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CHAPTER ONE

INTRODUCTION

1.1   Introduction

It may be argued that deficiencies in the use of Information Technology (IT) are the least of the problems of a continent plagued by a history of exploitation, post-colonial political difficulties, bloody civil conflicts, and extensive health, educational and economic problems. The impact of globalisation on Africa has not lived up to expectations, based on the figures released by the World Bank 2000 report. The report has shown that most of Africa's economies have indeed worsened in the age of globalisation and has resulted in increasing the information gap between developed and less developed countries (Henriot, 2001; Benjamin, 2001b).

Many believe that the information gap in less developed countries can be addressed through technology. Castells (2001) states that technology is a tool that enables access to information in all realms of activity which is usually seen as the solution to narrowing the gap between the advanced industrial and the less developed countries (LDCs) by allowing the LDCs to speed up development which would have taken far longer without the use of technology and access to information. Within South Africa, undeveloped areas have also to contend with a lack of access to information and technology.

Initiatives from the South African government have indicated an awareness of the critical role of technology in addressing the information gap between developed and undeveloped areas in Southern Africa (Snyman, 2002). In South Africa, however, the gap between those that have access to information and those who do not enjoy the same privilege is enormous. The existence of this huge gap in Southern Africa can be attributed to such factors as the legacy of the apartheid system, poverty, a lack of infrastructure in certain areas and the high costs of connectivity (Singh, 2002).

Overcoming these challenges are often underestimated by some as pointed out by World Bank President James Wolfensohn (2000) in his keynote address *The New Networked Economy: What is at Stake for the Developing Countries:*

> In many sub-Saharan African countries, there exists a blind notion that if the more developed countries use the technology then so should the developing countries. No IT policies or strategic buying plans exist which clearly identify the needs that are likely to bring overall benefit to a nation, or which determine what may be achieved with the available resources.

Wolfensohn (2000) goes on to say that without IT policies and strategic buying plans, there would be no harmony in the global network, and information technologies would serve not to brighten the future of mankind, but to darken it. Wolfensohn's remarks highlight the dangers associated with technology transfer into developing communities. Information Communication and Technology (ICT) centers are often relied on in an attempt to transfer technology and give access to information in developing countries. ICT centres are often used for the transfer of technology as they can be tailored to meet specific conditions imposed by the environment, are relatively cheap to deploy and maintain and have the potential to be accepted as a means to improve the local economy (Heeks, 1999; Colle, 2001).

The ineffectiveness of ICT centres, however, is one of the problems associated with poor technology transfer into developing countries (Van Audenhove, 1999; Conradie, 1998a). Many ICT centres in developing countries deployed for technology transfer, have as a result of their ineffectiveness been forced to close (Stilwell *et al*, 1999; Shetty, 2002;). Some ICT centres that have not closed have relied on handouts for their continued existence even though they have not been able to transfer technology successfully to developing countries (Butcher, 1995; Mphahlele & Maepa, 2003*).*
The intention of the research is to investigate possible reasons for the lack of effective technology transfer via ICT centres into developing communities and to suggest a way in which further attempts at technology transfer via ICT centres can be more effective.

1.2   Research problem

1.2.1   Main objective of research

The research focuses on attempts by Technikon South Africa (TSA) and various partners to implement Information ICT centres in rural and developing regions in South Africa. It is hoped that, from this longitudinal study, lessons will be learned which can be used to develop an approach for more effective ICT deployment via ICT centres. The study will take a formative and evaluative approach using case studies in order to address the following research question:

Which approach will ensure the successful sustainability of ICT centres in Southern Africa?

1.2.2   Research objective

The research objective for this study can be formulated as:

To investigate ICT centres over time in order to assist in the formulation of an approach that will ensure the sustainability of ICT centres

1.2.3 Sub-aims

To satisfy this main objective, the following sub-aims will be addressed:

Sub-aim one: To establish how each ICT centre was implemented and to identify the criteria used for the deployment of each centre

Sub-aim two: To determine how effective the ICT centres are perceived to be and to evaluate the level of success or failure of these projects

Sub-aim three: To identify the factors that contributed to the success or failure of the identified projects

Sub-aim four: To implement suggested changes in order to address the problems of ineffectiveness of the ICT centres

Sub-aim five: To monitor and review those ICT centres that have made changes for greater effectiveness

Sub-aim six: To draw up a conclusion that will indicate whether ICT centres are sustainable in Southern Africa

Sub-aim seven: To create an informative instrument for decision making to ensure the sustainability of ICT centres in Southern Africa

1.3   Demarcation of research

The research will be limited to six ICT centres that were deployed through TSA, each of which were located in developing areas in Southern Africa.

1.3.1 Research location

The research focuses on projects by TSA and its various partners to implement ICT centres in developing areas in Southern Africa. South Africa's neighbouring states will be included in this category. Developing areas were considered by TSA to be those areas populated by

communities, lacking in infrastructure and which had no previous access to ICT services. These areas were identified as recipients for ICT deployment.

1.3.2   The role of the researcher within TSA and the ICT centres

The researcher's role in the implementation and management of the six ICT centres was limited to the following perspectives:

- o   Initially the researcher acted in an advisory capacity to assist in implementing the infrastructure in the case of two of the ICT centers in order to assist the TSA in resolving the technical challenges posed by the two ICT centres
- o   The researcher assisted when ICT centres were failing to meet the original expectations as determined by the TSA
- o   After the researcher noticed the first problems with the ICT centres, he decided to gather data for research purposes in order to try and understand why the ICT centers were failing to deliver an effective service
- o   The researcher was enabled, through TSA, to monitor centres and advise people who were and are involved in the management of the ICT centres
- o   TSA management instructed the researcher to play an active role in assisting with the sustainability of the ICT centres and to advise on the implementation of each centre

1.4   Definitions of terms

1.4.1   ICT centres

ICT centres, within the context of the research, are defined as centres that can provide services through the use of Information and Communication Technology. ICT centres are able to offer at least the following services:

- o   Access to the Internet
- o   E-mail
- o   Access to basic word processing, spreadsheets and other application software
- o   Printing of documents
- o   Telephone facilities
- o   Basic IT training and support

Other facilities such as lamination of documents, faxing and photocopying facilities are often also available, but these are not considered essential elements in the definition.

1.4.2 Information Technology

Information Technology (IT) refers to technology that is based on networking, computers and software, and that adds value. Because information technology cannot be viewed in isolation, it must be seen as the enabler for upliftment and growth in a community.

1.4.3 Landscape audit

A landscape audit refers to the examination and documentation of characteristics of a specific geographic area that is served by an ICT centre in terms of the following:

- o Infrastructure which includes, access to power, water, transport, telephonic communication, physical buildings, legislation and cultural norms
- o Security of buildings that house the ICT centre
- o Support services which include access to IT support for both hardware and software

1.4.4 Abbreviations used throughout the text

The following abbreviations are used throughout the text and are defined as follows

SLA – Service level agreement which is a contract relating to the level of services rendered by the provider of the services and the user of that service.

UPS – Uninterrupted power supply refers to a backup power supply which is connected to sensitive equipment, usually computers, to prevent damage to equipment in the event of unreliable power supply or power outages.

CBT – Computer based training refers to the use of a software package together with the required hardware which allows users of the package to learn certain skills usually without the intervention of a person or teacher.

TSA – Technikon Southern Africa, the largest correspondence Technikon in Southern Africa.

1.5 Value of the research

The research will highlight problems and challenges faced by South Africa, which may or may not be prevalent elsewhere, and which must be considered when looking for solutions in ICT implementation. The intention of the research and subsequent recommendations is to sensitise potential donors and implementers of similar projects to the uniqueness of the

Southern African region. The identification and acknowledgement of specific critical success factors in establishing ICT centre effectiveness is key to ensuring success in the sustainability of ICT centres. The study will also explore theories and other research that deals specifically with technology transfer in developing economies.

1.6   Literature review

The transfer of technology to developing economies is one approach considered by first world countries as a way to assist in economic development. ICT centres offer one way of facilitating technology transfer to developing economies. Technology transfer will be discussed in detail to ensure a thorough appreciation of the potential of ICT in stimulating growth.

Many people are of the opinion that advances in ICT contribute to the creation of a new information society, which contributes to profound changes in all spheres of life, including globalisation (Conradie, 1998b; Ami, 2002; Siddiqi, 2001).

Globalisation, for instance, is seen as the confluence of economic, political, cultural and social factors interacting through the expansion of knowledge, information and technology on a world scale (Morales-Gomez, 1997; Davies, 2001). Information technology facilitates the adoption of globalisation across international borders. As the richer part of the world is advancing in terms of the Information Society, the developing countries are being left further behind resulting in a widening of the digital divide (De Boer & Walbeek, 1999). It is widely advocated that through the use of ICT centres in developing areas, it is hoped that the gap between the richer countries and developing countries can be narrowed by technology transfer (Grossberg *et al*, 2001).

It is important to define technology transfer within the context of the study. Technology transfer is best described as the combination of the transfer of knowledge and information needed to use equipment in order to satisfy a need. West (1996) supports this definition by stating that, in practice, technology does not refer to the equipment, but rather the information required to design and build it and put it to use. Therefore, the diffusion of knowledge and technology forms the basis of a well-designed strategy for technology transfer.

