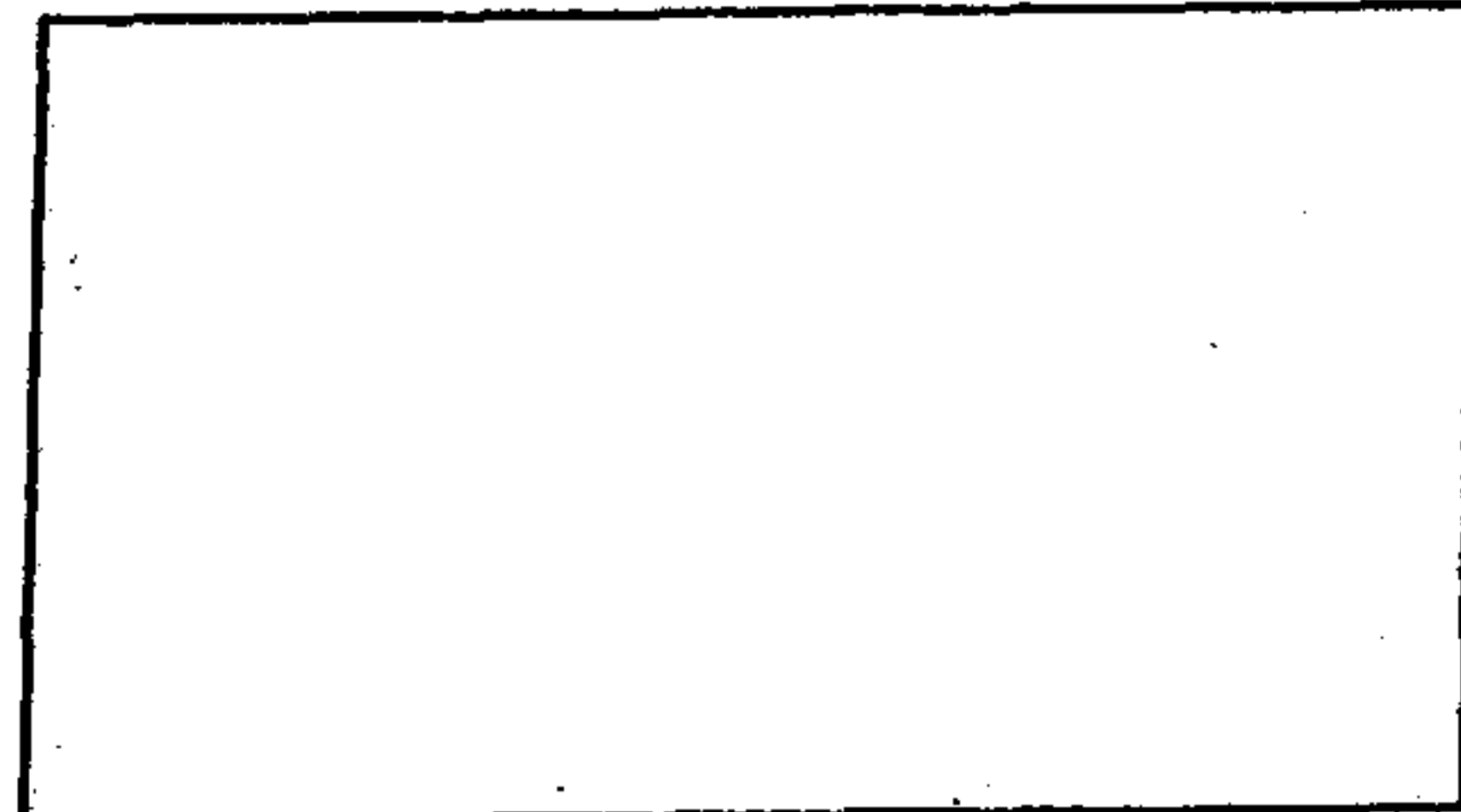
- 1 [] Head teacher
- 2 [] Class teacher
- 3 [] IT support staff
- 4 [] Other

What is the nature of your contract (tick all that apply)

- 1 [] Full time/permanent
- 2 [] Part time
- 3 [] Volunteer
- 4 [] Visiting/Placement
- 5 [] Other (specify).....

Authentication

I have read and understood the purpose of this survey and I on behalf of the school voluntarily agree to participate. [] (please tick to accept)



 Participant Signature

School Stamp

A1. In what type of location is your school

- 1 [] Urban (within 10 Kms from an urban centre)
- 2 [] Rural (over 20 Kms from an urban centre)
- 3 [] Semi-urban (over 10 Kms but less than 20kms from an urban centre)
- 4 [] Other (specify).....

A2. Which of the following best describes your school (tick all that apply)

- 1 [] Private
- 2 [] Government
- 3 [] Religious

- 4 [] Other (specify).....

A3. Which of the following categories describes your school (tick one)

- 1 [] Day Secondary School
- 2 [] Boarding Secondary School
- 3 [] Distance Education Centre
- 4 [] Mobile Education Centre
- 5 [] Other (specify).....

A4. How many pupils do you have in total at your school (specify number): _____

A5. In each class how many male and female pupils do you have at your school (provide required numbers in the table below)

Category	Class	Number	
Number of pupils in each class	Form One	Male	
		Female	
	Form Two	Male	
		Female	
	Form Three	Male	
		Female	
	Form Four	Male	
		Female	

A6. How many teaching staff do you have at your school (provide required numbers in the table below):

Category	Attribute	Number
Total number of teachers	Male	
	Female	
Contract	Full time	
	Part time	
	Other.....	
Length of Employment	1. Less than 2 yrs	
	2. More than 2yrs but less than 5yrs	
	3. More than 5yrs but less than 10yrs	
	4. More than 10yrs	
Nationality	Home	
	Foreign	

A7. How many staff provide IT specialist support at your school (if none, put zero)

- 1 Home staff (specify number).....
 2 Foreign staff (specify number).....

B1. How many computers does your school have?(specify number).....

B2. Where did these computers come from (tick all that apply)

- 1 [] Purchased them yourself (i.e. the school)
 2 [] Malawi Government
 3 [] Schoolnet Malawi
 4 [] Individual Donations
 5 [] Other (specify).....

B3. Which of the following are paid for by your school's budget (tick all that apply)

- 1 [] Computer Hardware
 2 [] Computer Software
 3 [] Internet Connection
 4 [] Computer maintenance and support
 5 [] We do not have a budget
 6 [] Other (specify).....

B4. Who pays for the budget (tick all that apply)

- 1 [] Malawi Government
 2 [] SchoolNet Malawi
 3 [] Individual sponsors
 4 [] Other (specify).....

A8. How many of the home staff at your school have received formal information technology training (tick one)

- 1 [] None
 2 [] Less than 5 people
 3 [] More than 5 but less than 10
 4 [] More than 10 but less than 25
 5 [] More than 25
 6 [] Other (specify).....

A9. Where did the home staff at your school obtain their IT training (tick all that apply)

- 1 [] Teacher Training College
 2 [] The University of Malawi
 3 [] At the School
 4 [] Other (specify).....

A10. Who provided funding for the training (tick all that apply)

- 1 [] The Malawi government
 2 [] Individuals themselves
 3 [] The school
 4 [] Other (specify).....

A11. Which of the following aspects have the home teaching staff been trained to do (tick all that apply)

- 1 [] Using computer as a teaching tool for specific subject areas(e.g. geography, Maths, English etc)
 2 [] Using word processing
 3 [] Using the internet to share information
 4 [] Using the internet for online learning
 5 [] Offering IT specialist support
 6 [] Other (specify).....

B5. Which of the following computer operating systems do you have at your school (tick all that apply)

- 1 [] MacIntosh
 2 [] Windows 95, 98, 2000, XP, ME, NT (circle all applicable Windows versions)
 3 [] Linux
 4 [] Unix
 5 [] Other (specify).....

B6. Which of the following software applications does your school have on its computers (tick all that apply)

- 1 [] Microsoft Office
 2 [] Drill & practice educational programs
 3 [] E-mail
 4 [] Internet browser
 5 [] Other (specify).....

B7. How many computers are connected to the internet (tick one)

- 1 [] None
 2 [] Less than 5 computers
 3 [] More than 5 but less than 10
 4 [] More than 10 but less than 15

- 5 [] Other (specify).....
- B8. How are these computers connected to the internet (*tick all that apply*)
- 1 [] dial up (modem and telephone line)
- 2 [] leased line (always connected)
- 3 [] Wireless connection
- 3 [] Not connected
- 5 [] Other (specify).....

- B9. Who provides the internet services at your school (*tick all that apply*)
- 1 [] None
- 2 [] Malawi SDNP
- 3 [] MalawiNet
- 4 [] Computer Land

- 5 [] Celtel
- 6 [] Other (specify).....
- B10. Which of the following educational purposes are supported by computers in your school (*tick all that apply*)
- 1 [] Learning
- 2 [] Teaching
- 3 [] Administration
- 4 [] Other (specify).....

- C1. Which of the following teaching subjects are supported by ICT use (*tick all that apply*)
- 1 [] Maths 5 [] Computer Education
- 2 [] English 6 [] Geography
- 3 [] History 7 [] Social Studies
- 4 [] Physics 8 [] General Science
- 9 [] Other (specify).....

C2. Do teachers use computers for educational purposes in the following classes at your school

Form	Use(<i>tick one</i>)	Type of use (<i>e.g teaching support, independent learning etc</i>)
1	1 [] Yes 2 [] No	
2	1 [] Yes 2 [] No	
3	1 [] Yes 2 [] No	
4	1 [] Yes 2 [] No	

C3. How often do pupils use computers in the following classes at your school

Form	Use(<i>tick one</i>)	Frequency of use (<i>tick one</i>)
1	1 [] Yes 2 [] No	1. [] Daily 2. [] Weekly 3. [] Monthly 4. [] Other.....
2	1 [] Yes 2 [] No	1. [] Daily 2. [] Weekly 3. [] Monthly 4. [] Other.....
3	1 [] Yes 2 [] No	1. [] Daily 2. [] Weekly 3. [] Monthly 4. [] Other.....
4	1 [] Yes 2 [] No	1. [] Daily 2. [] Weekly 3. [] Monthly 4. [] Other.....

C4. How often does each pupil have internet access in the following classes at your school

Form	Use(<i>tick one</i>)	Frequency of use (<i>tick one</i>)
1	1 [] Yes 2 [] No	1. [] Daily 2. [] Weekly 3. [] Monthly 4. [] Other.....
2	1 [] Yes 2 [] No	1. [] Daily 2. [] Weekly 3. [] Monthly 4. [] Other.....
3	1 [] Yes 2 [] No	1. [] Daily 2. [] Weekly 3. [] Monthly 4. [] Other.....
4	1 [] Yes 2 [] No	1. [] Daily 2. [] Weekly 3. [] Monthly 4. [] Other.....

C5. Which of the following categories of people are allowed to use school computers or the internet outside class hours i.e. at night, over the weekend, during holidays etc (*tick all that apply*)

- 1 [] None
- 2 [] Staff members
- 3 [] School pupils
- 4 [] Local community
- 5 [] Other (specify).....

C6. How is internet access supervised at your school (*tick all that apply*)

- 1 [] Not supervised
- 2 [] Supervised by teachers
- 3 [] Supervised by IT staff
- 4 [] Supervised by pupils (e.g. class monitors)
- 5 [] Other (specify).....

-----End of Questionnaire-----

Thank you for your participation in this survey. Now, please mail the completed questionnaire (using the return envelop provided) to: Anthony Ziba, P.O. Box 1002, Mzuzu before the 20th of February.

Appendix D

ICT Syllabus



REPUBLIC OF MALAWI

MALAWI

SENIOR SECONDARY TEACHING
SYLLABUS

**COMPUTER STUDIES
SYLLABUS**

FORMS 3-4

Ministry of Education, Science and Technology

**SENIOR SECONDARY SCHOOL
TEACHING SYLLABUS**

**COMPUTER STUDIES
SYLLABUS**

Ministry of Education, Science and Technology

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Poor text in the original
thesis.

Some text bound close to
the spine.

Some images distorted

TEACHING SYLLABUS FOR COMPUTER STUDIES

FORM 3

TEACHING SYLLABUS FOR COMPUTER STUDIES FOR FORM 3

Topic	Objectives	Content	Suggested teaching/learning experiences	Suggested teaching/learning resources	Suggested methods of assessment
Introduction to computers	Students should be able to:				
	1 define a computer	• Definition of a computer	• defining a computer	• computers • drawings/pictures of computers	• oral exercises • written exercises • tests
	2 define information technology	• Information technology	• defining information technology	• computer related devices - calculators - type writers - digital watches	
	3 trace the period during which the first computers were developed	• History of computers development	• discussing the period during which the first computer were developed	- counters - slide rule	
	4 state the uses of the first computers	• Uses of first computers	• stating uses of first computers		
	5 state types of computers	• Types of computers - analogue - digital - hybrid	• stating types of computers		
	6 compare types of computers		• comparing types of computers		

Topic	Objectives	Content	Suggested teaching/learning experiences	Suggested teaching/learning resources	Suggested methods of assessment
	7 classify computers	<ul style="list-style-type: none"> • Classification of computers <ul style="list-style-type: none"> - super computer - mainframe - minicomputer - microcomputers <ul style="list-style-type: none"> i desktop ii laptop iii palmtop • Computer terminology 	<ul style="list-style-type: none"> • classifying computers and stating their respective uses • discussing the computer terms students are likely to meet in this course 		
Areas in which computers are used	Students should be able to: <ol style="list-style-type: none"> 1 describe advantages of using computer 	<ul style="list-style-type: none"> • Advantages of using computers <ul style="list-style-type: none"> - speed - accuracy - reliability - large volume data storage - large volume data processing 	<ul style="list-style-type: none"> • discussing advantages of using computers in different applications 	<ul style="list-style-type: none"> • field visits <ul style="list-style-type: none"> - banks - ESCOM - post offices - water boards - airports 	<ul style="list-style-type: none"> • oral exercises • written exercises • tests

TEACHING SYLLABUS FOR COMPUTER STUDIES FOR FORM 3

Topic	Objectives	Content	Suggested teaching/learning experiences	Suggested teaching/learning resources	Suggested methods of assessment
Introduction to computers	Students should be able to:				
	1 define a computer	<ul style="list-style-type: none"> • Definition of a computer 	<ul style="list-style-type: none"> • defining a computer 	<ul style="list-style-type: none"> • computers • drawings/pictures of computers 	<ul style="list-style-type: none"> • oral exercises • written exercises • tests
	2 define information technology	<ul style="list-style-type: none"> • Information technology 	<ul style="list-style-type: none"> • defining information technology 	<ul style="list-style-type: none"> • computer related devices - calculators - type writers - digital watches - counters - slide rule 	
	3 trace the period during which the first computers were developed	<ul style="list-style-type: none"> • History of computers development 	<ul style="list-style-type: none"> • discussing the period during which the first computer were developed 		
	4 state the uses of the first computers	<ul style="list-style-type: none"> • Uses of first computers 	<ul style="list-style-type: none"> • stating uses of first computers 		
	5 state types of computers	<ul style="list-style-type: none"> • Types of computers - analogue - digital - hybrid 	<ul style="list-style-type: none"> • stating types of computers 		
6 compare types of computers			<ul style="list-style-type: none"> • comparing types of computers 		

TEACHING SYLLABUS FOR COMPUTER STUDIES

FORM 3

Topic	Objectives	Content	Suggested teaching/learning experiences	Suggested teaching/learning resources	Suggested methods of assessment
	7 classify computers	<ul style="list-style-type: none"> • Classification of computers <ul style="list-style-type: none"> - super computer - mainframe - minicomputer - microcomputers <ul style="list-style-type: none"> i desktop ii laptop iii palmtop 	<ul style="list-style-type: none"> • classifying computers and stating their respective uses 		
	8 understand the terms commonly used in computing	<ul style="list-style-type: none"> • Computer terminology 	<ul style="list-style-type: none"> • discussing the computer terms students are likely to meet in this course 		
Areas in which computers are used	Students should be able to: <ol style="list-style-type: none"> 1 describe advantages of using computer 	<ul style="list-style-type: none"> • Advantages of using computers <ul style="list-style-type: none"> - speed - accuracy - reliability - large volume data storage - large volume data processing 	<ul style="list-style-type: none"> • discussing advantages of using computers in different applications 	<ul style="list-style-type: none"> • field visits <ul style="list-style-type: none"> - banks - ESCOM - post offices - water boards - airports 	<ul style="list-style-type: none"> • oral exercises • written exercises • tests

Topic	Objectives	Content	Suggested teaching/learning experiences	Suggested teaching/learning resources	Suggested methods of assessment
	Students should be able to: 2 describe disadvantages of using computers	<ul style="list-style-type: none"> • Disadvantages of using computer <ul style="list-style-type: none"> - loss of jobs - limited job opportunities - loss of information, <ul style="list-style-type: none"> ▪ power failure, ▪ viruses 	<ul style="list-style-type: none"> • discussing disadvantages of using computers in different applications 		
	3 list down areas in which computers are used	<ul style="list-style-type: none"> • Fields in which computers are used <ul style="list-style-type: none"> - financial system <ul style="list-style-type: none"> ▪ accounting ▪ banking ▪ payroll ▪ sales - communication systems <ul style="list-style-type: none"> ▪ email ▪ internet ▪ fax ▪ www - transport systems <ul style="list-style-type: none"> ▪ traffic control ▪ shipping 	<ul style="list-style-type: none"> • discussing the uses of computers in different fields 		

