

**THE INTEGRATION OF
INFORMATION AND
COMMUNICATION TECHNOLOGY
INTO RURAL SCHOOLS OF SOUTH
AFRICA:
A CASE STUDY OF SCHOOLS IN
MALAMULELE**

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Thesis presented in partial fulfilment of the requirements for the degree of
Master of Philosophy
(Information and Knowledge Management)

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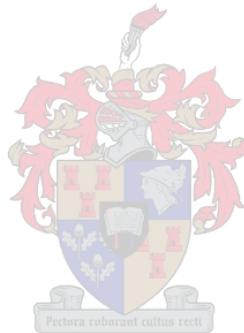
MARCH 2007

DECLARATION

I, the undersigned, hereby declare that the work contained in this thesis is my own original work and that I have not previously in its entirety or in part submitted it at any university for a degree.

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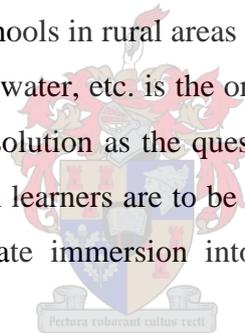
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ABSTRACT

The world has advanced and grown to a stage where a person without a basic computer literacy finds it almost impossible to function comfortably in society. To address the situation governments all over the world are encouraging their citizens to become technologically literate. Countries are spending large sums of money to integrate ICTs in education. The South African government on its part has realized and acknowledged the importance of Information and Communication Technology in education. Hence, its White paper on e-Education, which provides for the integration of ICTs into schools.

This study looks at efforts being made by the Department of Education and other education stakeholders to address the ICT situation in some schools based in a rural area of the Limpopo Province. A well-resourced school in so far as ICTs are concerned was visited to assess the functionality and applicability of ICT within the school system and to make comparisons to less resourced schools.

The study highlights the plight of schools in rural areas where the lack of basic amenities such as adequate accommodation, furniture, water, etc. is the order of the day. It is however pointed out that dwelling on these issues is no solution as the question of ICT integration into schools is a non negotiable one, if South African learners are to be kept abreast with trends in other parts of the world. That is, without adequate immersion into ICT, learners would not be globally competitive.



The ICT situation in schools in the Limpopo Province has been analysed within a framework developed under this study. The framework is set to help the Department of Education determine the suitable intervention programmes for each level of ICT integration. In addition, the study concludes with a recommendation. The success or failure to integrate ICT into schools, especially those in rural areas, depends to a large extent on the kind of intervention the government adopts. Since all schools have not attained the same level of ICT integration, there should be a clearly defined audit to determine what is needed and how it should be provided. This study raises some of the key issues for integration of ICTs in schools within a rural setting.

OPSOMMING

Die wêreld het vooruitgegaan en gegroei tot op die stadium waar dit vir iemand sonder basiese rekenaargeletterdheid byna onmoontlik is om gemaklik in die gemeenskap te funksioneer. Ten einde hierdie situasie aan te spreek, moedig regerings die wêreld oor hulle burgers aan om tegnologie-geletterd te word. Lande spandeer groot bedrae geld om IKTs in die onderwys te integreer. Op sy beurt het die Suid-Afrikaanse regering die belangrikheid van inligting- en kommunikasietegnologie in die onderwys besef en erken. Vandaar die witskrif oor e-Onderwys, wat voorsiening maak vir die integrasie van IKTs in skole.

Hierdie ondersoek kyk na pogings deur die Departement van Onderwys en ander belanghebbers in die onderwys om die IKT-situasie in sommige skole in 'n plattelandse gebied in Limpopo Provinsie aan te spreek. 'n Skool met goeie IKT-hulpbronne is besoek om die funksionaliteit en toepasbaarheid van IKT binne die skoolstelsel te assesser en om 'n vergelyking te tref met skole wat minder goed voorsien is.

Die treurige toestand van skole in plattelandse gebiede, waar die gebrek aan basiese geriewe soos voldoende akkommodasie, meubels, water, ens. aan die orde van die dag is, word deur die studie na vore gebring. Daar word egter aangetoon dat dit geen oplossing bied om op hierdie kwessies te bly stilstaan nie, aangesien die integrasie van IKTs in skole ononderhandelbaar is indien Suid-Afrikaanse leerders op die hoogte gehou moet word met tendense in ander wêrelddele. D.w.s. sonder voldoende blootstelling aan IKT sal leerders nie globaal mededingend wees nie.

Die IKT-situasie in skole in die Limpopo Provinsie is ontleed binne 'n raamwerk wat vir hierdie studie ontwikkel is. Die raamwerk is saamgestel om die Departement van Onderwys te help om geskikte intervensieprogramme te bepaal vir elke vlak van IKT-integrasie. Verder sluit die studie af met 'n aanbeveling. Die sukses of mislukking om IKT in skole te integreer, veral skole in plattelandse gebiede, hang in 'n groot mate af van die soort intervensie wat die regering instel. Aangesien alle skole nie dieselfde vlak van IKT-integrasie bereik het nie, behoort daar 'n duidelik gedefinieerde oudit te wees om vas te stel wat benodig word, en hoe dit voorsien moet word. Hierdie studie opper 'n aantal van die sleutelkwessies met betrekking tot die integrasie van IKTs in plattelandse skole.

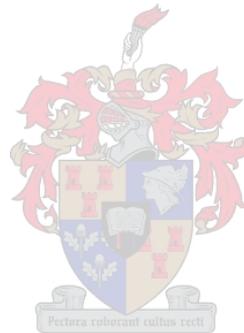
DEDICATION

This work is dedicated to

My lovely girls

Jennifer and Edem

I have set a mark which I hope you will do well to surpass.



ACKNOWLEDGEMENTS

My first acknowledgement goes to my GOD. His GRACE and GLORY saw me through the most trying times of my study.

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TABLE OF CONTENTS

	PAGE
DECLARATION	i
ABSTRACT	ii
OPSOMMING	iii
DEDICATION	iv
ACKNOWLEDGEMENTS	v
TABLE OF CONTENTS	vi
LIST OF TABLES AND FIGURES	ix
CHAPTER ONE: INTRODUCTION AND OVERVIEW	
1 INTRODUCTION	1
2 RESEARCH PROBLEM	1
3 THE AIM OF THE STUDY	3
4 RESEARCH METHODOLOGY	3
5 PRESUMPTIONS AND ASSUMPTIONS	4
6 VALIDITY OF THE STUDY	4
7 LIMITATIONS OF THE STUDY	5
8 GENERAL OUTLINE OF THE CHAPTERS	5
9 CONCLUSION	6
CHAPTER TWO: INFORMATION AND COMMUNICATION TECHNOLOGIES AND EDUCATION	
1 INTRODUCTION TO THE CHAPTER	7
2 THE NEED FOR ICTs IN EDUCATION	8
3 ICTs AND EDUCATION IN SOUTH AFRICA	12

4	SOME OF THE DRAWBACKS FACING SCHOOLS AND HOW THESE CAN POSSIBLY BE SOLVED TO ENSURE SUCCESSFUL INTEGRATION OF ICTS IN RURAL SCHOOLS	15
4.1	LEARN-O-VISION	15
4.2	CONNECTIVITY	16
4.2.1	INFOSAT	17
4.3	PERSONNEL PREPAREDNESS AND MAINTENANCE	19
4.4	FINANCE	20
4.5	SUPPORT STAFF AND MAINTENANCE	22
5	CONCLUSION	24

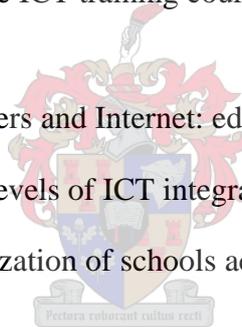
CHAPTER THREE: THE DESIGN AND PROCESS OF ENQUIRY

1	INTRODUCTION	25
2	THE RESEARCH DESIGN	25
2.1	QUALITATIVE RESEARCH METHODOLOGY	26
2.2	QUANTITATIVE RESEARCH METHODOLOGY	27
2.3	DESCRIPTIVE RESEARCH METHODOLOGY	28
2.4	EXPLORATIVE RESEARCH METHODOLOGY	28
3	THE SETTING	28
4	SAMPLING	29
5	DATA GATHERING PROCESS	31
5.1	THE QUESTIONNAIRE	31
5.1.1	RESPONSES FROM LEARNERS	32
5.1.1.1	COMPUTER LITERACY AND UTILIZATION OF COMPUTER LITERACY SKILLS	33
5.1.1.2	ACCESSIBILITY TO COMPUTERS AND THE INTERNET	34
5.1.1.3	BENEFITS OF THE USE OF COMPUTERS IN SCHOOLS	36
5.1.2	RESPONSES FROM EDUCATORS	36

5.1.2.1	KNOWLEDGE OF GOVERNMENT’S e-EDUCATION PLAN AND ITS BENEFITS	37
5.1.2.2	COMPUTER LITERACY SKILLS, ACCESSIBILITY TO COMPUTERS AND THE INTERNET	38
5.1.2.3	PROFESSIONAL DEVELOPMENT	42
5.2	INDIVIDUAL INTERVIEW	42
5.2.1	INTERVIEW WITH THE LIMPOPO PROVINCIAL EDUCATION DEPARTMENT ICT COORDINATOR	43
5.2.2	INTERVIEW WITH PRINCIPALS	45
5.3	OBSERVATION	47
5.3.1	SCHOOL OBSERVATION	48
5.3.2	OBSERVATION OF WORKSHOP	53
6	DATA PROCESSING AND CONSOLIDATION	57
7	CONCLUSION	58
CHAPTER FOUR: FINDINGS, RECOMMENDATION AND CONCLUSION		
1	INTRODUCTION	59
2	FINDINGS	59
3	RECOMMENDATIONS	64
3.1	AWARENESS PROGRAMME	64
3.2	PROFESSIONAL TRAINING OF EDUCATORS	66
3.3	TECHNICAL SUPPORT	74
3.4	FINANCE	75
4	THE REALITY OF ICT SITUATION IN LIMPOPO PROVINCE	78
5	CONCLUSION	85
BIBLIOGRAPHY		87
APPENDICES		93

LIST OF TABLES AND FIGURES

	PAGE	
Figure 3.1	Response rates from learners	33
Figure 3.2	Computer literacy skills of learners in sample	34
Figure 3.3	Access to computer resources of those who are computer literate	35
Figure 3.4	Response from educators	37
Figure 3.5	Awareness of government e-Education plans	38
Figure 3.6	Source of training for educators who are computer literate	39
Figure 3.7	Willingness to undertake ICT training course: educators who are not computer literate	40
Figure 3.8	Accessibility to computers and Internet: educators who are Computer literate	41
Table 4.1	Table categorizing the levels of ICT integration in schools	79
Figure 4.1	Graph showing categorization of schools according to ICT resources	83



CHAPTER ONE

INTRODUCTION AND OVERVIEW

1 INTRODUCTION

In this chapter, the research problem will be discussed and contextualized. We will look at how the benefits of Information and Communication Technologies (ICTs) can be realized in rural schools. Comparisons and contrasts of ICT resources will be investigated. The aim of the study is also stated and the research strategy and methodology adopted will be deliberated upon. The chapter also provides a review of the researcher's presuppositions and assumptions and a general outline of the remaining chapters. The chapter ends with highlights on the validity and limitations of the study.

2 THE RESEARCH PROBLEM

The global onslaught of ICTs has engendered the need for the integration of ICTs into all spheres of life, be it at work, at home, in schools or in the field of entertainment (Herselman, 2003:946). Against this background, educational institutions are making efforts to incorporate basic computer literacy in most of their courses. ICTs are now acknowledged as integral component to primary, secondary and tertiary education. At the same time some so-called ICT institutions with questionable credentials are mushrooming all over South Africa. Most of these institutions are not properly registered with the Department of Education because they do not have South African Qualifications Authority (SAQA) accreditation.

The Department of Education has included ICT in its Outcomes Based Education (OBE) curriculum. The Minister of Education, Ms G.N.M. Pandor has emphasized in the White Paper on e-Education (Department of Education, 2004) that ICT is creating new ways of learning and it has the potential to enhance the management and administrative capacity of schools. The potential of ICTs to drive the education system cannot be over emphasized. Some benefits to be derived from integration of ICTs in education are:

- Making learning more interactive.
- Enhancing the enjoyment of learning.
- Customizing curricula to meet learner need and development.
- Capturing data for storage to support decision making.
- Enhancing the avenues for collaboration and family members and the school community.
- Improving ways of accountability and reporting (SAIDE: 2005).
- Education will also become learner centred instead of educator centred.

It is the researcher's contention that, whilst some of the urban schools are relatively well-resourced and well staffed, the same cannot be said of many of rural schools in South Africa. The latter are confronted with overcrowded classes, lack of classrooms, lack of textbooks, inadequate furniture and other basic resources. In support of this assertion, Herselman (2003:946) cites Furlonger in her work to make the point that urban schools have advantage of information centres, Internet access to information and experienced educators. The question that arises is how can rural schools, which cannot obtain the aforementioned basic necessities, manage to successfully integrate ICTs into their curriculum? ICTs in fact, require more than just classrooms, tables and chairs and stationary. For instance, there is a need for well-trained ICT professionals (i.e. personnel who are capable of utilizing ICT resources in school work, technicians to install and maintain the equipment and others that produce learning content) who will be prepared to work in the rural areas, appropriate telecommunication infrastructure and the like.

The main thrust of this study is thus to investigate factors that hinder or encumber a successful introduction of ICTs in rural schools of South Africa and how these affect among other things the aim of providing equal and quality education for all as well as the global benefits derived from the use of ICTs. The study will look at the fact that in spite of the drawbacks faced by rural schools, some schools have managed to introduce ICTs into their curriculum. An indication that the successful integration of ICTs into rural schools can only be realized if the appropriate technologies which can surmount some of the obstacles hindering the introduction of ICTs are provided and if the playing ground is leveled to equal that of the urban schools. That includes bringing resources in rural areas to be at par with those urban areas.

3 THE AIM OF THE STUDY

The aim of this study is to investigate factors that are involved in integration of ICTs in rural schools in South Africa and to determine other approaches to make ICT flourish in rural schools. It is hoped that the findings of this study, will provide a benchmark for other rural communities elsewhere in South Africa. The specific objectives are to:

- Assess the state of ICTs in South African schools, particularly in rural schools.
- Analyze major factors that hinder the diffusion of ICTs in rural settings.
- Provide a framework for the introduction of ICTs in rural schools.

4 RESEARCH METHODOLOGY

The research methodology is mainly of qualitative nature with elements of quantitative analysis. This method of combining qualitative and quantitative methodologies was suggested by Creswell (in De Vos, 1998:361) to show that the researcher could mix aspects of the qualitative and quantitative paradigms in all or many of the methodological steps. Mouton and Marais (1990: 169-170) also suggest that the phenomena which are investigated in the social sciences are so interrelated that a single approach will not be enough to encompass human beings in their full complexity. This method has the complexity of making use of the advantages of both methodologies. From the explanation given for the use of both qualitative and quantitative approaches, the researcher feels the two approaches complement each other and enable a comprehensive presentation of the study undertaken.

This study also adopted a descriptive approach, as it gives a description of stakeholders' views and experiences about the use of ICTs in their schools. Stakeholders such as personnel responsible for ICTs in the Limpopo Province Department of Education, District Education ICT co-ordinators, school principals and ICT educators were interviewed. School and class visits were made during which ICT facilities and infrastructure were examined. Written open-ended survey interviews were conducted. The various data gathered were triangulated so as to provide a valid, reliable and trustworthy presentation. Vockell and Asher (1995:454) define triangulation as "the process of using multiple operational and multiple data collection strategies to measure an outcome variable". Triangulation is also described in Open University course E811 study guide (1998: 54) as:

Cross-checking the existence of certain phenomena and the veracity of individual accounts by gathering data from a number of sources and

subsequently comparing and contrasting one account with another in order to produce as full and balanced a study as possible.

In effect, by triangulating data collected, the researcher has applied multiple means of cross-checking the veracity of all assertions and observations.

5 PRESUPPOSITIONS AND ASSUMPTIONS

The main research propositions and assumptions are that the successful integration of ICTs in rural schools will depend on the following:

- The provision of adequate telecommunication infrastructure.
- The availability of qualified and competent personnel to teach and provide support for ICTs in rural schools.
- The preparedness of both educators and learners to utilize ICT resources provided.
- The availability of adequate financial resources to purchase and upgrade ICT equipment and services.
- The ability of the Department of Education to sustain the school connectivity projects.

This study assumes that ICTs will introduce a significant opportunity for teaching, learning and management of education services.

6 VALIDITY OF THE STUDY

According to Marshall and Rossman (1989) the aim of the validity criterion is to demonstrate that the research was conducted in such a manner to ensure that the subject was accurately identified and described. Unlike experimental designs where validity and reliability are accounted for before the investigation, Merriam (1991:120) states that "... rigour in a qualitative case study derives from the researcher's presence, the nature of the interaction between researcher and the participants, the triangulated data, the interpretation of perceptions and rich thick description". Thus Henning (1995) suggests that "validity is generally regarded as credibility of procedures which are articulated succinctly". In other words, one cannot evaluate procedures if they are not explicitly stated. Thus the validity of this research lies in clarity of the construct, its detailed account and rich description of how data was collected, managed and how decisions were made throughout the study. These had to be presented in a summarized version due to the limited length of this thesis. The validity of this research was guaranteed by employing the validation methods suggested by Le

Compte and Preissle (1993) and Mile and Huberman (1994), both of which the researcher used to verify the conclusions reached in this enquiry. The validation methods include among others; checking for representativeness, checking for researcher effects, getting feedback from participants, discovering a research philosophy, weighting the evidence, outlining, looking for negative evidence, replicating a finding and triangulating. These activities were conducted throughout the study.

7 LIMITATIONS OF THE STUDY

Leedy (1997:220) points out that during the research process, the researcher cannot avoid having data contaminated by bias of one sort or another. It is however unethical and unprofessional to fail to acknowledge the possibility of such limitations.

The limitations of this study are varied and may be viewed from different perspectives. Some of the limitations that come to mind are, some schools failing to permit the researcher to conduct the study there and the fact that the researcher did not have the time and resources to cover as much schools as possible in rural South Africa to make generalizations. It is also important to note that the researcher is a neophyte as far as research is concerned. Inexperience can result in numerous unintentional errors in the research design and process. However, reflecting upon these errors will accord the researcher opportunities to gain further insight into and understanding of the research process.

Furthermore, this is a small monographic study of a rural area, so the results cannot be generalized. The research findings are at best tentative without any corroboration, challenging and substantiation.

8 GENERAL OUTLINE OF THE CHAPTERS

The following is a summary of the stages of the inquiry as presented in this research report.

Chapter One explains the background to the study, context, research problem, aim of the study as well as the research methodology and the researcher's presupposition and assumptions. The validity and limitations of the study are also indicated.

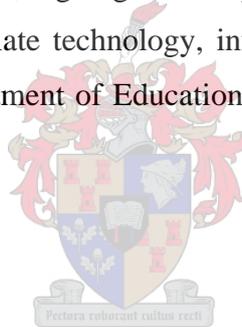
Chapter Two looks at ICTs and Education and makes a case for the need for integrating ICTs in South African Schools. This section discusses what is being done in some South African schools. The case of the rural schools is stated vis-à-vis the situation in the urban schools. The drawbacks to the successful integration of ICTs in rural schools is posited and how these drawbacks can be surmounted is deliberated on.

Chapter 3 discusses the research design and the research methodology used in the study. A description of the research procedures and extracted snapshots of empirical reality that has been investigated is indicated. The chapter also discusses the data processing and data consolidation methods utilized for the purpose of the study.

Chapter 4 highlights the findings of the study and makes some recommendations to address the findings. The reality of the presence and use of ICT resources in schools in Limpopo province is deliberated on.

9 CONCLUSION

In this chapter, the study was introduced with regard to its contents, aims and the research question(s). The research problem was elucidated. Emphasis is placed on the call that proper investigation be done on factors influencing the successful integration of Information and Communication Technologies (ICTs) in rural schools with special reference to schools in Malamulele, so that they can also benefit from the integration of ICTs. In the next chapter, the literature review will be presented, arguing that in spite of the drawbacks aforementioned in the rural areas, with the appropriate technology, infrastructure, dedicated personnel and unflinching support from the Department of Education, ICTs can be successfully integrated into rural schools.



CHAPTER TWO

INFORMATION AND COMMUNICATION TECHNOLOGIES AND EDUCATION

1 INTRODUCTION TO THE CHAPTER

This chapter will look at the need for ICTs in Education in South Africa and what the Department of Education is doing or has done to integrate ICTs into the school system with emphasis on the rural areas. The chapter will also highlight what some individual schools have done to acquire computers for their schools and the potential problems they may encounter. Furthermore, the researcher will assess some of the drawbacks that militate against the successful integration of ICTs into rural schools and how some of these drawbacks can be overcome. The chapter will conclude by arguing that despite the lack of basic infrastructure in rural areas, with planning and the adoption of appropriate technology, ICTs can still be smoothly integrated into schools.

ICT as described in the White Paper on e-Education “represents the convergence of information technology and communication technology” (Department of Education, 2004). The White Paper goes on to state that “ICTs are the combination of networks, hardware and software as well as the means of communication, collaboration and engagement that enable the processing, management and exchange of data, information and knowledge” (Department of Education, 2004). Isaacs, Broekman and Mogale (2004:39) define ICT as the use of “technology to create, store, process and use information in various forms (data, voice, image, multimedia presentations and other forms including those not yet conceived”. SAIDE

(2005:120) define ICT as “the technologies which together support people’s ability to manage to communicate information electronically”. Examples of such technologies are digital cameras, video recorders, televisions and radios. In this study ICT will be used to refer the set of activities and tools that facilitate the capture, storage, processing, transmission and display of information by electronic means to enhance teaching and learning.

2 THE NEED FOR ICTs IN EDUCATION

OECD (2001:9) and Rao (2004:261) make the point that the ubiquitousness and utility of ICTs is changing the way people live, learn, work and relate to each other. The explosion and free flow of information and ideas has brought knowledge and its applications to many millions of people, creating new choices and opportunities in some of the vital realms of human endeavour. These developments have created what scholars refer to as the knowledge society or learning society or information society. From this standpoint, we can note that the global economy is now based on the exploitation of knowledge in addition to labour and natural resources. A knowledge-based economy is one in which growth, development and innovations are driven by the optimal use of information and information products (SchoolNet Toolkit Guidebook1). That is the ability to transmit data over information and communication infrastructure.

The South African Institute for Distance Education (SAIDE) (2005:14) notes that the global explosion of information has not reached some populations. Thus we are experiencing what is referred to as the ‘digital divide. The term “digital divide” refers to a situation where some populations have access to ICTs and others have very little or no access at all (SchoolNet Toolkit Guidebook1) The use of ICTs in education is hoped to expand education to remote places and consequently help bridge the digital divide.