Technology transfer in the developing countries of Africa is not always effective due to the lack of information and commercial know-how required to assess the merits of the benefit of the technology (Ouma-Onyango, 1997; Latchem & Walker, 2001). Ouma-Onyango (1997) argues that the recipient countries are often poorly informed about alternative sources, suppliers and markets leaving donors or suppliers with extensive decision-making powers, very often to the disadvantage of the recipient country. This type of situation is worsened by

bureaucracies and by uninformed decision-making practices (Adedeji *et al*, 1991). Adedeji *et al*, (1991) consider technologies in enclaves as untransferrable and contributing less than their potential, and state that for a more beneficial and effective technology transfer, the following should be considered:

o   Suppliers and their operation record
o   A supplier's overall business profile and strengths and weaknesses
o   A supplier's competitors and intimate knowledge about their integrity

Adedeji *et al*, (1991) also warns of the concept of industry transfer as opposed to technology transfer. Industry transfer is the transfer of productive capacity and a little operational know-how resulting in the inability of the recipient of the industry being able to benefit from the industry transfer. This is aggravated by the fact that many countries do not have policies regarding the acquisition of technology. Some writers suggest that wholesale or indiscriminate transfer of technology to underdeveloped counties may not be in the best interests of Third World's peoples (Melody, 2003; Hyden, 1983).

The aforementioned practical factors and theoretical considerations have contributed to the commonly held view that technology should not just be transferred in a mechanical manner. Whatever technology is transferred to or intended to be used in Third World countries for the purpose of development, it should be adapted to local needs (Mohan, 1990).

Sackman (1986) states that the impact of IT in highly industrialised societies has been well documented, unlike the impact of IT in developing countries. Sackman argues that the influence that IT has on the lives of most rural dwellers in many developing countries is insignificant. This is supported by work done by (Hans & Reder 1998; Van Audenhove, 2003), whose observations have indicated that while developing countries have made slow progress in implementing IT, the focus has been on the automation of routine tasks as opposed to the development of advanced applications and telecommunications.

Ouma-Onyango (1997);, Odedra (1992); and Pater (2002) warn against the danger of local participants and project managers in under developed countries investing themselves with capacities that they may not possess, resulting in organisations not being able to effect change, and in so doing perpetuating the underdevelopment cycle. This is mainly due to development and implementation strategies which are based on Western belief systems, social and political values (Curtis, 1994; Pearce, 1996; Steinmueller, 2001) and is further complemented by strong economies that ensure a high degree of successful IT implementation (Hyden, 1983; Mutume, 2003).

Economies that are not strong and are still developing have to deal with challenges in technology transfer which stronger economies do not have to consider, such as a lack of infrastructure and the technical prerequisites for access to digital information. Other challenges to technology transfer include language barriers, lack of computer skills and, in some instances, legal restrictions and corruption (Michel, 1997; Saraswat, 1991). Perhaps the mechanism used for the transfer of technology to developing countries should be considered as one of the ways in dealing with challenges highlighted by Michel. The use of ICT centres is one way in which technology can be transferred and which could be seen as a tool to deliver communication and information to the rural and disenfranchised (Figueres, 2003). ICT centres could also be considered as key to technology transfer in developing areas and a way in which to stimulate economic growth (Colle, 2001).

1.7 Research approach

A large amount of academic research is based on empirical techniques (Remenyi, 1998). Furthermore, every empirical investigation presupposes an understanding of the material under investigation and, therefore, some kind of theoretical base, which enforces the need for extensive reading. After this, the empiricist goes out into the world and observes, through experiment or by relatively passive observation, what is happening. By studying these observations and collecting related evidence, the empiricist will draw conclusions and make the claim that something of value has been added to the body of knowledge (Millar, 1994; Cryer, 1996).

This study is centred on the philosophy of empirical research which is supported by a significant amount of theoretical research. Gummesson (1991) and Mouton (1996) points out that there is an expectation that the researcher should also develop a sensitivity to the theoretical categories which are being used so that they are transcended and transformed into better theory.

The research method which is employed in the study follows the principles of action research.

1.7.1 Action research

Action research was developed during the 1960s. French & Bell (1990) have defined it as:

> The process of systematically collecting research data about an ongoing system relative to some objective, goal or need of that system; feeding the data back into the system; taking action by altering selected variables within the system based

both on the data and on hypotheses; and evaluating the results of the actions by
collecting more data.

Action research usually involves a small-scale intervention on the part of the researcher in the
phenomenon being studied.

Action research as a process is dependent upon an external view of a situation and it
essentially involves:

- o Taking a static picture, which will be referred to as the benchmark of the
  organisational situation
- o Formulating a hypothesis based on this benchmark
- o The manipulation of variables under the control of the researcher, in the form of
  suggestions and assistance through technology, third parties, etc
- o Evaluating a second static picture of the situation after a reasonable amount of time

The action researcher is thus involved in a practical manner in an organisational situation. In
this situation there is not only an expectation that a 'contribution to knowledge' should be
made, but also the expectation that knowledge will be produced that 'can be applied and
validated in action' (Bell, 1993).

It should be clear from the above that action research provides the researcher with good
quality access, but constitutes a potentially demanding process for the collection of data given
the location of the researcher within a 'live' situation. The cooperation of the ICT centres and
TSA's staff or company personnel involved in the study were crucial to the success of this
strategy. The researcher had to fulfil the dual role of a consultant and an academic researcher
(Bell, 1993).

The process that was applied to the ICT centres consisted of five steps. The process was
reiterative and is outlined in the diagram below.