Topic	Objectives	Content	Suggested teaching/learning experiences	Suggested teaching/learning resources	Suggested methods of assessment
	Students should be able to:	<ul style="list-style-type: none"> - research systems <ul style="list-style-type: none"> ▪ scientific ▪ social - entertainment <ul style="list-style-type: none"> ▪ games ▪ movies ▪ multimedia - education systems <ul style="list-style-type: none"> ▪ computer tutorials ▪ problem solving 			
Computer components	<ol style="list-style-type: none"> 1 list down types of computer components 2 define computer hardware 3 describe briefly functions of hardware 4 define computer software 	<ul style="list-style-type: none"> • Types of computer components <ul style="list-style-type: none"> - hardware - software • Hardware • Software 	<ul style="list-style-type: none"> • listing down types of computer components • defining computer hardware • describing briefly functions of hardware • defining computer software 	<ul style="list-style-type: none"> • complete computer system • peripheral devices <ul style="list-style-type: none"> - printer - scanner - joysticks - lightpen • floppy diskettes 	<ul style="list-style-type: none"> • oral exercises • written exercises • practical assignments

Topic	Objectives	Content	Suggested teaching/learning experiences	Suggested teaching/learning resources	Suggested methods of assessment
	<p>Students should be able to:</p> <p>5 describe briefly the functions of software</p> <p>6 distinguish between hardware and software</p> <p>7 identify components of a computer hardware</p> <p>8 describe input devices</p> <p>9 describe output devices</p>	<ul style="list-style-type: none"> • Hardware components <ul style="list-style-type: none"> - CPU - input devices - output devices - storage devices - communication devices • Input devices <ul style="list-style-type: none"> - keyboard - mouse - scanner - joysticks - digital camera - microphone • Output devices <ul style="list-style-type: none"> - VDU - printers - speakers 	<ul style="list-style-type: none"> • describing briefly the functions of software • distinguishing between hardware and software • identifying elements of a computer system hardware • listing down input devices • explaining the uses of input devices • listing down output devices • discussing uses of output devices 		

Topic	Objectives	Content	Suggested teaching/learning experiences	Suggested teaching/learning resources	Suggested methods of assessment
	<p>Students should be able to:</p> <p>10 describe storage devices</p> <p>11 describe CPU</p> <p>12 describe communication devices</p> <p>13 identify types of computer software</p>	<ul style="list-style-type: none"> • Storage devices <ul style="list-style-type: none"> - hard disk - floppy diskettes - CD-ROM • CPU <ul style="list-style-type: none"> - memory - arithmetic logic unit (ALU) - control Unit • Communication devices <ul style="list-style-type: none"> - network cards - modem - hub • Types of software <ul style="list-style-type: none"> - systems software - applications software 	<ul style="list-style-type: none"> • describing storage devices • writing down types of storage devices • describing CPU • discussing communication devices • identifying types of computer software 		<ul style="list-style-type: none"> • oral questions • practical exercises • tests • written exercises

Topic	Objectives	Content	Suggested teaching/learning experiences	Suggested teaching/learning resources	Suggested methods of assessment
	<p>Students should be able to:</p> <p>14 describe systems software</p> <p>15 describe applications software</p>	<ul style="list-style-type: none"> • Systems software <ul style="list-style-type: none"> - operating systems - utilities - language translators • Application software • Applications packages <ul style="list-style-type: none"> - word processing - spreadsheet - database 	<ul style="list-style-type: none"> • describing system software • describing applications software 		
Safe use and management of computers	<p>1 practice safe management of computer laboratory</p> <p>2 identify possible causes of loss of software and data</p>	<ul style="list-style-type: none"> • Management of computer laboratory <ul style="list-style-type: none"> - equipment - personnel - materials • Causes of loss of software and data <ul style="list-style-type: none"> - power failure - accidental erasure - crashing of disk - viruses - poor storage of disks 	<ul style="list-style-type: none"> • discussing rules and regulations to be observed in the computer laboratory • discussing the possible causes of software and data loss 	<ul style="list-style-type: none"> • disk fackette • file antiviral software • backup file • UPS • utility programs • write protect knotch • passwords • hoovers • conditioners 	<ul style="list-style-type: none"> • oral questions • practical exercises • tests • written exercises

Topic	Objectives	Content	Suggested teaching/learning experiences	Suggested teaching/learning resources	Suggested methods of assessment
	Students should be able to: 3 identify possible precautionary measures against loss of software and data	<ul style="list-style-type: none"> • Safety precautions and practices <ul style="list-style-type: none"> - burglar proofing - fire fighting equipment - stable power supply (UPS) standard furniture - dust proofing - ventilating 	<ul style="list-style-type: none"> • discussing safety and precautionary measures in the computer lab • practicing safety and precautionary measures in the computer lab 		
	4 practice safety measures against causes of the loss of software and data	<ul style="list-style-type: none"> • Safety measures against loss of software and data <ul style="list-style-type: none"> - antivirus - stable power supply - good disk storage - backup - write protect - knotch 	<ul style="list-style-type: none"> • practising the precautionary measures against loss of data and software 		

Topic	Objectives	Content	Suggested teaching/learning experiences	Suggested teaching/learning resources	Suggested methods of assessment
Mastering the keyboard and the mouse	<p>Students should be able to:</p> <ol style="list-style-type: none"> 1 define a keyboard 2 define term key on a keyboard 3 list down types of keys 4 state the functions of keys 5 use the keyboard 	<ul style="list-style-type: none"> • Keyboard <ul style="list-style-type: none"> - letter keys - number keys - special keys - function keys • Typing <ul style="list-style-type: none"> - letters - words • numbers • symbols • function keys • special keys <ul style="list-style-type: none"> ▪ enter ▪ space bar ▪ backspace ▪ tab key • Keyboard posture 	<ul style="list-style-type: none"> • defining keyboard • defining a key on a keyboard • describing the keys on the keyboard • discussing uses or functions of the keyboard • typing lower case (small) letters • typing upper case (capital) letters using CAPS LOCK key or SHIFT key • typing numbers • typing symbols • practising using function keys • practising using special keys • practising good keyboard posture 	<ul style="list-style-type: none"> • typewriters • computers • touch typing program 	<ul style="list-style-type: none"> • practical exercises • written exercises • tests • practical tests

Topic	Objectives	Content	Suggested teaching/learning experiences	Suggested methods of assessment
	<p>Students should be able to:</p> <p>7 describe functions of the mouse</p> <p>8 perform tasks using mouse</p>	<ul style="list-style-type: none"> • Mouse functions <ul style="list-style-type: none"> - picking/ selecting options - pointing - drawing lines 	<ul style="list-style-type: none"> • describing functions of the mouse • performing tasks using the mouse 	
Operating systems	<p>1 define operating system</p> <p>2 outline the importance of operating systems</p> <p>3 state types of operating systems</p>	<ul style="list-style-type: none"> • Definition of operating system • Importance of operating systems • Types of operating systems <ul style="list-style-type: none"> - single users <ul style="list-style-type: none"> ▪ DOS ▪ Windows ▪ macintosh - Multitusers <ul style="list-style-type: none"> ▪ DOS ▪ Windows ▪ Novell - Multitasking <ul style="list-style-type: none"> ▪ Unix 	<ul style="list-style-type: none"> • defining operating system • explaining the importance of operating systems • stating types of operating systems • comparing types of operating systems 	<ul style="list-style-type: none"> • oral questions • written exercises • tests
			<ul style="list-style-type: none"> • computer/with DOS and windows • floppy diskettes 	

Topic	Objectives	Content	Suggested teaching/learning experiences	Suggested teaching/learning resources	Suggested methods of assessment
	<p>Students should be able to:</p> <p>4 state the functions of operating systems</p>	<ul style="list-style-type: none"> • Functions of the operating systems <ul style="list-style-type: none"> - job sequencing - activating computers - controlling functions - error handling - memory management - device scheduling 	<ul style="list-style-type: none"> • stating functions of the operating systems 		
	<p>5 list down contents of disk operating systems (DOS)</p>	<ul style="list-style-type: none"> • Contents of disk operating system <ul style="list-style-type: none"> - prompt - internal DOS commands - external DOS commands 	<ul style="list-style-type: none"> • listing down contents of the disk operating system 		
	<p>6 describe how DOS organises information</p>	<ul style="list-style-type: none"> • Information organisation <ul style="list-style-type: none"> - files - directories - drives 	<ul style="list-style-type: none"> • discussing the organisation of information in DOS 		

Topic	Objectives	Content	Suggested teaching/learning experiences	Suggested teaching/learning resources	Suggested methods of assessment
	Students should be able to: 7 explain the advantages of information organisation	<ul style="list-style-type: none"> • Advantages - easy access of information - easy transfer of information - easy sorting of information 	<ul style="list-style-type: none"> • explaining advantages of information organisation 		
	8 use DOS commands in file management systems	<ul style="list-style-type: none"> • DOS commands - view directories - changing directories - creating directories - deleting directories - deleting files - copying files - renaming files - wild cards 	<ul style="list-style-type: none"> • booting a computer • using file management commands 		
	9 use DOS commands in disk management systems	<ul style="list-style-type: none"> • Formatting a floppy disk • Labelling disk • Copying disk 	<ul style="list-style-type: none"> • using disk management commands 		
	10 define Windows	<ul style="list-style-type: none"> • Windows 	<ul style="list-style-type: none"> • discussing Windows operating system 		

Topic	Objectives	Content	Suggested teaching/learning experiences	Suggested teaching/learning resources	Suggested methods of assessment
	Students should be able to: 11 state the advantages of Windows 12 identify contents of a Windows 13 state the advantages of Windows over DOS	<ul style="list-style-type: none"> • Advantages <ul style="list-style-type: none"> - high speed - user friendly - task oriented - easy maintenance • Contents of Windows <ul style="list-style-type: none"> - menu bar - work area - title bar etc - scroll bar - status bar - scroll arrows - maximise button - minimise button - control menu box - icons • Advantages <ul style="list-style-type: none"> - high speed - user friendly - task oriented - easy maintenance 	<ul style="list-style-type: none"> • stating the advantages of Windows • identifying contents of a Windows <ul style="list-style-type: none"> - menu bar - work area - maximise and minimise buttons - scroll bar - status bar - scroll arrows - control menu box - icons • stating advantages of Windows 		

Topic	Objectives	Content	Suggested teaching/learning experiences	Suggested teaching/learning resources	Suggested methods of assessment
	<p>Students should be able to:</p> <ul style="list-style-type: none"> 14 identify contents of a Windows 	<ul style="list-style-type: none"> • Contents of a Windows <ul style="list-style-type: none"> - menu bar - work area - title bar etc - scroll bar - status bar - scroll arrows - maximise button - minimise buttons - control menu box - icons 	<ul style="list-style-type: none"> • stating windows • identifying contents of a Windows <ul style="list-style-type: none"> - menu bar - work area - maximise and minimise buttons - scroll bar - status bar - scroll arrows - control menu box - icons 		

Topic	Objectives	Content	Suggested teaching/learning experiences	Suggested teaching/learning resources	Suggested methods of assessment
Word Processing 1	Students should be able to: 1 define word processing 2 describe contents of a word processor 3 state the uses of icons and commands 4 get into word 5 create a document 6 format a document 7 edit a document 8 save a document 9 print a document	<ul style="list-style-type: none"> • Definition of Word processing • Contents of a word processor <ul style="list-style-type: none"> - cursor - toolbar icons - commands • Working with a word processor <ul style="list-style-type: none"> - Creation - Formatting - Editing - Saving <ul style="list-style-type: none"> ▪ commands ▪ icons ▪ password - Printing <ul style="list-style-type: none"> ▪ all pages ▪ selected pages 	<ul style="list-style-type: none"> • defining word processing • describing the contents of a word processor • discussing the use of icons and commands • getting into word • typing a document • formatting a document using icons and other methods • editing a document using icons or commands • saving a document using saving icons or commands or password • printing a document using printing icons, commands or password 	<ul style="list-style-type: none"> • computer set • word processing program • floppy diskettes • printer • paper • scanner 	<ul style="list-style-type: none"> • oral questions • written exercises • practical exercises

Topic	Objectives	Content	Suggested teaching/learning experiences	Suggested teaching/learning resources	Suggested methods of assessment
	Students should be able to: 10 close a file 11 exit a program 12 retrieve a saved document 13 state advantages of word processing over traditional typewriter	<ul style="list-style-type: none"> • Shutting down • Retrieving • Advantages of word processing 	<ul style="list-style-type: none"> • exiting a programme • retrieving a saved document • discussing advantages of word processing over traditional typewriter 		
Spreadsheet (Excel) 1	1 define spreadsheet 2 explain the uses of spreadsheets	<ul style="list-style-type: none"> • Definition of a spreadsheet <ul style="list-style-type: none"> - traditional - electronic • Uses of spreadsheets <ul style="list-style-type: none"> - arranging information - preparation of budgets - complex calculations - interest calculations - "what if" analysis 	<ul style="list-style-type: none"> • defining spreadsheets • discussing the uses of spreadsheets 	<ul style="list-style-type: none"> • computer • printer • paper • graph paper 	<ul style="list-style-type: none"> • oral exercise • written exercises • practical tests • projects

Topic	Objectives	Content	Suggested teaching/learning experiences	Suggested teaching/learning resources	Suggested methods of assessment
	<p>Students should be able to:</p> <p>3 describe the worksheet layout</p> <p>4 create a traditional worksheet</p> <p>5 get into excel</p> <p>6 Create an electronic worksheet</p> <p>7 describe cell entries into a worksheet</p>	<ul style="list-style-type: none"> • Worksheet layout <ul style="list-style-type: none"> - columns - rows - labels - cells - formula bar • Creation of traditional worksheet • Opening spreadsheet • creation of an electronic worksheet • Cell entries <ul style="list-style-type: none"> - number - text 	<ul style="list-style-type: none"> • describing the worksheet layout • creating a traditional worksheet • getting into excel. • creating an electronic worksheet • entering data • describing cell entries into a worksheet 		

TEACHING SYLLABUS FOR COMPUTER STUDIES

FORM 4

TEACHING SYLLABUS FOR COMPUTER STUDIES FOR FORM 4

Topic	Objectives	Content	Suggested teaching/learning experiences	Suggested teaching/learning resources	Suggested methods of assessment
Word processing (2)	<p>Students should be able to:</p> <ol style="list-style-type: none"> 1 format a document 2 insert text from other documents 3 insert objects in a document 4 create a table 5 appreciate the use of graphics 6 print documents in various ways 	<ul style="list-style-type: none"> • Working with a word processor <ul style="list-style-type: none"> - formatting - Merging <ul style="list-style-type: none"> ▪ mail merge ▪ text merge - Integration <ul style="list-style-type: none"> ▪ picture objects ▪ charts ▪ graphs ▪ drawings • Creation of tables in a word document • Graphics <ul style="list-style-type: none"> - structures - tools - activities • Printing <ul style="list-style-type: none"> i random ii sequential 	<ul style="list-style-type: none"> • formatting a document using icons and other methods • inserting text from other documents • inserting objects into documents • creating tables using wizard and from scratch • practising designs of graphical images using different graphical tools • printing document 	<ul style="list-style-type: none"> • word processing program • floppy diskettes • printers • printing paper • draw program - MS-Draw 	<ul style="list-style-type: none"> • oral questions • written exercises • tests • projects

Topic	Objectives	Content	Suggested teaching/learning experiences	Suggested teaching/learning resources	Suggested methods of assessment
Spreadsheet (Excel) II	<p>Students should be able to:</p> <ol style="list-style-type: none"> describe cell entries apply worksheet formatting skills use functions and formulae apply charting skills interpret graphs print a spreadsheet 	<ul style="list-style-type: none"> Cell entries <ul style="list-style-type: none"> formulae functions Moving around a spreadsheet using <ul style="list-style-type: none"> arrow keys tab key mouse scroll bars Column width Row width Functions and formulae <ul style="list-style-type: none"> copying cells relative reference absolute reference Chart wizard Graphs <ul style="list-style-type: none"> bargraphs linegraphs piechart Printing 	<ul style="list-style-type: none"> discussing types of cell entries applying formatting skills building functions and formulae entering formulae and functions choosing types of charts and graphs applying charting skills analysing graphs and charts printing worksheet or graphs 	<ul style="list-style-type: none"> computer set printer paper 	<ul style="list-style-type: none"> oral exercise written exercise practical tests projects

Topic	Objectives	Content	Suggested teaching/learning experiences	Suggested teaching/learning resources	Suggested methods of assessment
Database	<p>Students should be able to:</p> <ol style="list-style-type: none"> 1 define database 2 describe contents of database 3 describe file management methods 4 list down types of database model 5 describe steps followed in database design 	<ul style="list-style-type: none"> • Definition of database • Contents of database filing system <ul style="list-style-type: none"> - fields - files - records • File management methods <ul style="list-style-type: none"> - traditional - computerised • Database models <ul style="list-style-type: none"> - network models - relational model - hierarchical model • Steps in database design <ul style="list-style-type: none"> - identify entity - identify data about the entity - identify data for searching and sorting 	<ul style="list-style-type: none"> • defining database • discussing contents of database • discussing file management method • practicing file management methods • describing database models • discussing steps in database design 	<ul style="list-style-type: none"> • computers • database program • floppy diskettes • papers and folders • samples of <ul style="list-style-type: none"> - flat file records - relational file records 	<ul style="list-style-type: none"> • oral questions • written exercises • tests • project