To be productive and competitive in the knowledge economy, governments must focus on strategies to provide quality education. A quality education is one which can impart skills that will serve as a tool for productivity. Hawkins (2002:38) writes of this skill as “information reasoning” which he posits as “a process in which reliable resources of information are identified, effectively accessed, understood, contextualized and communicated to colleagues”. He further points out that employers require workers who possess skills necessary to collaborate, engage in teamwork, and be able to share information across global networks. These workers must also have the ability to learn quickly in a rapidly changing environment. This skill can be gained by providing ICT resources to all including those who have no access.

This view was endorsed by the former President of South Africa, Nelson Mandela who is quoted by Stern (1999:4) as stating that universal access to information is a means to “promote economic growth and development, consolidate democracy and human rights, and increase the capacity of ordinary people to participate in governance”. Therefore, it is imperative for society to reconsider the way skills are developed so that society can benefit from the use and harnessing of ICT and ICT resources.

OECD (2001) notes “all countries wish to enhance the quality and effectiveness of the learning process in schools and are looking to ICT as the means whereby this may be achieved”. UNESCO (2002:9) also points out that:

All governments aim to provide the most comprehensive education possible for their citizens within the constraints of available finance. Because of the pivotal position of ICT in modern societies, its introduction into education will be high on any political agenda.

To this end, many people have acknowledged that acquiring information through the use of ICTs in education is of crucial importance (Baartman, 2003:52).

The belief is that ICTs will create a citizenry of lifelong learners who can adapt to the global economy. Capper (2003:60) notes that the use of ICTs enhances learners’ performance, better prepares learners for most careers and vocation and shifts the traditional teaching method to a learner-oriented method. Cawthera (2001:11) notes that “If a country is to be internationally competitive it is essential that its labour force is able to utilize and harness the advantages of ICTs. If the education system fails to enable people to do this it also fails to meet the needs of the country and its economy”.

Isaacs, Broekman and Mogale (2004:36) have also pointed out that introducing ICTs into education will provide opportunities for the youth to function in the information age. That is, ICTs in education will promote cultural exchange, develop communication skills among learners and assist them with studies. For instance, learners can learn other peoples’ culture over the Internet and even exchange ideas about different cultural practices. ICTs are also a good way of making the newly introduced Outcomes Based Education (OBE) curriculum work well in all schools as learners will have numerous sources of information to utilize. ICTs thus will enable the National Department of Education to attain its goal of providing a unified national education system based on the democratic principles of equity, transparency and participation (Department of Education, 2001).

Kante and Savani (2003:17) have stated that the use of e-learning can reduce the cost of face to face training, time of training, expand educational opportunities and develop knowledge-economy skills which is increasingly demanded in the labour market. A case study in Mali is cited by these two authors to show the cost effectiveness of adopting ICTs in education. Fletcher (2003:10-14) also notes that “technology-based instruction can reduce time and cost needed for learning. Haddad (2003:6) supports the cost effectiveness of ICT in education by pointing out that “ICTs, although expensive, may end up to be the best investment to make acceptable levels of learning affordable for all students, anywhere, within reasonable time and resources”.

From the points made by the aforementioned authors, it is evident that the use of ICTs in education has the potential promise for cost reduction and for an improvement of training and quality of service.

Some academics have stated that the education of women will promote social and economic development. For instance, Hawkins (2002:42) quotes a UNICEF document which reports on a research that states, “an extra year of schooling will increase a woman’s future earnings by about 15 percent, compared to 11 percent for a man”. This perhaps supports the popular saying that “if you educate a woman, you educate a nation”. However in most societies, the observation is that women play second fiddle to men, so in such societies efforts must be made to accord women the full benefits of education.

Again in some religions, women are not accorded equal status as men. For example in some Christian churches, women are not accepted as priests or cannot hold some leadership positions. However, in recent times calls are being made for gender equality. For instance in South Africa, the constitution makes provision for gender equity. This move to empower women can be enhanced by providing ICTs in education. The Internet which has numerous sources of information is not exclusively for men. Women can also have access to it. So women can obtain information from the Internet, which they can use to assert their positions in society. Hawkins (2002:42) provides examples in Mauritania and Ghana where girls have indicated that the Internet has given them the impetus to assert their freedom and rub shoulders with boys as it affords them the opportunity to access information beyond the controlled information provided to them.

In many societies, especially the developing ones, providing proper education to learners with special needs pose real challenges. OECD (2001:28) makes the point that significant benefits have been derived from the use of ICTs by learners with special needs. The use of

ICTs in schools will afford children with visual and muscular difficulties to read, write and express themselves. Integrating ICTs in schools will enable children with special needs to attend ordinary schools.

UNESCO (2002:9) states that ICT permeates the business environment; it has underpinned the success of corporations and provided governments with an efficient infrastructure. It adds further that ICTs have added value to the process of learning, and in the organization and the management of learning institutions. Kante and Savani (2003:15) also support this view by stating that since ICTs have proved successful in business, there is no harm in trying it in education.

Technology will serve as points of mediation for teachers who are not well qualified. Educational materials can be prepared and distributed to all schools either through the Internet or the broadcast media. In Namibia, the government has noted that the value of ICTs in the classroom goes beyond that of a practical teaching aid (Bringing Computers to the Classroom ...). It further points out that “the need to use new technologies to raise the quality and efficiency of education cannot be overemphasized”. To improve the quality of education and technical proficiency of its human resource, the Namibian government feels that it is imperative to expose its children, parents and teachers to ICTs. This measure aims to increase productivity and accelerate development. In Zambia, ICTs in education is regarded as important as basic reading and writing skills (Schoolnet Zambia).

In Uganda, the government is has indicated its commitment to integrating ICTs into formal and informal education. Kawooya (2004) cites how SchoolNet in collaboration with the Ugandan government has introduced School-Based Telecentres to provide schools and communities with ICT facilities. Details to similar claims to the usefulness of ICTs in education in African countries can be accessed through (SchoolNet Toolkit Guidebook2).

The need to adopt ICTs in school is summarized into three rationales:

Economic rationale – to meet the requirements for employability as the 21st century unfold.

Social rationale - to fulfill the requisite for participation in society and the work place, and

Pedagogical rationale – to concentrate on the role of teaching and learning (OECD, 2001).

From the aforementioned, it might be safe to conclude that the value that ICTs will add to education is really exciting and it is worth giving a try.

It must however be pointed out that the use of ICTs in education has some drawbacks and some of the cited drawbacks are:

- Lost of personal contact between educators and learners.
- Lack of commitment on the part of both educators and learners to utilize ICT resources.
- High cost of installation.
- Lack of competent personnel to use ICT resources.
- Accessibility to hardware and software.
- Reliability and quality of computers.
- Professional training for ICT users.
- The provision of technical support (Jedeskog, 1999, Pelgrum, 2001, Ward, 2003, Rai, 2006.).

Moreover, Cawthera (2001:10) has argued that there is no research to prove that the application of ICTs in education will be more successful than other resources such as “textbooks, teacher training or nutritional supplements”. A similar assertion has been made by Fletcher (2003:14) who points out that “the arguments in favour of technology-based instruction are incomplete”. In spite of these apprehensions, education cannot ignore the changes wrought in society by the proliferation of ICTs.

The researcher however contends that the ultimate introduction of ICTs in schools will prove more rewarding than sticking to the traditional method of teaching and learning. This does not rule out the need for good planning for harnessing the potential of ICTs in teaching and learning.

3 ICTs AND EDUCATION IN SOUTH AFRICA

In the light of the developments stated above, OECD (2001:9) states that “all countries wish to enhance the quality and effectiveness of the learning process in schools, and are looking at ICT as the means whereby this may be achieved”. From this standpoint, the National Department of Education has realized that the provision of the relevant education with the application of ICTs can no longer be ignored. It has become crucial that access to ICTs in education is provided by all concerned. This means that the National Department of Education needs to devise a new curriculum that will ensure the integration of ICTs into the school system. This is the most optimal way for a country to produce skilled workers who will be able to compete on the highly competitive global market.

The National Department of Education also sees the integration of ICTs into the school system as a way of providing quality education to all and to redress the past inequalities in education. This view is emphasized by the Minister of Education, Ms Pandor in her foreword to the “White Paper on e-Education” (Department of Education, 2004).

Consequently, the Department of Education has introduced Information Technology (IT) into its new school curriculum. A White Paper has been released (Department of Education, 2004), to guide the department in the introduction of e-Education into the South African school system.

The White paper states that e-Education revolves around the use of ICTs to accelerate the achievement of national goals. e-Education will ensure the provision of the connectivity to enhance teaching and learning, provide the relevant support services such as pedagogical, curricular, assessment, managerial and administrative (Department of Education, 2004). This implies that, if successfully implemented, the country’s education system will be transformed to produce quality education with equal access to all and a breed of lifelong learners.

It is worthy of note that the private sector, parastatals and non-governmental organizations (NGOs) are also contributing immensely to supplement the government’s effort to integrate ICTs into education. Some of the projects engendered by the afore-mentioned include the South African SchoolNet, which was started with the formation of grassroots provincial networks to provide Internet connectivity to communities, and Mindset Learn, a satellite channel that broadcasts educational content to schools in South Africa and elsewhere in Africa. Schools join Mindset Learn by purchasing a kit which comprises of a decoder, a television set and orientation training to help teachers utilize the broadcasts optimally. Telkom’s Thintana project provided some 300 schools with computer laboratories, Internet connectivity and teacher training. Microsoft Foundation entered into an agreement with the National Department of Education to provide free software to South African schools for a period of five years. South African Digital Partnership was set up with the aim of establishing e-learning centres in schools and social enterprises settings in disadvantaged communities in South Africa for a period of two years. These projects have laid foundations to support the integration of ICTs in communities and schools. Other examples are the Khanya Technology in Education in the Western Cape Province, Gauteng on-line in the Gauteng Province, Connectivity Project in the Northern Cape Province and the Intel “Teach to the Future” Project that have a substantial ICT for school components.

It must however be pointed out that almost all of these projects are based in the urban areas and not in the rural areas. This can be attributed to the fact that the urban centres possess the attraction in terms of good job opportunities, good social life, good infrastructure, and the businesses to provide the financial acumen, etc. This is in sharp contrast to what pertains in the rural areas where according to Ward (in Valentine & Holloway, 2001) "... children are seen to be disadvantaged relative to their urban counterparts because of their physical distance from educational, recreational and employment opportunities and because of their lack of personal mobility". Herselman (2003: 945), also points out that the rural dwellers are struggling to meet their basic needs. The rural schools are faced with overcrowded classes or do not have classrooms at all, have no toilets, lack textbooks, furniture and other basic infrastructure for economic development and thus see the integration of ICTs in education as more of a luxury than a necessity. New technologies that speed up the delivery of education and textbooks are needed more in rural areas than urban areas.

Consequently, some rural schools are not letting the lack of basic infrastructure deny them the opportunity to use computers – a starting point for integrating ICTs into the school system. Educators in rural schools, who have acquired some computer literacy, try to use computers to prepare their lessons and texts. They encourage their School Governing Bodies (SGBs) and School Management Teams (SMTs) to acquire computers for their respective schools. Some schools have managed to acquire computers and even Internet connections from sources such as insurance companies, retail outlets, businesses and government enterprises. Other educators have contributed money to access the Internet from community mobile phone shops. Some private entrepreneurs have also acquired used-computers, refurbished them and in partnerships with the schools have set up computer literacy classes which educators and learners must pay to attend. Usually, once the entrepreneur has made his money, the computers are donated to the schools for their use. This is a clear indication that with or without the help of government, irrespective of location, schools in South Africa are eager to or are steadily trying to do something to integrate ICTs into the school system.

Though this is a laudable effort by schools, it must be pointed out that some entrepreneurs are providing schools with very outdated equipment which are unable to run modern applications and not compatible with the latest software. The worrying point here is the fact that unsuspecting schools are being turned into dumping grounds for disused-computers. It will be helpful if the National Department of Education will provide a policy guideline to protect schools from becoming dumping grounds for old disused and dilapidated computers.

In addition, the department can explore software on the market that can run on any computer from the oldest 286 to the latest Pentium and provide advice accordingly.

One such software that is the “New Deal” that claims to run on old computers. The “New Deal software is said to run on any computer be it a stand-alone or networked. It is also compatible with DOS, any version of Windows, OS/2 or Linux (www.newdealinc.com).

4 SOME OF THE DRAWBACKS FACING SCHOOLS AND HOW THESE CAN POSSIBLY BE SOLVED TO ENSURE SUCCESSFUL INTEGRATION OF ICTs IN RURAL SCHOOLS

Cawthera (2001:11) notes that those who advocate the integration of ICTs in schools acknowledge that there are problems associated with access and equity. The poorest areas are unlikely to benefit from the provision of ICTs in schools and this situation will create increased inequalities in education. Herselman (2003), Kante and Savani (2003) and Isaacs, Broekman and Mogale (2004) have all pointed to the barriers that have individually or in concert, frustrated the successful integration of ICTs in rural schools. Some of these barriers are the lack of electricity, telecommunication infrastructure, qualified and competent personnel, preparedness of both educators and learners to fully utilize ICTs resources available, cost of investing in technology, adequate storage facilities and the ability of the Department of Education to avail resources that will sustain the project.

Various suggestions have been made by researchers to offset some of these barriers and if the National Department of Education is to successfully integrate ICTs in all schools in South Africa, there is the need to consider some of these. Some of the suggestions offered are:

4.1 Learn-O-Vision

Herselman (2003:948) cites Callaghan’s description of Learn-O-Vision developed by D. Oosthuizen. Learn-O-vision can provide rural schools with facilities comparable to those of first-rate urban educational institutions even though they do not have electricity. The Learn-O-Vision uses a solar-powered computer system, television set, video recorder, writing and flannel board in a portable and secure box. These are all installed in a standard wardrobe size box on wheels. The front flap opens out and serves as a writing board with the video and television located in front. The solar-powered computer is located at the back of the unit. The unit is powered by two solar panels, which charges a battery. When fully charged, the battery can last one full school day. The unit can also use electricity. It can also be locked and wheeled into a secure place after use. With this unit, rural schools can get connected to the

Internet if a telephone line is available or other wireless connectivity is available. With Internet connectivity distance education is possible. Educational materials can be recorded on video or computer discs and used in teaching and learning. The unit can be described as a classroom on wheels; it can be wheeled and used anywhere. So teaching and learning can go on in any convenient place. This unit has many possibilities and guarantees the provision of quality education in the rural areas.

A supplementary source of power is the use of biogas. This can be generated from human excrement. The biogas project in Myeka High School in KwaZulu-Natal is mentioned by Cawthera (2001:33) and Herselman (2003:949) as a case in point. The biogas is used to power a generator which produces electrical energy to supplement the solar energy used in the school. The power thus generated provides enough power to run 47 computers, video resources and a photocopier. So in the absence of the sun, power can still be generated in rural areas without electricity. This project can be viable if schools can devise means to harvest large amounts of human excrement. With this project in place, one is assured that the problem of electricity and storage can be solved temporarily. This may not be a long-term solution but it provides an interim solution while the government rolls out electricity to rural areas.

4.2 Connectivity

Connectivity refers to the installation of computers in schools and connecting the computers to the Internet. Most of the rural areas in South Africa have very limited or no access to the Internet. This is due to the fact that there are inadequate or no telephone lines and thus limited or no capacity to connect to Internet Service Providers (ISP) (Baartman, 2003:53). Connectivity of ICTs in South Africa largely relies on telephone line connections and an ISP. In South Africa, Telkom holds the monopoly for telephone line connection (Hodge & Miller, 1997; South Africa Foundation, 2005) and as a result their charges are relatively high. Bakia cited by Cawthera (2001) concurs with this assertion. This is set to change when the Second National Operator (SNO) becomes fully operational. The lack of affordable telephone connectivity is a major set back in connecting schools especially those in the rural areas to the Internet. This problem has been attended to by the 2001 amended Telecommunication Act (Act No 64, 2001) that calls for the creation of an e-rate for schools. This means that schools will be charged a cheaper telephony rate.

Wireless systems are emerging and are considered potentially viable alternatives to higher telephone bills (Bakia, 2003:5). So schools that do not have telephone lines or cannot afford

the high telephony bills can opt for cheaper wireless systems. Wireless systems have been used in the Ulwazi E-learning partnerships in the Gauteng Province. According to Creamer Media's Engineering News Online, this project has successfully initiated "Canopy" Motorola's broadband wireless access to technology in some Mamelodi schools. (Wireless broadband brings e-learning ... 2004).

Furthermore, South Africa has nationwide wireless phone coverage from the three mobile (cellular) phone service providers – Vodacom, MTN and Cell-C. The mobile phone service providers are huge companies and so the National Education Department can enter into partnerships with them to provide services to rural schools where there are no infrastructure for landline services.

4.2.1 InfoSat

InfoSat is suggested by Cawthera (2001:39) as another way of getting information from the web in areas where there are no land lines. InfoSat consists of two parts when connecting to the web:

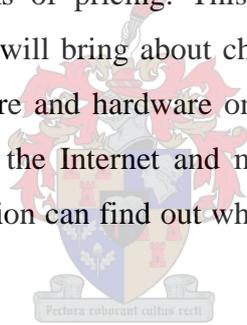
1. Incoming to a PC: receiving information from the web.
2. Outgoing from a PC: i.e. sending or requesting information.

InfoSat performs the first function, with information being transmitted from a satellite to a receiving dish and into a PC. For the second part, a telephone connection is needed to transmit signals to the satellite and to tell the satellite which web pages to transmit down. In the absence of landline connectivity especially in the rural areas, the connection can be made through a GSM system used by mobile phones. This system can be combined with solar power so that schools without landline telephones and electricity can also be connected to the web. Myeka High School in Kwazulu-Natal is mentioned by Cawthera (2001:33) to be using this method of connectivity because the school has no access to landline telephone connection or electricity.

A cheaper method of connectivity for schools that the Department of Education can exploit is a new wireless-based technology called Wireless Fidelity (WiFi). WiFi operates on a band of spectrum dedicated for Industrial Scientific and Medical (ISM) application, which is commonly used for personal appliances, such as microwave oven or a cordless home phone and for specialized purposes such as the radar "gun" used by law enforcement to read the speed of a moving vehicle.

Unlike a wired network, a WiFi network requires little more than an Access Point (AP). According to Levy (2003), WiFi technology is far less expensive to deploy than the wireless technologies used by cellular phone providers in the US. WiFi is a broadband network. Two or more WiFi networks can be connected to each other to form ad hoc broadband networks. A bandwidth measures the speed at which data is transmitted. Levi (2003) also posits that WiFi transmits data at a speed of 11 mbps (megabytes per second), which is sufficient for all types of multimedia. WiFi is cheaper, does not need a wired connection and it is easy to deploy everywhere so the researcher feels the Department of Education should give WiFi a trial run in schools.

Naidoo (2006:1) writes of two metros in Gauteng, Johannesburg and Tshwane, which have devised their own communication systems within their administrative offices which are saving them more than R 4 million a month. These communication systems are independent of Telkom and it provides the two metros with Internet and other related services and it is significantly cheaper. Naidoo expresses the opinion that these communication systems are set to compete with the SNO in terms of pricing. This development clearly indicates that innovations could be exploited that will bring about cheaper connectivity rates for schools. There are various intelligent software and hardware on the market, which can be acquired and connected to servers to access the Internet and most of these products are relatively cheap. So the Department of Education can find out which will best reduce cost and provide cheaper connectivity.



In terms of speed of access to the Internet, schools will have to opt for broadband technology. Broadband according to Spurge and Roberts (2005), who cite an EU source, refers to “high-speed ‘always on’ connections to the Internet that support the delivery of innovative content and services”. Compared to the narrowband ‘dial-up’ connections, broadband access is immediate. Large volumes of data can be instantly transmitted, within some few seconds and it is very efficient. There are a number of options available for the delivery of broadband. The narrowband is cheap but very slow and incapable of supporting large volumes of data. The three most common forms of transmission of broadband are; asymmetric digital subscriber line (ASDL) technology, which enables an existing telephone line to be upgraded to offer a broadband access connection, fibre optic lines and cable leased lines. Users in rural areas without landline telephone connections can use wireless and satellite technologies.

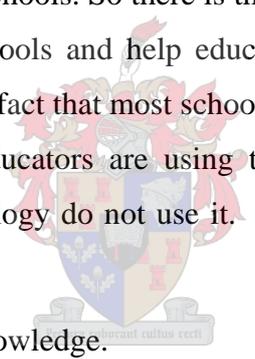
As far as ISPs are concerned, there are numerous ISPs whose services are affordable. The ISPs also offer high-speed leased line connectivity as well as a range of specialized services.

SchoolNet for example has volumes of deals with ISPs so that they can resell these services at discounted rates to schools. Schools thus have various ISPs to choose from. Unfortunately, most of the beneficiaries are schools in urban areas that were far better funded by the state and whose parents had a higher average income level. The National Department of Education will have to enter into partnerships with some of these ISPs to customize some of their services for schools and provide rural areas with more affordable rates. Alternatively the education department will have to set standards for ISPs that want to provide services to schools to meet.

The National Department of Education can also prepare off-line course content (in CD-ROM format) and distribute to schools that do not have access to Internet connectivity, while arrangements are being made to get the schools connected.

4.3 Personnel Preparedness and Maintenance

The provision of hardware in a school without the proper training and support will not enhance the integration of ICTs in schools. So there is the need for a support system that will help the integration of ICTs in schools and help educators acquire the appropriate skills. Capper (2003:60) has pointed to the fact that most schools in South Africa have computers or access to computers but not all educators are using them. She also observes that many teachers who have access to technology do not use it. Some of the reasons given by these educators are:

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- They do not possess the knowledge.
 - They are satisfied with their current teaching methods.
 - They feel the use of technology is too laden with technical difficulties.
 - They do not have the time to spend on the types of lessons best supported by technology.

Kerr is also cited by Capper (2003:60) to the effect that technology in education will see a dramatic shift from the traditional “chalk and talk” method of teaching and hence it will take time for all to fully embrace it. The challenge thereof is, making technology user-friendly to all educators and motivating educators to utilize ICT resources.

The National Department of Education can surmount these problems if a programme is developed to address the competencies of educators. This will call for an extensive staff development and support programme. A once-off workshop will not suffice to successfully integrate ICTs into schools as this form of in-service training been seen to be totally

inadequate and unreliable in the literature. In pursuit of a successful integration of ICTs into schools, there is a need for a continuous in-service professional development programme put in place by the National Department of Education. SchoolNet's "Intel Teach to the Future", Telkom Supercentres and Thintana, are projects which among others provide training to educators (see www.schoolNet.za). "Mindset Learn" is a satellite channel that broadcast educational programmes to help educators apply ICTs to their learning areas (see www.mindset.co.za).