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┌─────────────────────────────────┐
│            Step 1               │
│  Snapshot of the centre's status │
└─────────────────────────────────┘
                 │
                 ▼
┌─────────────────────────────────┐
│            Step 2               │
│  Implement measurements for centre │
│           assessment            │
└─────────────────────────────────┘
                 │
                 ▼
┌─────────────────────────────────┐
│            Step 3               │
│   Suggest, implement and monitor │
└─────────────────────────────────┘
                 │
                 ▼
┌─────────────────────────────────┐
│            Step 4               │
│   Determine effectiveness and   │
│          centre's status        │
└─────────────────────────────────┘
                 │
                 ▼
┌─────────────────────────────────┐
│            Step 5               │
│  If satisfied, document; otherwise go │
│          back to step 3         │
└─────────────────────────────────┘
```
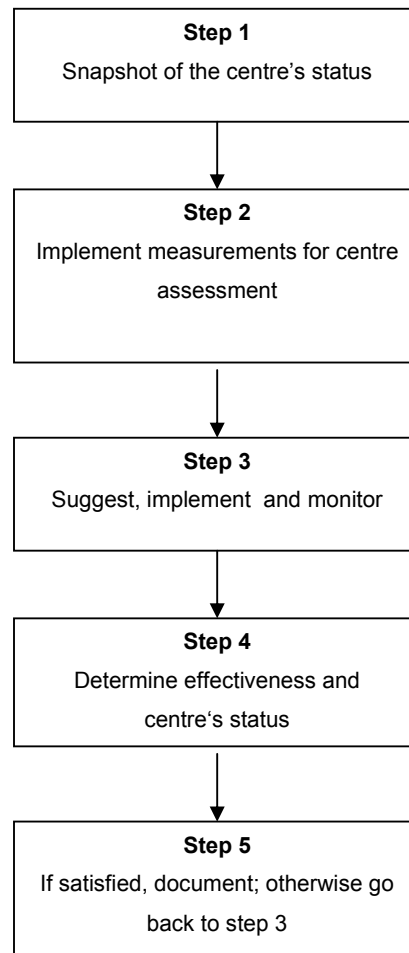
Figure 1-1 The research process applied to ICT centres

As can be seen from the diagram, each case study or ICT centre was subjected to an initial audit to establish the status quo. Thereafter, metrics or measurements were determined that were used for gauging changes to the effectiveness of the ICT centre. The third step focused on suggestions that were made by the researcher and communicated to the centre's staff to assist with the ICT centre's service delivery. It was also here where the suggested changes were implemented. The fourth step was where the researcher measured the changes according to the metrics determined in step two, in order to determine whether there had been a change or improvement in the ICT centre's effectiveness. Step five was where the researcher had to consider the outcomes of the measurements so as to determine the ICT centre's effectiveness. Should the ICT centre have showed insufficient improvement, the process reverted back to step three, namely the implementation of suggested changes.

1.7.2   Use of case studies

Each of the ICT centres included in the study can be regarded as separate case studies. The case study methodology is a way of establishing valid and reliable evidence for the research process as well as for presenting findings that are identified from the research (Yin, 1994).

> A case study may be defined as an empirical inquiry that investigates a contemporary phenomenon within its real life context, when the boundaries between phenomenon and the context are not clearly evident, and in which multiple sources of evidence are used. It is particularly valuable in answering **who, why** and **how** questions in management research (Yin, 1994b).

According to Bell (1993), the case study methodology has been used as an umbrella term for a family of research methods which have in common the decision to focus on an inquiry around a specific instance or event. It is the aim of a case study to provide a multi-dimensional picture of a situation in order to illustrate relationships, corporate political issues and patterns of influence in particular contexts.

1.7.3   Data collection methods

Three data collection methods have been used, namely participant observation, interviews and document analysis.

Interviews were used extensively throughout the research and conducted on an informal basis. They were conducted with a number of people who were involved in each ICT centre and people who have made use of the ICT centre's services. The interviewees included the management staff of the ICT centres, other stakeholders and members of the community who were reliant on the ICT centres. Through the interviews and ICT centre usage determination, a gap analysis was done to help determine the effectiveness of the ICT centres after adjustments had been effected. A gap analysis is defined, in this context, as the difference between the actual condition and the required need. The recommendations are based on the findings of the gap analysis.

Participant observation is the second method of data collection and was applied to a greater or lesser extent depending on the situation and circumstances. Typically this approach was used to obtain an understanding of the dynamics of an ICT centre and other issues which may prove significant in the research. The researcher at all times observed and recorded progress, identified problems and formulated the findings in terms of the approach that was

tested. After the changes had been implemented to the same ICT centres, the researcher again observed and recorded the impact of changes to the ICT centres.

Document analysis, the final data collection method, was used to collect data for formal and informal documentation that related to the centres.

1.7.4 Sampling

The sample consisted of the six ICT centres for which TSA had been responsible. The implementation of these ICT centres began late in 1997.

The names and exact locations of the ICT centres will not be divulged for internal political reasons within TSA. The chapter dealing with the individual ICT centres will, however, give a detailed description of the environment and other pertinent details of each ICT centre in question.

1.8   Overview of dissertation

The dissertation will be structured as follows.

1.8.1 Chapter one – Introduction

Chapter one introduces the reader to the widening gap between developed and developing communities and the perception held by many on how this gap can be narrowed by technology transfer via ICT centres. The concept of an ICT centre is defined and the role of ICT centres in technology transfer in developing areas. The chapter also describes the research process and approach that is used in the study. A definition of the research problem is discussed as well as the research objectives and questions that the study focused on.

1.8.2 Chapter two – Literature review

This chapter discusses the issues of technology transfer and obstacles to successful technology transfer to developing economies in general. This discussion is linked to the situation in Southern Africa, with reference to similar environments in other parts of the world. The role of ICT centres is described which leads to the discussion about possible reasons for the low success rate of these centres. Strategies for ICT centre implementation through technology transfer are also discussed.

1.8.3 Chapter three – Research methodology

The research philosophy underpinning the research process is examined, with particular reference to action research making uses case studies. The research instrument to be used for the assessment of the effectiveness of the ICT centres is described in detail.

1.8.4 Chapter four – Case studies

The six ICT centres that have been identified as part of the research area are described in detail. Information relating to the demographics, infrastructure and the environment in which the centres are situated, and other relevant information is also included.
The observations about each ICT centre are documented, based on the application of the research instrument. The following issues are presented in the chapter:

- o Summarised observations and interpretations – this data will include the before (benchmark) situation of each ICT centre
- o Identification of measures that could ensure sustainability
- o The process of implementation of these measures
- o The end result after solution implementation

1.8.5 Chapter five – Findings and Discussions

The six ICT centres are assessed in terms of effectiveness and sustainability. Those centres that are not sustainable are identified according to the predetermined criteria. The findings are documented in order to establish the reasons why some ICT centres are not sustainable.

1.8.6 Chapter six – Summary and Conclusions

A brief synopsis of the research is included together with conclusions based on the research questions and sub-aims.

1.8.7 Chapter seven – Recommendations

Based on the findings of the study an approach is described to suggest a possible way on how the deployment of ICT centres in developing areas in Southern Africa could be attempted.

The appendices contain the templates which were part of the research instrument.

1.9   Summary

In summary the purpose of this study, is to try and gain an understanding through attempts by Technikon South Africa (TSA) and various partners as to why ICT centre implementation is often unsuccessful. ICT centres in the study were mainly in rural and developing regions in South Africa, and from this longitudinal study, the lessons learned will be used to develop an approach for more effective deployment of ICT centres.

The research will also attempt to highlight unique problems and challenges faced by South Africa and which could be considered when looking for solutions in ICT centre implementation. Identification and acknowledgement of specific critical success factors in establishing ICT centre through effective technology transfer will also be examined.
The next chapter will discuss theory relating to the research.

CHAPTER TWO

LITERATURE REVIEW

2.1   Introduction

This chapter begins with a discussion of ICT for development, followed by an overview of technology transfer to undeveloped environments. The chapter then examines barriers to technology transfer in developing areas and discusses ICT centres with particular attention to sustainability, by referring to case studies and lessons learned in ICT centre deployment. The chapter concludes with a description of a model of ICT implementation which will be used in this study to design an appropriate approach for ICT centre deployment.

2.2   ICT for development

Development is a widely participatory process of social change in a society, intended to bring about both social and economic advancement, including greater equality, freedom, and other valued qualities, for the majority of the people through their gaining greater control over their environment (Bandura, 1998). There exists a realisation that access to technology is a development imperative. Making use of new communication technologies such as the Internet is understood to represent a development communication tool that can contribute to higher levels of social and economic improvement in developing countries by providing access to information, and that access to the Internet and information and the spread of this access can provide developing economies to reap the benefits of global networking (Mansell, 2004). Technology has the potential for communities to improve their lives through access to applications and digital information resources. The role of information in development is considered critical for knowledge building and informed decision making and for developing economies to be able to become part of the global economy (Melody, 2005) .
In addition, the adoption of technology may allow developing economies to facilitate closer integration of the value-added chain through the reduction of costs for services and products and the choice of suppliers across boundaries albeit physical or international (Mansell, 2004). ICT harnessed in the appropriate manner has the potential and ability to create opportunities for those economies to partake in the global economy. There is evidence to suggest that a strong correlation exists between economic growth and poverty reduction, and that through the promotion of the exchange of information, ICT has the potential to contribute significantly to development in rural areas (Srinivasan, 2001).

In developing economies it has been shown that ICT has had a great impact on decision-making processes, markets and local empowerment and has shown significant potential for

social and economic development (Mahmood, 2005). ICTs can be used for the alleviation of poverty, which in turn creates a conducive environment for social development. Research has also shown that ICT has the potential to contribute to aspects such as economic sustainability and social upliftment (Conradie, 1998 & Benjamin, 2000). ICT is also considered as a way of increasing integration of ideas, information and technology, which is especially important in the stimulation of economic growth (Ikeme, 2002; Reich, 1991; Annan, 2000).

Rural areas in particular need ICT in an attempt to narrow the information gap between the communities in the urban areas and the communities in the rural areas. The World Summit on the Information Society in 2003 strongly recommended that governments and other stakeholders make provision for access to information in those areas which previously never had the means to access information. This is supported by an increasing body of evidence which indicates that ICT is effective and commercially viable even in poor rural areas, if properly managed. Bangladesh, India, Indonesia and Senegal are examples of countries where ICT has been used successfully for improving the social and economic status of the regions where ICT was deployed (Ernberg, 1998b). Ernberg (1998b) argues that the provision of more advanced information and communications services which meet the needs of people in rural areas, could certainly make a significant difference, provided that people are made aware of the potential benefits and that the services can be provided at an affordable cost.