Topic	Objectives	Content	Suggested teaching/learning experiences	Suggested teaching/learning resources	Suggested methods of assessment
	<p>Students should be able to:</p> <p>6 explain different types of fields</p> <p>7 create database structure</p> <p>8 enter data</p> <p>9 perform operations on a relational database</p> <p>10 save and backup</p> <p>11 print document</p>	<ul style="list-style-type: none"> • Types of fields <ul style="list-style-type: none"> - character - numeric - alphanumeric - memos - logical etc • Database structure <ul style="list-style-type: none"> - field name - field type - field width - normalisation • Data entry • Working with database <ul style="list-style-type: none"> - sorting - indexing - querying - average - count and sum • Saving • Printing <ul style="list-style-type: none"> - selected - random - sequential 	<ul style="list-style-type: none"> • discussing types • demonstrating the types of field • getting into database • exploring database environment • entering data • sorting data • editing data • saving data • retrieving data etc. • getting into database • performing operations on a relational database • saving in floppy diskettes • create backup files • printing documents 	<ul style="list-style-type: none"> • computers • database program • floppy diskettes • papers and folders • samples of <ul style="list-style-type: none"> - flat file records - relational file records 	<ul style="list-style-type: none"> • oral questions • written exercises • tests • project

Topic	Objectives	Content	Suggested teaching/learning activities	Suggested teaching/learning resources	Suggested modes of assessment
Communication and Networks	<p>Students should be able to:</p> <ol style="list-style-type: none"> 1 define communication 2 define network 3 understand the basics of communication and network 4 identify importance of communication 5 identify equipment used in network 	<ul style="list-style-type: none"> • Communication • Networks • Basics of communication and networks • Importance of communication • Network equipment <ul style="list-style-type: none"> - modems - network cables - transmitters - routers - switches - bridges - hubs - network cards • Functions of network equipment • Network software <ul style="list-style-type: none"> - file server - communication 	<ul style="list-style-type: none"> • defining communication • defining network • discussing the basics of communication and network • outlining the importance of communication • stating the equipment used in network • discussing functions of network equipment • discussing the various software used in network 	<ul style="list-style-type: none"> • computers • modem • network programs • network cables • routers • switches • bridges • hubs • network cards 	<ul style="list-style-type: none"> • oral questions • written exercises • tests • practical tests

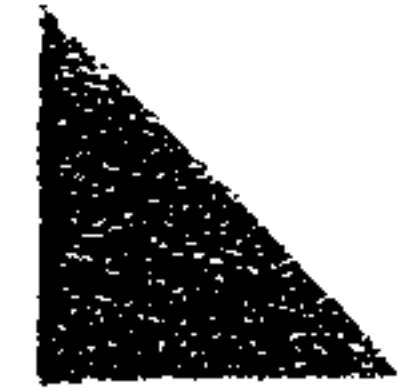
Topic	Objectives	Content	Suggested teaching/learning experiences	Suggested teaching/learning resources	Suggested methods of assessment
	<p>Students should be able to:</p> <p>8 describe various types of networks</p>	<ul style="list-style-type: none"> • Types of networks <ul style="list-style-type: none"> - local area network - wide area network 	<ul style="list-style-type: none"> • discussing the various types of networks 		
Career opportunities	<p>1 identify available further education opportunities in computer studies</p> <p>2 state job opportunities available in computing field</p>	<ul style="list-style-type: none"> • Education opportunities <ul style="list-style-type: none"> - colleges - institutes - universities - research • Job opportunities <ul style="list-style-type: none"> - lectures/teachers - computer operator - data processing managers - network administrators - information resource managers - computer programme hardware engineers 	<ul style="list-style-type: none"> • discussing the field available for further education in computer education in computer studies • discussing the career opportunities available in computing fields 	<ul style="list-style-type: none"> • career talks by computer professionals • field visits 	<ul style="list-style-type: none"> • oral • written • exercises

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- der Merwe, S, du Toit, C, (1997) *Computer practice for PCs, Vol 1, MS-DOS*. Cape Town: Longman.
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- Hinder, L (1999) *Information technology*. London: John Murray.
- Williams MC, (1997), *Using information technology, NVQ level 2*. Oxford: Heinemann.

Appendix E

Research Consent form



PhD Researcher: Anthony Ziba
 Napier University
 Edinburgh, Scotland
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1st Supervisor: Prof. Elisabeth Davenport
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2nd Supervisor: Dr. Keith Horton
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Study title:

Understanding Socio-Technical issues surrounding the Adoption and Use of Information and Communication Technologies for Educational Purposes in Malawian Secondary Schools.

Site of data collection:

.....Secondary School, Malawi.

Informed consent:

This consent form is part of the process of informed consent. This will provide you with background on the purpose of this study, what will be involved in your participation and how this research project relates to you. If you would like more information about anything mentioned here or information not included here, feel free to ask. Please take the time to read this carefully and to understand all accompanying information.

This document describes:

1. The purpose and specification of the research project
2. The role and responsibilities of the researcher
3. The roles and responsibilities of Napier University
4. An explanation about your participation
5. How your responses become information, how this will be handled after the exploration is complete and how any findings or outcomes will be disseminated.

1. The research project

The concept of socio-technical nature of technology underlines the fact that technology is not neutral. Instead technology is inextricably interrelated to the social context within which it is embedded. The research study outlined below, is particularly focused on this aspect and the nature of interaction between the technology (ICTs) and the Malawian social context within which it is embedded. The study will look at how technology is adopted, particularly within secondary schools,

how the technology is used and the consequences of such use and its implications to the Malawian nation. The three specific research areas are broken down below, as well as how this will impact on you.

Specific research area	Impact
1. Understanding ICT adoption processes within your school	<ul style="list-style-type: none"> • Interviews with some individuals • Questionnaires sent round
2. Understanding ICT use within secondary schools	<ul style="list-style-type: none"> • Observing computer classes/ lessons • Questionnaires sent round • Interviews with some individuals
3. Understanding consequences of ICT use and how these implicate the idea of adopting and using ICTs for educational purposes.	<ul style="list-style-type: none"> • Interviews with some individuals • Picture taking of some individuals while using ICTs

2. The researcher

The researcher [Anthony Ziba] will:

- comply with all legal considerations for this study.
- comply with the Napier University code of Practice on Research Ethics and the university's policies on Health, Safety and Equal Opportunities.
- not compromise the principles of non-maleficence and beneficence, legal obligations and any pre-existing rights in the conduct of research.
- consider the principles of justice and the fair treatment of participants in the study.
- consider the implications of the research to the psychological, social, political, religious, cultural and economic consequences of the work of the participants.

3. Napier University

The study outlined above forms part of a PhD programme undertaken by Anthony Ziba. The Department of Engineering and Computing within Napier University funds the PhD. It therefore complies with the University's specific code of Practice on Research Ethics and policies on Health, Safety and Equal Opportunities. A link to the Napier University research ethics code can be found here:

http://www.napier.ac.uk/depts/research/ethics_code.htm#procedures

The University requires research to comply with legal considerations. The most relevant to the research described above is the following:

- the Data Protection Act
- the Computer Misuse Act
- the Human Rights Act

4. Your participation

The research will take place in your school environment and is designed to cause as little disruption as possible. If, at any time you feel the progress or your work is being interfered with, or if you simply feel uncomfortable about the research, please let me know. You are able to withdraw from the study at any time.

A combination of methods will be employed during the study. Case study based techniques will be used to note, observe, photograph, interview and carry out questionnaire. Furthermore Discourse Analysis (DA) will be applied, to understand the underlying processes that lead to particular patterns of interaction between technology and the social context.

5. The data

Your responses will be gathered together collectively as grouped information. The information will then be analysed. The results of the analysis will be used towards a PhD thesis, which will be presented in verbal presentations and publications. There will be no links between your responses and you as a participant.

The collection, storage, disclosure and use of research data will comply with the Data Protection Act 1998. Data analysis from the study will form part of the researcher's PhD and papers for presentation and publication. The information gathered will be made available upon request to the supervisory committee, external examiners and other researchers as part of the PhD process. If information from the research is to be used in any publication or presentation, prior consent will be sought from you. This is to ensure that all parties are happy with the content and manner that the information is portrayed and that no information presented is confidential to the company. Any information about clients or any data that you articulate is specifically confidential to you or the school will be strictly classified and not used in this research.

Declaration:

Your signature on this form indicates that you have understood to your satisfaction the information regarding participation in the research project and agree to participate as a subject. In no way does this waive your legal rights nor releases the investigators, sponsors, or involved institutions from their legal and professional responsibilities. You are free to withdraw from the study at any time. Your continued participation should be as informed as your initial consent, so you should feel free to ask for clarification or new information throughout your participation. If you have further questions concerning matters related to this research, please contact:

PhD Researcher:

Mr Anthony Ziba
Napier University
0131 455 2792
a.ziba@napier.ac.uk

Participant Signature:

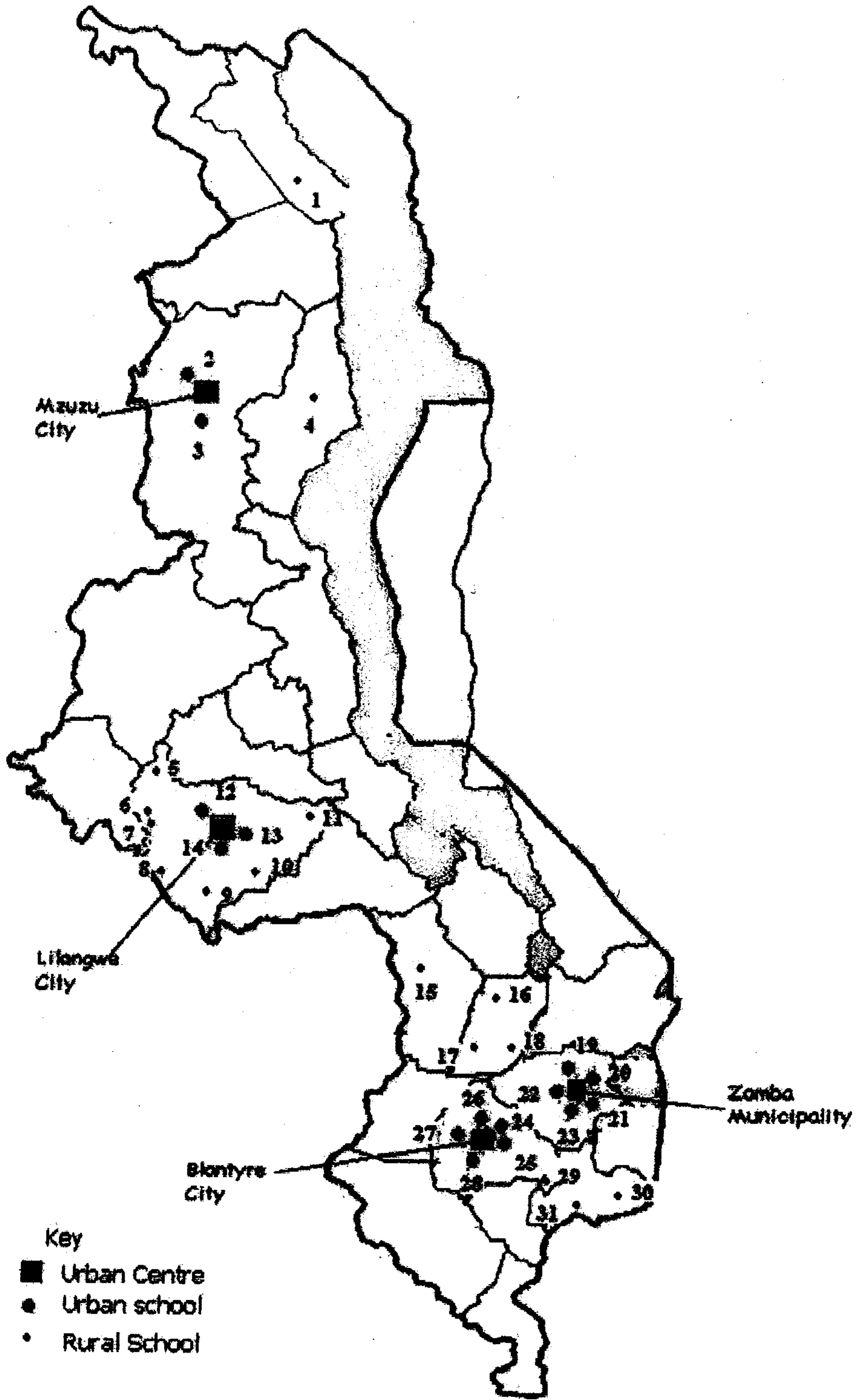
Date:

Researcher Signature:

Date:

Appendix F

Locations of Research Sites



Appendix G

Description of Research Sites

Description of Research Sites

RS 18 (BKT)

On the map, this school is represented by location 18. It is a rural school in the Southern Region of Malawi. It is surrounded by scattered villages. The majority of people around this area are Muslims. However, this school was built and is run by an international religious congregation which operates across the globe. Although the school is connected to the national electric grid and is covered by the telecommunications network, villages in the surrounding community do not have electricity. The majority of people in the surrounding community use charcoal and paraffin as the main sources of energy. The school has both Malawian and non-Malawian members of staff which include missionary volunteers from all over the world. As an educational institution, the school was built on a standard model defined by the religious organisation which owns it. In this case, the institution includes a secondary school and a technical college both situated in the same neighbourhood. Pupils who graduate from the secondary school move on to the technical college.

At the time of the visit, the school had a total of 20 computers which include 15 laptops and desktop computers. At this school the laptops are networked and are used by the pupils in all the classes, one of the missionary volunteers is responsible for the teaching of computer lessons, maintains the machines when they break down and acts as a head of the computer department at the school. He is also responsible for computer maintenance and support.

Apart from the pupils, the school does not provide computer access or lessons to people from the local community (i.e. the surrounding villages) and does not have internet connectivity.



Figure 1: Headmistress explaining the layout of the computer room and removing dust covers to unveil some of the laptops



Figure 2: Components laid bare on a demonstration board and some laptops within a computer room

RS 26 (HHI)

This is a secondary school in the Southern Region of Malawi. On the map, it is represented by location number 26 and it is situated in the middle of an urban centre. The school was built and is run by an international religious organisation based in Ireland. The school has electricity and so do the majority of people in the surrounding communities. The school has both Malawian and non-Malawian members of staff which also include missionary volunteers from Ireland. At the time of the visit, the school had a total of 20 desktop computers which were operating on Windows 95, Windows XP and Windows 98. The computers at this school were donated by the owners themselves i.e. church organisation in Ireland. At the school, the computers are located in a computer laboratory which has burglar bars and an air conditioner. The missionary volunteers are responsible for teaching computer lessons and training local teachers on how to teach computer lessons. At this school, computer lessons are also offered to the local community during the weekends. People from the surrounding areas are required to pay a fee and are supposed to have links with the school e.g. former teacher, former pupil, church goer etc. The school does not have internet connection. When these machines breakdown, it is the missionary volunteers who repair them and all the maintenance costs are met by the school owners.