The National Department of Education has also developed a portal called "Thutong" for both educators and learners to provide a wide range of curriculum and support material relevant to education (see www.thutong.org.za). The Department and its partners must ensure that these projects benefit rural schools also. ICT training should be made part of teacher training programmes, so that newly trained educators will possess ICT skills before entry into the education field. To this end, tertiary institutions can be roped in to assist in providing educators with ICT skills. Furthermore, awards can be introduced to motivate educators and institutions that integrate ICTs in their normal school functions. Considerations should also be given to set norms and standards to ensure equitable application of ICTs in all schools.

As far as acquiring and maintaining competent ICT professionals is concerned, urban areas will continue to have the edge over rural areas until the education department develops a plan to provide mouth-watering incentives that will entice these personnel to rural areas and maintain them there. A bursary scheme can be devised for ICT trainees and after their training; they will be obliged by law to serve the government in rural areas for a minimum period of time.

4.4 Finance

Another factor that militates against the successful integration of ICTs in rural schools is the problem of cost. The cost of acquiring ICT resources is not a one-time investment but a recurrent expense. The cost includes among others: acquiring software, maintenance and repairs, replacements, training, Internet access, insurance, setting up a room to use as computer centre and if possible, installing the necessary security devices (Cawthera, 2001:10). While it is often easier to secure computers and Internet access, the running cost that adds up to the Total Cost of Ownership (TCO) could be a major drain on a schools' budget. The improper management of these costs will result in an ICT system that does not function as an effective tool in education. Herselman (2003:945) notes that most rural areas live below the poverty line and are impoverished because of the lack of basic infrastructure.

This is reflected in the schools as they also lack adequate classrooms, water, toilets, books etc. So in schools where basic resources like the provision of adequate classrooms, access to clean water and acquisition of text books are lacking, questions will arise as to why go for ICTs when we cannot afford our basic needs (Kante & Savani 2003:17). Costs can be prohibitive so schools must know exactly what they want. Cawthera (2001) cites Osin and Bakia who point out that the cost of brand new computers is high. So he suggests the buying of clones rather than brand name products. Alternatively, schools can go for second-hand or refurbished computers.

When it comes to connectivity, Bakia (2003:5-6) suggests computers in schools could be networked to reduce cost. Networked computers do not have to have hard drives. They can be connected to either a local server or the Internet. This method is quite cheaper than stand-alone computers. Networked machines are simple so they require little maintenance or technical support. Upgrades are done on the server so the individual machines need not be replaced or discarded. Despite these advantages, there is the need for a proficient technical support to attend to troubleshooting. Again, the processing speed tends to be slower when the network traffic is heavy – for example, if there is a class session. The machines will not work if there should be a network collapse.

Rural schools can resort to other means to ensure that they acquire some of their ICTs requirements. Some of these are:

- Soliciting for donations- there are enterprises like insurance companies, retail outlets, factories, banks, government enterprises and the like whose customer base is educators. So when schools approach these enterprises for help, they will see it as a call to support a customer. Most governments departments, businesses, multinationals and other enterprises regularly replace their computers. So schools can approach them to ask them to donate their used computers. However, it is important to point out that some of the donated hardware is not free entirely. Schools may have to buy other hardware like memory and hard drive; moreover they tend to have short life spans. There is the possibility that companies may just dump disused computers that cannot be upgraded on schools. The donations can be in the form of money so that the schools can purchase their own ICT resources or be in the form of computer hardware and software or sponsoring ICT training for schools or sponsoring connectivity to the Internet.

- Creating an educational network: Herselman (2003:951) also suggests that schools can form an educational network so that the disadvantaged schools can benefit from schools with Internet at cheaper cost but obtaining high performance. In other words, schools that are nearer to schools that have ICT resources can form a cluster and use the infrastructure of the resourced school. Alternatively, schools can pool resources and establish an ICT resource centre for their use.
- Raising funds through levies: Schools and their SGB can raise funds through special levies or engage in other fund raising activities where they can involve businesses in the communities. It must be noted that due to the poverty level of rural communities, there are very few businesses that have appreciable turn-over to make any meaningful donation to schools. So fund raising activities do not normally succeed in rural areas. So rural schools should consider turning to big businesses, NGOs, foreign embassies, etc. for funding. There are some rural communities that run very successful stokvels and burial societies. So other communities can learn from them. Schools must be encouraged to consider forming alumni. Some of the potential members are well placed in society to be able to provide support to the schools. So the alumni can help raise funds or provide their Alma Mater with their ICT resources.

Whether computers are bought or donated, there should be proper planning and budgeting to ensure the successful integration of ICTs in schools. Skimping on the budget for ICT resources in schools may prove to be very costly in the long run. Bakia (2003:1) suggests “Total Cost of Ownership” (TCO) as a way of reckoning the cost involved in the integration of ICTs in schools. TCO is a borrowed concept from business that is applied to estimate the lifecycle of investing in technology. With the proper application of TCO, schools will be able to have a budget to cater for the integration of ICTs in schools. It is the researcher’s opinion that considering the benefits to be derived from the use of ICTs in schools, investing in technology will be a worthy cause.

4.5 Support Staff and Maintenance

Once computers have been set up in schools, they will need regular support and maintenance otherwise its efficiency will be ephemeral. The need for support staff to do regular upgrades, repairs and maintenance cannot be overlooked. This is a specialized role, which cannot be left to the educators alone. A formal support structure with full-time personnel to respond to trouble-shooting calls must be created by the education department and the schools. This role

can be out-sourced to enterprises in the ICT business or located in-house in the education system.

Within the education system, educators who volunteer to do the job can be provided with basic skills to handle minor repairs and upgrades. This is quite necessary as minor troubleshooting can be attended to just-in-time to avoid delays in schools activities. This again may depend on the extra-curricular time the educator may have. Care must be taken to ensure that this duty does not compete with the educator's curricular duties. Alternatively, the educator responsible for ICT can select a few learners who are technologically facile and train them to do the minor maintenance and repairs. The Education Department must ensure that there are skilled support staffs that are readily available to attend to calls so that schools are not unnecessarily disrupted because of system breakdown.

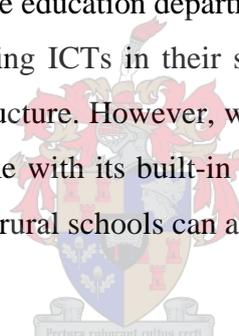
If the National Education Department and the various stakeholders solve the problems discussed above, there is a good chance that irrespective of the location of a school, the school will benefit in one way or the other from the use of ICTs. The researcher suggests that, considering the cost involved in integrating ICTs in schools and the numerous problems that beset rural areas, while still encouraging individual schools to adopt their own means of integrating ICTs in the various schools, the National Department should form partnerships with the private sector to set up educational network of schools or ICT resource centres in easily assessable points in rural areas. The school or centre will have all the appropriate ICT infrastructure and resources that will enable full utilization without any hindrances. Competent and well-qualified educators must man these schools or centres with their necessary technical support group. The stakeholders must then devise a plan on how schools are going to attend the network school or centre. Furthermore, the Department must come out with a policy that oblige all schools to use the network school or ICT resource centres and programmes taught in the network schools or centres must form part of the norms and standards of each school. This programme will ensure uniformity in the kind of curriculum that will be followed. There must also be a set of monitoring and evaluation tools to ensure that desired outcomes of the programmes are achievable. If there are problems, the situation will be evaluated and remedied by competent personnel tasked by the Department of Education. As time goes and with the availability of funds, integration of ICTs into individual schools can gradually be done to attain the required standard.

5 CONCLUSION

The chapter looked at the need for integration of ICTs into education and noted that there is ample evidence that ICTs will transform education to produce people who will be adequately equipped to compete in the Knowledge society.

The Department of Education has taken up the challenge to ensure that the curriculum offers the right programme which will see learners leaving schools with the necessary ICT skills with the capacity to be lifelong achievers. The department has introduced IT into the school curriculum and produced a white paper to guide it in the provision of e-Education to schools in South Africa. The private sector, parastatals and NGOs have joined to support the government's effort. The result is projects like Schoolnet, South African Digital Partnership, Microsoft's Agreement with the Department of Education to provide free software to schools and many more.

Individual schools are doing their lot to get ICTs introduced into their schools, despite the fact that there is no guidance from the education department. On the whole, urban schools are edging out rural schools in integrating ICTs in their schools. Rural schools are beset with mainly the problem of basic infrastructure. However, with the appropriate planning, ongoing professional development programme with its built-in evaluation and sustained by financial support and essential technical staff, rural schools can also benefit from the use of ICTs.



CHAPTER THREE

THE DESIGN AND PROCESS OF THE ENQUIRY

1 INTRODUCTION

This chapter discusses the research design and the process of empirical investigation which was guided by the research question. In the light of this, the research methodology is explained with specific references to the data collection, the relevant data processing techniques and method used to interpret the data collected.

2 THE RESEARCH DESIGN

The research design stems from the research problem stated in 1.2. Thyers, as cited by De Vos (1998:123), states that a research design is “a blue-print or detailed plan for how a research study is to be conducted.” Similarly, Merriam (1991:6) notes that:

A research design is similar to an architectural blueprint. It is a plan for assembling, organizing and integrating information (data), and it results in a specific end product (research findings). The selection of a design is determined by how the problem is shaped, by the questions it raises, and by the type of end product desired.

To this end, it is vital for the researcher to have a thorough knowledge of the methodological and analytical tools available, as well as awareness of their uses and their shortcomings. The research design applied in this study can be described as qualitative (because it will provide description of stakeholders’ views and experiences), quantitative (as some data will be statistically analyzed) and exploratory (because it will explore some educational territories that have not been sufficiently documented).

The research will also be interpretive as it seeks to provide insights in the behaviours expressed and the meanings of interpretations that subjects give to their world. The result of

the research will be contextual reflecting the reality of stakeholders in Malamulele schools highlighting their views and experiences regarding the issue of integrating ICTs into the school curriculum.

2.1 Qualitative Research Methodology

Qualitative study according to Creswell (1994:2) is an “inquiry process of understanding a social or human problem, based on building a complex, holistic picture, formed with words, reporting detailed views of informants, and conducted in a natural setting”. It can thus be said that “qualitative research uses unconstructed logic to get at what is really real- the quality, meaning, context, or images of reality in what people actually do, not what they say they do (as in questionnaires)” (Qualitative Social Science Research Methodology). With this study, the social world of both educators and learners which is located in their access to the use of ICT resources in schools is examined. That is, the means by which they try to acquire ICT resources in rural schools as well as the obstacles they have to overcome to ensure that they can also join the ICT bandwagon was investigated.

Qualitative research according to Leedy (1997:156) “has grown out of diverse disciplines (anthropology, sociology, psychology) that are marked by distinctive interests, theories, issues and research methods”. However, Vockell and Asher (1995:193) point out that qualitative research is relatively new, as educational research followed the dictates in psychology, which remained experimental and based on surveys that convert data to statistics and working with predetermined groupings of participants’ responses. Qualitative research therefore appears to be constructivist and interpretivist in its epistemology, although positivist research with qualitative data is not unusual (Henning, 1995).

The task of the qualitative researcher is to try and capture data on the perceptions of local actors ‘from the inside’, through a process of deep attentiveness of emphatic understanding and of suspending or ‘bracketing’ preconceptions about the topics under discussion as much as possible (Miles and Huberman, 1994:6). This view of immersing in the everyday life of the setting chosen for study is held by Marshall and Rossman (1989:11) and Silverman (1993:25). To achieve this, the qualitative researcher makes use of a range of sources of data collection to gather data on any number of aspects related to the unit of analysis, including the physical setting of the study, in order to put together a complete picture of the social dynamics and other information of a particular situation, programme, phenomenon or activity.

Qualitative research can therefore “provide a broader version of theory than simply a relationship between variables” (Silverman, 1993:27). While this study has a specific focus, the strategies employed by the inquirer allow for the management of unplanned themes. By developing a focus for data collection, the research is not approached with narrow questions or hypotheses. Thus this study is both inductive and deductive at times. This goes to support MacMillam and Schumacher (1993) who suggest that while neither system of logic is completely satisfactory, they both can become effective if integrated within a single study. For instance, a hypothesis could be addressed in an interrelated, explanatory manner when one poses questions, given answers will explain the answers to other questions, whereby the researcher acquires a deductive character. According to Miles and Huberman (1994:10), qualitative data serve not only as a good strategy for discovery and developing hypothesis, but also possess a strong potential for testing hypotheses (if the unit of analysis invites such a hypothesis).

Four types of problems which can occur as a result of poor procedures in qualitative research are pointed out by Erickson (1986:14). These are; inadequate amounts of evidence, inadequate varieties of kinds of evidence, inadequate attention to disconfirming evidence and the lack of attention to discrepant cases. Sadler in Vockell and Asher (1995:210) also cites some areas of pitfalls and cautions those attempting to observe and make generalizations and inferences in qualitative research. Bearing this in mind, this study is asserted to be unambiguously interpretive and pragmatic, with no claim to externalize or generalize the findings beyond the research position.

2.2 Quantitative Research Methodology

The quantitative researcher collects facts and studies the relationships of one set of facts to another. The researcher measures, using scientific techniques that are likely to produce quantified and if possible generalized conclusions. Quantitative research uses questionnaires, or observational techniques to collect information about the characteristics of a person, group, program or other educational entity.

In this study, questionnaires will be used to seek to explain the stakeholders’ views on the integration of ICTs into the school curriculum. The findings will be statistically presented in a formal scientific style using passive and impersonal language. The quantitative researcher according to De Vos (1998:242) “sees himself as detached from, not as part of, the object that he studies”. The researcher can therefore conduct an objective inquiry. Reid and Smith (1981:87-89) also point out that the role of the quantitative researcher is to be an objective

observer, whose inquiry is focused on specific questions or hypotheses that ideally remain constant throughout the investigation. The data collection procedures and types of measurements are constructed in advance of the study and applied in a standardized manner. The interviewer or observer is not expected to add his/her own impression or interpretations. Measurements are focused on specific variables that are quantified through rating scales, frequency counts and other means. Results of data analysis are presented by obtaining statistical breakdowns of the distribution of the variables and by using statistical methods to determine associations between variables.

2.3 Descriptive Research Methodology

As indicated elsewhere, the aim of this study is to present an accurate, carefully and systematic description of the views, expressions, characteristics and activities of how schools in Malamulele are trying to integrate ICTs into the school curriculum. The aim of descriptive research is to examine an event or phenomenon and characterize it as it is in a specific context (Le Compte & Preissle, 1993:39). There is no manipulation of treatments or subjects; the researcher takes things as they are. Merriam (1991:11) states that descriptive research implies that the end product is rich ‘thick description’ of the phenomenon under study. By ‘thick description’, research attempts to capture the meaning in an interactional experience. Meanwhile the view of the participants (emic description) will be given. Apart from these experiences, certain phenomena will be described, measured and later analyzed.

2.4 Exploratory Research Methodology

This study is also exploratory in nature as the purpose of the research is to investigate and gain new insights and better understanding of the research phenomenon (means adopted by schools in Malamulele to integrate ICTs in the curriculum). The exploratory nature of this research is to be emphasized by the fact that one of the aims of this inquiry is to describe certain key issues, patterns and categories in participants’ meaning structures so as to identify and discover important variables and propositions for further study. Though it does not allow for the formulation of hypothesis prior to the investigation, it adopts a flexible approach and a hypothesis develops as a result of the research.

3 THE SETTING

The study is conducted in the Malamulele area of the Vhembe District of the Limpopo Province. Malamulele is a rural area. It is about 200km from Polokwane which is the capital of the Limpopo Province. Malamulele has five education circuits; Vhumbedzi, Malamulele

North East, Malamulele East, Malamulele West and Malamulele Central. There is an Educational Multi-Purpose Centre (EMPC) which serves as professional development centre for educators. The EMPC is one of the former Colleges of Education that has been transformed into a centre for the continuous professional development of educators. There are 50 high schools in the area. Apart from three, which are privately run, the rest are government run. There are 105 government-run primary schools and two are privately run. The study took place in five of the high schools in the area. These were the schools that responded favourably to the request to conduct an academic research. Two of the schools are in one circuit and the other three are in another circuit. Twelve schools were randomly selected from all the five circuits. Only five of the schools responded. The others kept saying they were awaiting response from the School Governing Bodies (SGB) to participate in the study.

4 SAMPLING

The term sampling according to Kerlinger in De Vos (1998:190), “means taking any portion of a population or universe as representative of that population or universe”. Vockell and Asher (1995:170) also state that “the term sampling refers to strategies that enable us to pick a subgroup from a larger group and then use this subgroup as a basis for making inferences about the larger group – the researcher’s goal is always to generalize about the population based on observation of the sample”. Powers, Meenaghan and Toomey cited by De Vos (1998:190) define a population “as a set of entities for which all the measurements of interest to the practitioner or researcher are represented”. De Vos (1998:190) also quotes Seaberg who defines sampling “as the total set from which the individuals or units of the study are chosen”. A population is therefore, the totality of persons, events, organization units, case records or other sampling units with which the research problem is concerned.

Often it is impossible to identify all the subjects of a population of interest. So samples are chosen for a study. Reid and Smith (1981:70) concur with this by stating that “the major reason for sampling is feasibility”. They go on to explain that even if it were theoretically possible to identify, contact and study the entire relevant population, time and cost considerations would often render this a prohibitive undertaking. Thus with sampling, time, money and effort can be channeled into producing better and quality research. Arkava and Lane (in De Vos 1998:191) maintain that “the observation or study of a phenomenon in its entirety would be tedious and time consuming and would produce a massive amount of data, which by implication would be difficult to process, analyze and interpret”.

There is a bone of contention regarding the size of a sample. Various suggestions have been made as to the size of a sample. Some scholars feel that the larger the population, the smaller the percentage of that population the sample needs be. Others also feel that the sample must be determined by the relative homogeneity or heterogeneity of the population and the desired degree of reliability for the purpose of the investigation. Other factors which influence the size of a sample are: the heterogeneity of the population, the desired degree of accuracy, the type of sample, the available resources and the number of variables in which the data is grouped. This indicates that there is no agreement on the minimum number of subjects who should be involved in a study. To this end, the researcher aligns with Kerlinger (in De Vos, 1998:193) who posits that representativeness must be considered when sampling. In other words, a sample must reflect the characteristics of the population relevant to the study. To achieve representativeness, the research methodologists agree that ‘random sampling’ is the only technique available to ensure an optimal chance of drawing a sample that is representative of the population from which it is drawn. According to Vockel and Asher (1995:172) “random sampling is generally the best and simplest way to draw a sample from a population. With random sampling, every member of the population has the equal opportunity to be included in the sample, and pure chance is the only factor that determines who actually goes into the sample”.

Apart from random sampling, there are other forms of sampling methods (De Vos 1998:195-200). For the purposes of this study, the researcher used purposive sampling. Purposive sampling is based on the assumption that “one wants to discover, understand, and gain insight, therefore one needs to select a sample from which one can learn the most” (Merriam, 1991:48). Patton (in Leedy 1997:162) also posits that:

Purposeful sampling is done to increase the utility of information obtained from small samples. Participants are chosen because they are likely to be knowledgeable and informative about the phenomenon the researcher is studying.

In the study, the researcher focused on high schools in the Malamulele area of the Limpopo Province and drew samples from three of the five education circuits in the area. The researcher felt high schools had relatively bigger budgets than primary schools and should thus be in a better position to acquire ICT resources. The demand for ICT literate high school graduates is higher than that of primary schools. So they are more likely to be more knowledgeable on ICTs.

The sample in this study consists of five schools. Two of the schools are offering Computer Application Technology (CAT) as an examinable subject and their ICT resources were donated by Telkom and MTN. One school has received approval to introduce CAT as an examinable subject and has bought computers from school funds. The other two have also bought a few computers from their school funds and use the computers for administrative purposes. The researcher also previously visited a school with well-resourced computer labs in Polokwane. The purpose of the visit was to ascertain what ICT resources an urban school has, the feasibility and sustainability of integrating ICTs in schools and then to compare it with what pertains in rural schools.

5 DATA GATHERING PROCESSES

The pattern and format of the study determine the nature of the data collection methods and how this is implemented. Qualitative data collection is eclectic in nature, and therefore utilizes rich and diverse data to answer questions about the complexity and variability of human life (Le Compte & Preissle, 1993:158). Patton (in Merriam 1991:67-68) describes qualitative data as consisting of:

Detailed descriptions of situations, events, people, interactions, and observed behaviours, direct quotations from people about their experiences, attitudes, beliefs and thoughts, and excerpts or entire passages from documents, correspondence, records and case histories.

As stated earlier in chapter one, data for this study would be drawn from different sources using three modes of capturing the participants' views and experiences: questionnaires, observations and interviews. The use of multiple methods of collecting data is what Denzin (1988) refers to as triangulation, a research mechanism that serves to enhance the validity of the inquiry by using different data sources, different collection methods and often also different analysis methods, all focusing on the research problem at hand.

5.1 The Questionnaire

The aim of the questionnaires was to ascertain the following:

- Computer literacy of both educators and learners.
- Accessibility of ICT resources.
- What the ICT resources are used for.
- The benefits of ICT resources in education.