The growing recognition of the impact ITC has on the creation of employment opportunities and income generation in developing communities is critical to the continued momentum for ICT deployment in developing countries and communities (Daniels, 1999). Information and information handling has been shown as essential in micro-enterprises in Kenya, especially as many of these small enterprises were established in rural areas and previously did not have access to ICT and information. Advances in ICT, specifically the Internet and the World Wide Web, make possible a radically different type of future society, particularly in developing countries. The potential for this type of communication in developing areas has only begun to be realised, especially as the potential of the Internet and the World Wide Web enables disadvantaged people to communicate with societal decision-makers (Rogers, 2000). Communities can therefore be empowered to determine their own futures through developing self-efficacy and collective efficacy as communities gain access to accurate information about social problems and their possible solutions (Bandura, 1998). It is becoming increasingly clear that there is a critical need for information and also for all to become part of the information society.

The process through which the new communication technologies are used as a means for furthering development towards an information society is called informatisation (Rogers, 2000; Singhal & Rogers, 2001). Informatisation in Southern India, for example, has shown an

improvement in development in the last several years by allowing communities access to both information and knowledge (Singhal & Rogers, 2001).

Although there is evidence that ICT has been effective, there is also concern expressed by some that that although there have been many attempts to implement IT solutions in rural areas around the world, there is very little evidence to suggest that the objectives of these attempts have been realised (Lanvin, 2003; Heeks, 2002; Menou, 1995; Berg, 2003).

Despite numerous attempts to harness ICT in developing areas for development and growth, there is still a significant gap between developed economies and developing economies for those that need access to information (Singh, 2002). Singh (2002) attributes the existence of this huge gap to factors such as legacy systems, poverty, a lack of infrastructure and the high costs of connectivity. Attempts at trying to deploy access to information in developing areas are often unsuccessful, as consideration has not been given to factors which are necessary to support universal access to information. For example, some governments in developing countries were determined to provide universal access to ICT services, often forgetting their own incapability to provide national access to basic services as well as universal services. (Lanvin, 2003; Heeks, 2002; Menou, 1995). Although the use of technology such as the Internet and cellular phones has increased the freedom to communicate, sub-Saharan Africa has the least developed telecommunications infrastructure in the world, with only 0,4 per cent of the world's telephone lines (Nxasana, 2002).

While appreciation for the value of Information Technology (IT) is clear (Nedtel, 2003; Castells, 2001; Conradie, 1998; Benjamin, 2000), the effective deployment of IT should be considered as key in realising the potential of IT and development (Snyman & Snyman, 2001).
Effective deployment of IT relies on the understanding of local conditions which could impact on its successful deployment in developing economies. A lack of understanding of local conditions can result in obstacles stand in the way of developing countries being able to take part in the information society, thus negating the potential of technology as a tool for development (Sebusang & Masupe, 2005). Obstacles to IT deployment and, more importantly, the sustained use and success of IT, are often symptoms of an initial lack of understanding of local conditions, resulting in total failure of IT projects. It appears that many of the mistakes such as ignoring the local conditions and specific community needs were being repeated by organisations attempting to improve the economic situation of developing areas through technology transfer (Benjamin, 2003; Berg, 2003). This is a situation that developing countries, especially, cannot afford (SAIDE, 1999). It would seem that many failures have occurred because of inadequate planning.

There appears to be little evidence of a thorough evaluation of the failures, in so doing depriving others of insights into practices to be avoided (Mphahlele & Maepa, 2003; Adler & Bartholomew, 1992). The same approach to IT implementation is used time and again in developing areas resulting in the recipients of IT not being able to realise the intended benefits of IT deployment (Butcher, 1995; Van Dijk, 1997). The views of Butcher and Van Dijk are supported by others who maintain that there is also evidence to suggest that IT deployment in developing countries is a highly uneven process which has resulted in varying degrees of success between countries **(**Davies, 2001; Roman & Blatmann, 2002)**.** This fact could suggest that the recipients of the technology between these countries also vary in terms of needs and local conditions. There are those who advocate the importance of adapting the way in which ICTs are deployed in developing countries and even in communities in the same countries. (Refer to the section 2.7 , page 49 on lessons learned). Based on the poor record of attempts to implement technology in developing countries, it seems that there is no 'one-size-fits-all' approach and it is therefore important to keep in mind that not every attempt to implement an ICT project needs to use the same plan used in a previous attempt. Those responsible for the deployment of ICT in developing countries need to decide which methods and approaches are going to be used.

Nevertheless, the potential of ICT for development is still considered one of the most effective ways for facilitating development in developing countries, and is based on the transformation from manual labour to automation of tasks through the advances made in technology (Bell, 2002). Bell bases his theory on the move from a goods producing society to a service-driven society. Bell argues that there is a growing need for information in most modern occupations (Webster, 1995). While there is some criticism of Bell's work, there is evidence to support Bell's suggestion that technology and the influence that technology has on social aspects, especially in a developing economy (Duff, 1998). There is strong evidence that technology needs to be viewed in isolation when used for development and, as Bell - like many others – suggests, that there is a need to place more emphasis on other issues critical to successful ICT deployment in developing countries. Unless addressed, these issues can become obstacles to effective deployment of ICT. It is obvious that many developing countries which focus purely on technology for development whilst ignoring other factors like that of technology transfer, are often characterised by having insurmountable obstacles to ICT implementation. This in turn results in these developing countries maintaining the lag between developing countries and developed countries.

The lag in developing countries partaking in the globalisation process over the years has been largely due to attempts to overcome obstacles such as sparse population densities and high infrastructure costs. It is argued, however, that with the emergence of new technologies, and especially through the implementation of ICT centres, the lag experienced by developing countries can be addressed (Figueres, 2003). ICT centres in developing economies have shown that they facilitate improvements in productivity, as they provide access to knowledge

and information which are key to productivity (Castells, 2001). Castells (2001) maintains that there is evidence to suggest that that the lag between developing countries and developed countries, particularly in income and poverty, are decreasing and that access to ICT has contributed to this turnaround.

The argument for using ICT in development revolves around the enabling effect of ICT. ICT has the potential to provide access to knowledge and information, which are key to productivity and improvements in productivity (Castells, 2001). ICT also increases the possibilities for action between and among people in situations where latitudinal and longitudinal location seems immaterial to the social activity at hand (Scheuerman, 1996). In other words, barriers to development resulting from location, especially between developing and developed countries, can be overcome through the use of technology.

What remains for effective deployment of technology is an integrated approach to the use of ICT in development (Figueres, 2003). The integrated approach used for the transfer of technology depends on the form in which the technology is to be transferred from developed countries to developing countries. Technology can be transferred in a purely informational form, known as disembodied technology transfer, or, alternatively in an embodied format which refers to technology in the form of a product or machine, together with the ability to use the product or machine (Keller & Chinta, 1990). Keller and Chinta (1990) maintain that the approach and form of technology which is transferred is critical in determining the effectiveness of the technology transfer. The recipient of the technology must have the means to be able to make the most of the technology. Herein lies the key for the effective transfer of technology through the recipient ability of being able to harness technology effectively (Berg, 1993). This dissertation attempts to provide evidence that for technology transfer to be effective, the ability to harness technology in developing areas should ideally be the main focus.

2.2.1 Harnessing ICT for development

It should be clear that technology alone cannot be seen as the catalyst for development but should be transferred in the correct manner in order to be effective. Webster maintains that there are five factors, (listed below), that could be considered as the criteria for influencing the effectiveness of ICT and its impact on development (Webster, 1995):

- o Technological
- o Economic
- o Occupational
- o Spatial (information networks)
- o Cultural

The technological factor deals with the innovation of affordable information technology and the speed at which improvements are made which affect and influence people (Wigell-Ryynänen, 2002). As technology is continually advancing, improvements not only result in the increased affordability and impact of the technology, but also in ease of use. In other words, later technologies are becoming more user friendly and require less sophistication for effective use (Dagron, 2001). This means that communities in disadvantaged areas are therefore more able to use and harness the potential of the technology provided that they have been trained in the use of it. There is no longer a need for highly skilled personnel to operate and maintain ICT, for with the rate at which technology improves, so does the ease of use. For this reason it becomes increasingly viable to deploy technology in remote areas as the need for access to skills normally found in cities, is significantly reduced.

The economic factor is a measurement of the impact that ICT has on an economy (Adam & Wood, 1999). In the case of Nigeria, for example, information and communication technologies have opened up new opportunities for the Nigerian print media to improve on their products and services through marketing and dissemination of information to customers (Ehikhamenor, 2002). Quantifying the improvement resulting from technology is critical for those who have to justify the technology transfer to developing areas. This is particularly important as in some instances the needs of the community are constantly being assessed and then aligned with solutions to address these changing needs (Clark, 2002). Therefore, technology underpins the mechanism which supports the solutions that satisfy the dynamic nature of the changing needs. Technology, is not considered as a means to an end, but rather as a way in which an idea can be applied to address a need.

The occupation factor can best be described as a change in the way in which people work. People have moved towards occupations that require information to carry out their tasks (Veskimae, 2002). Linked to the previous factor, the occupation factor entrenches the notion of technology as an enabler. Veskimae bases this assertion on the work done by Porat (1978), who developed what has become a typology to occupations that are primarily engaged in the production, processing or distribution of information. The occupation factor is a good example of the move from manual tasks requiring little information to tasks which are reliant on the ease of access of information. Castells contends that the effectiveness of the technological information revolution is the driving force behind the success of all other major transformations, resulting in the industrial society being replaced by the Information Society. (Naisbitt & Abudene, 1986). For this reason alone, ICT centres, if used effectively on a sustainable basis, should be seen as one of the most effective ways of allowing communities in general to develop their respective local economies.