At this school, interviews were held with an expatriate ICT teacher who also works as the head of ICT department and the school's ICT technician. He has over 10 years of experience working in Malawi as a teacher. Interviews were conducted in the computer room and there was no background noise throughout the interview process. The interviews were recorded, notes were taken and photographs of the technology in situ were also taken

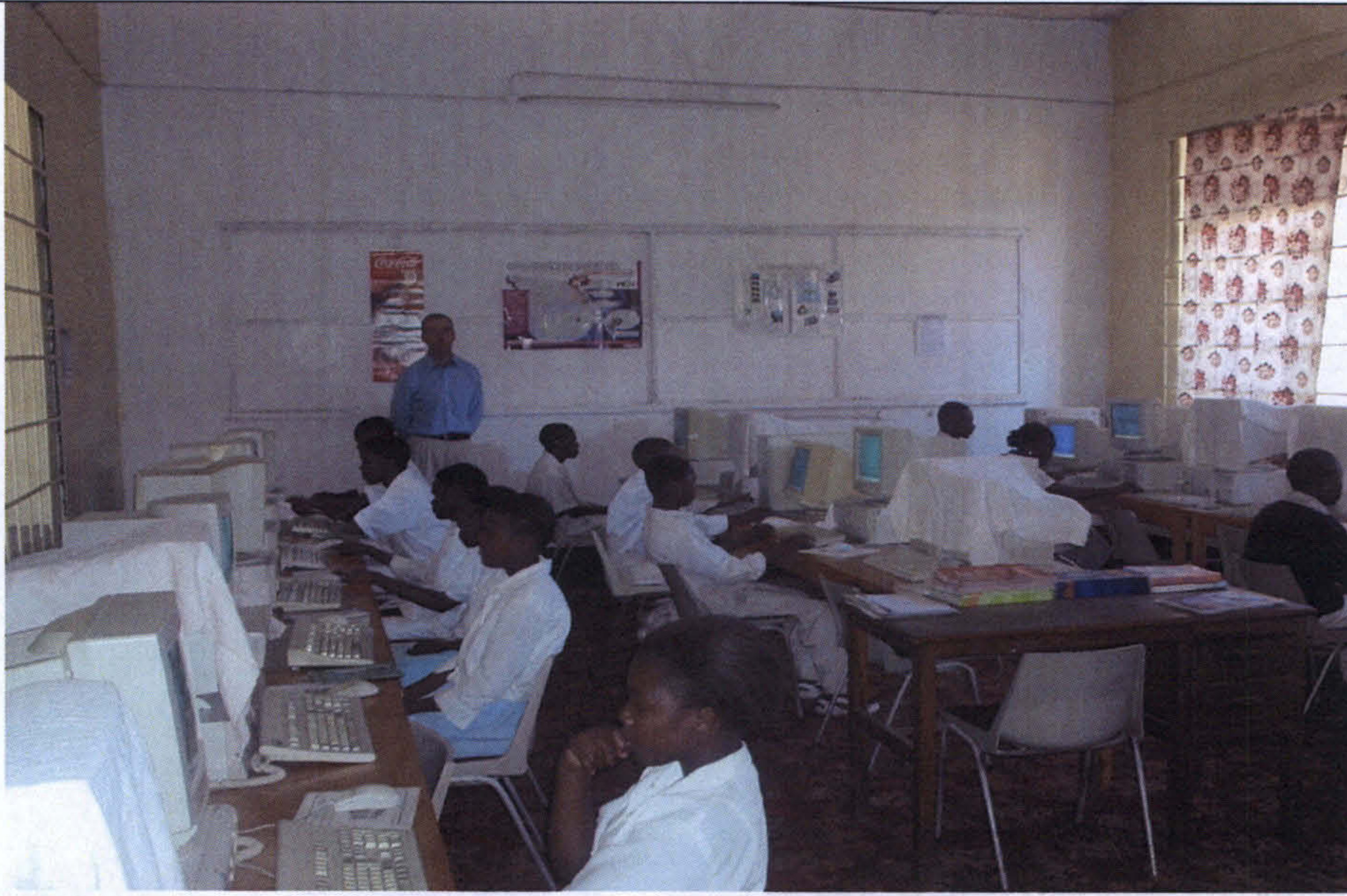


Figure 3: Expatriate teacher delivering a computer lesson and typical computer class in an urban school

RS 3 (KT)

This is a secondary school in the Northern region of Malawi and it is represented by location 3 on the map. The school is situated in the middle of an urban centre and it is a government institution. This means that it is owned and fully funded by the Malawi ministry of Education. The school is connected to electricity and is also covered by the telecommunications network in Malawi. At the time of the visit, the school had 12 desktop computers which were donated by SchoolNet Malawi. The school also had one local Malawian teacher who was responsible for the teaching of computer lessons and the maintenance of the machines. The school did not have internet services and access to computers was restricted to teachers and pupils only i.e. other people from the surrounding area were not allowed to use these computers.

At this school, interviews were conducted in the staff-room and there were three other members of staff present in the room. The interview was recorded and notes were taken.

RS 1 (CD)

This secondary school is in the Northern Region of Malawi and it is represented by location 1 on the map. It is located in the hilly and rural region of Northern Malawi and close to the northern tip of Lake Malawi. The people in the surrounding villages are rice farmers and fishermen. The school is owned and run by missionaries who settled in the region over 100 years ago. Although people in the surrounding villages do not have electricity, the school generates its own electricity through the use of a diesel powered generator. At the time of the visit, the school had 17 desktop computers which were donated to the school by the missionary owners. The school is responsible for maintenance and support of the computers.

At this school, interviews were conducted with the ICT teacher, a missionary, who has been at the school for more than ten years. The interview was conducted in the teacher's office and some interviews were also done thereafter with three pupils in the same room. All the interviews at this school were recorded and notes were taken.

At this school, the interview was recorded and notes were taken.

RS 15 (NTU)

The location of this rural school in the southern region of Malawi is represented by the number 15 on the map. The school has electricity but the majority of people in the surrounding community do not have electricity in their homes. They rely on firewood and paraffin as their main sources of energy. At the time of the visit, the school had 12 computers which were donated by SchoolNet Malawi. Access to these computers was restricted to teachers and pupils only. Outside class hours, members from the surrounding villages are not allowed access to the computers.

At this school, interviews were conducted with an ICT teacher and the headmaster. Informal chats were also done with members from the local community. The interviews were recorded and notes about the visit were taken.

RS16 (CLW)

This is a rural secondary school in the Southern Region of Malawi. On the map, the location of this school is represented by 16. The school is located in an area which is covered by the national telecommunications network and the school is also connected to the national electric grid. At the time of the visit, the school had a total of 18 desktop computers which were all donated to the school by SchoolNet Malawi. Interviews at this school were conducted with the ICT teacher. This interview was recorded and notes were taken

RS 12 (CP)

This is a government sponsored school located in an urban centre within the central region of Malawi. On the map, this school is shown by location 12. The school has electricity and its location is covered by the telecommunications grid. At the time of the visit, the school had 25 desktop computers on Windows 98 and Windows 95 which were donated by SchoolNet Malawi.

At the school, the computers were placed in one of the classrooms which had been re-arranged to accommodate the machines. In this case, electric sockets were drilled in the walls and burglar bars were fitted on the door and windows. Two teachers were responsible for the teaching of computer lessons to the pupils. Of the two one had a diploma in IT from the university of Malawi and the other one had no formal IT qualification.

The school has turned to the local community for sustainability and has made ICT as an optional subject i.e. those who want to learn can come and learn. In this urban location, population is high, industries are many and there are a lot of computer colleges but the fees in these colleges are exorbitant. Therefore, the school benefits more from the local community which prefers the cheap school courses as opposed to the colleges.

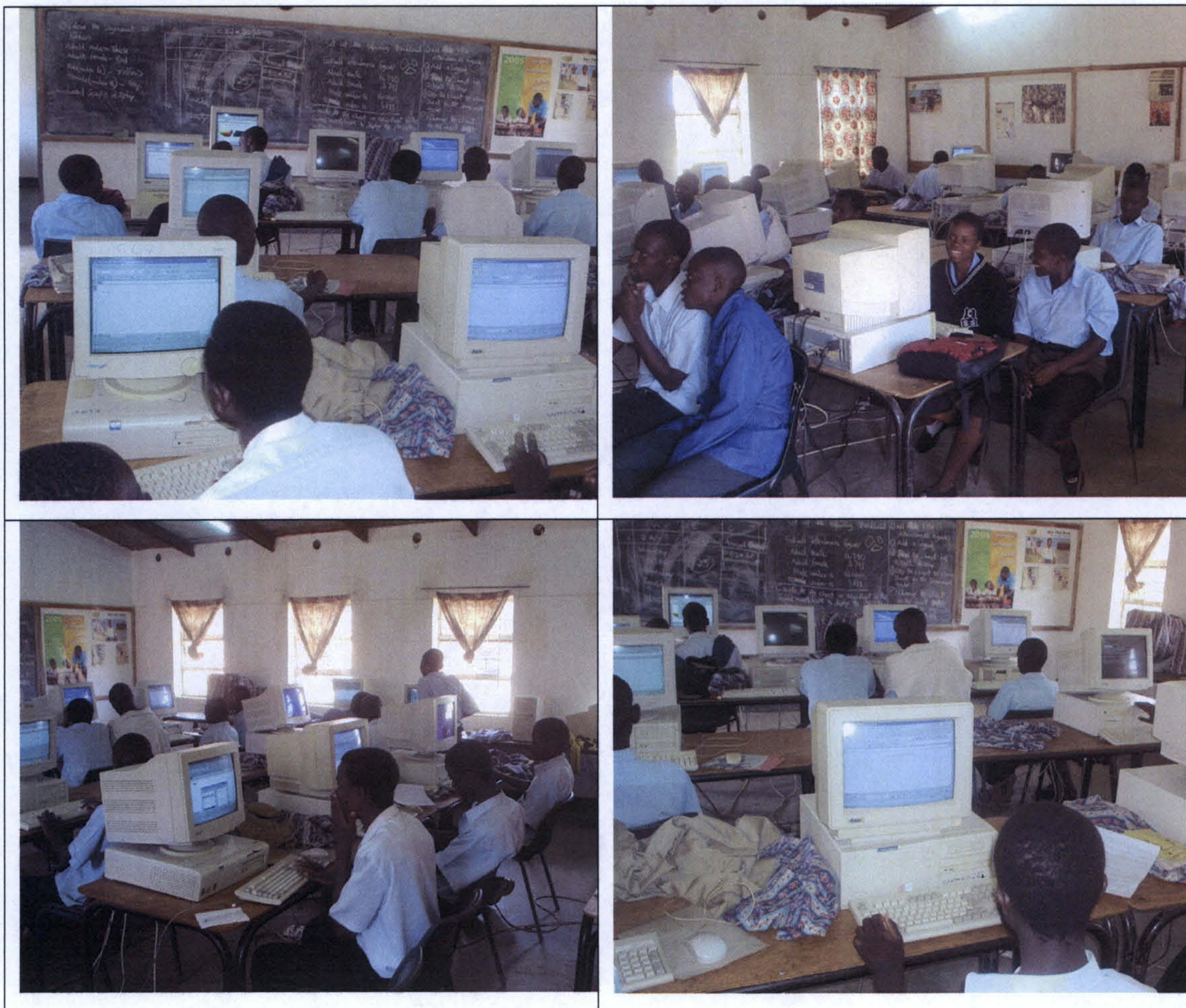


Figure 4: ICT class in session

The school doesn't have technicians to repair the machines when they break down, but is able to hire technicians from the city centre at a fee.

At this school, interviews were held with the school's head of ICT department and one ICT headteacher. These interviews were conducted in the computer room with no background noise. Interview recordings were made, notes about the visit and photos were also taken.

RS 6 (LKB)

A school in the rural area of the central region of Malawi. On the map, this school is represented by location 6. The school is well connected to the telecommunications grid and has electricity. It is sponsored by the Malawi government although it was originally built by the Catholic Missionaries. At the time of the visit, the school had a total of 25 desktop computers. These computers were running on windows 98. The school had two IT teachers both of whom did not have formal IT qualifications.

The computers were donated by schoolnet and were located in one of the classrooms which had been turned into a computer laboratory. The room was dusty and had poor lighting (i.e. one 40w bulb in the middle of the classroom).

At this school, the donated technological artefacts were used to train pupils on how to operate computers. Pupils were also being trained on how to type letters using computers i.e word processing. However, members of the local community could bring in floppy disks from various sources and thereby increased the risk of introducing viruses into the computers.

The school does not have a computer maintenance unit and when the machines break down, they are simply dumped at the back of the computer laboratory.

At this school, interviews were conducted with an ICT teacher and the head of ICT department. The head has over 10 years of experience and the ICT teacher has 5

years of experience and is training to become an IT technician for the school. The interview was recorded, photos were taken and notes about the visit were also taken.

RS 4 (NB)

A school located in the rural area of the northern region of Malawi. On the map, this school is represented by location 4. It is surrounded by scattered villages and rubber plantations. The school was built by missionaries but is now run by the government. It has 20 desktop computers on windows 98 and 95. The school acquired the computers through two ways. Firstly, one of the former owners of the school, Marianist Brothers, went back home in the United States where he found several computers that were about to be thrown out. He then decided to collect those computers and ship them to this school. The school received a consignment of 5 desktop computers from the missionary. Later on, the school also got 15 desktop computers running on windows 95 and 98 from Schoolnet. At the school, the computers were located in one of the classrooms which had been turned into a computer room. The room itself had burglar bars but was dusty and had litter all over the floor with no proper / systematic arrangement of desks and chairs.

At the time of the visit none of the twenty computers was in working condition. They had all broken down. However, prior to these breakdowns, the school used the machines to train pupils in word processing. The computers were also used for administrative purposes like setting examinations, record keeping and other secretarial purposes. The school does not have a computer maintenance unit and once the computers broke, they were left in the classroom. However, when all the computers were grounded, the school felt the importance of having computers and decided to purchase one computer from the local Malawian dealers. They bought one brand new machine and started using it for administrative duties. As for teaching and learning, the school also decided to buy a television set which is used to deliver lessons via a satellite dish.

At this school, interviews were conducted with the deputy headmaster and the ICT teacher. These interviews were held in the deputy headmaster's office. There was no

background noise and the interviews were recorded and notes taken. Photos were also taken.

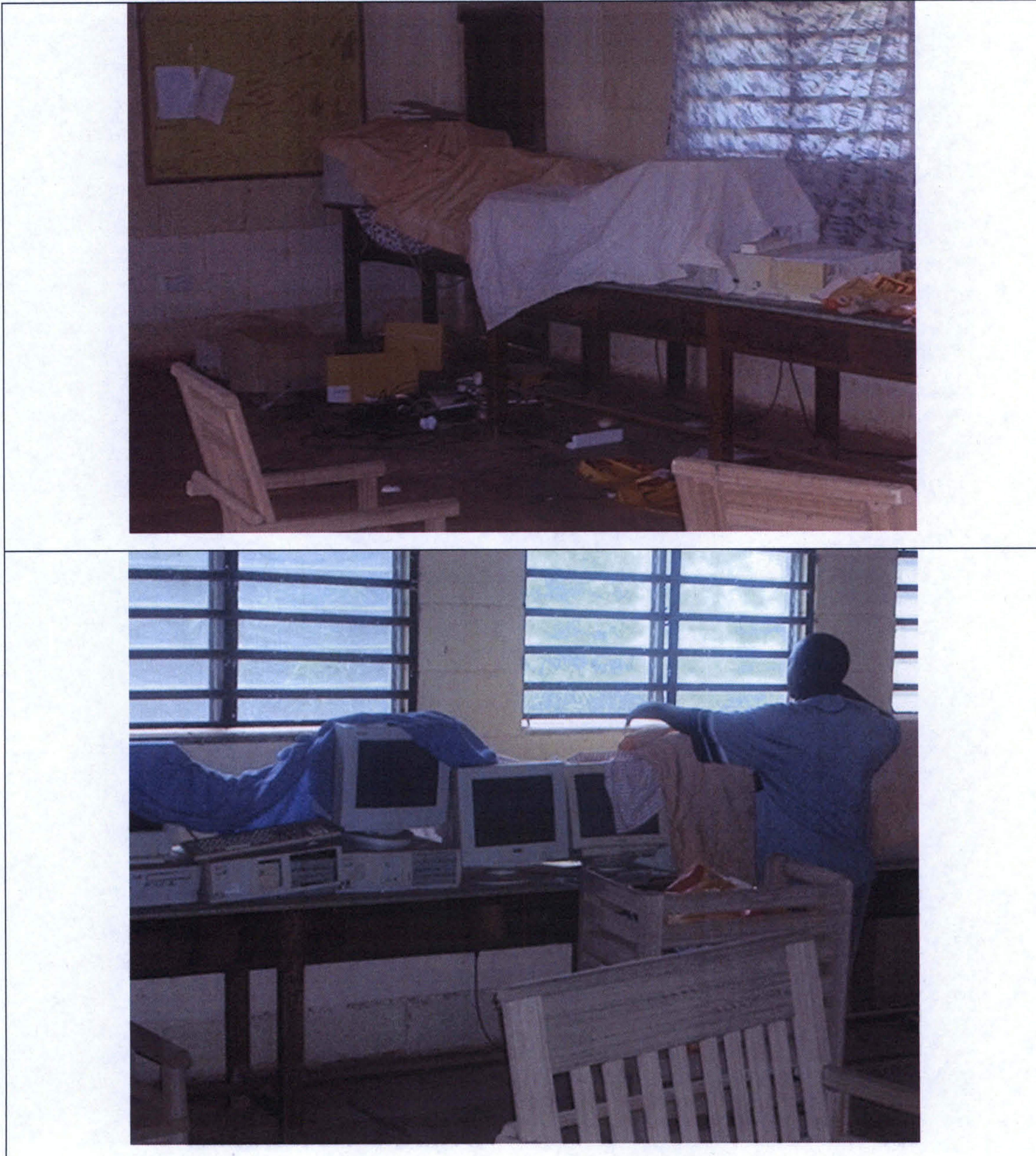


Figure 5: ICT teacher uncovering computers in a computer room



Figure 6: ICT teacher describing the nature of the donated computers at a school



Figure 7: Broken computers and a futile attempt to repair broken computers at the school



Figure 8: New purchase : one computer purchased for administrative tasks at the school

RS 5 (DZZ)

A school in the rural area of the central region of Malawi. On the map, the school is represented by location 5. It is located in the outskirts of the capital city of Malawi. The school has electricity, but the surrounding villages are not connected to electricity. In this area masked dancers are very significant part of the people's culture and so are initiation ceremonies. At the time of the visit, the school had two computer studies teachers. It is a government school and had a total of 26 desktop computers. This was one of the first five schools to receive computers from the schoolnet project. At that time, schoolnet Malawi selected five schools in the central region to which they donated desktop computers. Once the machines were delivered to the school, they were located in one of the classrooms which had been turned into a computer room.

The computers at this school are used by pupils, teachers and some people from the local community particularly civil servants e.g. policemen. Pupils are trained on how to use these computers i.e. acquisition of basic word processing skills and the teachers use the computers to compile and print examination papers. As for the local community, they access the computers at a fee. The school does not have internet facilities.