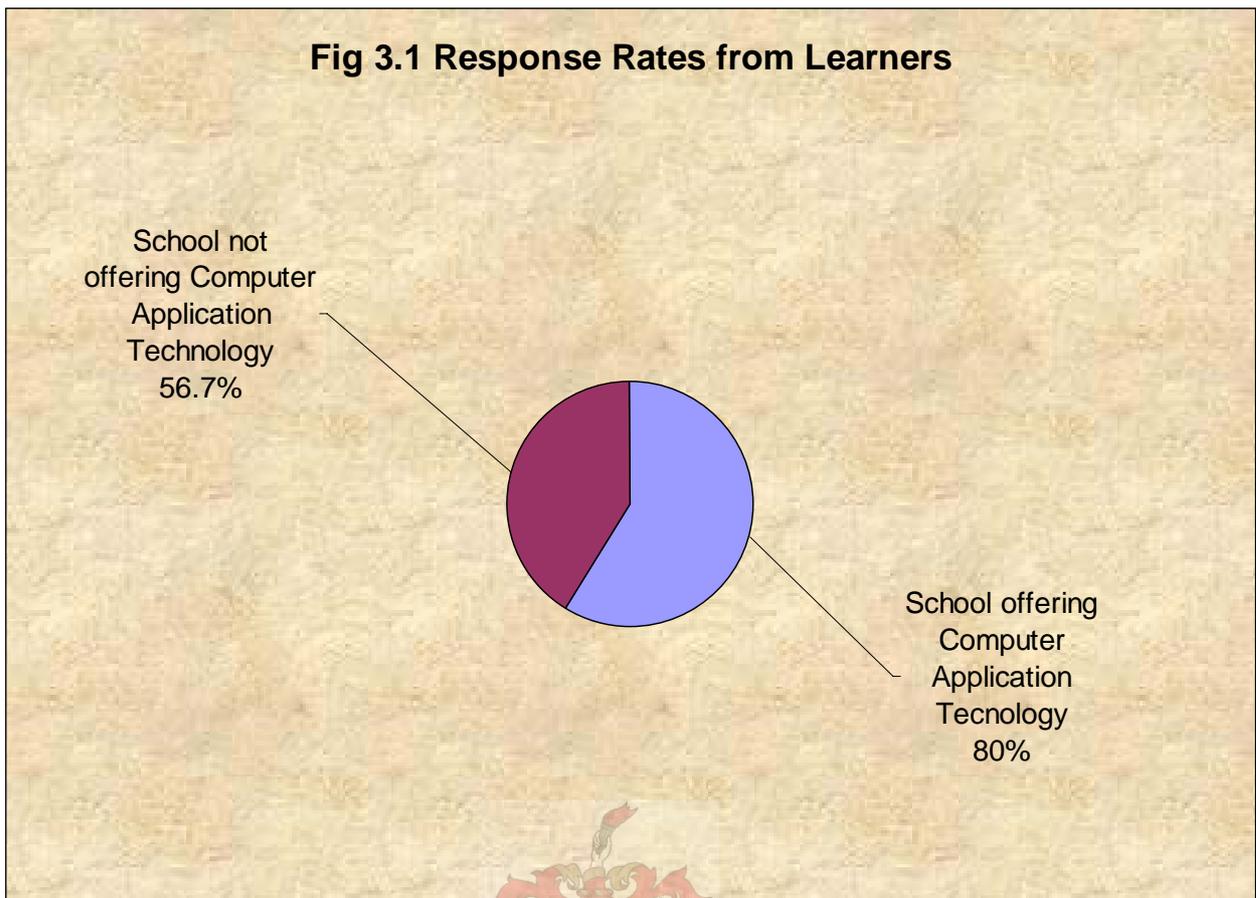
- Professional Development for educators

A semi-structured and open-ended questionnaire was distributed to educators, learners and administrative staff (where available) to complete. Bell (1993:76), states that questionnaires are a good way of collecting certain types of information quickly and relatively cost-effectively. The questionnaire was used as a follow-up interview to get more clarifications on the phenomenon being studied and to obtain written artifacts from the participants.

The questionnaires were delivered personally to all the participating schools. The questionnaires were handed to educators responsible for ICT in all the schools. Two of the educators were principals of their respective schools. They distributed the questionnaires to randomly selected respondents as requested. Each school received 50 questionnaires for learners, 20 questionnaires for educators and two of the participating schools had administrative staff so they got one questionnaire each. The distribution of the questionnaires was done in one day. The researcher agreed with the schools to collect the questionnaires after two weeks. However, it took more than a month to collect some of the questionnaires. Some of the questionnaires were not returned. Respondents with special reference to educators were lackadaisical in returning the questionnaires.

5.1.1 Responses from Learners (See Appendix A for Questionnaire)

Overall, 165 completed questionnaires were received from learners out of the 250 questionnaires distributed. Thus 66% of the questionnaires distributed were received. Eighty responses (80%) out of the 100 questionnaires sent to schools that are offering CAT were returned. This high rate may be attributed to the fact that the questionnaire was dealing with a familiar area. The ICT educator made sure that learners brought along their responses when the latter came to class. Eighty-five (56.7%) out of 150 questionnaires sent to schools that do not offer CAT were returned. These learners may not be conversant with items in the questionnaires. The low rate of return may be due to the fact that the person responsible for collection was not up to the task. Alternatively the learners may not have been comfortable answering the questions and thus did not bother to return them.



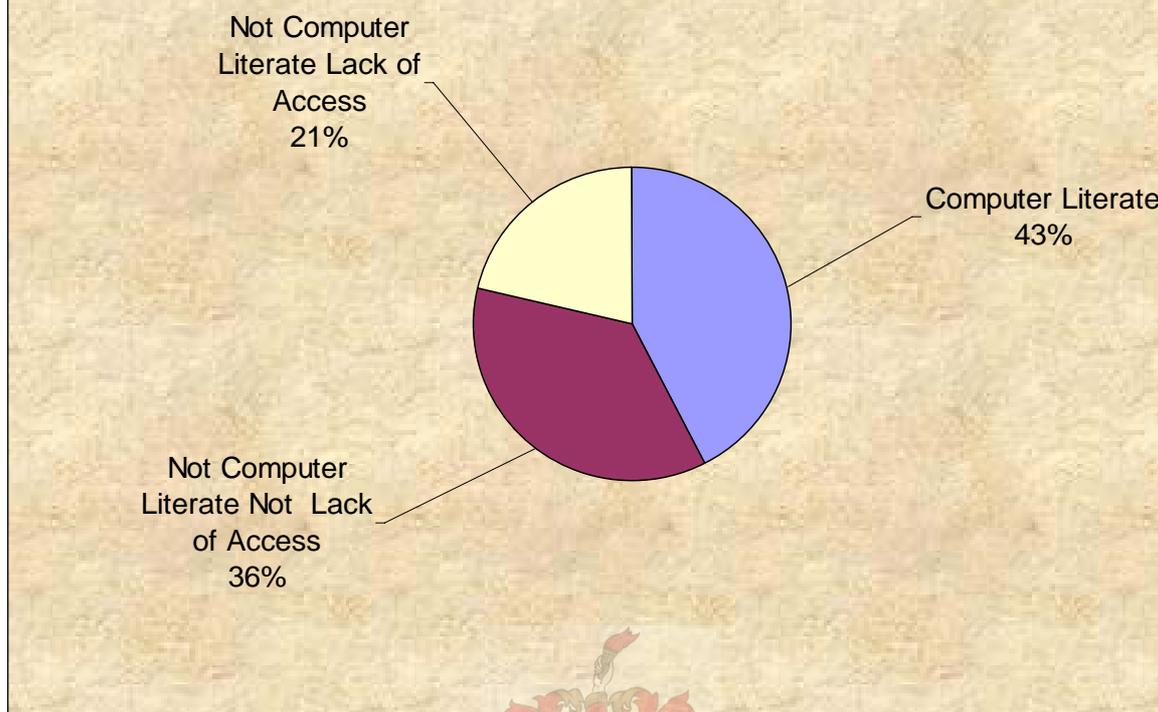
The responses are categorized under the following subheadings:

- A. Computer literacy and utilization of computer literacy skills.**
- B. Accessibility to computers and the Internet.**
- C. Benefits of the use of computers in schools.**

5.1.1.1 Computer Literacy and Utilization of Computer Literacy Skills

Of the 165 returned questionnaires, seventy-five (42.4%) indicated they were computer literate. They have basic computer literacy skills in Microsoft Word, Excel and Power point software packages. Ninety-five (57.6%) of the respondents indicated they are not computer literate. Thirty-five (37%) of the respondents who indicated they were not computer literate gave reasons such as lack of access either at school or home and the lack of money. The rest did not respond to the question. The learners are prepared to learn the skills if ICT resources are made available.

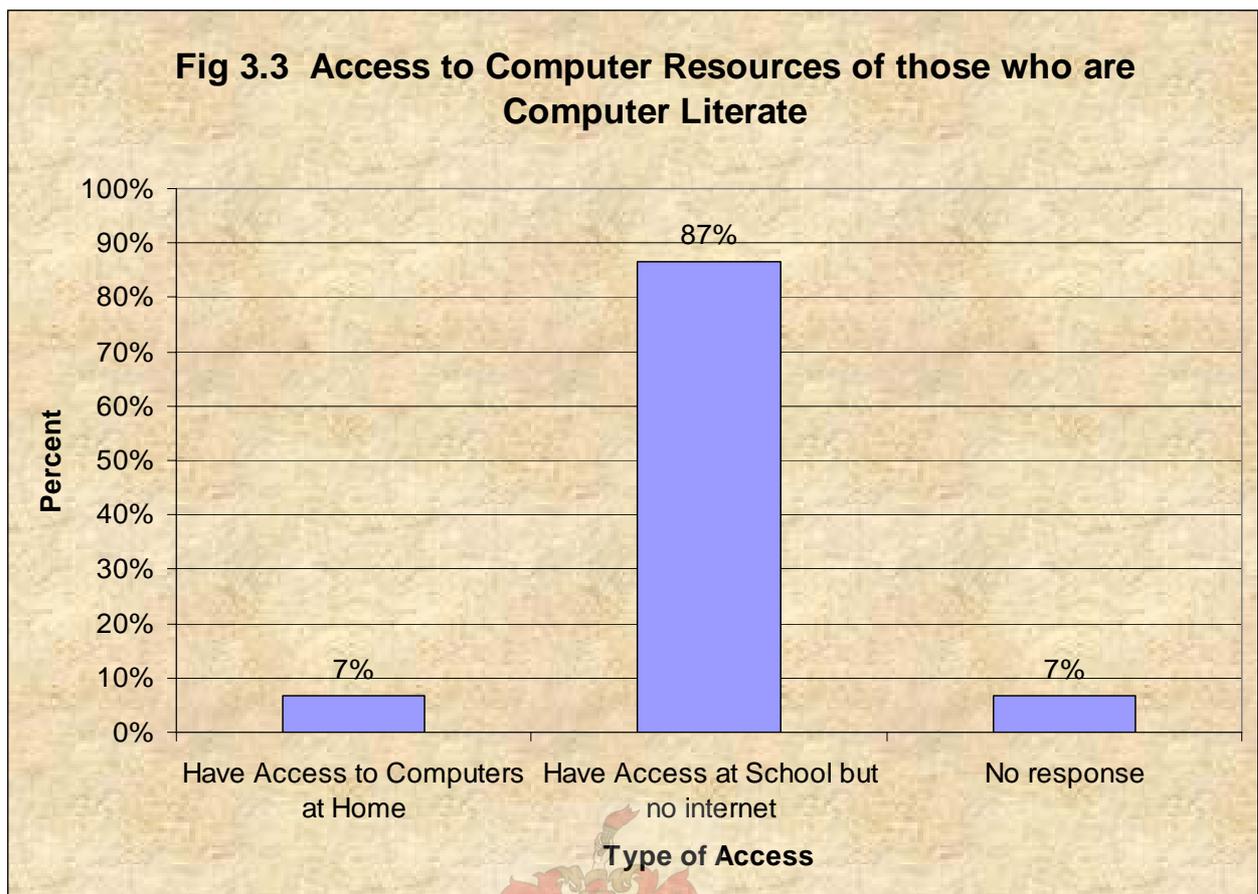
Fig 3.2 Computer Literacy of Learners in Sample



The computer literacy skills were utilized for typing, creating folders and saving on files, drawing, and Power point presentations, play music, watch movies and Internet searches.

5.1.1.2 Accessibility to Computers and the Internet

The respondents indicated above as being computer literate have access to their school computers. Five or seven percent of these respondents indicated they have access to computers at home as well as at school. The other sixty-five (93%) only have access to computers during school periods and at times on Saturdays during classes organized by their school. Forty-five (64.3%) indicated they have access to the Internet at school. Two of the schools used for this study have Internet. Those who are not computer literate have no idea about the Internet.



The respondents who have access to the Internet indicated that they use the Internet for downloading music and movies, sending e-mails, searching for information to complete assignments, job applications and reading of newspapers online.

The hardware that are accessible to learners are:

- Monitor
- Keyboard
- Central processing unit
- Mouse
- Floppy disks, CDs and DVDs
- Scanner and
- Printer

The respondents indicated that they have access to software packages such as:

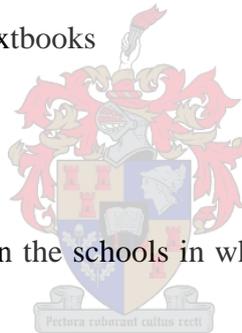
- Microsoft Word

- Microsoft Excel
- Microsoft Power point and
- Encarta Encyclopedia

5.1.1.3 Benefits of the use of Computers in Schools

From the responses, learners indicated their preparedness to learn and utilize computers if made available to them. Some of the benefits they hope to derive from the use of computers in their schools are:

- Gaining more information from the Internet
- Enjoy their learning
- Presenting neat work
- Good record keeping
- Equipping them with skills for the tertiary and the job market
- Less reliant on out-dated textbooks
- Keeping them busy
- A source of entertainment



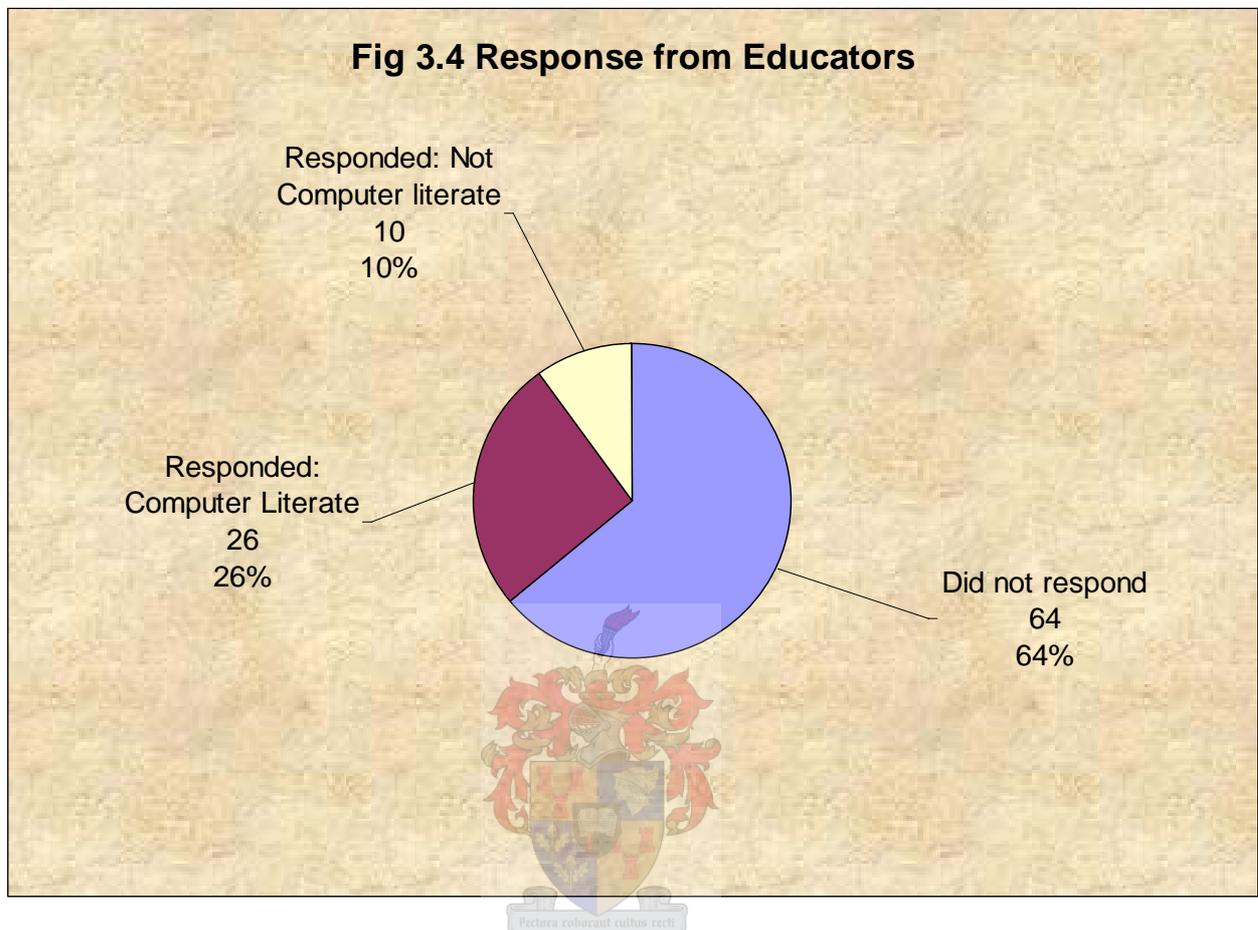
From the responses of the learners in the schools in which the research was carried out, the following themes stand out:

1. Learners have inadequate computer literacy training and thus limited computer literacy skills.
2. Few learners have access to ICTs in the schools.
3. Learners have limited access to ICT resources and therefore have limited ideas of benefits that can be gleaned from the use of ICTs.
4. There is limited knowledge of ICTs and ICT resources.

5.1.2 Responses from Educators (See Appendix B for Questionnaire)

Of the 100 questionnaires distributed to educators, only thirty-six (36%) were returned. It was noted that twenty-six (72%) of the educators were computer literate and they come from two of the schools that had computers in their schools. The other ten (28%) were not computer literate. Educators who did not return their responses kept giving excuses such as being too busy to fill in the questionnaires, leaving them at home, and unwilling to help a

colleague get further education whilst they have given up and unfulfilled promise to return them. The impression created was that they were not committed.

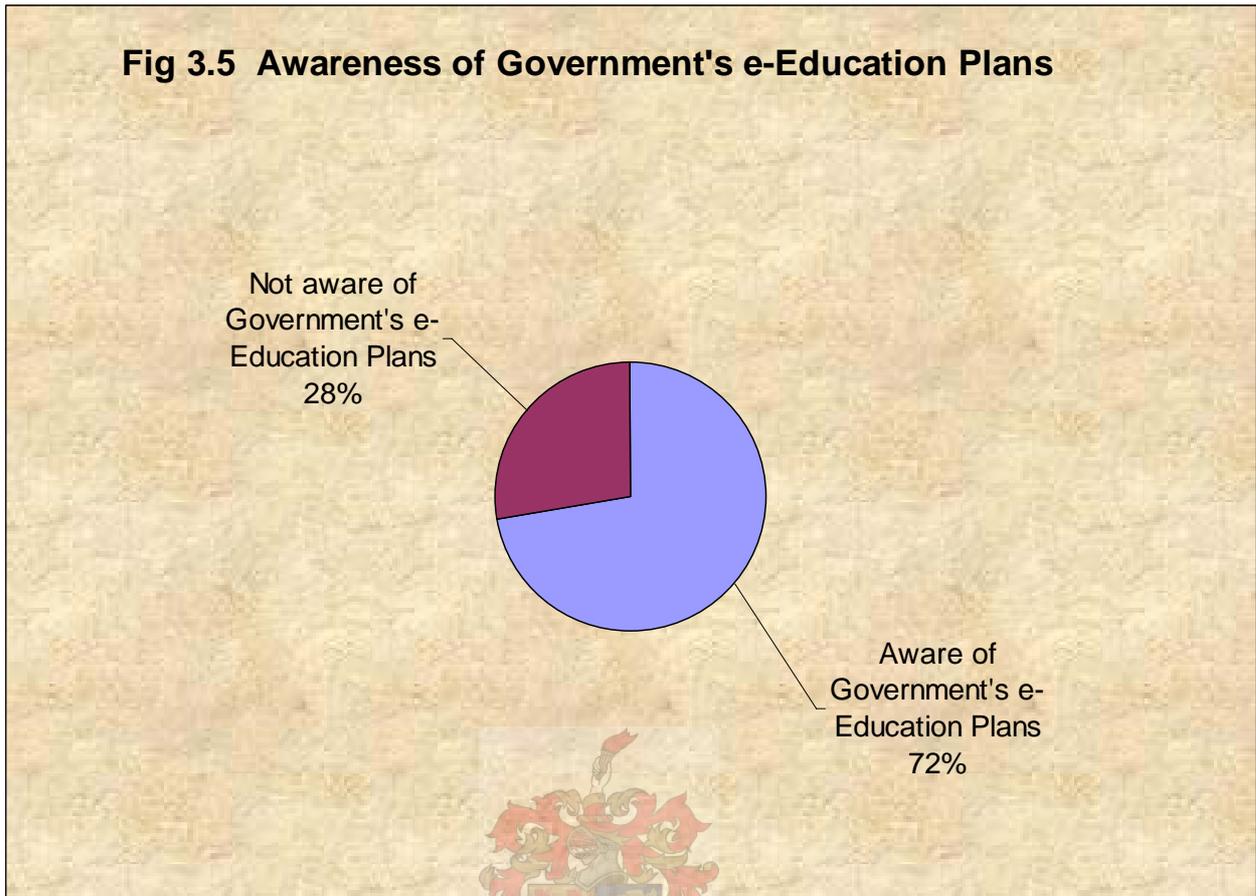


Responses from educators are categorized under the following subheadings:

- A. Knowledge of government's e-education plans and its benefits.**
- B. Computer literacy skills, accessibility to computers and the internet**
- C. Professional development**

5.1.2.1 Knowledge of Government's E-Education Plans and Its Benefits

Twenty-six (72%) indicated they were aware of government's plan to integrate ICTs into the education system. The respondents felt that if successfully implemented, teaching and learning will be improved as lots of information sources will be available, schools will be able to liaise with colleagues in the different provinces and even beyond the borders of South Africa, there will be uniformity in terms of materials provided to learners. The e-Education will shift the emphasis from the use of chalk in teaching.

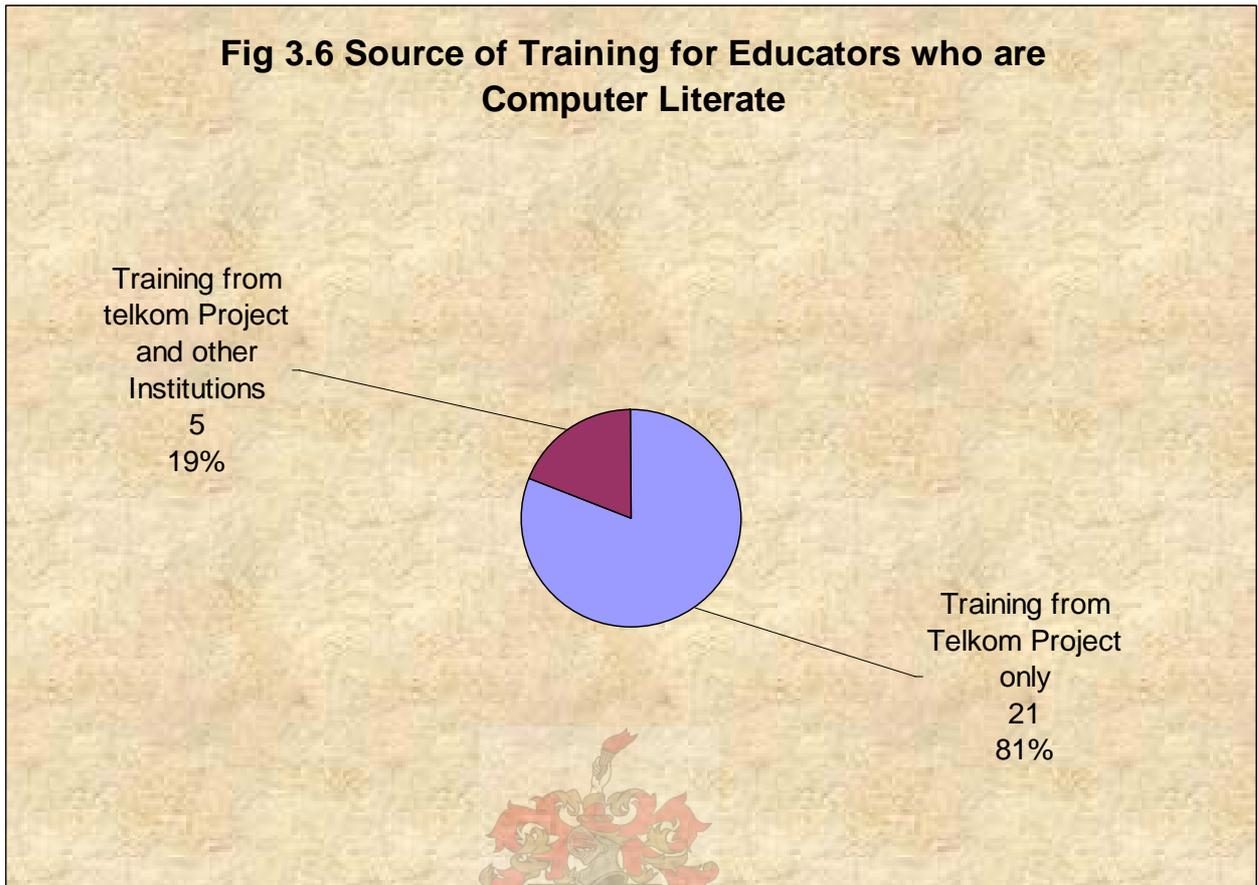


Respondents stated that their schools are acquiring computers and applying to the Department of Education to introduce CAT as an examinable subject as their way of preparing for government's e-Education roll out.