The spatial factor must be considered in terms of time and space. The physical location is no longer a barrier to access to information; through the use of remote access and networks

information can be accessed at any time (Goddard, 1995). Historically, one of the major reasons for developing economies being isolated from the developed world was due to the physical location of the developing economy. This is no longer a barrier for these previously isolated economies, and the barriers to development resulting from location can be relatively easily addressed through communication technologies such as the Internet and other communication technologies (Scheuerman, 1996). Coupled to the ability to access information in remote areas is the added advantage for communities or individuals in being able to access information at will. Previous constraints resulting from normal working days or business hours do not determine when information can be accessed. Provided the means of information access is flexible in terms of people's needs, the user can work and make use of ICT when it is most convenient.

Finally, the social factor is a result of a media-filled society such as television, radio, newspapers and the Internet which enables the dissemination of information mainly along what Poster (1995) refers to as the information superhighway. The rate of adoption of the Internet and the World Wide Web may represent the fastest diffusion of any innovation in the history of humankind. In around 1991 the rate of adoption of the Internet passed the "critical mass", meaning that an adequate number of adopters had occurred for further diffusion to become self-sustaining. Thereafter, increasing millions of new users have adopted the Internet each year.

Although developing countries may not share the same rate of absorption as in developed countries, the principle certainly still applies to the rate of Internet adoption in developing areas (Rogers, 2001). This research focuses mainly on ICT centres and the centres' menu of services and it is important to appreciate the role of alternative means of communication other than the Internet. For example, with the advent of cell phones, small messaging services (SMS) has indeed made the cell phone an effective and affordable means of communication.

It is therefore clear that Webster's five factors have a significant influence on the potential and flexibility of ICT adoption. These factors should be considered when transferring technologies to developing countries, and that technology alone must be seen as an enabler only when transferred with due consideration given to these factors.

2.3   Technology transfer

Over the years, various views have been developed regarding the definition of technology transfer. These views were influenced at the time by the nature of the technology transfer and in particular the purpose for the technology transfer. The nature or type of technology determined what could be achieved with the technology. While the purpose of the technology

was determined largely by the sophistication of the technology. In other words technologies developed in earlier years had less potential and use compared to the same kind of technology developed in more recent years. An example is the telephone and the cell phone, both of which are used in verbal communication. The cell phone provides additional services and does not restrict one to the wired network.

Views regarding technology transfer from developed economies to developing economies have emphasised the differences between cultures, politics and the economic situation between the donor and the recipient of the technology and will be discussed further on under the heading 'Obstacles to technology transfer' (Johnson *et al,* 1997). This study strives to highlight the importance of considering factors such as culture and economic which could influence technology transfer, that may not be ordinarily be apparent in a homogeneous society (Clark, 2002; Heeks, 2002). For this reason it is critical to appreciate the concept of technology transfer within the context of prevailing circumstances and local conditions in developing countries.

The concept of technology transfer can be defined as the purchase of some piece of equipment together with the information required to design and build it and put it to use (Adedeji *et al,* 1991). The definition of equipment in the context of technology transfer refers to machinery, computer equipment or any other device together with the necessary software or other manufactured essential parts needed so as that this piece of equipment can be activated and used. The definition does not include elements such as the knowledge required to enable the operator to use the equipment as this is discussed next**.** The focus of technology transfer is therefore not only on the actual technology, but rather on the information that is necessary to enable the recipient of the technology to use and maintain it without the continual assistance of a third party This important observation links up with the previous discussion which refers to the user's ability to harness technology. Unless there is sufficient knowhow, the potential of the technology cannot be effectively harnessed. Furthermore, unlike the technology itself, information on how to use the technology is often unavailable, leaving the technology user to fend for himself and, in doing so, negating the purpose for the technology transfer in the first place. Many assert that learning and mastering core technology means developing the capability and capacity to 'manage' the technology on a sustainable basis (Clark, 2002, Dragon, 2001; Heeks, 2002; Veskimae, 2002; Castells, 2000; Adedeji *et al,* 1991).

It should now be evident that the technology or equipment in technology transfer is only a part of the transfer process, and that technology transfer relies on consideration of the local factors of the recipient and the assurance that the recipient is able to use the technology for transfer to be effective. Factors needed for effective technology transfer are also referred to by Muller (1980) who states that there are four layers to take into account to fully understand

technology transfer and should be considered for effective technology transfer. The four layers are technique, knowledge, organisation and product.

Technique refers to the resources and energy required to facilitate the transfer of technology and the ability to project manage and deploy or implement the technology. This layer is usually the responsibility of those charged with the responsibility of the actual implementation of the technology, although the recipient of the technology should also be involved (Clark, 2002).

Knowledge refers to the experience and skills needed by the recipient of the technology to use the technology after it has been transferred. This is when the implementer of the technology has signed off the transfer, and the responsibility for the technology reverts to the recipient (Benjamin, 2002).

Organisation refers to the bringing together of technique and knowledge and is part of responsible technology transfer. The organisation also refers to an overall project plan which should ideally factor in essential elements for the most appropriate approach for technology transfer. This approach forms the core of the study and is discussed in more detail.

Product refers to the result of the technology transfer process. The end result or product of the technology transfer process should be monitored and measured long after the transfer has been completed, in order to determine the success (Figueres, 2003).

Molnar and Karvalics (2001) refer to a fifth layer that they consider vital to technology transfer. They refer to the ownership by the local community who would benefit from the technology, in particular, the way the community is able to take advantage of the technology. The receiving partner or country must have the ability to absorb and manage the technology and not merely receive it. In other words, the receptor must possess or have access to the skills in order to take advantage of the technology and to realise its full benefit (Pistorious, 2000).

The five layers referred to are impacted on by the local conditions and needs of the recipient to a greater or lesser degree. Previous failed attempts at technology transfer to underdeveloped societies confirm that those responsible for technology transfer failed to realise that technological development must be deployed within the norms of the prevailing culture and that local conditions must be considered in technology transfer (Adedeji *et al,* 1991). It should become clearer towards the end of this dissertation that there is no single solution for technology transfer, as circumstances differ from location to location (Berg, 1993). These changing conditions are mostly due to factors which, unless identified and managed, result in barriers to technology transfer. Those responsible for technology transfer to developing countries must be sensitive to the barriers or challenges in the way of successful

transfer and should have the ability to overcome these barriers. Ignoring barriers to technology transfer is likely to result in poor and ineffective technology transfer. Those responsible for the transfer process must therefore be aware of the barriers and adapt the approach accordingly (Castells, 1998).

2.4   Barriers to technology transfer

Large organisations in developed countries, making use of IT and realising its effectiveness, have by their success created the impression that IT could be used to help developing countries in the same way (Shitma, 1998). This perception very often leads to certain factors being ignored, which causes unforeseen barriers or obstacles and often prevents effective technology transfer (Sassen, 2002). These barriers to technology transfer are hindrances that make the transfer of technology to developing countries difficult or even impossible.

Research carried out in developing countries confirmed that the likelihood of successful technology is inhibited if barriers are not identified, inhibit the transfer of technology resulting in the lack of a full realisation of the benefits of technology (Ouma-Onyango, 1997).

The aforementioned theoretical considerations have led to the now widely held view that technology should not just be transferred in a mechanical manner (Mohan, 1990). Rather, when technology is transferred to Third World countries, it should be adapted or made appropriate to the needs of the local community if it is to contribute to meaningful development (Clark, 2002, Dragon, 2001; Heeks, 2002; Veskimae, 2002). Just as importantly, successful technology transfer also depends on buyer capability (Michel, 1997).

Decisions for the successful diffusion of technology in developing countries should be viewed within the context of the country in question, to establish the most appropriate method of technology transfer (Shitma, 1998). Factors to be considered are variety, complexity, and unfamiliarity of the transferor of technology in the transfer process (Shitma, 1998). Complexity increases as variety increases, and the difficulty in managing complexity increases with the lack of familiarity with the cultural, economical, legal, and political aspects of the countries involved. In other words, the level of complexity could be viewed as symptomatic of the effectiveness of the transfer and possibly even as a pre-cursor to the ultimate success of the transfer process.

Kirkman (1999) points out that ideal change in the developing world is not as simple as might be expected, because the same microeconomic and macroeconomic factors that have contributed to the countries' underdevelopment will also form barriers to building an ICT-based economy. The International Telecommunication Union lists a number of issues indicating the lack of access to everyday technologies which are available in developed

countries. This results in challenges that should be taken into account before ICT solutions have an impact in the developing world (ITU, 2003):

- o Half the world's population have never made a phone call
- o 18 % of the world's population has access to nearly two-thirds of the world's telephones
- o 8 % of Africa's population has access to telephones
- o 40 % of South Africa's population has access to telephones
- o 96 % of Europe's population has access to telephones
- o 36 % of South Africa's population has access to cell phones
- o 6 % of Africa's population has access to cell phones
- o Less than one-third of the world's population has access to electricity