Figure 9: Computers at a pioneer school

RS 11 (NAM)

This is a school in the rural area of the central region of Malawi. On the map, it is represented by location 11. The school is owned by the government and had a total of 13 computers at the time of the visit of which only two were functioning. The rest had broken down. At the time of the interviews the school had no qualified ICT teacher. The computers were acquired through a donation from schoolnet. The school is located in a rural context on the outskirts of the capital city, Lilongwe in central region. It is a government sponsored boarding institution and has a total 27 members of staff none of whom received formal IT training to enable them use ICTs in teaching/learning activities.

An interview with two interviewees: the head of ICT department and a computer studies teacher. They each had over five years of teaching experience and the interview was conducted under a shed in the school's garden during the morning hours of a very sunny day. The interview was recorded and notes were taken.

RS 2 (MM)

This is a school in an urban area of the northern region of Malawi. On the map, it is represented by location 2 and it is owned and run by the Catholic missionaries in Malawi. At the time of the visit, the school had a total of 15 computers that came from two main sources – missionaries and Schoolnet Malawi. Of the 24 members of staff, one also provides IT (specialist) support to the school although he does not have formal IT qualifications.

The main purposes for ICT use at this school are teaching, learning and administration. At this school, only pupils in senior classes (i.e. forms three and four) use these computers. Outside class hours, access to the computers is open to staff members, school pupils. There is no internet access at this school and costs for ICT maintenance and support are met by the school itself.

This was a one-to-one interview with the headmaster of the school with over 15 years teaching experience and basic knowledge about ICTs in secondary education.

Conducted in the headmaster's office. Just the interviewee and the interviewer were present. Conducted during off work hours – no background noise. Notes taken and interview recorded.

RS 14 (BW)

A school in an urban area of the central region of Malawi. This school is also located in an urban context in the city of Lilongwe represented by location 14 on the map. It is a government sponsored day-release institution and has a total of over 1000 pupils. Of the 25 members of staff, none provide IT (specialist) support to the school and none of them received formal training on how to use ICTs for educational purposes. At the time of the visit, the school had a total of 15 desktop computers that were donated by Schoolnet and at the time of the visit, all 15 machines were not being used. They were kept in the store-room.



Figure 10: SAFE – some of the donated computers being 'kept' in the storeroom



Figure 11: Storeroom with newly fitted burglar bars to protect computers

RS 8 (CSP)

This school is also located in a non-urban context in Lilongwe. On the map, it is represented by location 8. It is a government sponsored day-release institution and at the time of the visit, it had 38 members of staff - 3 of whom claimed to teach ICT subjects and provide IT (specialist) support to the school despite not having formal ICT training apart from attending an in-house training sponsored by the school on word processing.

The school also had a total of 12 desktop computers that were donated by the World Bank and no internet facilities. The main purposes for ICT use at this school were teaching, learning and administration. Both teachers and pupils use these computers. However, staff members only are all allowed to use these computers outside class hours and nobody supervises such use.

A one to one interview was conducted with the headmistress who has approximately 8 years teaching experience. The interview was conducted in the headmistress' office during the afternoon hours. There was no background noise and the interview was recorded and notes taken.

RS 10 (MTU)

This is a government sponsored school in the rural area of the central region of Malawi. On the map, this school is represented by location 10. At the time of the visit, the school had a total of 15 computers but only 5 of them were working. The school also had one IT teacher who did not have formal IT qualifications. The computers at this school came as a donation from the British Council through Schoolnet Malawi. The officials from the British council donated the computers to the school at a function which was attended by government officials and political leaders. At the school, the computers are located in one of the classrooms which has been fitted with burglar bars and pad locks to ensure security. There is a sour relationship between the school and local people from the surrounding villages. There is no maintenance unit at the school and when machines break down, nothing is done to them.



Figure 12: Broken computers left unattended



Figure 13: Working computers in the same room

A group interview was conducted in the backyard of the staffroom during the afternoon hours with the headmaster, head of ICT department and an ICT teacher. Each of them had over 9 years of teaching experience.

RS 7 (LKG)

This is another school located in the rural area of the central region of Malawi. Its location is shown by position 7 on the map. At the time of the visit, the school had a total of three ICT teachers one of whom had formal IT qualifications acquired from abroad. The school also had 15 computers which came as a donation from schoolnet. Of the 15 computers, 5 were not working. The headmaster and the teachers were first called to a 'sensitisation' meeting organised by schoolnet Malawi. At the end of the meeting, forms were given to the attending schools to apply for computers from schoolnet. This school applied and schoolnet sent them a consignment of 15 computers.



Figure 14: One of the donated computers being used for administrative purposes

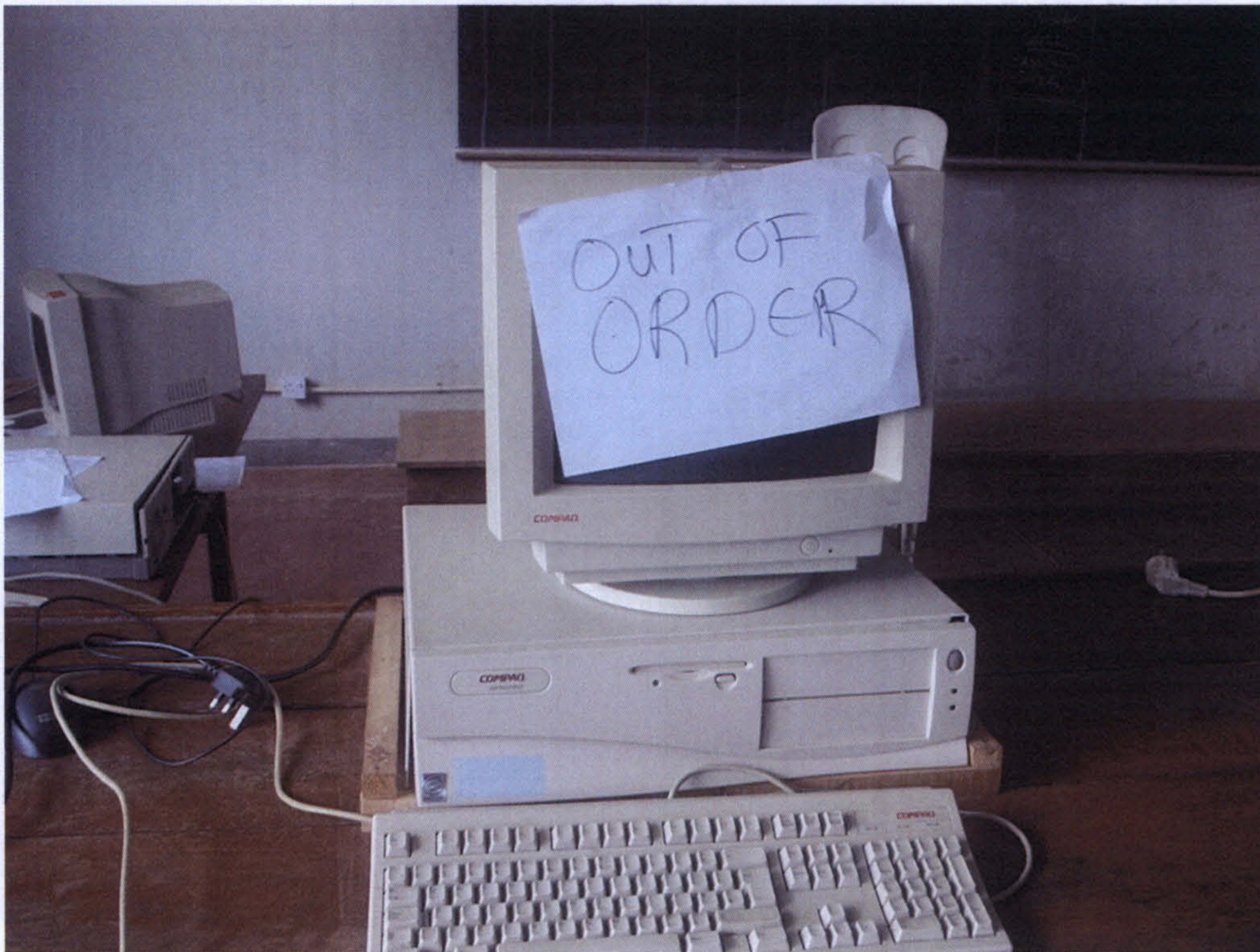


Figure 15: One down – A recently broken down machine



Figure 16: Computers in a classroom

RS 9 (NSR)

This is a school in the remote and rural area of the central region of Malawi. On the map, it is shown by location 9. At the time of the visit, the school did not have electricity and was not connected to the telecommunications network. In this part of Malawi, initiation ceremonies and masked dancers form a very significant part of the society and cultural values are highly upheld. Both male and female members of the society are required to attend initiation ceremony as they enter puberty. At the end of these ceremonies, male graduates are welcomed into the male fold (they become adults) and they are now allowed to participate in mask dancing (*nyau / zirombo*) while the females come out of the initiation ceremony more knowledgeable about their roles in a male dominated society (e.g. being subordinate to the male folk particularly their husbands – *'mkulu wa pa banja ndi mwamuna'*). This school was built and funded by the World Bank to counter this male domination and the school bases its enrollment on a one-to-one ratio of male to female pupils. Despite lack of electricity, the school was given 10 computers. However, at the time of the visit the computers were not being used due to lack of electricity.

At this school, an interview with the headmaster and a teacher responsible for ICT issues at the school was conducted. The headmaster had no technical knowledge

about ICTs but had over 12 years of experience. The ICT teacher on the other hand, had no formal IT training but had knowledge of how to use the computer. The interviews were conducted both in the headmaster's office and in the school's staff room. There was no background noise in both places. The interview was recorded and notes were taken. Several photos were also taken



Figure 17: Solar panel at a remote secondary school



Figure 18: Donated ICTs awaiting sufficient electricity supply at the school

RS 24 (NJ)

The school is located in an urban context within Blantyre City. On the map, the school is represented by location 24. It is a government sponsored day institution and at the time of the visit, it had a total of 15 desktop computers that were donated by Schoolnet Malawi. Of the 21 members of staff, less than 5 members of the 21 received formal IT training to enable them use ICTs in teaching/learning activities. The training was provided by computer schools within Blantyre and funding was provided by individual teachers themselves. Main aspects of their training included how to use word processing and how to use the internet. The school, however, did not have an established IT maintenance / support unit. However, the school had 2 members of staff who were responsible for fixing hardware problems despite not having formal IT qualifications. At this school, an interview with an ICT teacher was conducted in the computer room during the morning hours of the day. The interview was recorded and notes were taken.



Figure 19: Computer room

RS 25 (OLD)

This school is located in an urban centre in the southern region of Malawi. It is owned by a religious organisation. On the map, this school is represented by location number 25. At the time of the visit, 2 of the 30 members of staff had received formal IT training on how to use ICTs for educational purposes. The training was provided by the school itself and funding was met by individuals themselves.

The school also had a total of 15 desktop computers that were donated by, Beit Trust, a non-governmental organisation and Schoolnet Malawi. All the 15 computers were running on Windows 98 platform and had MSOffice installed on them. At the time of the visit, the main purposes for ICT use at this school were administration, teaching and learning. Both pupils and teachers at all levels were allowed to use the computers. However, use of these computers was not allowed outside class hours by anybody in the community.



Figure 20: Some of the computers covered to protect them from dust

RS 21 (ZA)

This school is also located in an urban context in the municipality of Zomba. It is a grant/church sponsored boarding institution and at the time of the visit, the school had a total of 15 desktop computers that were donated by Schoolnet Malawi and Beit Trust. It also had one teacher who provided provide IT lessons and support to the school. This was the only teacher who had acquired some ICT knowledge at the University of Malawi. All the 15 machines run on Windows operating systems and only one of them had e-mail and internet facilities. Connection to the internet was through dial-up and was only allowed at night due to high telephone /internet costs during peak hours. The main purposes for ICT use at this school were teaching, learning and administration. Pupil access to the internet was restricted to levels 3 and 4. Only school pupils and staff members were allowed to use these computers outside class hours and teachers always supervised such use.

An interview with the deputy headmaster who also doubles as an ICT teacher was conducted at this school. The interview was recorded and notes about the visit were taken.



Figure 21: Computer room donated by Beit trust



Figure 22: Inside the computer room

RS 23 (MLG)

This school is also located in an urban context in the municipality of Zomba. On the map, it is represented by location 23. It is a government sponsored boarding institution and at the time of the visit, it had a total of 20 desktop computers that were donated by Schoolnet Malawi. The main purposes for ICT use at this school were teaching, learning and administration. Only school pupils and staff members were allowed to use these computers outside class hours and nobody supervises such use. The school is responsible for ICT maintenance and support. However, none of the teachers had received formal IT training. Interviews at this school were recorded and notes were taken.

RS 17 (BLK)

This secondary school is located in the southern region of Malawi. On the map, it is shown by location 17. It is owned and run by the Malawi government and at the time of the visit, there were only two IT teachers at the school both of whom did not possess formal IT qualifications. The school had a total of 20 computers but only five were working. The computers at this school were donated to Balaka secondary school by Schoolnet Malawi. This school is one of the pioneer schools that were identified by schoolnet to receive computers. At the school, the computers are located in the school library and are used to train the pupils in word processing.

Interviews were conducted with the headmaster, head of ICT department and an ICT teacher and were recorded. Notes and photos were also taken.



Figure 23: Computers in the school library

RS 29 (SOH)

This school is represented by location 29 and it is situated in an urban context in the city of Blantyre. It is a government sponsored boarding institution and at the time of the visit, it had a total of 13 desktop computers that were donated by Schoolnet Malawi. The school also had 12 members of staff and none of them had received formal IT training on how to use computers. The main purpose for ICT use at this school was administration and at the time of the visit, neither pupils nor teachers at all levels were using these computers for educational purposes. Use of these computers was not allowed outside class hours by anybody in the community.

At this school, an interview was conducted with the headmaster who was initially reluctant to participate in the interview for fear of what he called 'political reprisals'. He had over 20 years of experience as a teacher and heads the schools ICT department. Several officers including the regional educational officer from the ministry of education were present during this interview. The interview was recorded and notes were taken.

RS 13 (LLG)

An urban school in the Central Region of Malawi represented by location 13 on the map. At the time of the visit, the school had 12 computers and there was no qualified ICT teacher at the school. An interview was conducted with the headmistress. The interview was recorded and notes were taken. Despite some initial resistance from the headmistress to have some photos of the technology in situ taken, the researcher was finally allowed to take pictures of the computers in the computer room.

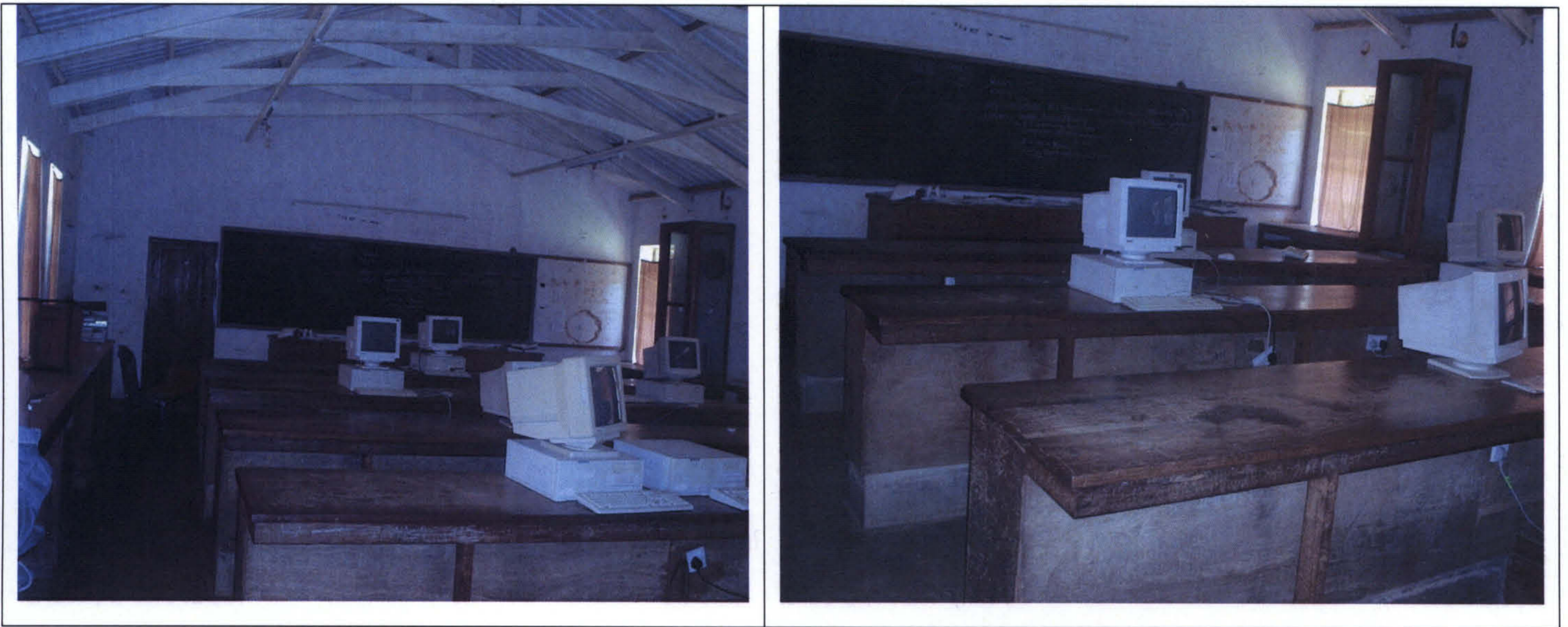


Figure 24: Inside the computer room – ‘working’ computers



Figure 25: Inside the computer room: broken computers

RS 30 (MJ)

This is a school in the southern region of Malawi and it is represented by location 30 on the map. It is located in one of the rural areas of Malawi. At the time of the visit, the school had 15 computers of which only 10 were working. The computers were acquired from Schoolnet. At the school, the computers were located in a classroom which had been turned into a computer room. This room was initially being used for home-economics lessons. The room also serves as a meeting room for the staff members. An interview with the ICT teacher was conducted in the secretary's office during working hours. There was no background noise, the interview was recorded and notes were taken.