5.1.2.2 Computer literacy skills, accessibility to computers and the internet

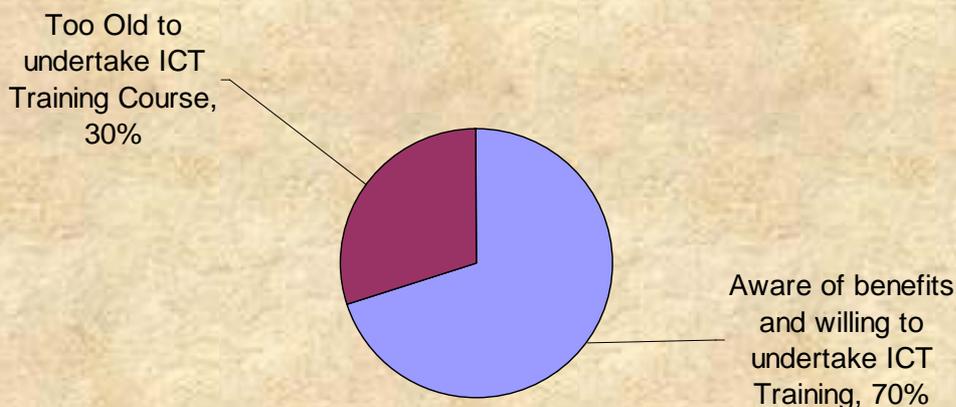
The respondents discussed above indicated that they have basic computer literacy skills in Microsoft Word, Excel, and Power point. They use these skills in their lesson and test preparations, typing correspondences, preparing class lists, preparing school budget, drawing graphs, preparing tests and examination schedules and to teach learners computer literacy skills. Five (14%) have obtained Diplomas in Computer Studies awarded by various institutions such as Awuxeni Computer Academy, University of Venda, Database College, Patcom College, to mention a few. As to whether these colleges offer accredited courses is not known to the researcher. 26 (72%) of the respondents obtained their computer literacy training through the Telkom Project in their school.

Fig 3.6 Source of Training for Educators who are Computer Literate



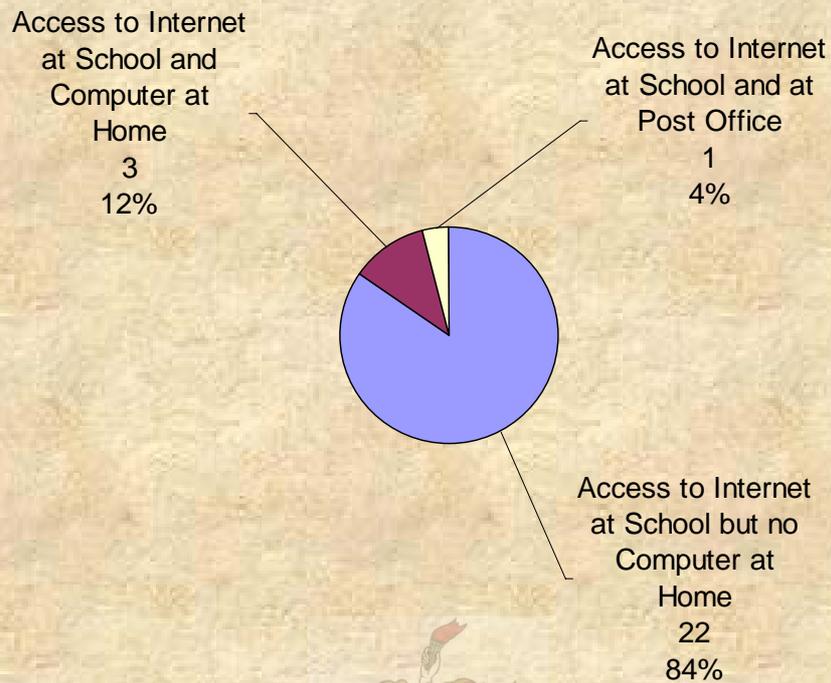
Ten (35%) indicated that they were still undergoing computer literacy training with various institutions. Those who were not computer literate, form 28% of the respondents. Of these, seven (70%) indicated they were aware of the benefits to be derived with computer literacy and were prepared to undergo training if resources were available. Three or 30% felt they are too old to acquire new skills.

**Fig 3.7 Willingness to Undertake ICT Training Course :
Educators who are not Computer Literate**



Twenty-two (84%) of the respondents have access to computers in their respective schools (i.e. during normal school sessions) and no computers at home. Three (i.e. eight percent) of the respondents indicated that they have their own computers at home and have access to the Internet at school. One respondent (i.e. three percent) accessed the Internet at school and from the post office. Twenty-six or 72% indicated that they have access to the Internet in their respective schools. They use the Internet searches for information concerning their teaching subjects, job searches, sending e-mails, downloading music and movies, and to read newspapers online.

**Fig 3.8 Accessibility to Computers and Internet:
Educators who are Computer Literate**



Hardware available to respondents are:

- Monitor
- Keyboard
- Central processing unit
- Mouse
- Scanner and
- Floppy disks, CDs, DVDs and memory sticks (for storage)
- Printer

The respondents have access to the following software packages:

- Microsoft Word
- Microsoft Excel
- Microsoft Power point and
- Encarta Encyclopedia

- Overhead projector (this is found in one school)

The hardware and software are bought, upgraded and maintained by the school from the school funds.

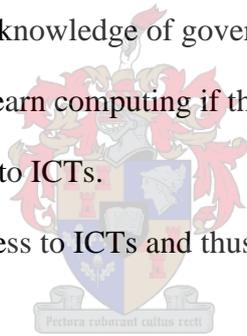
Thirty-three (92%) acknowledged that ICT will enhance teaching and learning. ICTs will provide other sources of information open up new opportunities including new jobs, and reduce work load. Access to the Internet will make their work a lot easier.

5.1.2.3 Professional Development

Sixteen (44%) of the respondents indicated that they had registered with various educational institutions to study computer literacy. There was no indication as to whether the National Department was offering or sponsoring any professional development programmes for educators.

The following was identified from the responses of the educators in the schools where the researcher carried out the study:

- Educators have inadequate knowledge of government's e-Education plans.
- Educators are prepared to learn computing if the resources are made available.
- Few educators have access to ICTs.
- Educators have limited access to ICTs and thus cannot derive the full benefits of the use of ICTs.
- Educators have no adequate training to use ICTs or to teach ICT in schools.



5.2 The Individual Interview

Interview is the second method of data gathering employed for this study. In qualitative research, interviewing is considered as a major source of data for understanding the phenomenon under study (Merriam, 1991:86). Combined with observation, interviews allow the researcher to check description against fact (Marshall & Rossman, 1989:82). The aim of the interview in this study was to describe and understand the participants' attitude towards the use of ICTs in schools. It afforded the researcher an opportunity to gather rich data while at the same time providing participants insight into the government's plan to integrate ICTs into the school curriculum. In conjunction with the other methods of data collection, (questionnaire and observation) used in this study, the interview serves to verify, establish and expand upon the information obtained from the respondents of the study. Johnson (1992:87) differentiates three types of interviews according to their degree of structure

(structured, semi-structured and unstructured). The semi-structured type was used in this study. This type of interview probes the views of small elite individuals. These individuals have particular experiences or knowledge about the phenomenon being studied. The researcher interviewed personnel responsible for ICT in the Department of Education in the Limpopo Province and educators who were responsible for ICTs in their schools.

5.2.1 Interview with the Limpopo Provincial Education Department's ICT Coordinator (See Appendix C for Interview Schedule)

The researcher gathered from the representative of the Provincial Department of Education that the government's White Paper on e-education has been sent to all the schools in the province. A business plan has been drafted and presented to the MEC for Education to approve. Meanwhile, District ICT coordinators have been trained and they are supposed to be running basic computer literacy programmes for educators in the various schools. In addition to the training, the District coordinators are to embark on advocacy programmes to make stakeholders aware of the e-Education programme. The District coordinators are to utilize computer labs in the various EMPCs or schools that have well resourced computer labs.

If the business plan is approved, the Department will build a computer lab in each circuit office to be used by schools in the various circuits. Implementation will commence in the 2007/2008 financial year.

Funding for the roll out of ICTs to the various circuits will be funded mainly by the Department of Education. But the Department will accept donations from any enterprise that offers help. Sponsors the Department expects to have on board are Telkom, MTN and Microsoft. These companies have partnered with the Department in providing some schools with ICT resources. As of now about 300 schools out of about 4000 government schools in the Province have benefited from these donations.

The standard packages that the department offers to schools are computers connected to the Internet or stand-alone computers, printers, overhead projectors, white screens and Microsoft software. The "Intel Teach to Future" which is administered by SchoolNet SA is recommended by the Department. As far as donors are concerned, the Department of Education does not specify what they give to schools. But the Department recommends that the minimum specification for computers to be used in schools is Pentium II. In the case of software, no special software is desired. So the normal Microsoft software packages are acceptable.

The Department has also designed a management programme called “Schools Administration Management System (SAMS) and copies are being prepared to send to all schools in the province. The SAMS software is intended to help schools with administrative issues. The Department plans to organize a workshop for principals before copies of the SAMS software are distributed.

The Department acknowledges that Limpopo Province is largely rural and illiteracy is rife. So it plans to embark on an awareness programme to showcase the benefits of the use of ICTs. Then the communities will be given basic computer literacy training. Once community members adopt the use of ICTs, the Department will help them to develop ICT Small Medium and Micro Enterprises (SMMEs) to run their businesses. In return, the communities will provide the needed support to ICT programmes in schools.

All government schools in the Province are targeted to benefit from the roll-out of ICTs. Basic ICT Training has already started for all educators in government run schools in the province. The Department feels educators will not like ICT if they do not know its value, so through advocacy programmes, the Department will highlight the benefits of the use of ICTs to educators. Educators will be trained as ICT champions to handle trouble shooting and minor repairs. ICT resources will be provided mainly by the Department of Education. The Department plans to train so many educators so the shortage of ICT educators is not envisaged.

As far as security is concerned, the White Paper on e-Education spells out measures to filter materials which will be available to schools over the Internet. Free anti-virus software will be provided by the Department to all the government schools in the province.

There is no ICT policy for schools yet. The Department feels it needs first to train all school principals first. Then the Department will work with the principals to draw up a policy for the schools.

To ensure that schools do not become dumping grounds for disused computers, the Department has set a minimum standard to be adhered to by all stakeholders.

There will be independent research institutions appointed by the Department of Education to continuously assess the impact and effectiveness of integrating ICTs into government schools in the province. Institutions the Department expects to rope in are the Universities of Limpopo and Venda for Science and Technology. The Department feels it has enough funds to sustain the ICT programme in schools.

The Department has no plans yet to study the impact of ICTs on learning outcomes of the learners and motivation of the educators, but it intends to develop one.

From this interview, the researcher noted the following:

- The Department is not aware of what goes on in some of the districts let alone the individual schools as far as ICTs in schools is concerned. The researcher knows that there is no ICT training taking place in Malamulele as alleged by the ICT personnel in the Department. This is because the researcher has been teaching in Malamulele for over ten years.
- Of the five schools studied only one principal had a copy of the White Paper on e-Education. This is a pointer to the fact that documents from the Provincial Education Department offices are not reaching their intended destinations. It is also possible there is no effective communication link between circuits and schools. There should have been a circular to this effect.
- There is no explicit plan in place to outline how the roll out of ICTs will be effected.
- Departmental ICT standards have not been adequately communicated to schools. If it has been done, then, these standards are not being enforced.

5.2.2 Interview with Principals (See Appendix D for Interview Schedule)

The responses obtained from principals responsible for ICTs in the various schools are as follows:

Computers available in schools ranged from a minimum of ten to a maximum of forty.

Apart from two of the schools which got donations from Telkom and MTN and the other three bought their own ICT resources using school funds.

The schools that got their computers as donations have them maintained by the donors and the rest do their own maintenance from the schools' budget.

The donors provide technical support for the schools they gave computers as donations and the other schools do not have any technical support. Educators who are responsible for ICTs in the schools do minors trouble shootings and refer major problems to private technicians.

Two of the schools have their computers situated in computer labs. Two others have theirs in the various staff rooms and one school is in the process of creating a computer lab.

Two of the schools use the computers to teach the learners and in addition, use the computers for administrative purposes. The other three use the computers for administrative purposes only. One school allows the Representative Council of Learners (RCL) to use the computers for their newsletter.

Schools which use the computers to teach, teach their learners CAT. One school also uses software from Microsoft to teach Mathematics and Physical Science.

The ratio of learners offering CAT to a computer is 4:1 in one school, and in the other school the ratio is 6:1.

Two of the schools which have donated computers allow access to grade ten learners and grades eleven to twelve learners who are offering CAT, Mathematics and Physical Science.

Three of the schools have Internet connection. One had Internet but it was disconnected due to the non-payment of Telkom bills.

All the schools use Microsoft Office software packages.

Two schools got their software packages as part of donations, one principal made a copy from his personal computer for the school and the other schools indicated they bought their copies. All the schools have not upgraded any of their software yet.

In one school all the educators are computer literate and in the others more than half of the staffs are computer literate or they are engaged in studies to become computer literate.

Only two of the schools have qualified ICT educators and the ration of learners to ICT educators is about 120:1.

Only one principal has trained all his educators to become computer literate. Two of the schools that have their computers donated have basic computer literacy training courses run by their sponsors from time to time with the aim of training all the educators eventually. The rest of the schools have no plans in place yet to train their educators. They hope educators will take their own initiative to become computer literate.

The computer literacy programmes in the schools are not recognized by SAQA. The reason being that recognized computer training programmes are expensive and the schools cannot afford them. The principals maintain that educators who want recognizable and accredited training must do it on their own.

Most principals feel the Department must provide incentives to reward educators who use ICTs in their work.

Principals feel by involving all stakeholders, there will be progress in the integration of ICTs in the schools.

From the interviews the researcher noted the following:

- All the interviewees were keen to use ICT resources if introduced into their schools.
- The interviewees lacked adequate information on government's plans to introduce e-Education into South African schools
- There is lack of adequately trained professionals to handle ICTs in schools.
- Very few learners are offering CAT because there are very few computers available.
- No school had an ICT policy.
- Financial constraint is limiting the acquisition and use of ICT resources in schools.
- There is no ICT support staff in any of the schools studied.
- ICT resources were too few to meet the requirements of a large population.
- No attempt has been made to involve the community in any way.
- No significant or reliable support from the National Department of Education.

5.3 Observation

Merriam (1991:87) refers to collecting data by means of observing phenomena of interest in natural settings. Silverman (1993:11) further posits that this method of data collection is fundamental to qualitative research. It has its aims to “gather first-hand information about social processes in a ‘naturally occurring’ context”. Through observation, the researcher learns about behaviours and the meaning attached to those behaviours. An assumption is made that behaviour is purposive and expressive of deeper values and beliefs (Marshall & Rossman, 1989:79).

Bell (1993:110) has identified two main types of observation and these are: participant and non-participant observation. Bell goes on to point out that participant observation transfers the whole person into an imaginative and emotional experience in which the fieldworker learned to live in and understands the ‘new’ world. Participant observation is generally regarded as the principal data gathering strategy for qualitative research because it takes place in real time and place, with the observer fulfilling an everyday non-research role in context, while interviews have to be set up and requires expert skills to elicit valid data.

Ackroyd and Hughes (1981:119) point out that a participant observer is the key instrument and as such should “make informed judgments about how and to what extent such influences affect the data is able to collect, the inferences he may make, and the ultimate analysis presented”. In addition, authors such as Silverman (1993) and Alvesson and Sköldbberg (2000) caution that interviews on their own yield data which the interviewees want to volunteer and nothing else. So other methods of data collection such as observation can be adopted to ensure reliability and validity of the data collected.

This technique is however criticized by Cohen and Manion (1989:129) who state that:

“The accounts that typically emerge from participant observation are often described as subjective, biased, impressionistic, idiosyncratic and lacking in the precise quantifiable measures that are the hallmark of survey research and experimentation”.

The researcher took note of this warning and tried to be as objective as possible. An interview with some of the respondents was carried out while visiting their ICT resources.

5.3.1 School Observation

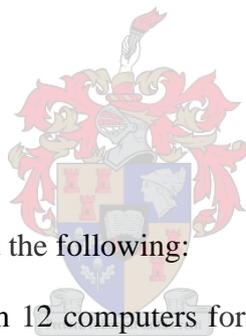
The researcher opted to use participant observation because he wanted to further investigate how ICTs are being handled in schools, so school visits in which questionnaires were distributed was done. To gain insight to the use of ICTs in education, a visit to a former model C school in Polokwane on the 4th of November 2005 was undertaken. Polokwane is the capital of Limpopo Province hence an urban area. Former Model C schools in South Africa are well resourced. This school was to serve as a benchmark for comparison with the schools the researcher was studying in Malamulele.

As far as ICT resources were concerned, the school has:

- 3 computer labs, with 120 fully networked and server managed computers.
- All the computers are linked to the Internet.
- Grades 8 to 12 all do computyping as an examinable subject.
- Delphi programming is used for Grades 10 to 12 Computer Classes.
- All the educators are computer literate (the least literate has Intel Teach to Learn Computer training offered SchoolNet SA).

- Software packages used: Microsoft Office and Delphi. Delphi is also taught as an examinable subject up to matric level.
- Educators use computers for lesson, test preparations and administrative purposes.
- Learners are allowed to use computers for their studies out of normal computer lesson periods.
- Two support staff (one permanent and the other temporary) are on hand to repair, maintain and attend to trouble-shooting cases.
- There is one qualified ICT educator with a Diploma but with no teaching qualification.
- All ICT resources are financed from school funds and donations from businesses in Polokwane.

With this background knowledge, the researcher visited 5 schools in Malamulele for my study on the 2nd of March 2006. (For the sake of confidentiality the schools shall be given the labels **A**, **B**, **C**, **D**, and **E**.)

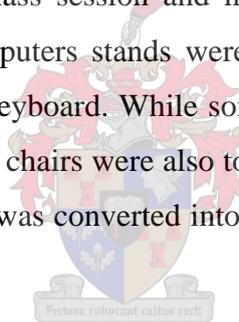


In **School A**, the researcher observed the following:

- A computer laboratory with 12 computers for learners fully networked and server. There is also one stand-alone computer for administrative purposes (These were donated by MTN).
- There are two printers – one in the computer lab and the other in the principal's office.
- All computers except the one for administrative purposes are linked to the Internet (which is paid for by Telkom). This agreement will expire in 2008.
- There is an overhead projector with a white cloth spread over a chalkboard to create a white screen.
- A photocopier and a risograph are located in the office of the Heads of Department (HODs).
- There is a qualified ICT educator.
- Some of the teachers are computer literate.

- Only Grade 10 to 12 learners who are offering CAT and Grade 11 to 12 Physical Science and Mathematics learners have access to the computers during lessons.
- Educators have access to the lab and use the computers for lesson preparation and tests and other administrative purposes.
- Learners do not have access to computers outside computers lessons period.
- During a class session there are 4 learners to 1 computer.
- Software packages and some educational software in Mathematics and Physical Science were donated by Microsoft SA.
- Repairs, maintenance and upgrading are done by Telkom.
- There is a satellite dish donated by Multi-choice (There is no landline phone connection to the school).
- CAT textbooks are supplied by the Department of Education.

The researcher actually visited a class session and noted that the learners were crowded around each computer and the computers stands were not suitable for a large group. The learners took turns to work on the keyboard. While some were typing, other learners had to write with books on their knees. The chairs were also too low. Classroom chairs were carried to the computer room. A classroom was converted into the computer lab. This school has no administrative staff.



In **school B**, the observations are as follows:

- There are 2 computers laboratories with 40 computers, networked and server managed and 2 stand alone computers for administrative purposes (Donated by MTN).
- There are four printers with scanners - two in the computer laboratories, one in the administration office and one in the principal's office.
- There is a landline phone-fax machine in the principal's office.
- All the computers are linked to the Internet (which is paid for by Telkom.) This agreement will expire in 2007.
- There is a satellite dish donated by Multi-choice. (The Internet is accessed via the satellite dish).

- There are 4 ICT professionals with diplomas in Computer Science. The other educators have been trained in computer literacy by MTN.
- All educators have access to computers and they use the computers for lesson preparations, tests and administrative purposes.
- Only Grades 10 to 12 learners who are offering CAT have access to computers.
- During a class session there are 6 learners to a computer.
- The school buys its own software packages from school funds.
- Learners do not have access to the computers outside computer lesson periods.
- CAT textbooks are supplied by the Department of Education.

It was observed that learners crowded around one computer. A science laboratory was converted into one of the computer laboratories. There was inadequate space for learners to work on the keyboard. One learner worked on the keyboard while the others looked on. That is, the learners take turns to type. This school has one administrative staff who has a stand alone computer connected to a printer in his office which is adjacent to the principal's office. There is also a photocopier and a risograph in the office.

In **School C**, this is what was observed:

- The school has 10 new computers bought from school funds. In addition, there is a stand alone computer for administrative purposes.
- There is no Internet connection.
- There is one printer for the administrative officer.
- The school has 3 copies of CAT textbooks bought by the school. The Department of Education has given the go-ahead for the school to introduce CAT as a learning area in the school.
- There is no qualified ICT educator, but 3 educators are computer literate.
- There is a small room to be converted into a computer laboratory.
- CAT is to be taught in Grade 10 in 2006.
- During a class session there will be 8 learners to a computer.
- Microsoft software packages have been bought from school funds.
- There is no landline phone connection to the school.