These statistics present a bleak picture for those relying on technology as a solution for less developed countries. It is therefore essential that any attempts at technology transfer must be sensitive to the differences between the developed economies and developing economies to ensure effective transfer. Attempts at technology transfer are possibly made even more difficult, as research on information technology in general has traditionally focused its attention predominately on the USA and UK without being sensitive to how applicable these models and frameworks would be elsewhere in the world (Elliot, 1996). Dasgupta and Gopalakrishnan (1999) support this observation and maintain that there are factors specific to the local environment which are significant in technology transfer in developing countries.

Umanath and Campbell (1996) have identified two major groups of factors which impact on technology transfer in developing countries, namely, environmental and organisational factors. In the next section, barriers to transfer will be discussed under these two broad headings. A suggested model which could be used to assess the effectiveness of the transfer of ITC to developing countries will be referred to briefly.

2.4.1   Environmental factors

Environmental factors are those factors which can be considered as constraints imposed by external factors that influence technology transfer.

2.4.1.1   Economy and competition

The transfer of new technologies into a country usually requires investment and technology adaptation may also require substantial investments in design and/or production which is normally the case when transferring appropriate IT to developing countries. Financing is also often required (and particularly difficult to obtain) in the early (developmental) phases of a

technology transfer project (McKenzie *et al,* 1997). The problem is that without financing, very little technology investment or transfer takes place and the provision of financing depends upon those who possess financial resources (donors, for example) being convinced that the projects will justify the financial support. According to McKenzie *et al,* (1997), this is the financial reality that underpins all technology investment and transfer processes, although financing perspectives may differ enormously according to the project, technology and purpose.

Countries suffering from of a weak economy often suffer from limited access to capital as well, and have to contend with a weak exchange rate which often results in the procurement of second-tier technology (Dasgupta & Gopalakrishnan, 1999). Dasgupta and Gopalakrishnan are of the opinion that these economies which purchase second-tier technology suffer the negative effects of IT adoption, especially in a developing area, as the technology very often does not conform to recognised standards, resulting in problems with reliability and maintenance. Also, owing to the risks perceived for new technologies, financing costs tend to be higher. Although many countries are revising their trade policies in order to liberalise markets, substantial tariff barriers remain in many cases for imports of foreign technologies which limits exposure to ICT in these developing countries (McKenzie *et al,* 1997).

Mansley *et al,* (1997) argues that the lack of access to finance should not be viewed in isolation as an obstacle to technology transfer, but rather be seen as a result of risk analysis. For example, lack of confidence in "unproven" technology in the developing environment, together with uncertain costs of the development of infrastructure, high front-end capital costs and also high user discount rates, are some of the issues that could be considered risks. These types of risks sometimes become obvious only when it is apparent that other suppliers of technology have not invested in developing areas.

Although competition between suppliers of services and products is often not considered an issue in most rural areas within the context of IT, the opposite can be true. Little or no competition can result in poor service, high costs of IT support, difficulty in accessing new technologies and, ultimately, a higher price that will be paid by the client (Hulbert, 2000). Hulbert pointed out that in certain areas where there was an existing ICT centre that appeared not to be successful, competing computer vendors would be loathe to commit to the rendering of services in the same area due to perceived risk, resulting in a barrier to competition and leaving the door open to a monopoly. One of the case studies discussed further on in this dissertation illustrates the perceived risk of vendors in providing technology in rural areas with little or no infrastructure. The reasons given by the vendor for not wanting to provide technology in this area were that the vendor had to rely on third parties who increased the cost of support over and above a reasonable cost. This increased cost had to be covered by the ICT centre, the support making it non-viable for the centre.

Pater (2000) observes that a lack of competition between ICT centres providing telecommunications has hampered the closing of the digital divide. Pater (2000) also acknowledges the general acceptance of the ability of telecommunications to address poverty and other imbalances in Third World countries. However, due to a lack of incentives, vendors have focused on the more affluent areas in these countries and it would appear that profit is their only motive. In South Africa , for example, less than 50% of people living within the country's borders have access to telephones, and of those that do have access, the greater majority live in cities and towns (The Acacia Atlas, 2005).

2.4.1.2   Legislation and policies

Countries subjected to legislation regarding restricted access to telecommunications imposed by the national telecommunication provider, can pose an obstacle to technology transfer when the national telecommunication provider has the monopoly. A monopoly prohibits alternative means of communication and forces the customer to use its services which usually, if available in an developing area, can also be costly (Martin, 1999). An example of the impact of such a monopoly was when an ICT centre, which was to rely on the Internet, was proposed in Lesotho. The lack of connectivity to the Internet was a reality. Although an affordable and practical solution would have been to link the centre via a microwave link to the backbone of Telkom in South Africa, Lesotho's legislation prohibited the use of this type of third party technology (West, 1999).

Legislation relating to telecommunications in South Africa, for example, inhibits wireless broadband connectivity which could be helpful in bringing access to remote areas in South Africa (Bidoli, 2003). Bidoli (2003) is concerned not only about prohibitive legislation but also about Telkom protecting its own interests at the expense of the country's needs. As South Africa's Telkom enjoys a monopoly, it also influences legislation pertaining to alternative means of communication and reduces the choices of alternative modes of communication.

From the point of view of the suppliers of technology and especially software, problems are sometimes encountered with regard to piracy. Even if legislation exists in the developing country regarding piracy or illegal copying of software, it may not be exercised effectively. In some developing countries it may not even be considered unethical for illegal copying of software (World Bank, 1993).

At the Acacia conference held in South Africa early in 2003, delegates voiced their frustration at governments in Africa responsible for preventing ICT progress by means of legislation. An example of this is the lack of South Africa's universal-access penetration rate, as people have been disconnected from a service they could not afford (Melody, 2003). Melody indicates that this is the result of policy failure and sudden reversals of policy, ignoring advice and backtracking on the Telkom listing and second network operator processes.

Delegates agreed that governments have a large role to play in the implementation of technology in their respective countries by removing barriers to socio-economic progress through harnessing the power of ICTs (Burrows, 2003).

Yumba (2002) highlights the paradox confronting many African countries in that although the importance of information with respect to national development is recognised, severe constraints to information deployment exist. This is due to the lack of an overall national policy on information systems and services that could support the deployment and coordination of information systems. Policies defined and supported by governments can, however, result in the encouragement of the deployment of projects such as ICT centres and often offer incentives for these (Snyman, 2002).

Widespread access to the Internet and even telephone lines is very often obstructed by poor telecommunications - the result of vested interests in state monopolies of obsolete networks with prohibitive price structures in Africa. The lack of adequate communications represents Africa's most potent form of censorship (Kerrits, 2004).

Frameworks at sub-regional, regional and international levels should be established and/or strengthened for the development, transfer and application of environmentally sound technologies and corresponding technical know-how, with a special focus on developing countries' needs. Such frameworks very often do not exist in developing countries resulting in the absence of national capacity to assess, develop, manage and apply new technologies (UN Department for Economic and Social Affairs, 2005).

Even in countries with established frameworks that support transfer, serious consideration has to be given to the prevailing governmental policies with particular regard to the economic situation on both a local and international scale. For example, if policies in a country are such that they favour the local economy, this may pose a significant obstacle to technology transfer (Samli & Kosenko, 1982). The diagram appearing below depicts a model for transfer of technology into a country with biased or uncertain policies.

Figure 2.1 Technology transfer model for countries with uncertain or biased policies
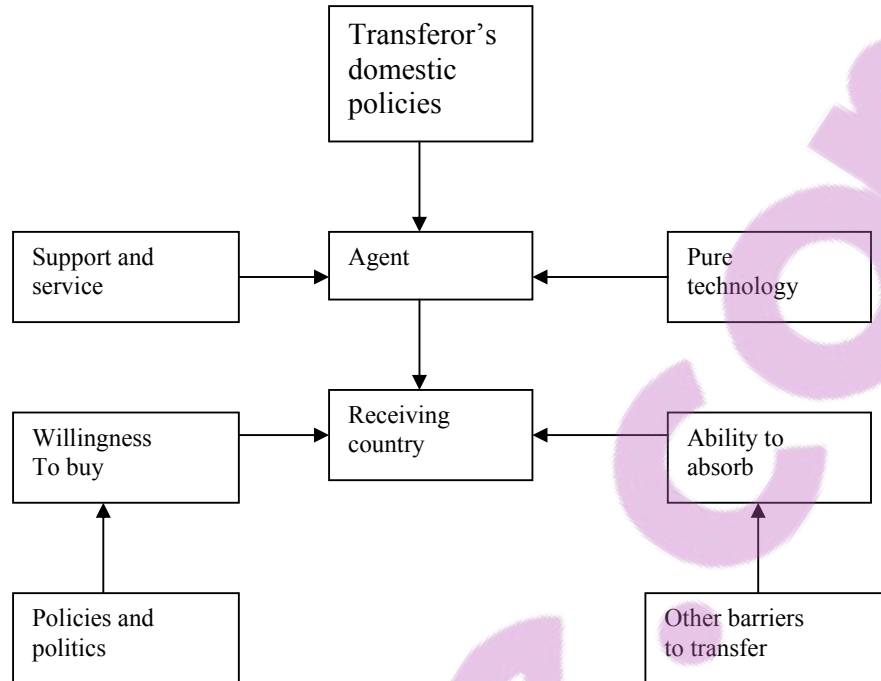
Source Samli & Kosenko (1982)

The model above, designed by Samli & Kosenko (1982), highlights the importance of ensuring that from the early stages of the transfer process, the identified policies of the receiving country are understood together with other issues which could prove to be barriers to transfer. This includes the recipient of the technology's ability to use the technology. Should these identified polices indicate any potential obstacles to the transfer of technology, then the approach must be adjusted accordingly. The transferor's policies could also play a role in the transfer process as this may determine how technology can be transferred.

2.4.1.3   Physical considerations

Physical considerations that have to be considered in technology transfer relate, for example, to issues such as access to communities, supply of electricity as well as issues relating to the challenges imposed by the environment, such as climatic conditions.

An irregular or non-existent electricity supply can cause a major barrier to the use of ICTs, especially outside the major towns. Many areas in South Africa have limited power distribution networks which do not penetrate significantly into rural areas, and regular power outages for many hours is a common occurrence, even in some towns (Jensen, 2002).

In many areas, dust is a constant presence, even without occasional dust storms in deserts or extremely dry areas. Few buildings are sealed against the dust as the warm, dry climate makes for little need to protect humans (if not computers) from the elements.

Extreme temperatures in many areas necessitate a closed and air conditioned room and a stable environment for computers (Vaihia, 2002). For example, in Phalala (South Africa) ICT centres were faced with problems which were aggravated by power failures or interruptions, poor connectivity, security failure and policy and inadequate buildings (Etta, 2004).

2.4.2 Organisational factors

Organisational factors are those factors which can be considered as constraints resulting from the social norms that influence technology transfer. As opposed to environmental factors, organisational factors appear to be more difficult to identify and manage.

Organisational factors pertain to the human element and are key in dealing with new technologies, especially when IT is involved. The involvement of IT staff and users in IT-related projects is fundamental to the success of an IT project, and organisations in which IT staff are more involved in IT adoption normally have a higher success rate than organisations that do not involve the IT staff (Grover, 1993).

The attitudes of people involved in technology transfer, according to Davis et al, (1998), very often outweigh the impact of technical issues in the successful deployment of technology transfer. This is because the focus is often more on the technology transfer than on the individuals who will use and benefit from it, often resulting in unsuccessful technology transfer. An example of not focusing on individuals is the threat of the 'brain drain', which often means that developing countries are not able to maintain a core of technically competent people who can help with the absorption and diffusion of the technology into the country (Keller & Chinta, 1990).