RS 31 (PRV)

This school is shown by location 31 on the map and it is situated in a remote area of the southern region of Malawi. It is a government sponsored secondary school and at the time of the visit, the school had three ICT teachers and a total of 15 computers which were donated by Schoolnet Malawi. At the school, the computers were located in a classroom which had been fitted with burglar bars and padlocks. The school had no computer maintenance and support unit. Outside class hours, members of the local community are not allowed to access the computers and the school does not have internet facilities. An interview with an ICT teacher was conducted and the interview was recorded. Notes and photos were also taken.

RS 27 (ST)

This school is also located in an urban context in the city of Blantyre. On the map, this school is represented by location 27. It is a Catholic secondary school which also receives government funding. At the time of the visit, the school had a total of 20 desktop computers that were donated by the Beit Trust and Schoolnet Malawi. The school had 30 members of staff and none of them had received formal IT training. However, the school relies on a Catholic missionary who provides free IT support and teaching to the school. At this school, an interview was conducted with the headmistress who had knowledge on how to use a computer and had over 15 years of

teaching experience. The interview was conducted in the headmistress' office and there was no background noise. The interview was recorded, notes and photos were also taken.



Figure 26: Some of the computers in a computer room outside class hours.

RS 28 (NT)

This school is also located in an urban context in the city of Blantyre. On the map, it is represented by location 28. It is a private sponsored day-release institution and at the time of the visit, it had 13 desktop computers that were purchased by the school itself. The school also had 8 members of staff one of whom was responsible for ICT training and support despite not being formally trained in ICTs. At the time of the visit, the school had an approximate machine to pupil ratio of 1:5 and a machine to teacher ratio of approximately 2:1 and all the 13 machines were running on Windows 98 platform. The school also had internet facilities and

connection to the internet was through dial-up and was always supervised by the ICT teacher. The interview with the ICT teacher was recorded and photos were taken.

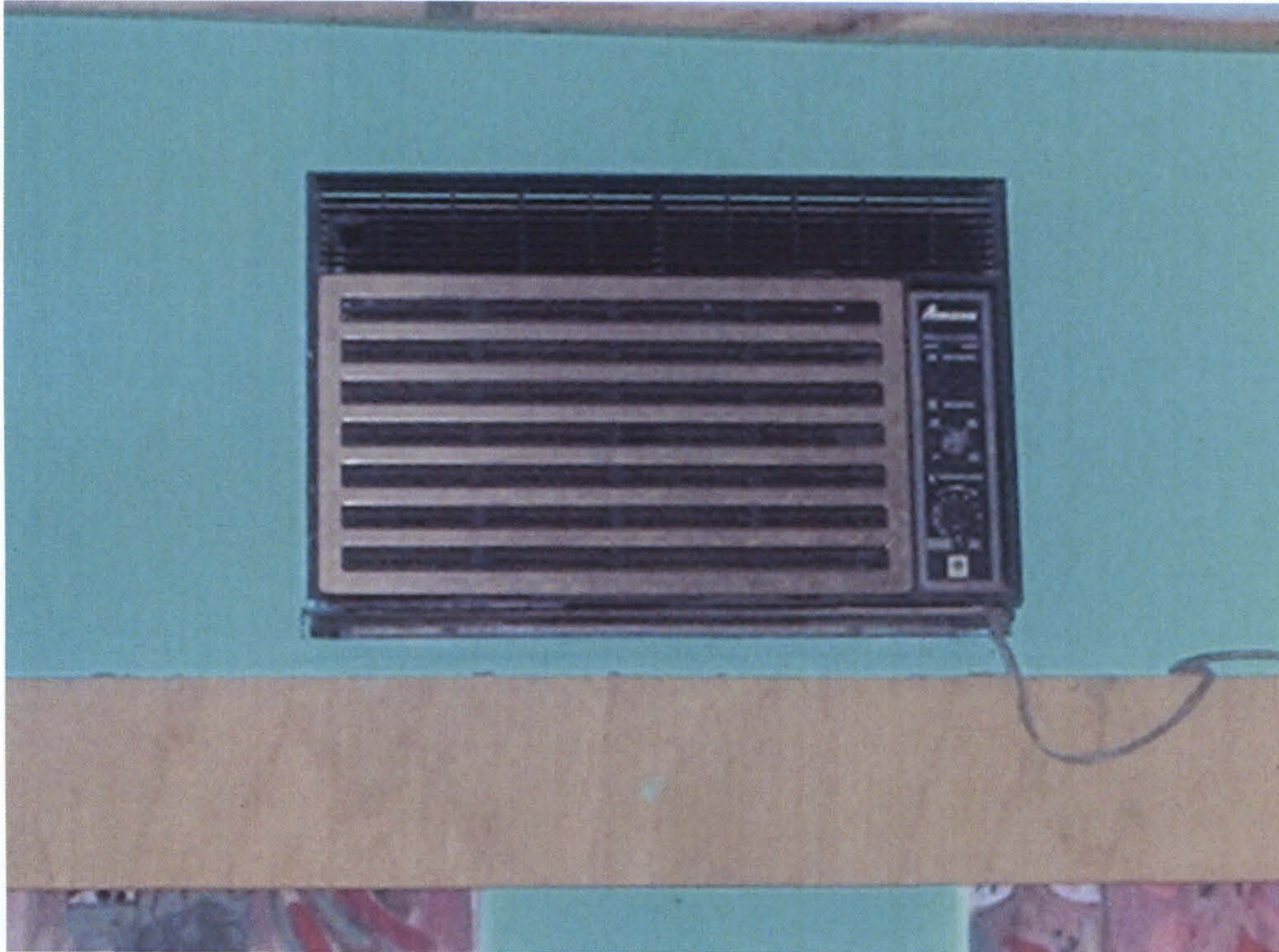


Figure 27: An air conditioner to keep the computer room temperature low



Figure 28: ICT lesson in progress at a private secondary school

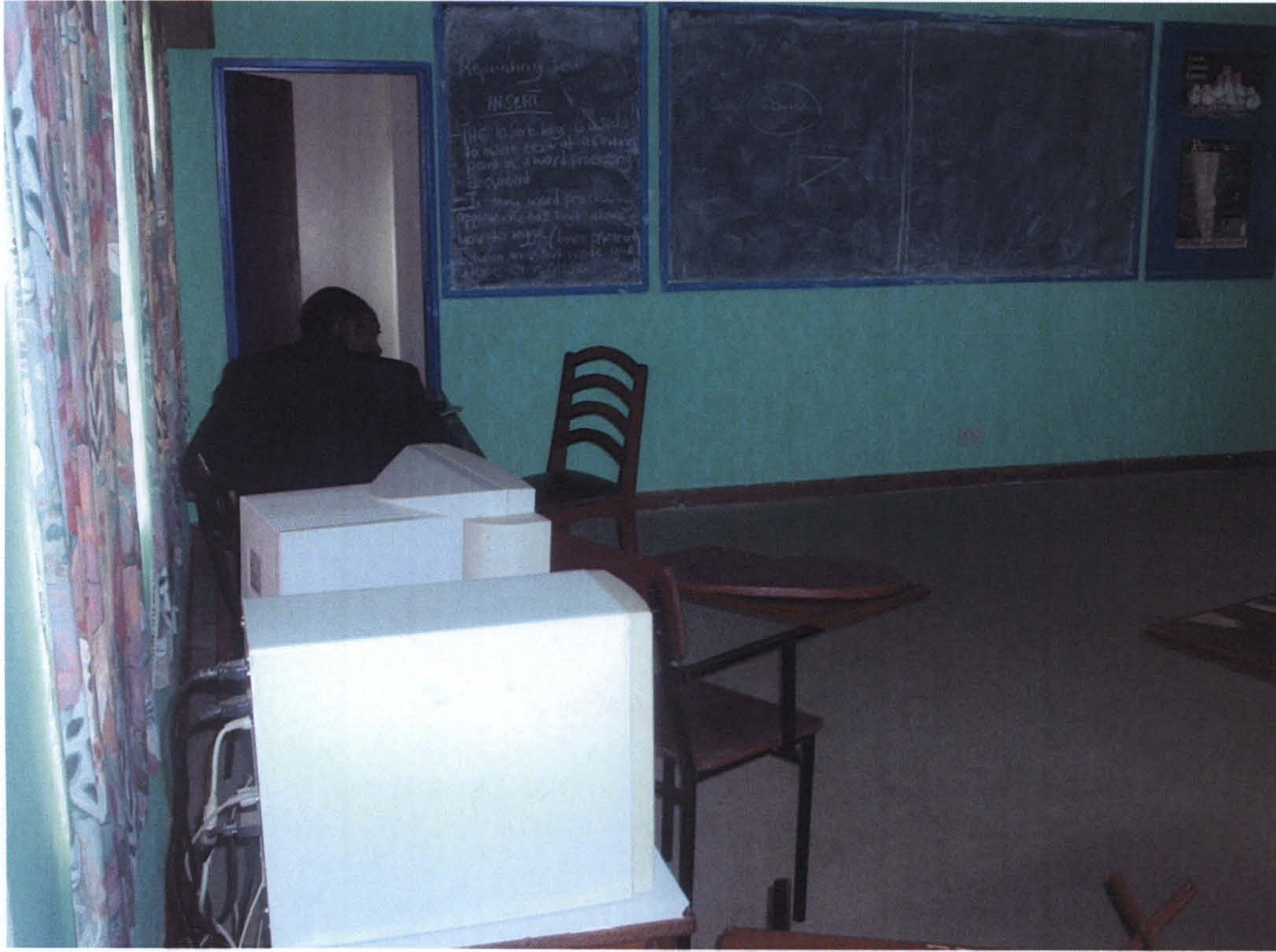


Figure 29: ICT teacher listening to the interview recording

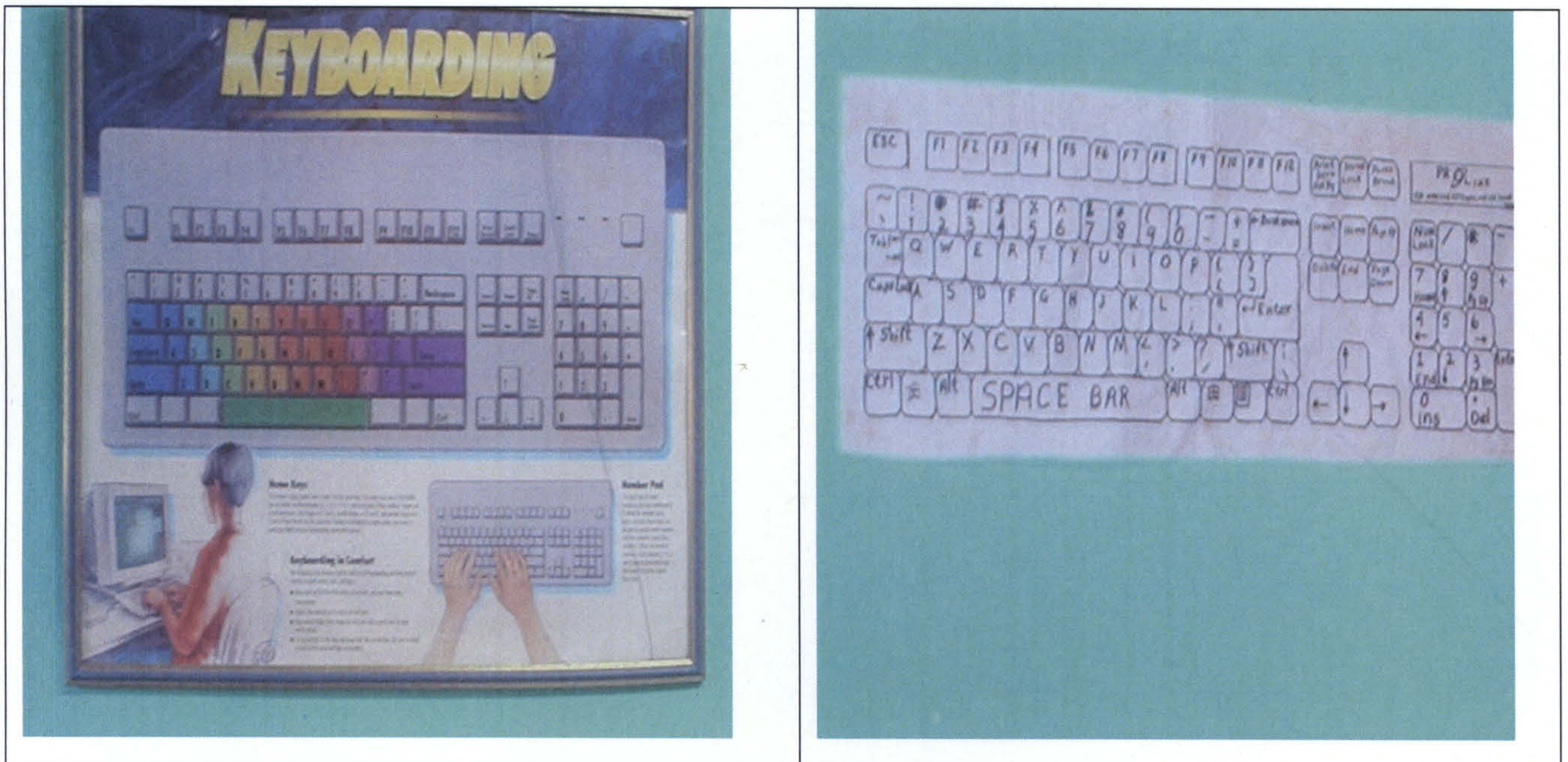


Figure 30: Some posters in the computer room

Appendix H

STIN Analysis - Affiliations

AFFILIATIONS

Location	Region	Research Site Number	Level of affiliations					Affiliation demands			Nature of affiliation (contingent / intermittent/ continuous)	Type of Affiliation (e.g. mono-valent, multi-valent,
			Local	National e.g MG	Regional e.g. SNet	Global e.g. WB	Individual	Regulative (coercive)	Normative (code of conduct)	Mimetic		
Rural	North	RS4 - NB	✓	✓	✓		✓	✓	✓	intermittent	Multi then Mono-valent	
		RSI- CD	✓	✓			✓		✓	continuous	Multi-valent	
		Central	RS8CSP	✓	✓		✓		✓		contingent	Mono- valent
			RS 5DZZ	✓	✓	✓	✓		✓		contingent	Mono- valent
			RS 11NAM	✓	✓	✓			✓		contingent	Mono- valent
		RS 10MTU	✓	✓	✓			✓		contingent	Mono- valent	
	RS 6LKB	✓	✓	✓			✓		contingent	Mono- valent		
	RS 7LKG	✓	✓	✓			✓		contingent	Mono- valent		
	RS 9NSR	✓	✓		✓		✓		contingent	Mono- valent		
	South	RS 15NTU	✓	✓	✓			✓		contingent	Mono- valent	
		RS 16CLW	✓	✓	✓			✓		contingent	Mono- valent	
		RS 17BLK	✓	✓	✓			✓		contingent	Mono- valent	
		RS 18BKT	✓	✓			✓		✓	continuous	Multi-valent	
		RS 29SOH	✓	✓	✓			✓		contingent	Mono-valent	
		RS 30MJ	✓	✓	✓			✓		contingent	Mono-valent	
	RS 31PRV	✓	✓	✓			✓		contingent	Mono-valent		

AFFILIATIONS

Location	Region	Research Site Number	Level of affiliations				Individual	Affiliation demands			Nature of affiliation (contingent / intermittent/ continuous)	Type of Affiliation (e.g. mono-valent, multi-valent, valent,)
			Local	National e.g. MG	Regional e.g. SNet	Global e.g. WB		Regulative (coercive)	Normative (code of conduct)	Mimetic		
Urban	North	RS 2-MM	✓	✓	✓		✓	✓	✓	intermittent	Mono-valent	
		RS 3-KT	✓	✓	✓					contingent	Mono-valent	
		RS 14BW	✓	✓	✓					contingent	Mono-valent	
	Central	RS 12CP	✓	✓	✓		✓			contingent	Mono-valent	
		RS 13LLG	✓	✓	✓					contingent	Mono-valent	
		RS 26HHI	✓	✓			✓		✓	continuous	Multi-valent	
	South	RS 27ST	✓	✓			✓			continuous	Multi-valent	
		RS 24NJ	✓	✓	✓				✓	contingent	Mono-valent	
		RS 25OLD	✓	✓	✓				✓	contingent	Mono-valent	
		RS 28NT	✓	✓	✓			✓		continuous	Multi-valent	
		RS 21ZA	✓	✓	✓				✓	contingent	Mono-valent	
		RS 23MLG	✓	✓	✓					contingent	Mono-valent	
		RS 22MLS	✓	✓	✓					contingent	Mono-valent	
		RS 20SMY	✓	✓	✓				✓	contingent	Mono-valent	
		RS 19PLC	✓	✓	✓				✓	contingent	Mono-valent	