In **School D**, the observation was:

- The school has 10 computers for administrative purposes and these are located in the staff room and there is one computer in the principal's office.
- There is a phone-fax, photocopier and a risograph in the principal's office.
- There are two printers – one for staff use and the other in the principal's office.
- All the computers are used for lesson preparations, tests and administrative purposes.
- All the 36 educators in the school have paid the principal who is a qualified IT professional to teach them basic computer literacy.
- The school's Internet has been disconnected by Telkom as a result of non-payment.
- Learners do not have access to computers.
- Microsoft software used by the school belongs to the principal.
- The principal does repairs and maintenance of the computers.

The observation in **School E** is as follows:

- The school has 5 stand alone working computers each with its own printer.
- All the computers are connected to the Internet.
- There is a landline phone-fax in the principal's office.
- The computers are used by educators for lesson preparation, tests and administrative purposes.
- Grades 11 and 12 learners have access to the internet to make applications on line for further education and career purposes.
- The RCL use the desktop publisher to publish their newsletters.
- 10 out of the 30 educators have undergone basic computer literacy training.
- The ICT resources are bought from school funds.
- There is no body responsible for repairs and maintenance.

The researcher observed that some other schools have gone into partnership with private individuals who provide computers and teach basic computer literacy in schools. These individuals provide the schools with refurbished computers and trainers for a period of three

months. A minimum number of learners and educators are required to register and pay an agreed fee. In this instance, a minimum of 200 learners were expected register and pay R300 and a minimum of 12 educators were expected to register and pay R900 before the training can begin. The training is done for three months. After the end of the period, exams are written, certificates are awarded and the computers are donated to the schools for the school to continue with the training and the income generated thereby, goes to the school. Asked if the Department of Education was aware of this arrangement and if it approves of this enterprise, a principal the researcher spoke to, said his SGB wrote to their circuit office to be allowed to engage in this enterprise as a way of raising funds for the school. The letter the Circuit Manager wrote to give his approval was shown to the researcher. The researcher during a discussion with the Provincial ICT Co-ordinator gathered from the Provincial ICT Co-ordinator that approval for such projects should be obtained from the District ICT Co-ordinator. However, nobody in the schools was aware there was a District ICT Co-ordinator. So the Circuit Manager was the person they could turn to. What was noted from this enterprise was that, some of the computers used were too old to be upgraded and their memory capacities were too small to suit the latest software packages. The exam and certificates awarded in some instances were not accredited by the South African Qualification Authority (SAQA) and hence not recognizable. In another instance, the SGB could not run the project because the entrepreneur left after getting his money without awarding certificates and thus nobody wants to enroll for the training again.

From the observation, the following was identified:

- There is no ICT policy at school level.
- There is inadequate financial support for the use of ICTs in schools.
- There is lack of appropriately trained educators to handle ICTs in Schools
- There are no personnel responsible for ICTs at circuit level.
- No significant or reliable support from the Department of Education.
- All the schools have electricity installed.
- All the schools except one had landline telephones.

5.3.2 Observation of Workshop

Following the interviews with the Provincial ICT coordinator, educators and the observations, the researcher arranged a workshop for principals and educators responsible for

ICTs in schools in Malamulele. The Provincial ICT coordinator was invited to workshop the attendees on the e-Education policy. The workshop took place 7th of June 2006 at the Shingwedzi EMPC. All the five circuit managers were invited but only one turned up.

The workshop was set to start at 9:30 am. But it started late because of the late arrival of the Provincial ICT coordinator. He had to travel from Polokwane a distance of about 200 kilometres. He invited the District ICT coordinator. Whilst waiting for the officials from the Department, the researcher chatted with some of the educators to find out if they were aware of the e-Education policy, whether they have the e-Education policy document and what ICT resources are in the various schools.

Nobody present had any information on e-Education nor have the policy document. The educators also pointed out that they were operating as 'lone rangers' in the acquisition of ICT resources. There was no support from the Department. The Provincial ICT Co-ordinator was late, so he phoned to find out if the District ICT Co-ordinator had arrived. It was then that attendees wanted to know from the researcher who was their District ICT Co-ordinators. The researcher also did not know of any District coordinator for Malamulele area. While still engaged in informal discussions, a man and a woman came to enquire where the workshop was taking place. They were directed to the hall and there they introduced themselves as the District coordinators. The researcher welcomed them and took their credentials for introductions later. Within ten minutes, the Provincial ICT coordinator arrived. He apologized for coming late and said he got lost.

The researcher introduced the Provincial and District coordinators. The man was head of Media and Information Section of the District Education office. Under his section were the ICT and Library sectors. The woman was the ICT coordinator. The woman took the podium first and greeted the attendees and said she was glad to meet the house. The man followed and stated that they were invited by the Provincial ICT coordinator. He pointed out that according to African tradition; a chief does not walk alone. Some of the chief's subjects must move with him to clear the dew from his path. He then indicated he remembered coming to address educators at the venue in 2004 on the Integrated Quality Management Systems. He went on to highlight the importance of ICTs in society. Examples of using ATMs, Credit cards, the use of technology to communicate and many more were given. Attendees murmured and nodded their heads. The researcher overheard one attendee comment that "we have been using technologies all these times and yet we are still ignorant". When the head of

the Media and Information Section of the District Education office had completed, he asked the house to be excused because they were to attend another meeting in another District.

The Provincial ICT coordinator took the podium and firstly allayed the fears of educators that ICTs will displace them. He pointed out that it was a misconception. With the aid of a projector and a laptop, he defined, explained and spelt out the goals of the e-Education policy to the educators. He explained how the policy will be implemented. He also indicated the three phases of the e-Education policy. Phase I is from 2004 to 2007. This phase will see training educators and prepare schools for ICTs. He stated that by the end of Phase I, fifty percent of schools should have access to a networked computer facility for teaching and learning, and fifty percent of schools should hopefully be connected to the planned educational network. Phase II will be for the integration of ICTs in schools and Phase III which will be from 2010 to 2013 will see the full ICTs integration into the Education system, Management, Teaching, Learning and Administration. He concluded by stating that since schools were differently resourced, so also will be the realization of the various phases. So while some schools with resources may be in Phase III, schools without resources may be in Phase I or II. The Provincial ICT coordinator brought copies of the e-Education policy documents to be distributed to all the attendees.

During discussion time, he suggested that the EMPC should be furnished and used as an ICT training centre. Attendees indicated that Malamulele is wide as such four schools in central points were suggested to serve as training centres. These schools are also located in four of the five circuits in Malamulele. The schools have ICTs resources and connected to the Internet. These resources were donated by Telkom and Internet.

A committee was formed to facilitate the training of educators and to liaise with the District Coordinators to ensure that Malamulele is no longer left out in any ICT programme of the Department of Education. The idea of an area ICT committee was well received by the Provincial coordinator who stated that he was going to sell the idea to the other Districts.

At the end of the workshop, the committee held its first meeting. The committee consists of a principal and six educators. The principal was nominated as the chairperson, the researcher is the vice-chairperson. The researcher was requested to serve on the committee as he will share the knowledge of his study. There is a treasurer and a secretary. The first task the committee set was to conduct a survey of the four schools to determine if the schools possess the relevant resources to support ICT training. A competency skills level survey will also be conducted among educators to ascertain what ICT skills educators possess and what training

is required. This will inform the committee what training to requisition from the Department. The committee also noted that some educators teaching CAT have not been adequately trained. So during the survey, the committee will find out how many CAT educators are in Malamulele and then requisition further training for them.

The following was noted from the workshop:

- The fact that only one circuit manager attended the workshop and the others did not and did not send any apologies shows the lack of dedication and commitment they have toward the e-Education concept. It goes to confirm the frustration the Provincial ICT coordinator expressed when he pointed out that correspondence from the province do not reach the intended destinations. For example, schools in Malamulele had not received copies of the White Paper on e-Education. Meanwhile, Phase one had already started. He indicated his frustration with the channel of communication, so he said he will try to communicate directly with the committee at the same time as with the District and Circuit offices.
- The District coordinators have not delivered anything to Malamulele and so there was nothing concrete they could offer at the workshop. This might explain the reason for their hurried departure. Moreover, it was their duty to organize workshops for areas under their jurisdiction. But because they had failed, the workshop had to be run by the Provincial ICT coordinator. To highlight the District's failure, the Provincial ICT Co-ordinator invited the District Co-ordinator to come and hear what their constituents say about them.
- There is apparently no communication from the District Education office to the various circuits. So Malamulele is not benefiting from some of the Department's initiatives.
- Many educators who were contacted after the workshop expressed their wish to have basic computer literacy skills. Some also pointed out that they are now aware that they cannot live without the basic skills in computing.
- The researcher noted during a post-workshop interview with the Provincial ICT coordinator that the Department had no training programme for educators. When the coordinator was asked about a training programme, he pointed out that the normal Microsoft software was okay. The question is which programmes of the software should be considered adequate for basic computer literacy training. In fact

the ICT coordinator could not explain what constitute basic computer literacy training.

All in all, the researcher noted that the Departmental protocol of sending correspondence to schools in Malamulele should be evaluated and the factor(s) blocking the free flow of information from the Head office to the schools be removed. This shows that the support from the Department is inadequate.

6 DATA PROCESSING AND CONSOLIDATION

Data processing, according to Marshall and Rossman (1989:112) entails bringing order, structure and meaning to the mass of the data collected. Johnson (1992:20) also opines that data processing involves a continual process of looking for meaning by sorting reiteratively through the data. In this study, the data analysis method, which will be adopted is based on the suggestion by Miles and Huberman (1994). They define qualitative data analysis as a process consisting of three phases:

- data reduction,
- data display and
- drawing conclusion.

Drawing conclusions or verifications are interwoven before, during and after data gathering in parallel form. That is, qualitative data analysis is “a continuous iterative enterprise of selecting, focusing, simplifying, abstracting and integrating the data” (Miles & Huberman, 1994:119). According to Johnson (1992:90), qualitative data processing should comply with the following criteria:

- Important issues, variables or themes should be identified.
- Discoveries ought to be made about how these variables, issues or theme patterns interrelate in the bounded system.
- Explanations need to be given about how these interrelations influence the phenomena under study.
- Fresh new insights need to be advanced.

Merriam (1991:111) argues that data processing could occur before data is collected, as the researcher decides which conceptual framework, which cases, which research questions and which data collection methods to use. Once this has been done, the large amount of data from

the various gathering techniques will have to be consolidated. The researcher systematically worked through the data that had been collected and identified and summarized the themes that were crucial to the successful integration of ICTs into rural schools. The themes that the researcher was looking for during the data gathering process were:

- A. The National Department's policy on integrating ICT in schools.**
- B. The availability of finance to support the ICT integration process.**
- C. The kind of support schools are receiving from the National Department of Education.**
- D. The availability of qualified and competent personnel to drive the process.**

The general findings of the inquiry will be discussed in the next chapter.

7 CONCLUSION

In this chapter, the tenets of the research in which the inquiry was conducted were discussed. The researcher explained the format of the study, methods of data collection and processing. This because the researcher believes that understanding the various components of research and their interrelated nature is vital to conducting valid research. Thus integrated within this theoretical framework, this chapter has aimed to explicate the systematic process of data followed, from its initial gathering, through its analysis, to the consolidation of the final empirical findings, all of which were presented by means of example and summary. These findings will be discussed in the next chapter.

CHAPTER FOUR

FINDINGS, RECOMMENDATIONS AND CONCLUSION

1 INTRODUCTION

This study has attempted to answer the research question posed in chapter one. This chapter aims to present the findings of the research. The consolidated data will be interpreted against the background of the existing theoretical framework, as well as against new literature, which is referred to as the result of the findings. This is done through a discussion of the conclusion drawn from the findings. Implications for practice, policy and the way forward for the successful integration of ICTs into rural schools are also discussed. A model will be presented to suggest how schools can be categorized according to the ICT resources present in a particular school and how this may help the transition between Phase I, II and III of the e-Education policy.

2 FINDINGS

In this section, the findings of the empirical study are discussed.

1. Both educators and learners are eager to acquire computer literacy skills. The learners' and educators' eagerness to acquire computer literacy skills is not as a result of the novelty of ICT programmes in schools but the realization of the potential benefits of ICTs in education. This is noted in the survey conducted in the schools. The only snag is the lack of adequate ICT resources and the inability of the Department of Education to provide proper training to educators.

2. The study revealed that many schools, especially those in rural areas, do not have any ICT policy. This is due to the fact that the South African government's White Paper on e-Education has not been well communicated to schools. For instance, of the five schools used for this study only one indicated it had a copy of the document. The other schools were not aware of the document. Apart from the White Paper on e-Education, there was no other means used to inform schools of the commencement of phase one of e-Education and what was expected of schools. Moreover, the schools have limited understanding of ICT planning and development at local levels.
3. The Department is relying on educators in the EMPCs in the Province to create awareness on the e-Education policy document and provide training for educators. In Malamulele, the Shingwedzi EMPC does not have any educator responsible for ICTs and it does not have ICT resources with which to train educators. Therefore, there is no ICT coordinator in Malamulele, so no ICT training has taken place or is in progress. It is worthy of mention that Malamulele is a vast area and even if there was an ICT training centre at the Shingwedzi EMPC, it would not be adequate to cater for all educators. Moreover the Shingwedzi EMPC is not centrally located so it would inconvenience educators who live and work far from the EMPC to participate in the orientation. This state of affairs clearly indicates that the Department of Education has not done any study to determine whether places selected to provide ICT training for educators are suitable and adequately resourced. Malamulele for instance will require at least four ICT training centres.
4. The Department has not created a single poster, brochure or leaflet to inform and educate stakeholders on its plan to roll out ICTs into schools and how individual schools are to plan and to implement ICT activities. Posters, brochures and leaflets can be placed in schools, education offices and other public places to highlight the themes of the e- Education policy. Posters will also provide graphic representations of ICT resources for stakeholders to identify with. Posters or short briefs on ICT planning in schools can provide a good starting point for improving the awareness of educators and administrators.
5. The researcher also noted that like the schools that had not seen the White Paper on e-Education before, the school that has possession of the White Paper has no inkling what the document was about and what role was expected of schools. Even schools where computers have been donated are not aware of the White Paper on e-

Education. These schools sought sponsorship for computers to use to enhance administration and teaching. The lack of knowledge of the tenets of the e-Education policy has led to schools resorting to their own means to introduce basic computer literacy programmes. Schools are not introducing computing as a result of the e-Education policy but rather as a result of prior experience of some educators' interaction with computers and the interest generated by other educators. Some schools have introduced computing as a way of attracting learners. So in schools where there are no computer literate educators, little or nothing has been done to acquire ICT resources.

6. The absence of ICT policy in schools has partly exposed unsuspecting schools to unscrupulous entrepreneurs who are exploiting the situation by entering into bogus agreements with the pretext of teaching computer literacy in schools, charging exorbitant fees and turning the schools into dumping grounds for disused computers.
7. There are no guidelines as to what specification of computers are acceptable and there is no instrument to verify if the basic computer literacy being taught in the schools is what the Department prescribes. Schools are teaching computer literacy skills as an end in itself contrary to the intention of government's e-Education plans. There are no defined standards stipulating what ICT resources to purchase or accept as donations or to determine the basic requirements for a computer laboratory. Schools buy or accept or improvise just to ensure they have computers in schools and as a result, one will find that some of the computer rooms are not appropriately furnished and too small. The content of the computing courses vary from school to school.
8. Schools have not budgeted for ICT resources. So they acquire some of the ICT resources with money available and forget that the resources will need maintenance. So when minor things like ink or paper gets finished, they are only procured when there are available funds. This is a serious anomaly if one takes into cognizance the role ICTs are expected to play in schools. It means that anytime there is a shortage of a resource, then that ICT resource will be temporarily out of use.
9. The Internet provides immediate access to information, enables easy and cheap exchange of information, music, movies and games (if necessary for schools) but it is unaffordable to most schools because of the high cost of telephones bills. Most schools in Malamulele are unaware of the e-rate bill in the Telecommunications Amendment Act passed in 2001.

10. The researcher also noted that the well-resourced schools such as the Model C School he visited offer Computer Programming as examination subjects. On the other hand, some rural schools are offering CAT as examinable subjects because they claim they cannot afford the cost of teaching Computer Programming. This situation will entrench inequalities in the education, which the e-Education policy proposes to eradicate.
11. Schools in Malamulele are faced with the problem of inadequate textbooks for Computer Application Technology. The worst scenario is that each year the government expects the schools to “top-up” the copies of textbooks they already have. This directive does not take into cognizance the fact that with the rapid technological changes the present textbooks will also become obsolete. The Department of Education should consider making available the latest textbooks to schools. So that the schools do not have outdated computer textbooks to work with. This is the only way the Department can provide the requisite education to learners to make them global competitors.
12. In all the schools studied where learners are taught computing, it is taught as any other subject in the school curriculum. When computers are used in other subjects, it is often limited to enhancing presentation through word-processing. That means computers are not integrated into teaching and learning. The positive step of using ICTs in presentation can be developed further by providing training for educators so that with time, ICTs can be wholly integrated into the school curriculum.
13. Some of the schools teaching computing in Malamulele do not have the appropriately qualified educators. Some of these educators did computing as part of their studies in the tertiary institutions and thus do not have the teaching methods. Some also learnt computing on their own. The question is what standard of ICT training is being taught the learners.
14. The Department has approved applications for some schools to introduce computing without verifying if the schools have the appropriate resources to teach computing. One school the researcher visited had received approval from the Department, yet, they do not have a room to teach computing. This school is thinking of converting a classroom or a library into a computer laboratory and crowd learners in the other classes or use of the library.

15. Schools in Malamulele do not have trained technical staff to attend to repairs and trouble shooting. These problems are attended to by the person responsible for ICT in the school or the machines are taken for repairs out of the school at a cost. The implication thereof is that while the machines are out for repairs, the role of the machine is temporarily disrupted till the machine is returned. Meanwhile some of these problems could be attended to immediately if there was trained technical support available and there would be no cost involved.
16. The White Paper on e-Education (Department of Education, 2004) proposes that full integration of ICTs in schools should be realized by 2013. But as indicated earlier, no conscious effort is being made to integrate ICT into the school curriculum. For instance the Department of Education is currently organizing workshops for Grade 10 educators to be trained on how to prepare and deliver lessons in the new school curriculum but none of these workshops have integrated computing into the training. Kozma et al (2004) made the observation that if ICTs are to have any significant impact on teaching and learning, then ICTs should be integrated into the curriculum and not treated as a separate subject such as computer literacy or keyboarding. SAIDE (2005:99) also supports this view by citing Eisenberg and Johnson who write that:

It has become increasingly popular for educational technologists to advocate integrating computers into the content areas. However, when learners learn isolated skills and tools without a basic understanding or rationale for their use in problem-solving endeavors, these skills are of little value. Therefore, it is critical that we teach learners how to use computers in a way that allows them to be creative, flexible, and purposive in their pursuits. While there are specific skills that learners should learn, the transfer and application of skills from situation to situation should be recognized as the most beneficial part of any curriculum. As most technology scholars note, learners develop true 'computer literacy' when they have genuinely applied various computer skills as part of the learning process.

This excerpt should inform those who are organizing workshops on the new curriculum for educators to consider a carefully integrated programme from the onset. The researcher therefore calls on the curriculum section and the technology section of the Department of

Education to work together as a team to provide an integrated approach to the new curriculum. This will afford educators the opportunity to regard ICTs as part of teaching and learning resources to utilize across the curriculum and not as stand-alone resources to be learnt separately. This process will help fast track the successful integration of ICTs into the school system.

The implications of the above findings are manifold. But the recommendations will be limited to that of:

- Awareness programme
- Financial support
- Technical support and
- Training for educators

Consequently, the recommendations will focus on these.

3 RECOMMENDATIONS

Since e-Education is a paradigm shift that is crucial to providing a better, all inclusive education, there should be no half measures in its implementation. Change is vital and crucial in all human endeavours so all stakeholders must be encouraged to embrace it and ensure the successful integration of ICTs in education so that the future leaders of the country are globally competitive. In view of this, we must heed Fullan's (1985) assertion that:

change will occur when certain elements are in combination: attention to the development of clear and validated materials; active administrative support and leadership at district and school level; focused, on-going in-service of staff development activities; the development of collegiality and other interaction-based conditions at the school level; the selective use of external resources, both people and materials.

The Department of Education must ensure that the appropriate resources are provided and all the views of the relevant stakeholders are carefully considered to ensure that rural schools can also successfully integrate and utilize ICTs without any hindrances.

3.1 Awareness Programme

There is a need for a massive awareness campaign. Advocacy programmes must be embarked on to make the stakeholders realize the benefits of the utilization of ICTs and

particularly its integration in education. Rao (2004) also points out that most people in developing countries have little opportunity to connect to the Internet and therefore are not aware of the socio-economic benefits and stimulus ICTs can bring to their lives. He goes on to indicate that because of the absence of demonstration projects in some countries, very limited information is available to assess and to advocate the impact of ICTs on development. The same goes for the rural areas. The Department of Education will make a huge impact if the benefits of ICTs are demonstrated to stakeholders. UNESCO (2002:45) supports the idea of an awareness campaign by asserting that:

To raise teachers' awareness of the need to become ICT literate, most countries expend considerable effort in public relations around ICT, describing good or emergent practices, organizing discussion sessions, developing informative web sites and so on.

The Department of Education must take a cue from the advertising strategies of some of the popular brands like coca-cola and the cellular phone service providers and embark on an awareness campaign to sell the benefits of the use of ICTs to all stakeholders.

The Department of Education to my knowledge has not made any single poster, brochure or leaflet to highlight its e-Education plans. It will be prudent for the Department of Education to explore and embark on poster campaigns to convey its message. Posters must be sent to all schools, offices and places that stakeholders frequent. The posters will create impressions on stakeholders to desire to know more or get involved. The researcher for instance knows that so many people have never met or seen Nelson Mandela in person but the day they meet or see him they will readily recognize him because his image is displayed all over. So the same can be done to make the public aware. A short two to six pages brief on the role of ICTs and their planning and implementation in schools would also be useful.

The mass media can be roped in to carry educational campaigns to highlight the intention of the Department of Education and the benefits thereof in the use of ICTs. The Department of Education should use various workshops and other platforms that are arranged for all the stakeholders. Fun activities such as road-shows are also ways the Department of Education can consider to draw attention to the e-Education plans. The awareness programmes will prepare the mindset of stakeholders for e-Education. It will also disabuse the stakeholders' minds of any misgivings they may be harbouring.