In the context of this research, organisational factors include cultural issues, community involvement in technology transfer and ICT centres, and those responsible for the management of projects dealing with technology transfer.

2.4.2.1 Cultural factors

Culture can be defined as the attitudes, beliefs and norms that are shared by individuals and is typical of a group of people (Alu, 2001).

The transferor of technology should always be aware of the different cultures specific to different countries, and it is to the transferor's advantage to understand and appreciate how these differences could influence the technology (Madu, 1990). Madu (1990) explains that

successful transfer of technology cannot rely on simple models of transfer, but should focus on socio technical variables in order to address cultural perceptions, as culture influences perceptions and how people conceptualise issues. In other words, the success of transfer of technology depends on how well technology is integrated into the cultural value systems of developing countries. Technology transfer to developing countries with a markedly different culture to that of the transferor could fail if it is insensitive to the values and belief system of the developing country.

The inability to understand how to adapt the technology to different cultures by the transferor and the receiver of the technology, could lead to a further aggravation of socioeconomic development in developing countries (Madu, 1990). For example, those responsible for transferring information must be aware that information used and stored for one purpose may be useful for another and that the recipient culture must therefore be understood. This is important as there may be information relating to the recipient society which could have a significant impact on the success of the technology transfer project (Giddens, 1991).

A framework is suggested by Madu (1990) for technology transfer into developing countries, focusing specifically on addressing cultural differences between the transferor and the receiver of the technology:

Figure 2.2 Prescriptive framework for the transfer of the appropriate technology

938   *Prescriptive framework for the transfer of appropriate technology*

Structural definition:
Identify the LDC's development problems, needs, capabilities, expectations and aspirations.

Identify the stakeholders (ie interest groups that may influence the technology transfer decision-making process).

What are the interrelationships between the LDC's subsystems (ie socioeconomic, political, environment, cultural and ethical value system, technology, etc)?

Behavioural definition:
Identify the stakeholders' views and the cultural values of the LDC, and how they will influence the technology transfer process.

How can these perspectives and values be integrated into the decision-making process?

How can management and technical training programmes be designed to integrate these values?

Are these and other required capabilities adequately developed?

No → Develop the necessary capabilities.

Yes

Technology definition:
Identify the technologies that will best satisfy the LDC's needs given its capabilities.

Evaluate these technologies' hardware and software in terms of ease of adaptation, ability of LDC to modify and develop its own technology.

Can the hardware and software be easily adapted and/or modified?

No → Seek alternative technologies.

Yes

Transfer the appropriate technology.

Control mechanism:
Evaluate the performance of the transferred goals based on the defined needs and objectives of the LDC.

Make technology assessment to determine the future of technology due to changing LDC's needs and technological changes.

Figure 1. Prescriptive framework for technology transfers.

FUTURES November 1990

Source: Manu, 1999

As can be seen from the above diagram, there are three definitions which refer to the process suggested in the framework that need to be followed for appropriate technology transfer to developing countries.

The structural definition refers to the assessment of the communities' overall development needs within the context of the local conditions. In other words, the structural definition refers to the identification and understanding of conditions which could impact on the technology transfer and which this study refers to as a landscape audit. The concept of a landscape audit is discussed in detail in Chapter Seven. The definition also includes identifying authorities within the community and also other stakeholders who can influence the process of technology transfer. Finally, the definition covers the interrelationships between the sub-systems in the local community with an emphasis on the local value systems, culture, work ethics and politics.

The behavioural definition then proceeds with the identification of the communities' specific cultural issues that pertaining to values, and subsequent perspectives to be addressed in the decision making process. This is perhaps the most critical part of the entire process as it involves active participation of stakeholders, as the outcome of the participation of the stakeholders is used to formulate a methodology for integrating the solution with the identified community perspectives and values.

Thereafter, the framework tests the recommended technologies against the identified needs, and if the technology is found to be inappropriate, the process reverts back to identifying appropriate technologies until consensus is reached.

The last step of the framework should be considered as an ongoing process geared for continual assessment of the effectiveness of the technology transfer.

Examples of technological failures are mostly evident on the application level or in software packages developed in developed countries which are geared towards the prevailing culture of the country responsible for developing these packages. Software from the developed regions of the world has generally been designed to work in a particular cultural environment (Davis, 1992). Davis (1992) gives an example of one culture making use of a software package developed with another culture in mind: the adaptation of a packaged banking system by the State Bank of India. It was found to be unsuitable as the banking practice in India is organised on a social responsibility ethos quite different to that of the American philosophy.

Personal contact, another example of cultural difference between some countries, may be the dominant mode of communication. Resistance may result from the perception that computers degrade personal communications which is internalised within the people involved in the implementation of ICT centres (Yavas *et al,* 1992).

Language, not seen as a problem in developed countries, has proved to be a barrier to technology transfer in developing countries for two major reasons. Firstly, as English predominates as the preferred language for communication - especially for information technologies as well as for global trade - packages and software manuals require a basic understanding of English by the user, and very often developing countries are not able to cope with this demand (Sebusang & Masupe, 2005). Secondly, those members of the community who have the ability to communicate well in English and who subsequently understand the software packages, are prone to leaving the community in search of better living standards (Little & Margetson, 1989).

Chatman (1994) maintains that culture can also have an effect on the ownership of projects and has identified factors such as individualism, avoidance, power play and differences between male and female as being significant to the ownership of projects. The importance of studying the culture of the recipient organisation is key to the implementation of technology (Wjinbeek, 2000). Information systems must be built with a respect for the diversity of cultures. When dealing with ICT centres, particularly in rural areas, it could happen that cultures may differ from region to region. This should also be taken into consideration when implementing IT. Cultural barriers, as well as attitudes of arrogance about local knowledge have often stood in the way of the establishment of open communication channels between communities and those responsible for transferring technology. Although it may be apparent to have local knowledge, the inability to access it is very often as a result of a lack of understanding of the local culture (Dagron, 2001).

User resistance can very often be the result of cultural norms that were ignored. In some cultures, information is still equated with power (a fact which could restrict the willingness of personnel to share data and information through integrated systems), based on the concept of authority as the right to command. The best approach would be to ensure that the authority is convinced of the needs and objectives of the system and especially that the system will not undermine authority in any way. Cultures which have a high resistance to change will be least likely to adopt IT (Adedeji *et al,* 1991; Macome, 2002).

2.4.2.2   Community involvement

Community involvement is described by many as key to successful technology transfer. According to Colle (2001) there is evidence that top-down approaches have had little effect in

the successful development of poorer nations, and that bottom-up approaches, on the contrary, have shown to have been more successful and appear to be gaining acceptance. Durning (1989) warns that although the push-pull factor is an essential part of community mobilisation, communities cannot do this alone. Durning stresses the need for external partners to work together in development projects. These views are supported by others whose opinions stress that community participation is key in empowering communities in development projects (Freire, 2004).

According to Burgelman (1992) there is a small margin for error when implementing IT solutions in developing communities, as developing economies lack the resources of developed nations and therefore have only one chance of making a success of a project. For example, due to a lack of funding and technical skills, experimenting and testing in technology related projects cannot take place in developing economies.

The following steps to include community participation for participatory empowerment in technology transfer projects are suggested (Lillie, 2004):

- o Identification of solutions in such a way so as to share and get support from the community and an appreciation of the project
- o Development of community structures to facilitate the process of technology transfer
- o Community education is essential to ensure community understanding of the process and benefits of the technology transfer
- o Group action for the general overall mobilisation of the community
- o Formation of alliances with third parties for support
- o Measurement and adjustment to indicate progress and benefit of technology transfer
- o Functioning alone without the reliance of donations and the realisation that this is key to the success and sustainability of technology transfer

These steps revolve around the necessity of the inclusion of the community for the entire length of the project, in order to achieve effective and successful project closure.

Schiller (1996) argues that market forces are key drivers in the dissemination of information and whether or not the information will realise profit. Schiller is also of the opinion that class plays a significant role in determining what information is available to whom, and thus who is able to benefit from information. In other words, successful technology transfer is a function of class and market forces. The sustainability of IT projects in the long run, according to Schiller's view, must hinge on market forces or demand, and on those groups who will realise a benefit from technology transfer.

Schiller stresses the importance of the need for information which manifests itself in the community. This can be translated into supplying information and technology in terms of what the community wants and not what others think the community may need. Although Schiller supports Bell's claim regarding the necessity for information in modern society, Schiller highlights the role that market forces plays in the determination of what information is needed for profit (Schiller, 1996).

Local leadership participation is also critical for successful projects in developing areas and should be promoted to the extent that decisions are in the hands of local leadership, thereby increasing local control, which will lead to community ownership and subsequently mobilisation (Lubbe, 1999).

Community involvement not only refers to the involvement of the community leadership but also to those community members who have local expertise and can contribute to the technology implementation (Wilson, 1993).

2.4.2.3 Project Management