Appendix I

STIN Analysis - Environment

ENVIRONMENT

Location	Region	Research Site Number	Institutional Pressures					Technical pressures						
			Culture	Government policies and regulations	Politics	School objectives	School size	Standardized / Sanctioned practices (e.g. monetary - the WB)	Nature of ICTs	Infrastructural richness		Telecommunications grid (Location)		
										ICT Skills base	Availability of ICT resources e.g. number of PCs			
Rural	North	RS4 - NB	✓	✓		✓	✓		✓	✓	✓	✓	✓	
		RS1- CD		✓		✓	✓		✓	✓	✓	✓	✓	
	Central	RS8CSP	✓	✓		✓	✓		✓	✓	✓	✓	✓	
		RS 5DZZ	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	
		RS 11NAM	✓	✓		✓	✓		✓	✓	✓	✓	✓	
		RS 10MTU	✓	✓		✓	✓		✓	✓	✓	✓	✓	
		RS 6LKB	✓	✓		✓	✓		✓	✓	✓	✓	✓	
		RS 7LKG	✓	✓		✓	✓		✓	✓	✓	✓	✓	✓
		RS 9NSR	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓
		RS 15NTU		✓		✓	✓		✓	✓	✓	✓	✓	
		RS 16CLW		✓		✓	✓		✓	✓	✓	✓	✓	
		RS 17BLK		✓		✓	✓		✓	✓	✓	✓	✓	✓
	South	RS 18BKT		✓		✓	✓		✓	✓	✓	✓	✓	✓
		RS 29SOH		✓	✓	✓	✓		✓	✓	✓	✓	✓	✓
		RS 30MJ		✓		✓	✓		✓	✓	✓	✓	✓	✓
		RS 31PRV		✓		✓	✓		✓	✓	✓	✓	✓	✓

Appendix J

STIN Analysis - Interactions

INTERACTIONS

Location	Region	Research Site Number	Cultural Rules	Social routines (institutional routines)	Documentation (rules, regulations etc)	Symbolic action (e.g. strategic acceptance / philanthropic donations)	Learning by using or imitation (e.g. deep adoption)	
Rural	North	RS4 - NB	✓	✓	✓	✓	✓	
		RS1- CD		✓	✓	✓	✓	
	Central	RS8CSP	✓		✓	✓		
		RS 5DZZ	✓		✓	✓		
		RS 11NAM	✓		✓	✓		
		RS 10MTU	✓		✓	✓		
		RS 6LKB	✓		✓	✓		
		RS 7LKG	✓		✓	✓		
		RS 9NSR	✓		✓	✓		
		RS 15NTU			✓	✓	✓	
		RS 16CLW			✓	✓	✓	
		RS 17BLK			✓	✓	✓	✓
	South	RS 18BKT			✓	✓	✓	
		RS 29SOH			✓	✓	✓	
		RS 30MJ			✓	✓	✓	
		RS 31PRV			✓	✓	✓	

INTERACTIONS

Location	Region	Research Site Number	Cultural Rules	Social routines (institutional routines)	Documentation (rules, regulations etc)	Symbolic action (e.g. strategic acceptance / philanthropic donations)	Learning by using or imitation (e.g. deep adoption)	
Urban	North	RS 2-MM	✓	✓	✓	✓		
		RS 3-KT		✓	✓	✓		
	Central	RS 14BW			✓	✓	✓	
		RS 12CP			✓	✓	✓	
		RS 13LLG			✓	✓	✓	
		RS 26HHI			✓	✓	✓	✓
	South	RS 27ST			✓	✓	✓	✓
		RS 24NJ			✓	✓	✓	
		RS 25OLD			✓	✓	✓	
		RS 28NT			✓	✓	✓	✓
		RS 21ZA			✓	✓	✓	
		RS 23MLG			✓	✓	✓	
		RS 22MLS			✓	✓	✓	
		RS 20SMY			✓	✓	✓	
		RS 19PLC			✓	✓	✓	

Appendix K

STIN Analysis - Identities

IDENTITIES

Location	Region	Research Site Number	Presentation e.g. constructing identities	Culture / ethnicity	Multiple-identities or multi-level identities e.g helper/helped	Profiling / self-monitoring	Local Tension (e.g. Cultural conflict)
Rural	North	RS4 - NB	✓	✓	✓	✓	
		RS1- CD	✓	✓	✓	✓	
	Central	RS8CSP	✓	✓	✓	✓	✓
		RS 5DZZ	✓	✓	✓	✓	✓
		RS 11NAM	✓	✓	✓	✓	✓
		RS 10MTU	✓	✓	✓	✓	✓
		RS 6LKB	✓	✓	✓	✓	✓
		RS 7LKG	✓	✓	✓	✓	✓
		RS 9NSR	✓	✓	✓	✓	✓
	South	RS 15NTU	✓				
		RS 16CLW	✓				
		RS 17BLK	✓				
		RS 18BKT	✓		✓	✓	
		RS 29SOH	✓				
		RS 30MJ	✓				
		RS 31PRV	✓				

IDENTITIES

Location	Region	Research Site Number	Presentation e.g. constructing identities	Culture / ethnicity	Multiple-identities or multi-level identities e.g. helper/helped	Profiling / self-monitoring	Local Tension (e.g. Cultural conflict)
Urban	North	RS 2-MM	✓	✓	✓	✓	
		RS 3-KT	✓		✓	✓	
	Central	RS 14BW	✓			✓	
		RS 12CP	✓			✓	
		RS 13LLG	✓			✓	
		RS 26HHI	✓			✓	
	South	RS 27ST	✓			✓	
		RS 24NJ	✓				
		RS 25OLD	✓				
		RS 28NT	✓			✓	
		RS 21ZA	✓			✓	
		RS 23MLG	✓				
		RS 22MLS	✓				
		RS 20SMY	✓				
		RS 19PLC	✓				

Appendix L

Transcript and example of data analysis

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QSR N6 Full version, revision 6.0.

Licensee: C & IT Services.

PROJECT: Data Analysis - QSR, User Tony, 10:50 am, Sept 12, 2007.

+++++

+++ DOCUMENT: RS26

+++ Document Description: An interview transcript for a Malawian secondary school represented by Research Site number 26 on the map

+++ Retrieval for this document: 417 units out of 417, = 100%

++ Text units 1-417:

1 RS26

2 *How many computers do you have

3

4 We have 20 computers in the computer suite and then we have a couple in

5 the headmistress' office and the accounts department. But for teaching

6 and student access we have 20 PCs all in full working order. we have

7 windows 95 98 XP. We are now phasing out the win 95 and we are bringing

8 them all to win 98 and XP.

9 * How many pupils access these comps

10

11 Eeerrrr... mmmhhh... let me think..this is the computer room timetable so we

12 split the teaching hours into two. We have two teachers here, one is me

13 and the other teacher who is also a history teacher whom I am sort of

14 training to take over from me when I leave. The idea is I am a missionary

15 teacher here for a while so I am trying to kind of hand over the work to

16 a local person rather than them being dependent on me. So between us, my

17 colleague takes forms one and two and I take forms three and four. So
18 each week is eerrrr...260 pupils and then we have some after school classes
19 as well. There is an after school class on Monday which some students and
20 staff can pay to come to. It's just an additional class sort of an income
21 generating activity for the computer room to maintain the computers.
22 That's Monday afternoon for one hour per week. And we raise some funds
23 because obviously sometimes there are breakages sometimes there are new
24 equipment needed and for the printer we need paper and cartridges so we
25 need to generate some money somehow and we do that through after-school
26 classes. But for after-school classes the people who come are somehow
27 connected to this school. So they are either teachers, may be students
28 who have left for one or two years or current students who are not in the
29 computer class who want to learn as well.

30 * Do you also involve the local community

31

32 No. Not the local community, in that case we would just be overwhelmed by
33 the numbers so it is not possible.

34 * How did you acquire these computers?

35

36 These computers errr... errr...initially about two years ago we received
37 these computers from church in Ireland. So it was a generous donation
from

38 Ireland. Then I came along and these ten computers were here and we

39 decided we needed to update them because they were getting older
40 beginning to break down so we went to eerrrr... schoolnet. They are an
41 organisation who distribute computers to schools in Malawi. They get the
42 computers from the UK or the US. They clean them and upgrade them a
43 little bit and then they distribute them. We as a school pay a fee of
44 about MK10000 per year for the use of these computers. So we have about
45 15 computers rented if you like from schoolnet. In return, they provide
46 errr maintenance and backup and some other services. So when they break
47 down I can take them across to schoolnet and they will either fix it or
48 replace with another computer as long as the payment is made per year.
49 It's kind of subscription or rental agreement. So the rental agreement is
50 you get 15 computers and you get maintenance for those 15 computers. So
51 we had to apply to get these computers, the headmistress had to apply and
52 we've had these computers for a year and a half almost. So it's fifteen
53 from that and the other five have come through donations as well from
54 Ireland, the new ones with XP on them. But I really like the schoolnet
55 option because we can not always depend on donations you know, it's
56 better to be self sustaining. You can just go to schoolnet and pay the
57 rent so it means you don't need a computer technician on site as many
58 schools do not have computer technicians. So we can go straight back to
59 schoolnet to get them fixed and we can concentrate on teaching which is
60 what we should be doing at school.

61 * Why did these donations come to RS26?

62

63 Yes there is a connection between RS26 and eerrrr ... errr obviously RS26 is

64 owned by CCAP but it's a government school and we can't deny that it's a
65 government school but the school proprietors are CCAP Blantyre synod. So
66 the Presbyterian church in Ireland and CCAP are partners. So one of the
67 schools obviously which CCAP are looking after is RS26 so we've had a long
68 connection between the Presbyterian church in Ireland and RS26 in an
69 educational way. We are involved in Malawi in some hospitals like Mulanje
70 Mission Hospital and Ekwendeni Hospital in the north and so on, but in
71 schooling we are involved with RS26 generally. So if there is a link and
72 we have some members of staff who work here from Ireland and there have
73 been some two, three or four members of staff before me and then I am
74 just next in that series of staff. So my role here is computer teaching
75 and also developing and generating the school and trying to encourage
76 further educational atmosphere...activities for students, facilities
77 development and maintenance and so on. Our computer room is one of those
78 things. So people in Ireland have a connection with RS26 because they know
79 that I am here and they know that PCI in Ireland is sponsoring CCAP in
80 Malawi. So errr... people do send donations to places they know. Because
81 there are so many places in the world they can send things to but they do
82 not know anything about those places but they know I am here and they
83 know how they are being used...I give them feedback and write letters back
84 and things like those.

85 * What do you do with these computers

86

87 We have four forms in our school, a general secondary school format forms
88 one to four. Forms one and two, they receive basic computer awareness and

89 computer knowledge. Things like mouse skills, keyboard skills, what is a
90 computer eerrrr taking this sort of mystery away from them about what a
91 computer is eerrrr it's quite basic and then may be moving on to
92 something like teaching Microsoft word, Microsoft paint where they draw
93 things using the mouse eerrrr....obviously then using Microsoft word so
94 that they can begin to type letters, posters for clubs and societies in
95 school errrr and the like eeerrr basic sort of skills in forms one and
96 two. In form one and two, we try and err..eer.. because we only have 20
97 computers here we have approximately 50 or 60 in each class and we have
98 three streams. So in term one we take 20 students from the class, in term
99 two we take another 20 in term three another 20 so that covers all 60 in
100 a class. So it means everybody in this class receives a little basic
101 training. It's not by any means the way I would like it but we have to
102 work with limited resources but it means that students receive a little
103 knowledge they know what a computer is they know what a keyboard does, a
104 mouse does. They know and it opens up their awareness therefore if they
105 want to go and do more in third form, fourth form or the polytechnic they
106 have a basic grasp of the knowledge. So form one and two are very basic
107 and then in form three we begin to focus a little bit more err..r. we ...
108 we take the most interested and best students from form two and we sort
109 of register them for computer classes in form three and we try and select
110 twenty students from form two over.. from each class to take part in the
111 form three classes and we give them that same twenty students a class in
112 term one, term two and term three so they get a class all year.

113 * How is the selection of students done?

114

115 Well, it's done eerrr... the teacher who teaches them, myself and the other
116 teacher, we try and assess them we give them a test at the end of form
117 two eerrrr....errr. we sort of assess their interest level well perhaps the
118 theory and where they have a keen interest in computers ... ideally you
119 would like to offer computers to everybody but it's not possible we just
120 do not have enough teachers or we do not have enough facilities. If we
121 had a room with a hundred computers we could do but we can't so we have to
122 somehow narrow down the numbers. So the aim in the third form is to try
123 and develop more things like Microsoft Word, Microsoft Excel, Microsoft
124 Powerpoint eerrr .. doing more advanced computers basically. The aim is
125 just to find out which students will go ahead and do MSCE computers. So
126 fourth form again we cut down the numbers again for those students who
127 are interested in doing MSCE because they are not all interested and the
128 ones who are capable of doing MSCE we assess them again at the end of
129 form three through examinations and observed examinations because
130 computers are different you can't just assess people through a written
131 exam, you have to observe them and do an assessment so on form four the
132 teacher and I again sit down and at the start of the year we try to
133 decide as best we can who is capable and who wants to do MSCE and at the
134 start of form four we begin to cover in much more detail the syllabus for
135 MSCE.. there is a syllabus that needs to be covered in form three and in
136 form four for MSCE computers. Currently this is our first year in doing
137 MSCE computers. There was exams last year but we weren't ready that time
138 and things were a bit disorganised with the educational board but this
139 year we gonna put about 20 or almost 25 students on MSCE. It's the first
140 year we have done it so it's not too bad. So there are three streams and

141 there are about 8 in each class. They are small classes which means you
142 can focus more time on individual students and we do Microsoft Word
143 mainly quite advanced skills now, Microsoft Excel advanced skills again
144 and then we move on to the new topic Microsoft Access which tends out to
145 be a little bit complicated and a bit difficult because students have
146 never heard about databases before errr.r..rrr it's just hard to get your
147 head around it err...errr... it's just hard to grasp. So it takes time so we
148 spend the whole year studying these three topics eerrrr and then they
149 also have the theory element to their examination. This is the practical
150 element. In the theory part errrrr...errr... I can show you the notes...these
151 are the notes which I made up ...unfortunately the MANEB hasn't provided a
152 text book... there is nothing available so we are working with limited
153 resources you know. We are saying you know do the test but there are no
154 resources (laughing) so it's a bit difficult. so I have made these notes
155 myself from my home country where I have used these notes and I have used
156 them in the past before so these are just the contents as you can see...
157 it's sort of basic hardware, basic software, parts of the computer,
158 what's inside the white box errr the system unit errr...rrrr... memory,
159 storage, computer performance things like RAM and ROM, software,
160 operating systems, application software, networks, and we talk a bit
161 about internet, e-mail. Now we don't have internet or e-mail in our class
162 so its very much theory based subject which is unfortunate because
163 computers are practical things. If we had internet and e-mail it could
164 make it much easier but we are not at that stage yet. Then we talk about
165 computers and their use in every day life. How you might use your
166 computer in your career because computer is much more than just an
167 academic subject. We hope that students will go on to use them whether

168 they are working in a bank or an accountancy firm or a doctor or a nurse
169 or a business man. So it's every day use of how computers are used for
170 example the super-market, at the point of sale machine through scanning
171 barcodes and things like that for example through swipe cards, or through
172 using the internet, e-mail making much more practical and career based
173 subject. So we look at things like that, how you use them at home, how
174 you use them at the work place and then we talk a little bit about
175 Information Technology how it is affecting our society today and how it
176 is changing society in terms of communication and how it is bringing the
177 world much closer together err...errr.. we are living in a global village I
178 suppose we can say now eerrrr errrr also then we talk about good working
179 practice of computers how do we look after our computers like
180 keyboarding how to look after ourselves when we are working on computers
181 because sometimes working on computers can be very tiring we can get
182 strain because of typing or we can get strain because of eyes looking at
183 the screen all the time without taking a rest and things like that
184 errr...er.... Health and safety issues really. Then we talk about security
185 issues copyright laws and things like those which come from the internet
186 because if you copy something off the internet that's copyrighted by
187 somebody else for security issues errrr...errr...and then we talk about
188 computer viruses and how they can damage computers and to be aware of
189 them and software that can er..er.. neutralise the virus and stop the
190 virus err.eer.. so that covers everything err ... data protection as well
191 we talk a little bit about it .. protecting data and err...err....that's
192 about it. So this is the book which I use in class with the notes
193 available errr...errr... I photocopy these notes and they are available in the
194 library for students. There is no text book written for the syllabus,

195 no. Unfortunately. It is something that I would dearly love you know
196 because these notes you know are fairly basic .. they are just black and
197 white and are not very exciting for students to look at. If they could
198 have a really nice glossy booklet with colour pictures, explanations
199 and more detailed obviously that would encourage students to learn. So
200 it's something we are lacking at the moment but computers is a new
201 subject in Malawi so therefore [pause] errr....errr... you know I hope may be
202 in the next two, three, four years perhaps a text book will be released.
203 Errrr...errr.... Just on the text book thing, there are text books which we
204 use in class in the practical element MS word, Excel, those ones on my
205 desk... Those ones I purchased them myself from the UK from a computer book
206 company in the UK and they cover the syllabus fairly well actually
207 although they have nothing to do with the Malawi education syllabus..
208 they cover it well and I feel they are important because they have
209 exercises in them and they have projects they can do they have
210 explanations they have pictures of keys and screens and things like that
211 which we can't draw on the blackboard. So you just hand them out and you
212 leave the students to work for half an hour or on their own they can just
213 follow the book which explains exactly what to do. So we keep this desk
214 just here which we call the information desk it's a bit like the computer
215 library if you like it's really for form four's use because they are the
216 ones who are doing the MSCE exam more or less like so they have a couple
217 of books, computer books which give very much detail, very much detailed
218 information about computers which I purchased again from the UK. So they
219 can browse through those but they can't take them away from the room. So
220 they can look at them during class or we have an open access time on
221 Tuesdays and Wednesdays after school so they can come and practice their

222 computer skills and then there is also past papers, past MSCE papers and
223 the syllabus which they can read and then grasp books which they use for
224 word excel etc and then I also keep magazines for local computer firms,
225 computer ICT magazines for their interests. So it's just to give them a
226 little bit more work so that they can on their own rather than just
227 listening to me. Provides just the library where they can search for
228 information which they want. Sort of self learning for the form threes
229 and form fours we have direct classes during the week and then they get
230 some spare time to do projects and to do an exercise in class generally
231 the class is the teaching class where I am teaching them so it is
232 generally good to have some time during the week where they can practice
233 on their own and they can go at their own speed so we open the classroom
234 on a Wednesday and a Tuesday afternoon after school from about 3:15 to 4:15
235 and that's free to them the ones who are registered for MSCE. So they
236 come and practice and ask me questions because I am not teaching them
237 it's just open access really.