The Department can also explore the possibility of establishing ICT information centres in circuit offices. Educators can then be encouraged to access and submit some of their personal

information from time to time. This will ensure that educators do not have to go to the Regional offices all the time for minor information. Information on salary, leave days, and the like, can be readily available on portals for the educators. Once educators realize how simply they can access information using ICTs, they will be “thirsty” for more.

3.2 Professional Training of Educators

The introduction of e-Education means that the educator is faced with a critical role to play. To begin with, the Department of Education has to provide sound educational reasons to educators as to why ICTs must be integrated into schools. Ward (2003:12) indicates that educators must be active participants in this discovery process. During this process, educators must reflect on current practices, the limitations of current practices and awareness of what the new technologies can offer to improve teaching and learning. It is only by doing this that educators will be motivated to fully participate in the integration of ICTs in schools and willing to abandon the traditional mode in favour of a learner-centred approach supported by ICT. To adequately fulfill this role, the educator will then have to undergo a professional development programme. The professional development programme according to Ward (2003:12) “must assist teachers to become change agents and risk takers able to adapt to the new teaching paradigms implicit in the use of ICT”.

Training programmes must address the fear that ICTs will diminish the importance of educators. Selwyn (2001) notes that thinking that ICTs will dis-empower the educator, undermines the educational potential of ICT itself. So ICT education must emphasise the point that schools will continue to be the central feature of the learner and the educator will still be the point of contact. What will change will mainly be the new role of the learner as integration of ICTs will be learner-centred. The role of the educator requires a range of technical and pedagogical skills. Providing training for the integration of ICTs into the school system can be addressed on two fronts: the educator in service and the potential educator in training. This programme will have to be continuously updated to ensure that the training provided matches the rapid technological changes.

As far as the former is concerned, the Department of Education must first conduct a survey to ascertain the competence levels of all educators. The result of this survey will reveal the various competence levels. This result will inform the Department of Education on what types of courses to develop to address the various needs identified.

There may be educators who have no computer skills at all. For the novice, programmes must first address the fear of the use of ICTs and show them that they will be able to use

ICTs. The programme should organize the novices into smaller groups so that they can work confidently and be allowed to make mistakes. Within these small groups individual needs can be identified and addressed. This is very important as some of the educators may have problems of motor-skills and they have to be taken through motor-skills such as pointing, clicking and dragging with a mouse (UNESCO 2002:48). Once these skills have been mastered, the confidence of these educators will be boosted and they will become more confident.

The Department must consider developing a standardized training programme for educators. This will go to ensure that there is some standard in computer literacy among educators. The researcher observed that computer literacy means different things to different people. For instance a person who can only type on a computer says he/she is computer literate. Meanwhile such a person has no idea of the workings of other programmes like Excel and Access and the like. So a standardized computer literacy programme can solve this problem. International standards such as International Computer Driving Licence (ICDL) that is being used in Europe and best practices in integrating ICTs into the curriculum should be used. Furthermore, the availability of such a programme on CD-ROMs can assist schools to run their own training. Even educators can learn on their own using such a programme.

The Department of Education might be thinking of using workshops to provide ICT training for educators. OECD (2001:76) notes that it takes time and resources for educators to become knowledgeable about technology and confident enough to use it effectively in the classroom. So a one-day workshop or seminar will not adequately provide educators with the requisite skills. Workshops should be ongoing. This goes to support Goldenberg and Gillimore (1991) who suggest that one solution is to do away with one-day workshops and rather create contexts in teachers' work lives that will assist and sustain meaningful change. As indicated earlier, the Department must ensure that the current training programmes in the new curriculum must incorporate demonstration using ICTs to deliver lessons.

The Department can utilize some of the school holidays to offer training to educators on how to use ICTs to search for information and support teaching and learning. It is important that this training focus not only on understanding how to use Microsoft products but how to integrate ICTs into teaching and learning. The appropriate time will be during the second quarter or second semester breaks. During this time, many programmes would have started running. Educators will be assigned to various centres according to their competency levels. Training at these centres should be conducted by qualified and competent trainers appointed

by the Department of Education. The Department can enter into partnerships with other institutions or private enterprises to offer their services if there are no suitable people to run the training in the employ of the Department of Education.

These training programmes should design methods of assessing and granting recognition to the trainees through promotions or awards. The training programmes should also be monitored and evaluated to ensure that the training attains the desired outcomes. Realistic and achievable goals should be set for each holiday training programme and it should be evaluated during the next school term to determine if the skills acquired are appropriately being applied. If the observations are unsatisfactory, then the programme can be redesigned or a different approach used to impact the skills.

It must be indicated that educators should be prepared to be receptive to training programmes that the Department of Education will make available so as to realize a successful outcome. Lawson and Comber (1999:42) point out that, educators themselves are limitations to the successful integration of ICTs because of their fear of the computer or a lack of skill or understanding how ICT can enhance educational experience of learners. This point is supported by Mooij and Smeets (2001) who state that “if teachers are not confident in their ability or competence to handle computers will hamper their willingness to introduce technology in the classroom”. This problem can be solved by ensuring that the training programmes for educators are designed to change the educators’ attitudes and knowledge on how to integrate ICTs into classroom practice. Hawkins (2002:42) suggests that educators should be able after training to transform their classrooms from places where a static one-way flow of information from educator to learner occurs into a dynamic learner-centred learning environment where learners interact with peers in teams, both in their own classroom as well as with virtual classes around the world through the Internet.

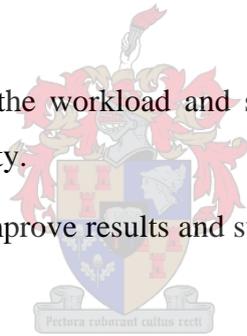
The researcher aligns with Kortecamp and Cronlinger (cited by Lawson & Comber 1999:42) who suggest that a mentorship system can be used when new technologies like ICTs are introduced to educators. This will enable the more experienced educators to assist the novices with the challenges of introducing new technologies in the school system. Essom (2003:5) point out the benefits of mentoring to be:

- Receiving help and guidance to develop self-esteem and self-confidence for learners who may be returning to learning after a long break. For some it may be the first time they have entered into a formal learning situation since their school days.

- Developing the self-confidence of those people intending to return to work after a long absence and who need skills such as ICT.
- Helping to increase motivation of learners, raising their aspirations and ultimately, their achievements.
- Being able to tap into the wisdom of a more experienced person and in particular, someone who will be able to empathize with the learner's situation.
- Many ICT mentors may only recently have undertaken IT training themselves so their experiences and feelings as a learner will still be fresh in their minds.

Essom (2003:7) state the benefits of mentoring to the organization (Department of Education) as:

- A valuable resource to complement existing teaching staff and enhance the services offered by the Department of Education.
- A possible source from which to recruit ICT staff for the Department of Education in the future.
- ICT mentors help relieve the workload and stress on existing teaching staff and thereby increase productivity.
- Mentoring schemes help improve results and success rates, and help in the retention of learners.
- ICT mentors help provide support for the development and use of new technologies.



The mentor will also benefit by obtaining:

- Personal satisfaction and enhancement of his/her own learning
- The satisfaction of helping others to grow in confidence and develop their potential.
- Enhanced self-esteem.
- Enhanced status-feeling of being valued for their knowledge and skills.
- Opportunity to develop and improve communication and interpersonal skills.
- Opportunity for possible career development and progression, e.g. becoming a qualified tutor.
- Opportunity to give something back to the community (Essom, 2003:8).

From the aforementioned, the use of mentors will be beneficial to all the stakeholders. So the Department can identify ICT skilled educators in the various schools and request them to mentor their colleagues or identify freshly qualified ICT graduates and hire them to help train educators. It will be helpful if the Department of Education will provide training for the mentors identified before appointing them. Training for mentors can be a year-long. This will address the quest to provide defined standards of training. The Universities of Limpopo and Venda can be contracted to provide such training. Taking a cue from Demitriadis et al. (2003), the researcher suggests the course content should consist of technological and pedagogical studies. The trainees will be required to attend lectures, group discussions and perform team project works. Selected lecturers of the aforementioned universities must be identified to run the course, but these should be trained first with the integration of ICTs in teaching and learning, creation of educational content and measurement of outcomes. Didactic approaches such as interactive learning environments, project based learning and collaborative learning must be emphasized as part of the training. The trainees after the second semester must be assigned to selected schools to do teaching practice for a minimum period of four weeks. The selected schools must have the resources to support the teaching practice. Once the trainees are ready they must be assigned to training centres to work with educators.

The universities should assign lecturers to monitor the trainees on an ongoing basis to ensure that the trainees are doing the right thing. The course should be evaluated by independent persons from time to time so as to provide inputs for running and upgrading. The Department of Education can consider providing accreditation for this course so that more educators will be enticed to undergo such training. This course can also be considered for the professional development of educators. Educators will then have to do the teaching practice in their respective schools provided ICT resources are available otherwise they will have to be taken to designated schools where ICT resources are available and the schools are selected for experimenting the integration of ICTs into schools.

Schools and Circuit ICT champions must be elected to be trained as trainers. These ICT champions will ensure that activities concerning ICTs are carried out in the various schools and circuits. They will also be provided with training so that they can train other educators and see to it that the strategy for ICT is successfully implemented. For instance educators in Malamulele can be identified, assess their ICT competency level, given further training to meet Department of Education standards and then tasked to spearhead ICT training in schools and the circuits. These ICT champions should be supervised by well-qualified ICT

Co-ordinators in the Districts and Circuit offices. Performance appraisal can be instituted to determine how these ICT champions are performing and if their work is found to be satisfactory, they are rewarded accordingly.

Bax (1999) suggests the following roles for teacher trainers and the Department of Education can find it useful for ICT champions in school and circuit levels:

- The trainer should attempt to ensure that the larger teacher education programme of which the particular session is a part is appropriate, context-sensitive, and likely to encourage reflection and long-term change.
- In order to prepare for the session the trainer should investigate the trainees' background, paying attention to the trainees' preferred learning styles, the kind of participation they consider to be appropriate, their key worries in the area of pedagogy to be covered and the personal and professional experience they bring to the session.
- The trainer should attempt to ensure participation of trainees at a level and in a way appropriate to the cultures and individuals concerned.
- The trainer should ensure that the aims of the session are known to the trainees at the appropriate point in the process.
- The trainer should make concessions to the varied learning styles and preferences of trainees, so far as these are known. This will probably mean the use of experiential approaches, and in any case will be as varied as possible to help overcome the context gap.
- The trainer should challenge old ideas, and offer new ones, in a sensitive and appropriate way.
- The trainer should take a wide view of teachers' development in the selection of issues, material and activities for the teacher education session.
- The trainer should attempt to ensure that the content of the session is 'negotiable'.
- The trainer should attempt to ensure that the key points are as relevant as possible to trainees' working context, probably by deriving them from trainees' working contexts.
- As far as possible, trainees should be left to decide specific classroom practices for themselves.

- The trainer should attempt to ensure appropriate evaluation of the session, with results available to trainer and trainees.

With these in mind, the researcher calls for the forming a community of educators with a set goal to achieve. For instance, a few educators (between six and twelve) teaching the same subject but in different schools coming together led by an ICT coordinator to work on integrating ICT into their learning area. The meetings could be via electronic media or face-to-face. The ICT coordinator can be a fellow educator. OECD (2000:74) also argues in support of cooperative learning by pointing out that:

At the level of the individual teacher, there needs to be a psychological transition from working and learning alone, with a belief that knowledge production belongs to others, to a radically different self-conception which, in conformity with interactive models, sees the co-production of knowledge with colleagues as a natural part of a teacher's professional work. At the system level ways have to be found to bring teachers together in such activity.

In effect, these educators will be creating a Community of Practice (COP). Wenger (in Sim, 2006:78) defined community as “the social configuration in which our enterprises are defined as worth pursuing and our participation is recognizable as competence”. In short a community of practice implies that a group of individuals have agreed to undertake mutual endeavours. OECD (2001:76) points out that teacher to teacher contact is more appropriate as teachers value views of other teachers, and accept their experience as valid. Furthermore, UNESCO (2002:52) indicates that “the success of these teacher networks is proven, although there are pitfalls to be aware of:

- not too much difference in starting position,
- an equal input from participating members,
- an open mind for sharing experiences,
- task orientation,
- shared responsibility, but also somebody who takes an organizational lead”.

This COP should design programmes to provide basic literacy training for beginners and to build on what those who have basic ICT skills possess. The outcomes of this programme should be the ability of educators to apply ICT skills in their school work.

The researcher proposes that each school manager and Heads of Departments (HODs) or a senior teacher should be provided with initial ICT training. The training of these managers will accord them the opportunity to become aware firsthand of how ICTs are used, and what it takes in integrating them into teaching and learning and what problems their staff can experience. With this knowledge, they can properly play their role as team leaders who can provide leadership and motivation to other staff members. This puts them in a position to engage in meaningful discussions with colleagues on the integration of ICTs in the schools. Lockwood (1999:17) says this conception of leadership regards the principal for instance as a master educator rather than an administrator “limited to coping with the minutiae of school life and divorced from the demand of instructional leadership”. Furthermore, the training will equip them with the ability to manage themselves and the other staff members responsibly and effectively and also guide them to manage in-school training for other colleagues. Effectively, the training of these people affords them the ability to become managers who are reflective and opportunistic in their learning and teaching. Opportunistic managers are able to capitalize on the chances to learn and change through their experiences at work. These managers will in their role as team leaders see to the smooth integration of ICTs in their respective schools. These team leaders will be expected to provide “just in time” guidance, encouragement and trouble-shooting assistance to their colleagues.

The Department of Education can institute a reward system for educators and schools that are integrating ICTs in their teaching and learning and school administrative and management systems. The reward could be in the form of points to be earned by educators for their schools or personally. These points could be redeemed for ICT resources or discounted ICT resources purchased from participating shops.

The Department of Education should also consider guiding schools to incorporate an ICT professional development growth plan in its Integrated Quality Management System (IQMS) which has been instituted to appraise and develop educators. If this recommendation is adopted, educators will have to include ICT training as part of their Personal Growth Plan (PGP) which in turn would be embedded into the whole school improvement plan.

The curriculum for educational training institutions must include compulsory ICT training. The Department of Education must set a minimum level of ICT skill which an educator must possess before passing college and when entering the teaching field. During teaching practice, the future educator must be encouraged to apply ICT in their lessons if resources are available. The school management must also provide support for such educator.

To conclude the discussion on professional development the researcher quotes Galanouli, Murphy and Gardner (2004:66) who indicate that:

Successful models for ICT professional development for teachers should address a variety of concerns. These include the provision of sufficient time, good technical and social support, good equipment and resources. The school management teams need to be committed to and must actively promote the aims of the professional development and there should be teacher input in the course content to ensure relevance to their teaching practices. The delivery model should be flexible and should reflect the individual needs and levels of ICT competence of the teachers involved. The programme and/or tutors must recognize the different learning styles of their audience and must both understand and challenge teacher attitude to ICT. In addition there should be a desire to transform teachers' perspectives of their profession by using ICT.

3.3 Technical Support

Integrating ICTs in schools does not end with the provision of ICT resources. The challenge is to ensure that the ICT resources are running efficiently. Problems such as electrical spikes, viruses, dust, heat, trouble shootings, upgrading, maintenance and repairs are bound to crop up every now and then. To effectively handle these problems, there is a need for well-trained technical support staff on hand to tackle these problems as they arise. Technical support is required right from the school level up to the Education Department offices. It must be pointed out that some of the technical problems can be immediately sorted out by the educators and administrative staffs. These skills will be imparted during training. However, care must be taken to ensure that the solutions of technical problems do not overburden educators and administrative staffs or the technical problems are of such nature that normal duties are sacrificed.

As far as schools are concerned, learners can be provided with basic training to attend to minor technical problems and take care of ICT equipment. There may be some learners who are very interested in ICTs. So they can be identified and trained. Hawkins (2002:40) cites an initiative in Namibia where SchoolNet Namibia has provided learners with the technical training necessary for them to refurbish install and maintain school computer labs. The provision of such basic skills can save the schools money and time. In addition, such training equips the learners with life-skills which they can utilize as a career.

The Department of Education can consider setting up technical support offices in the Province, Regions, Districts and Circuits. The offices must be manned by well trained technicians who must be on hand to attend to problems when they are called to do so. The technicians must visit schools to ensure that systems are running efficiently. A helpdesk software can be created to register complains, track requests for support and responses. Volunteers can be considered to serve as ICT technicians but it must be noted that schools cannot bank on regular service from volunteers.

Students in the tertiary institutions who have technical expertise can be employed on a part time basis out-of hours. By so doing, jobs will be created by the Department and the students will also be benefiting from remuneration received, which can supplement their source of income. This system can work in places where schools are closer to tertiary institutions. This will ensure that the students do not have any problems of transportation. In the case of Malamulele, the nearest tertiary institution is about 50 km away. The students may be faced with transport problems. But with proper planning and timely arrangements by the Department of Education and the institution, the students can be transported to and from the various places.

Alternatively, consideration can be given to recently unemployed graduates who are found to be technologically inclined. Such people can sign contractual agreements with the Department of Education for a minimum period of time, then they are trained and employed to work as technicians. This will also help reduce the unemployment problems in the rural areas.

Should the Department find the retention of technicians a challenging task due to the fact that technicians may be attracted to more lucrative jobs, then the option of outsourcing the technical division can be considered.

3.4 Finance

Investing in ICTs involves huge capital outlay. So a proper financial planning must be made before ICT resources are acquired. If proper financial planning is not in place, there would obviously be wastage and white elephants. The Department of Education must ensure that there is a clearly defined business plan, which must cover among other things; creating secured rooms for the ICT resources, acquisition of the appropriate resources, installation, employing and training of staff, repairs and maintenance. A realistic budget must be drawn up to reliably support the integration of ICTs in schools. The sustainability of the project must be borne in mind also. Rural schools must be given special attention when it comes to

finance because the schools in the rural areas do not have the financial acumen to support the integration of ICTs into the schools. The Department of Education should as a policy include the purchase and renewal of ICT resources into schools' core funding.

Malamulele, being a rural area has no viable business and the communities are poor. The schools in Malamulele are also under-resourced. Schools in Malamulele have never had any large budget. This is because the main source of funds for the schools is the paltry fees paid by learners. In some high schools learners pay R150.00 each per year. Because of the unusually low budgets the schools run on, there is no guarantee that they can adequately include the cost of integration of ICT resources. Since the community lacks the financial muscle to support the schools, the burden falls on the Department of Education. The Department can respond to this challenge by training the school managers in handling complex budgets. The training must include the implications of integrating ICTs in schools. Since issues such as measures to recover costs may arise, school managers or principals should for example be helped to understand how a small business is run.

The Department must ensure that the ICT resources that are supplied to schools are optimally utilized. Cawthera (2001:47) reports on a research finding which shows that the best way to lower the unit cost, i.e. the cost per learner is to increase the level of usage of the ICT resources. Research needs to be carried out to determine the level of usage. If the level of usage is low, then the cause for the low usage must be investigated and eliminated.

The low level of usage can be addressed by inviting the community to share the use of the ICT resources. This school-community partnership will serve three purposes. These are:

1. The low level of usage will be eliminated.
2. The community will be afforded the opportunity to access ICT resources, and
3. It may result in cost recovery and income generating venture.

Cost recovery is highly recommended as it is a way of meeting running costs of the ICT resources. In some cases, the total cost of the ICT resources can be recovered. Schools can charge the community for using their ICT resources. However this school-community partnership requires careful planning to ensure that normal classes are not disrupted. This may mean the community may have access to the schools' ICT resources after school hours. So issues regarding access to the school property and security must be seriously considered. One must not take for granted that a school-community partnership will work in all cases. ICTs are of a technical nature and considering that literacy levels in the rural areas is low, it

will be nearly impossible to get the community utilizing the ICT resources fully. Again with unemployment high in the rural areas, one wonders if a community that is unable to meet its basic needs will have enough money to pay for the use of ICT resources.

A possible solution will be twinning. That is paring less resourced schools with well resourced schools. This will enable the less resourced schools to utilize the resources of neighbouring schools that have ICT resources. The government can pay the school for the use of their ICT resources. Alternatively, a centre like the Shingwedzi EMPC in Malamulele can be furnished with ICT resources and manned by competent and qualified staff and some of the educators in Malamulele can go there for ICT training.

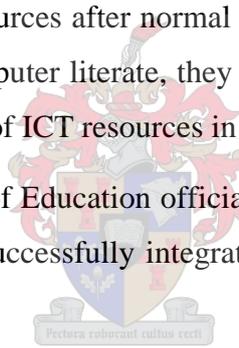
There is a need for the Department of Education to consider entering into partnerships with the private sector. The private sector can support the Department's effort in supplying ICT resources to schools. The Department of Education can continue to play its traditional role of owning schools, providing inputs, such as books, materials and equipment, with the private partners providing assistance under contract. As already indicated in the study, Telkom and MTN have donated computers to some schools and are training some of the educators. Hawkins (2002:40) cites instances in Chile and Uganda where the various schools have benefited from partnerships from the private sector. There are cases where donors may be prepared to provide all the ICT resources and in other cases donors may decide to offer some help. For example, a company may donate computers and another may decide to sponsor Internet connectivity and the like. However the Department must set guidelines as to what schools should accept. Some of the donations may turn out to be more expensive or the schools may be used as dumping grounds for disused computers. For instance when old computers are donated and they need to be upgraded. This will need more money and some of the computers cannot support the latest software, so they may be unusable and they will be occupying space.

This public-private partnership should also explore ways of getting business enterprises providing rebates for schools to enable them to acquire their own ICT resources relatively cheaply. Microsoft for instance has such an agreement with the Department of Education to provide free software to schools. Other companies can be encouraged to follow suit. Private companies can be requested to adopt schools and provide them with their ICT resources and the requisite training. The researcher recalls instances where the former president, Nelson Mandela had convinced big businesses to build classroom blocks for rural schools.

In the study, it was mentioned that some of the agreements between some donors of ICT resources and the recipient schools will soon come to an end. This calls for a serious look into the sustainability of some of these projects. The indication is that if other sources of finance are not found, the chances are that the project will grind to a halt. So while there is a suggestion that there should be a public-private partnerships to help provide inputs for the integration of ICTs into schools, caution must be taken to ensure that such partnerships are sustainable or donors should make sure that the projects initiated in the various schools become sustainable before the termination of the partnerships.

The Department of Education should consider teaming up with other government Departments and partners so as to provide ICT resources in places within the community such as public and community libraries, community resource centres, civic centres, tribal authority offices, etc. so that educators and learners have easy and ready access to ICTs outside the school premises. This measure will be providing those who are not in the formal education sector to have access to ICT resources in the community apart from learners and educators having access to ICT resources after normal school hours. The researcher believes that if the community becomes computer literate, they will be in a better position to provide proper support for the development of ICT resources in schools.

It will be beneficial if Department of Education officials will visit other countries especially those in the third world that have successfully integrated ICTs into their rural communities and learn from them.