238 * Why do teach them these skills?

239

240 Errrm ...errr...I think probably I am sitting here on May 2006 perhaps
241 because maybe the careers in computers are a bit limited. Because
242 computers is a very new technology to Malawi even in the world computers
243 are new technology but I think if we look at the way the computers have
244 taken off and expanded in Europe, in the UK, in the US and other parts of
245 the world perhaps we can see what is going to happen in Malawi and in
246 Africa because communications technologies have really exploded around

247 the world err...errr.. and we can see how computers are now gradually
248 coming into Malawi you know many offices now have computers especially in
249 cities like Blantyre, Lilongwe and Mzuzu errrr...errr.. many people are
250 using e-mail and internet we have so many internet cafes now err...errr..
251 most students who go to the polytechnic, Malawi college of accountancy or
252 chancellor college will be required to have computer skills to do their
253 assignments to do spreadsheets to do word processing for their essays or
254 whatever on the computer. Many schools are now going to make it
255 obligatory that you type your assignments so things like that are
256 gradually coming in and I think we have seen it increasingly more in
257 universities and colleges and once more schools and colleges are opened
258 up to internet and e-mail, it's a whole new world really and it would
259 create a whole new interest for students because I think internet really
260 is a way of accessing any type of information that you want in the world
261 and if you know how to access information then it's a key to learning and
262 understanding and getting good jobs and so on. Perhaps it used to be in
263 the past when you had to have the information yourself in your head but
264 now I think we can see it in the world that its knowing how to access the
265 information which is the key because you can find it on the internet or
266 you can find it from a friend on the road or you can ask a colleague or a
267 family member or anybody but if you know how to access that information
268 and ICTs help us.You even see the expansion of cell phones and sms this
269 is computer technology. And you know businesses will increasingly use
270 computers for record keeping for doing repetitive jobs for keeping price
271 for making business decisions even using computers err...err... I think
272 students particularly those who are going through at the moment are kind
273 of at the start of the computer explosion in Malawi. So I think it is a

274 very important subject for the students.

275 * What have been your experiences using these computers in the classroom?

276

277 Errrr i think the awareness of comps is growing we can see it before I

278 came here 3 yrs ago I had no experience of what comps were like in malawi

279 but for the past two years so icant compare but even from my two years I

280 can see it growing you know the first formers the first time they would

281 come into classroom many of them know what a computer does many of them

282 know how a computer works and a mouse works or a keyboard works and

283 that's quite a jump from two years ago when many of them were did not

284 know what a mouse or a keyboard was and also you can see how students

285 pick up very quickly the use of the mouse the keyboard and the computer

286 eerrrr... errr ... perhaps it's just because err..eerrr people are beginning

287 to gro up more with computers and therefore errreee... rrrr.. they get more

288 familiar with it whereas in the past people who are now middle aged or

289 older people weren't aware of computers and therefore it's hard to learn

290 or train them in computers because they are not used to it whereas

291 younger children they are growing up with it therefore it's just a way of

292 life that you have a computer, you work with a computer, you go to the

293 internet café, or you come to school and you have a computer so I think

294 it's growing a lot and err...errrr.. but then you have also the ... perhaps

295 people who have never come across computers before so it's a challenge tp

296 train them and it's also a challenge for me as somebody coming from the

297 UK because I take it for granted in some ways because we do have a lot of

298 computers and we do computer teaching in the UK err...eerrrr... so whenever

299 you are teaching you have to try and remember that well for a student who
300 have never seen a computer before it's completely foreign and unknown
301 you know I am talking about press the mouse what does that mean – a
302 mouse is the thing that runs around the floor, it's the grey mouse you
303 know what I mean. Or press the keyboard you know err...err.. what is a key
304 – a key is may be a bunch of keys which we use to open doors up- you
305 don't press a key. Or err as screen, people come in here and say ohh
306 there is lots of televisions here [laughter]. So things like that are a
307 challenge because you then realise things that you take for granted and
308 err then you have to start from basics so that can be a bit of a
309 challenge because some students may be know nothing about computers and
310 then others know everything and they want to go straight to play games or
311 they want to Microsoft database straight away so you have the same people
312 in the same class, 20 students so how do you teach that class as one...
313 it's a challenge and I think you have to start with the lowest common
314 denominator really. It's not fair to leave people behind and to lose
315 people and to be honest, people who come in here thinking that they are
316 advanced students err...err... you can always learn new things about
317 computers because they have not been taught by me before so you know
318 everybody has a little bit of different knowledge they know about
319 computers so I have a little bit of different knowledge compared to the
320 other teacher who is here and another teacher and so on. So you always
321 learn new things new techniques new shortcuts new way of doing things
322 even if you are an advanced student so it's not wasted by any means. But
323 we can see going through form one form two form thre and form four a real
324 progression in students learning and by form four they are pretty
325 advanced I would say and well prepared and well able to make a decision

326 if they want to concentrate more on computers at the polytechnic or
327 further education and may be say no I am just going to leave it now but
328 at least they have IT or computers on their MSCE certificate and I would
329 say that's a very attractive thing for an employer or in the future
330 err...err.. but you can also see standards of computers you know may be
331 form one form two form three and form four was like this two years ago
332 but now everything has shifted up a little bit in forms one two three
333 and four and may be the grades level has shifted up slowly like this and
334 that's very encouraging and I hope it continues.

335 * Did you say you are training your colleague to takeover from you when
you leave?

336

337 Yes, there is one teacher at the moment. Ideally I would like to have an
338 apprentice teacher and a trainee teacher with me full time to like train
339 him or her errr...err.. but due to limited teachers in the school and the
340 Malawi education system we can't afford to do that. So this teacher will
341 err...errr... throughout this year I am training him on some technical
342 things. Training him you know about schoolnet and how to access the
343 computers and err..rrrr...he is using his books and some that we got from
344 the UK and he is err learning the syllabus. Things like that but he is
345 also err...err.. you know he is a history teacher also so his time is
346 limited and by no means ideal. But you work with limited resources
347 [laughter]... it's not perfect by any means but we are doing the best we
348 can because. I only hope that by next January when we start the new
349 school term he will be [pause] hopefully assisted by another teacher who

350 may come or within the school or anyone who has a keen interest in
351 computers so that they can work together. I think it is important to have
352 a team working together rather just being fully dependent on one. And
353 perhaps whenever I leave RS26 there will be need for a computer teacher so
354 may be the school will be able to request from the ministry of education
355 a computer teacher. And while I am here they know there is no great need
356 because I am here doing the job. But there are certainly teachers out
357 there in education now who are trained specifically for computers like we
358 have a history teacher or a French teacher you know , there are teachers
359 now who are trained as computer teachers so err....err... it's again because
360 technology is new and this is a new subject for teachers to be teaching.
361 So may be in the next two to three years we will have a dedicated full
362 time Malawian teacher for computers. Because there is no err...err... I don't
363 errr...err... I don't..... [pause] err..err... really agree with the fact that
364 err errr... well I mean err... you know Malawian people the local people
365 can teach computers no problem. You know they don't need me here in
366 particular, I am here to simply assist them. To help, to train and
367 encourage, to help lift up the teachers so as to fulfil their potential.
368 But I am only here on a temporary measure you know and that's my role
369 here to train people up and then to step aside and go away back to my
370 home country because I have many things to do [laughter]. Errr ...so you
371 know you don't want to become dependent and dependency for a society is
372 not good and that's why our church and I believe that I am here on a
373 partnership role and it's not about me coming and err..saying I know
374 everything and I am going to tell you the way to do things. It's not like
375 that you know. It's a partnership role where we are working together as
376 fellow Christians as fellow teachers and we are seeking to help each

377 other through err.... I hope in the near future to pass on the computer
378 notes and the keys and let somebody else take it on because that's
379 empowerment of people and that's the way it should be. And I am glad to
380 say that we have some people coming from Malawi to Ireland to do training
381 with us. So it's partnership, its true partnership you know- the CCAP
382 send people to Ireland and the PCI, the Presbyterian in Ireland, send
383 people here. So it's two way its not just us sending but they send also
384 so we learn things from people from Malawi as well.

385 * Does the school have a computer maintenance unit?

386

387 Well when our machines break down especially the ones for schoolnet, we
388 send them directly to schoolnet at the Ginnery Corner and they either fix
389 them or replace them within one or two days. It's quite fast and its
390 good. Obviously with over 260 students per week we can't really afford to
391 be losing one or two computers. But a key thing to do is to try maintain
392 and look after the computers and not let them break you know what I mean.
393 So the behaviour in class is an important thing where students do not
394 abuse the computer room rules. where students can't change settings,
395 can't bring in software and things like that because that's how viruses
396 occur and that's how problems occur err..rrrr... This room is always
397 supervised by a teacher, it's never left unlocked so therefore the
398 teacher should be here supervising making sure that the students are not
399 breaking things or causing trouble because it's a very valuable room. If
400 things get damaged, students suffer because they can't be taught
401 computers so it's important. The other computers that are not from

402 schoolnet I try and maintain them as best I can. Although I am not a
403 computer technician but through some experience and through some training
404 I have a basic training so I maintain them. And later this year we are
405 receiving a group through our partnership from Ireland who are coming
406 here a group of 14 people and there is a computer technician on that
407 team. so he will come and service all the computers in july make sure
408 everything is up to date put on virus software clean the computers
409 defragment you know its like servicing a car . so that's very useful
410 andmeans that myself and the other teacher can focus on the teaching
411 because with all these classes during the week we don't have enough time
412 to maintain these computers. Errr ...and I personally don't want to get
413 involved in all that because I want to spend time with students teaching,
414 encouraging and empowering them to do assignments that's all. But
415 maintenance is a problem you know. Things like eerrr... errrr... simple
416 things like the dust which you see in the room here causes a lot of
417 problems and eerrrr...

AFFILIATIONS

Region	Research Site Number	Level of affiliations				Affiliation demands			Nature of affiliation (contingent / intermittent/ continuous)	Type of Affiliation (e.g. mono-valent, multi-valent)	
		Local	National e.g. MG	Regional e.g. SNet	Global e.g. WB	Individual	Regulative (coercive)	Normative (code of conduct)			Mimetic
South	RS 26HHI Examples in interview transcript	65 "...but it's a government school and we can't deny that it's a government school but the school proprietors are CCAP Blantyre synod..."	65 "...but it's a government school and we can't deny that it's a government school but the school proprietors are CCAP Blantyre synod..."			72 "...So if there is a link and we have some members of staff who work here from Ireland and there have been some two, three or four members of staff before me and then I am just next in that series of staff. So my role here is computer teaching and also developing and generating the school and trying to encourage further educational atmosphere...activities for students, facilities development and maintenance and so on. Our computer room is one of those things. So people in Ireland have a connection with RS26 because they know that I am here and they know that PCI in Ireland is sponsoring CCAP in Malawi. So err... people do send donations to places they know..."		373 "...I am here on a partnership role and it's not about me coming and err...saying I know everything and I am going to tell you the way to do things. It's not like that you know. It's a partnership role where we are working together as fellow Christians as fellow teachers and we are seeking to help each other through err... I hope in the near future to pass on the computer notes and the keys and let somebody else take it on because that's empowerment of people and that's the way it should be.	13"...We have two teachers here, one is me and the other teacher who is also a history teacher whom I am sort of training to take over from me when I leave. The idea is I am a missionary teacher here for a while so I am trying to kind of hand over the work to a local person rather than them being dependent on me..."	68 "...so we've had a long connection between the Presbyterian church in Ireland and RS26 in an educational way..."	Multi-valent Does not focus only on the supply of technological artefacts but also considers other parameters within the adopting context e.g. support and maintenance arrangements, cultural issues, teaching methods etc

ENVIRONMENT

Location	Region	Research Site Number	Institutional Pressures					Technical pressures				
			Culture	Government policies and regulations	Politics	School objectives	School size	Standardized / Sanctioned practices (e.g. monetary - the WB)	Nature of ICTs	Infrastructural richness		Telecommunications grid (Location)
										ICT Skills base	Availability of ICT resources e.g. number of PCs	
	South	RS 26HHI Examples in interview transcript		√ 152 "...unfortunately the MANEB hasn't provided a text book... there is nothing available so we are working with limited resources you know..."		√ 101 "...So it means everybody in this class receives a little basic training. It's not by any means the way I would like it but we have to work with limited resources but it means that students receive a little knowledge they know what a computer is they know what a keyboard does, a mouse does..."	√ 97 "...In form one and two, we try and err... because we only have 20 computers here we have approximately 50 or 60 in each class and we have three streams. So in term one we take 20 students from the class, in term two we take another 20 in term three another 20 so that covers all 60 in a class. So it means everybody in this class receives a little basic training. It's not by any means the way I would like it but we have to work with limited resources..."	√ 4 We have 20 computers in the computer suite and then we have a couple in the headmistress' office and the accounts department. But for teaching and student access we have 20 PCs all in full working order. We have windows 95 98 XP. We are now phasing out the win 95 and we are bringing them all to win 98 and XP.		√ 13 "...We have two teachers here, one is me and the other teacher who is also a history teacher whom I am sort of training to take over from me when I leave..."		

IDENTITIES

Location	Region	Research Site Number	Presentation e.g. constructing identities	Culture / ethnicity	Multiple-identities or multi-level identities e.g. helper/helped	Profiling / self-monitoring	Local Tension (e.g. Cultural conflict)
	South	RS 26HHI	<p>√ ICT adoption processes influence and are influenced by the way adopters want to present themselves to the outside world</p> <p>376 "...It's a partnership role where we are working together as fellow Christians as fellow teachers and we are seeking to help each other through err... I hope in the near future to pass on the computer notes..."</p>		<p>√ ICT adoption processes involve multiple identities which influence and are influenced by the adoption process</p> <p>367 "...I am here to simply assist them. To help, to train and encourage, to help lift up the teachers so as to fulfil their potential..."</p>		
		Example in interview transcript					

INTERACTIONS

Location	Region	Research Site Number	Cultural Rules	Social routines (institutional routines)	Documentation (rules, regulations etc)	Symbolic action (e.g. strategic acceptance / philanthropic donations)	Learning by using or imitation (e.g. deep adoption)
URBAN	South	RS 26HHI Example in interview transcript		<p>√</p> <p>Social or school routines influenced, and are influenced by, the way ICT adoption processes occur</p> <p>87 "... We have four forms in our school, a general secondary school format, forms one to four... In form one and two, we try and err... because we only have 20 computers here we have approximately 50 or 60 in each class and we have three streams. So in term one we take 20 students from the class, in term two we take another 20 in term three another 20 so that covers all 60 in a class. So it means everybody in this class receives a little basic training." [101]</p>	<p>√</p> <p>Rules and regulations shape and are shaped by ICT adoption processes</p> <p>136 "... there is a syllabus that needs to be covered in form three and in form four for MSCE computers..."</p>	<p>√</p> <p>ICT adoption processes also influence and are influenced by symbolic representations e.g. partnerships / Christian fellowships etc</p> <p>376 "...It's a partnership role where we are working together as fellow Christians as fellow teachers and we are seeking to help each other through err... I hope in the near future to pass on the computer notes and the keys and let somebody else take it on because that's empowerment of people and that's the way it should be..."</p>	<p>√</p> <p>ICT adoption processes influence and are also influenced by interactions which include imitation or empowerment pressures</p> <p>367 "...I am here to simply assist them. To help, to train and encourage, to help lift up the teachers so as to fulfil their potential. But I am only here on a temporary measure you know and that's my role here to train people up and then to step aside and go away back to my home country because I have many things to do [laughter]. Errr ... so you know you don't want to become dependent and dependency for a society is not good and that's why our church and I believe that I am here on a partnership role and it's not about me coming and err...saying I know everything and I am going to tell you the way to do things. It's not like that you know</p>

Appendix M

Summarised Questionnaire data