4 THE REALITY OF THE ICT SITUATION IN LIMPOPO PROVINCE

From the study, the researcher has observed that schools are beginning to acquire ICT resources and schools are at various stages of ICT development. Consequently, a table has been created to depict the state of ICT integration in schools. This table will serve as a framework to inform the Department of Education on what ICT resources there are in the various schools and it will also help to categorize schools according to the level of ICT resources schools have. The researcher hopes the Department of Education will critically evaluate the situation in the Province and determine what intervention measures to offer schools in the various models so that they meet the desired target set out in the e-Education White Paper. UNESCO (2002:11) also points out that:

Educational research studies show that programmes of professional development for teachers are most effective if directed to the stage of ICT development reached by schools. The implications of these research findings are that teacher development is best conceived as an ongoing process, with many professional development activities conducted in schools.

This citation goes to strengthen the point that a wholesale approach will not be beneficial to all schools. So there is the need for the Department of Education to adopt the relevant intervention methods that will address the specific needs of each school in the models. The table categorizes the ICT resources into three models; Model 1 depicts schools with little or no ICT resources, Model 2 shows schools with some ICT resources but not enough to fully integrate ICTs into the school system. Model 3 is considered the ultimate goal for all schools to attain. In this model, schools are expected to fully integrate ICTs into the school system.

Table 4.1 Table categorizing the levels of ICTs integration in schools.

DESCRIPTION	ICT RESOURCES IN SCHOOLS
Model 1	<ul style="list-style-type: none"> ▪ Less than 10 Computers ▪ No Network ▪ No Internet Connection ▪ No Learner Access to computers ▪ No Computer lab ▪ No qualified ICT educator ▪ Computers used for administrative purposes and by some educators
Model 2	<ul style="list-style-type: none"> ▪ More than 10 Computers ▪ Networked Computers to local server ▪ Internet connection ▪ Learners have access to computer mostly for lesson ▪ Computer-learner ration is 1:±6 ▪ 1 or more computer lab/s

	<ul style="list-style-type: none"> ▪ ICT taught like any other curriculum subject ▪ Computers used for administrative purposes and by some educators in teaching and learning ▪ Have a qualified ICT educator who does the work of ICT technician
Model 3	<ul style="list-style-type: none"> ▪ More than 50 computers ▪ Networked computers ▪ Internet connection ▪ Learners have access to computers for the full school day ▪ Computers used for managing school activities including learning and teaching process (e.g. preparation of course materials, grading etc) ▪ ICT taught and used across the curriculum ▪ Computer-learner ratio is 1:2 to 1:4 ▪ Have qualified ICT educators ▪ Have at least one ICT technician and educational content manager

Model 1 depicts schools beginning to acquire ICT resources. So they have less than ten computers. The few ICT resources are used by some educators who have basic computer literacy skills. The other educators without any computer literacy skills may begin to explore how to use the ICT resources. The computers are not networked and there is no Internet connectivity. The computers are located in the staffroom or offices. Learners do not have access to the ICT resources. The computers are used for administrative purposes and not part of the teaching and learning process.

Schools within this category as the table shows are far from the ideal situation and so the Department of Education must provide interventions to ensure that these schools attain the status of Model three. To determine what intervention strategy the Department of Education should provide, it is of utmost necessity to do a needs analysis of the individual schools to find out what ICT resources are available and what are the ICT competency levels of educators. With this information, the Department will be in a position to decide what sort of training to offer educators and what ICT resources to provide to the schools and whether to set a network of schools or to provide individual schools with the ICT resources. For

example, the Department of Education can group the educators according to their ICT competency level so that relevant training can be provided for each group. This will, for instance ensure that educators who have some basic ICT knowledge will not be bored with a beginner's training. If the needs analysis is not done, a situation will be created where ICT training and resources that have been provided will be repeated. This scenario will result in the slow down of the integration of ICTs into schools and the waste of resources.

Model 2 sees schools becoming more aware of the contribution of ICTs to teaching and learning. More ICT resources are acquired. There are more than ten computers. The computers are networked to a server and there is an Internet connection. Learners have access to ICT resources in the school. Learners are taught basic computer literacy skills. There is increased familiarity with computers on the part of educators who consequently develop interest in pedagogical use of technology. Since ICT resources are few, not all learners have access to them. The computer-learner ratio is about 1:6. The ICT resources are also utilized for administrative and management purposes. There is a qualified ICT educator who also doubles as an ICT technician. The computers are located in a computer lab. The school acquires some educational software to enable the use of ICT in teaching and learning. The curriculum assists movement to the next stage. The first task of the Department of Education is to ensure that these schools do not slip back to Model one. The intervention in this category will be different from what will be provided in model one. The intention is to provide interventions which will see schools here attaining a model three status.

Model 3 paints a picture of schools acquiring more ICT resources. A school should have more than 50 computers. In addition to the descriptions in stage two, all learners have access to the computer labs and the ICT resources. The ideal situation will be to have computers in all classrooms. The computer-learner ratio is 1:2 to 1:4. ICT is taught across the curriculum. There are more ICT educators and at least one technical support staff. At this stage schools should be expected to fully integrate ICTs into the whole school system. This stage is where the e-Education policy document is targeting. For schools to reach this status the appropriate ICT resources should be made available, educators should be provided with the appropriate pedagogical and professional development and the provision of technical support is essential. Professional development should be made an integral part of school technology and school improvement plan. Full integration is also not possible if the school curriculum is not changed to suit the use of ICTs. In effect, the Department of Education should ensure sufficient level of provision of ICT resources in schools which must be combined with the requisite professional and curriculum development to realize complete integration of ICTs in

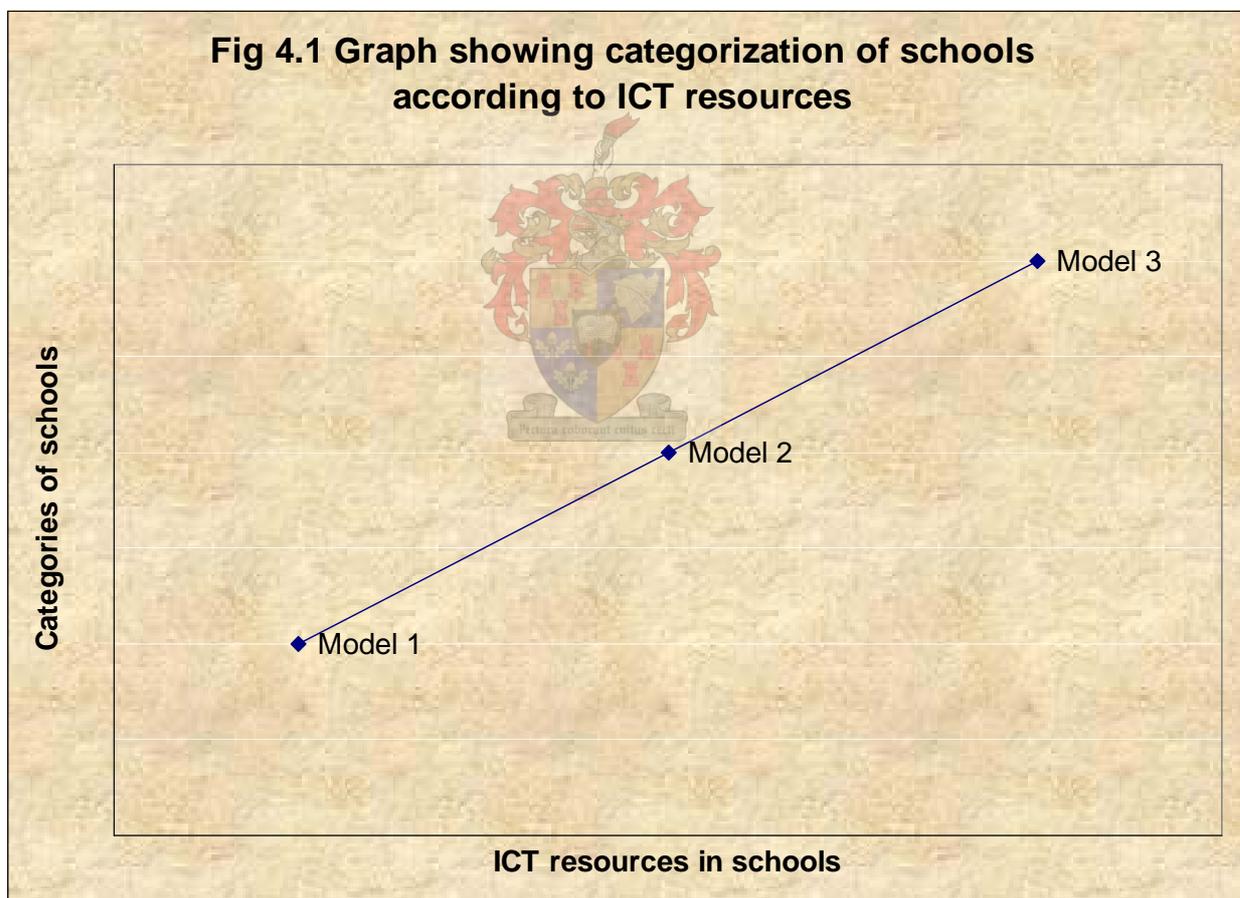
schools. So the challenge is to ensure that schools here are continuously improved to maintain the standard. It must be pointed out that without the full support of the Department of Education schools in rural areas cannot attain model three status.

From the five schools studied, only two of the schools can be placed in Model two. These are the schools where ICT resources were donated. The challenge now is for the Department of Education to provide the intervention which will see them attaining a model three status. The other three are in model one. These schools are using the meagre school fees they have collected to acquire their ICT resources. As things stand, only schools that have a good source of finance and/or donation of ICT resources will be able to produce learners with some ICT skills. The other schools cannot afford to acquire ICT resources on their own. Consequently, these schools will continue to produce learners whose skills will fall short of the global demands. The Department of Education must critically assess the situation and find out what kind of intervention to provide to enable schools in model one to at least achieve a model two status. Also the Department of Education must set in motion plans to move schools in model two to model three. If providing individual schools with ICT resources will prove financially impossible, then a network of schools as suggested earlier in the study can be considered while plans are made to get ICT resources into needy schools.

From the knowledge of the researcher, no school in the province has attained a model three status. This is a clear indication that Limpopo Province is not producing the future leaders with the prerequisite skills that will enable them to function effectively in the knowledge society. So far the Department of Education has not come up with any visible plan to ensure ICT integration. The new school curriculum for which training is being provided still does not integrate ICTs into the curriculum. These training workshops would have provided an opportunity for the Department of Education to attempt integrating ICTs into learning and teaching and evaluated the process to determine if the approach will succeed. If there are problems, they will be noted and rectified before whole-school integration of ICTs is implemented.

The table can also be seen as a continuum, where schools are trying to gradually infuse ICT into the curriculum. Demetriadis et al (2003) from a study into the introduction of technology into Greek secondary schools note that “there is indication that teachers proceed to adopt ICT in stages”. Myhre (1998) also note that teachers initially focus on their own interaction with the new ICT resources and as they gradually become comfortable with the technology, they start to explore the potential benefits of integrating it into teaching and learning. Myhre

(1998) concludes that as teachers' confidence increase; they turn their interest to pedagogical use of technology rather than its peripheral use. This process does not occur overnight and is not easily achieved because according to Joyce and Showers (1998) the adaptation to ICTs will need time for reflection and experimentation before educators can use it effectively in the classroom. These authors support the view that ICT integration in schools proceeds at a gradual stage. In effect the graph depicts the stage at which each school is with regard to its ICTs resources. This graph takes into cognisance the ICT resources schools have and not the time it takes for each school to acquire the ICT resources using their own means. If the time it takes to acquire the ICT resources were taken into consideration, then one would have attempted to determine how long it will take a school in model one for instance, to attain a model three status. The graph is shown below.



Schools in model one are beginning to develop their ICT resources by acquiring some computers which will be used by educators who have basic ICT skills for administrative purposes only. Schools do not use ICTs to support teaching and learning. Schools in Model

one are schools that do not have the necessary resources to acquire their ICT needs. There is the possibility that the school leadership is not computer literate thus show little or no interest in acquiring ICT resources.

With the increase use of ICT resources, schools become more informed of the benefits of ICTs in education, so more ICT resources are acquired and utilized in more school work. More use is made of ICT in administration and educators start to acquire basic computer literacy skills and to explore ways of adapting the available ICT resources to their teaching and learning processes. This will place schools in Model two.

As indicated earlier, there are schools in Limpopo Province that are well-endowed with ICT resources and thus fall within the model two status but because there is no curriculum in place and fully qualified staff especially in the rural school to champion ICT integration in schools, the schools cannot attain model three status. This makes educational content development and capacity building a key area of focus for the Department of Education.

There is no policy to guide the integration of ICTs. Schools use some ICTs to support teaching and learning processes but the level of integration is limited. Some educators are computer literate and more continue to acquire ICT skills but these skills preclude how to integrate ICTs into teaching and learning. It must be pointed out that schools in this model are schools that have ICT resources donated or have good source of funding, for example their school fees. Very few schools can be found in this category.

Model three will materialize when a new school curriculum is designed; resources for hardware, software, connectivity, technical support and professional development for educators are made available to enable complete integration of ICTs into the school system. If there are some programmes available, then it can start experimenting in selected schools to determine its success. By so doing, any problems that may arise will be solved. Schools to be selected for such experiments must be from all the provinces and from both the rural and urban areas. This will ensure that all areas of the country are represented and a balanced picture of the workability of ICT integration will emerge. Once the experimental schools proof successful, the Department of Education can proceed with the roll out of ICTs to all schools. For the Department of Education to accomplish full integration of ICTs into schools; there should be massive sources of finance for acquisition of ICT resources, integrated professional development programmes, curriculum support and technical support staff. If the business of integration of ICTs is left to individual schools alone, the dream of full integration will remain but a dream.

5 CONCLUSION

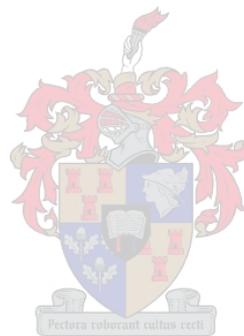
The integration of ICTs into education is seen by scholars and governments as very crucial if any country is to produce people to contribute effectively to the knowledge society. There is abundant evidence that South Africa is also doing its lot to ensure the successful integration of ICTs into the school curriculum. Various programmes have been launched and success stories are being told of some these projects. Despite these achievements, very little seems to be happening in rural areas. The prevalent story one hears of the rural areas is that of the lack of basic infrastructure and poverty. These stories presuppose that ICTs cannot be integrated into rural schools successfully because there are other basic needs to be attended to.

This study acknowledges that there are problems in rural areas but these should not preclude the rural areas from benefiting from the use of ICTs. The study has also highlighted the case of some rural schools where ICTs have successfully been integrated. From this study, there is clear evidence that with the proper professional development, appropriate technology and continuous support from the Department of Education, rural schools can also have ICTs integrated. It must be noted here that a project that succeeds in one area may not necessarily be successful in another. What needs to be done is, before ICT resources are supplied to schools, needs analysis of the area should be carried out to determine precisely what will be feasible in that area. It is only then that ICTs will be successfully integrated into rural schools. The provision of ICT resources must go hand-in-hand with the professional development of educators. It is worthy of mention that schools must be selected and the integration of ICTs piloted to determine its feasibility before a mass roll out. During the piloting process, emergent shortcomings should be identified and rectified.

The table and graph depicting the ICT resources level in the Limpopo Province provide a broad picture of what pertains in the Limpopo Province as far as ICT resources in schools are concerned. With this framework one can classify schools according to their ICT resources and determine what kind of intervention is needed in each school. Without such a framework, it would be quite difficult to determine what the ICT needs of individual schools are. Providing schools with ICT resources without such framework may lead to schools receiving ICT resources which they already have and some may not receive any ICT resource at all. The support of the Department of Education and its partners is the best way to realize full integration of ICTs in schools.

The Department of Education should note that the successful integration of ICTs in schools is a massive task. Training without the ICT resources will be futile as there will be no tools to

work with. The stocking of schools without the relevant training will result in the misuse of the ICT resources and if the relevant curriculum is not made available, ICT resources will continue to be treated as an add-on in teaching and learning. So there should be an integrated approach which will see professional development tied to the school curriculum goals, supported by adequate supply of ICT resources and sustained by a well trained technical staff and an adequate financial base.



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APPENDIX A

QUESTIONNAIRE FOR LEARNERS

Hello

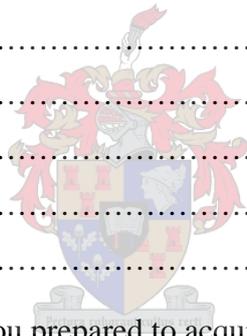
This questionnaire is aimed at determining the factors that can enhance the relative success of introducing Information and Communication Technology (ICT) in rural schools and what factors will militate against such process.

Kindly answer each question and reflect your true reaction when doing so. Indicate your choice by ticking the appropriate box and feel free to comment where necessary.

1. Are you computer literate? Yes No

2. If yes, please mention the computer literacy skills you have and what you do with these skills:

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3. If no, can you state why and are you prepared to acquire these skills if resources are made available to you?

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4. Do you have access to computers in your school? Yes No

5. If yes, please state what you do with the computers.

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6. What hardware/s is/are accessible to you?

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7. What software/s is/are accessible you?

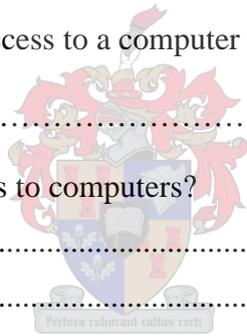
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8. Apart from school, do you have access to a computer anywhere else? Yes No

9. If yes, please mention the place.

10. At what times do you have access to computers?

.....
.....



..

11. Do you have access to the Internet? Yes No

12. If yes, please mention where and what you do on the Internet.

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13. Please state how the introduction of computers in education can benefit your schooling.

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APPENDIX B

QUESTIONNAIRE FOR EDUCATORS

Hello

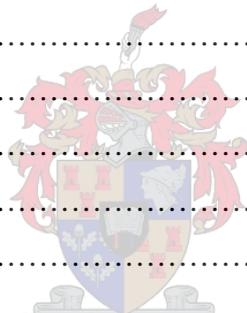
This questionnaire is aimed at determining the factors that can enhance the relative success of introducing Information and Communication Technology (ICT) in rural schools and what factors will militate against such process.

Kindly answer each question and reflect your true reaction when doing so. Indicate your choice by ticking the appropriate box and feel free to comment where necessary.

1. Are you aware of government's plan to introduce Information Technology as a resource to enhance teaching and learning and to assist in whole school development? Yes No

2. If yes, please mention what your school is doing to embrace this programme.

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3. What do you think will be the benefits of this programme to your school?

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4. Do you possess any computer literacy skills? Yes No

5. If yes, kindly mention them and state where and how you apply these skills.

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6. How did you acquire these skills?

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7. If you do not have computer literacy skills, are you prepared to acquire them if the resources are made available? Yes No

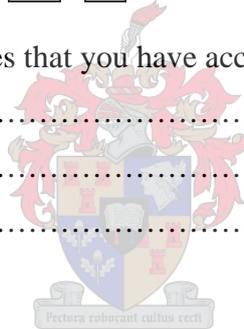
How do you think computer literacy skills will enhance your work?

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.....

8. Do you have access to computers? Yes No

9. If yes, mention where and the times that you have access to them.

.....
.....
.....



10. Please mention the hardware and software that are accessible to you by filling in the table below.

HARDWARE	SOFTWARE	SOURCE

11. How are the above mentioned upgraded and maintained and by whom?

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12. Do you have access to the Internet? Yes No

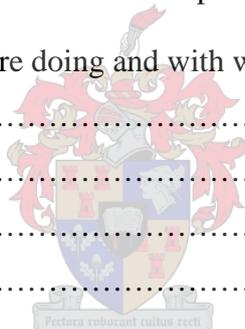
13. If yes, mention where and what you do on the Internet.

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14. Are you engaged in any ICT professional development for teachers? Yes No

15. If yes, please indicate what you are doing and with which institution.

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16. If no, please state why and whether you are prepared to engage in any if made available.

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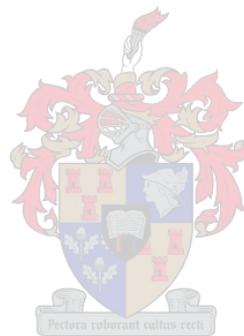
THANK YOU VERY MUCH FOR YOUR RESPONSE AND TIME!!!

APPENDIX C

INTERVIEW SCHEDULE FOR ICT COORDINATION IN THE PROVINCIAL EDUCATION DEPARTMENT

1. What measures are in place to ensure the successful roll out of government's e-education plan?
2. Which organizations/institutions are involved in rolling out the school networks and providing the necessary equipment, training, etc.?
3. How many schools have benefited so far?
4. What do these schools have?
5. Do you have standard package (hardware, software, training, etc) for every school?
6. What community support is envisaged?
7. What minimum requirement is required for a school to be considered for the project?
8. What plans are afoot to rope in schools that do not meet these requirements?
9. What professional development plans are in place for educators and administrative staff involved in this project?
10. How will the department handle educators and administrative staff who feel they do not need ICTs in their work?
11. What kind of technical support does the department offer participating schools?
12. How do schools obtain their resources?
13. What security systems does the department provide schools as far as abuse of the Internet and confidentiality are concerned?
14. Does the department have ICT policy for schools?
15. What can the department do to save schools from becoming dumping grounds for old computers?
16. Is there any special attention reserved for schools in very remote rural areas that have not got the resources to go the ICT way?

17. Does the department have plans to lure and maintain qualified ICT personnel in the rural areas?
18. How is this project maintained and evaluated?
19. How can the department ensure that this project is sustainable?
20. Do you have a policy to study the impact of ICTs on learning outcomes of the students and motivation of the teachers?



APPENDIX D

INTERVIEW WITH PRINCIPALS OF SCHOOLS WHERE QUESTIONNAIRES WERE DISTRIBUTED.

1. How many computers do you have?
2. How did you acquire them?
3. How do you maintain the financially?
4. What technical support do you have?
5. Where is/are the computer/s located?
6. Who has access to the computer/s?
7. What are the computers used for?
8. If for learners, what learning areas are taught using computers?
9. If learners have access to the computers, what is the ration of learners to the computers?
10. What groups of learners have access to the computers?
11. Do you have Internet? How do you pay for the Internet?
12. What software packages does your school use?
13. How do you acquire this software?
14. How do you upgrade the software?
15. How many educators are computer literate?
16. What is the ratio of learners to educators teaching ICT?
17. Do you have a plan to capacitate educators who are not computer literate?
18. If yes, what is the plan and is it recognisable by SAQA?
19. If no, why?
20. How do you think one can motivate educators who lack the necessary ICT skills to take interest in computing?
21. Do you have any policy informing the use of ICTs in the school?