The involvement of project managers responsible for the implementation of technology transfer is critical to the successful conclusion of these projects. The project manager is responsible for the systematic integration of communication and information into all phases of the implementation processes (Schoen, 2002). Schoen (2002) highlights the lack of consideration when fitting the right people to the right project and that too much emphasis is put on technical expertise and not enough on the skills needed to manage people. This often results in developed countries selling solutions to problems that marginalised communities did not perceive as problems in the first place. Project managers should realise that teamwork brings about local commitment and motivation, which results in trust and commitment from grass roots level and brings about true participation for developing communities within their cultural environmental framework (Servaes *et al,* 1998).

Burgelman (2001) maintains that project managers and other people responsible for technology transfer in developing communities must be in a position to identify mistakes as early as possible, but, more importantly, must be able to ensure that these mistakes are rectified in the shortest possible time. Otherwise repeated attempts to implement IT in developing communities will face greater resistance by the communities.
 Wilson (1993), however, maintains that there is a real danger of project managers becoming merely information brokers and in doing so excluding the communities' involvement in the project. Not only are the intended future beneficiaries of the technology transfer excluded in

the initial stages of the transfer, but also very often local partners who have the knowledge needed for successful technology transfer are also ignored.

Many organisations responsible for the implementation of technology transfer to developing countries make use of external project managers or consultants (Peled, 2001). Peled (2001) warns of the dangers of using consultants in IT-related projects for the following reasons:

- o Consultants have an incentive to hide poor performance and have a greater ability to do so
- o The organisation in effect outsources its technical skill to IT suppliers
- o The organisation also outsources its management skill to the consultants
- o There are no established methodologies to measure the effectiveness of the final system

It is imperative to critically assess the choice of project managers when appointing project managers for technology transfer especially when considering outsourcing the project management of these projects.

There is also sometimes a real danger that technology transfer is selectively made available by those who have the means, in order for self-gain (Webster, 1995). Organisations responsible for funding IT projects in developing economies must be managed in terms of putting the recipients' needs above the donors' needs to ensure appropriate information dissemination and the donor or sponsor of technology transfer projects put their needs above those of the recipient of the technology. This may or may not happen in all technology transfer projects however, but the recipient may not always be able to ascertain if the donor was indeed the party who benefits more. Berg (1993) maintains that there is evidence to suggest that donor involvement in technology transfer projects often leads to inefficiencies, weak local ownership and limited commitment. For this reason alone it is crucial that those responsible for managing technology transfer to developing economies be acutely aware of this problem in successful transfer, and be able to gauge the effectiveness of the transfer.

2.5   Measuring the effectiveness of technology transfer

Effectiveness can be defined as the degree to which an organisation fulfills its goals. Technology transfer effectiveness is the degree to which information, and ability to access it, is moved successfully from one organisation to another (Rogers *et al,* 2000). Rogers *et al,* (2000) point out that the ultimate test for assessing the effectiveness of the technology transfer is at the level of the recipient and how the recipient has adopted and implemented the technologies. Rogers *et al,* (2000) also refer to the absorptive capacity of the recipient which highlights the ability and resources needed to adopt the new technologies. Research also

suggests, however, that community readiness is an important factor for technology transfer to be transferred successfully (Cohen & Levinthel, 1990). Berg (1993) refers to technical cooperation and suggests that authorities in developing economies focus on building capacity outside the public sector in order to counter the disruptive organisational disarray and lack of economic incentives. People responsible for technology transfer into developing nations should therefore be sensitive to the lack of absorptive capacity in these countries and should reconsider their strategies for technology transfer.

In order to demonstrate the effectiveness of technology transfer, a conceptual model suggested by Menou (1995) could be applied.

Figure 2-3 gives a diagrammatic representation of this conceptual model based on Menou's ideas for the assessment of the effectiveness of technology transfer to developing economies. The diagram groups all role players into four categories, namely, the provider of the services for the community - referred to as the information service provider, the user of the services - referred to as the beneficiary, the donor - referred to as the funding agency, and the community as a whole - referred to as the society.

The relevant measures used to evaluate each role player are linked to indicators which are derived from the measures, and include the performance and cost-effectiveness of the information provider in assessing the impact of services on the community at large. It is critical to measure the effectiveness of a technology transfer project in order to appreciate the success of the project and to ascertain the probability of sustainability of the project. This is especially relevant in the light of concerns regarding the ineffectual bridging of the digital divide. Menou's conceptual model is an attempt to provide a method of structuring a methodology that can be used to identify areas which impact on the effectiveness of IT transfer to developing countries.

FIGURE 2-3 The conceptual model for measuring the impact and effectiveness of IT for developing economies
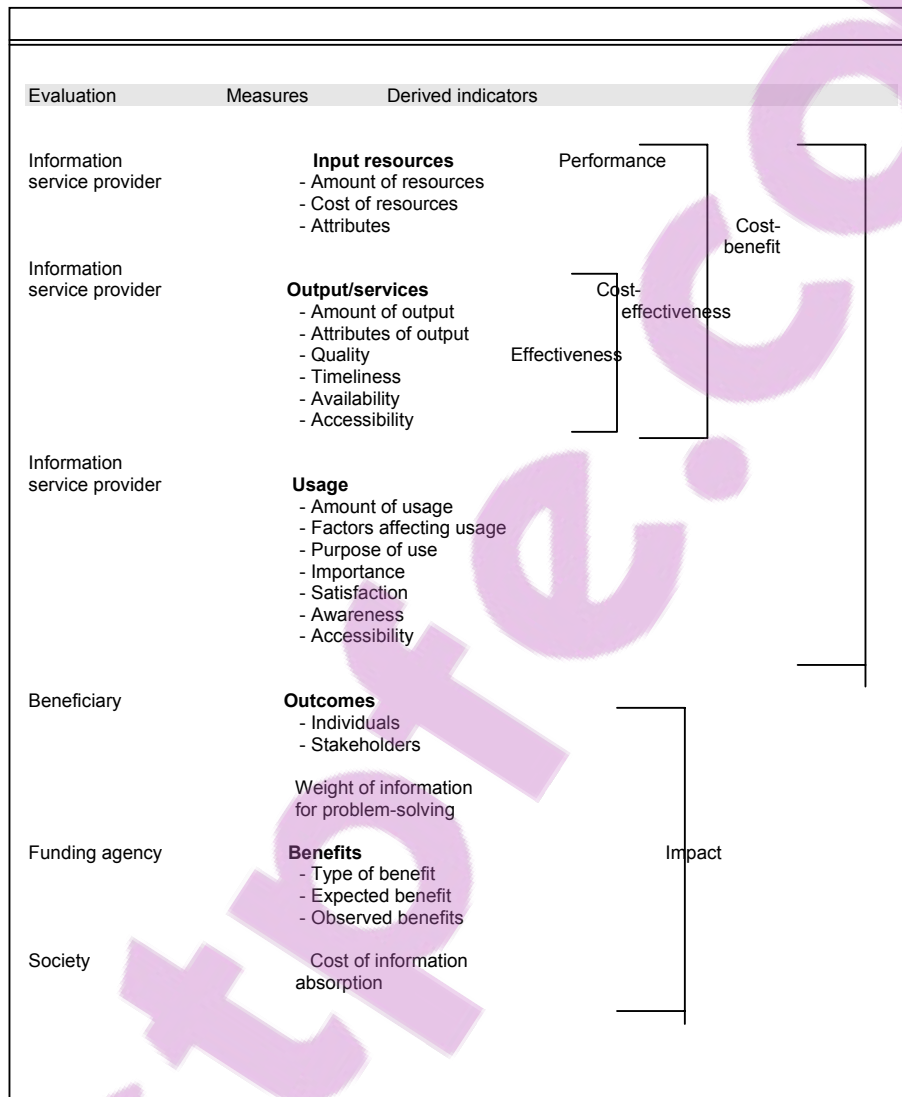
Menou (1995) highlights the importance of technology transfer sustainability and indicates that the authorities in the recipient developing economies must be made aware of the impact and benefit of the technology transfer. Through this conceptual model Menou also highlights a method for assessing the benefit and subsequent sustainable potential of technology transfer projects in developing economies. Webster supports this argument and highlights the fact that even if information is available, its benefits need to be communicated. Webster underlines the importance of including issues such as affordability, supply of relevant information and the

way in which information can be accessed when technology transfer takes place. This should be considered key in developing an approach for technology in developing economies (Webster, 1995).

In order to assess the impact and effectiveness of the transfer of IT into developing countries, it is critical to highlight the importance of being able to measure the cost-benefit, impact and effectiveness factors of the transfer. The measures identified by Menou are objective and can be assessed, giving an indication as to the overall effectiveness of the transfer of technology.

Many projects aimed at technology transfer in developing areas rely on ICT centres as the means for facilitating technology transfer (Colle, 2001). ICT centres have emerged in the last ten years as the primary means of providing public access to a range of telecommunications services and technology transfer, and they are attempting to provide solutions to problems concerned with the digital divide (Noronha, 2003). The focus on ICT centres and the consideration of them as a way of transferring technology to developing areas from developed areas, stems from the success of ICT centres in developed countries. The argument is that improvements by enabling access to knowledge and information through the use of ICT centres in developed countries, should also be able to demonstrate the same success in developing countries (Kusakabe, 2004; Fernandez-Maldonado, 2003; Rogers, 1995).

The next section will focus on what ICT centres are, a discussion on ICT centres in general and ICT centres in South Africa.

2.6   ICT centres

The term ICT centre is a generic term, which has acquired a variety of forms and names throughout the world although they all offer the same kind of services. A list is given of some of the more common terms used to describe an ICT centre:

- o   Community Tele Services Centres (CTSC)
- o   Multipurpose Community Telecentres (MCT)
- o   Virtual Village Hall
- o   Community Information Centre
- o   Electronic cottage
- o   Telekiosk
- o   Telecottage
- o   Telecentre

These centres are all characterised as facilities for people who generally cannot individually afford the services provided by ICT centres, because they are too expensive and too complicated to use (Zongo, 2003). Services provided by these centres include all or a

combination of the following: access to telephones, access to the Internet, access to PCs and related software, access to printing, photocopying, laminating facilities and in some instances access to IT-related training.

Zongo also emphasises that by sharing the cost of the telecommunication infrastructure and local facilities, the telecentres are expected to provide services at a more affordable rate and become commercially viable. Zongo (2003) defines an ICT centre as a way of improving social upliftment through access to information and communication. Benjamin (2003) defines an ICT centre as an organisation that offers telecommunication and other information services to disadvantaged communities. The definition chosen by the researcher within the context of the research, is 'a service provider of basic IT related services, access to telephonic communication and access to the Internet in order to address community defined information and knowledge requirements'. In other words, ICT centres can be considered as a means of allowing communities access to information and knowledge.

In international literature the first reference made to telecentres appeared in 1974 when the term satellite office was used (Obra *et al,* 2002).These telecentres or satellite offices were characterised by the distance between the satellite office and the organisation's main office. It was an attempt to enable the employees to perform the expected tasks remotely and still work for the organisation.

ICT centres were established in the early 1980s in Scandinavia (particularly Denmark) as 'social experiments' in promoting the use of advanced Information and Communications Technology (Cronberg, 1991). At the same time emerging in the 1980s, telecentres were cultivated in part by an innovative group of women in Bangladesh who set up enterprises renting out cellular telephones in their villages. That initiative blossomed into an international effort that has brought telephones, fax machines and even Internet capabilities to the most rural of regions, including countries in Latin America and Africa (Denes, 2001).

Similar projects were established in other parts of Europe and North America. These centres in developed countries were mainly to bring access to ICTs for people who normally would not be able to access information in other ways through the transfer of technology.

In 1992, the International Telecommunication Union (ITU) held a conference in Buenos Aires aimed at how to develop best-practice, sustainable and replicable models of ways to provide access to modern telecommunication facilities and information services, particularly to people in rural and remote areas (Benjamin, 2001a). To this end, pilot projects, particularly ICT centres, were implemented in a number of countries, in different regions, at different stages of development and with different geographical, social, economic and cultural conditions (Ernberg, 1998). Throughout the 1990s, the ITU has been establishing and supporting ICT centre projects in developing countries. A major programme is run by the International

Development Research Centre (IDRC), called PAN in Asia and Latin America and called Acacia in Africa.

A short while after the initiative from the ITU took hold, the Hungarian Telecottage movement began in the early nineteen nineties as a result of an enthusiastic grassroots initiative and the first operating Telecottage was founded in 1994 in Western Hungary. Telecottages or ICT centres gained momentum in Hungary mainly due to the cooperation between the Hungarian Telecottage Association and government (Snyman & Snyman, 2001).

The World Bank devoted its 1998 World Development Report to 'Harnessing Information for Development', and devoted much attention to ICT centres, describing them as a powerful engines of rural development and a preferred instrument in the fight against poverty (World Bank, 1998).

In 1998, a United Nations Development Program (UNDP) pilot project, supported by various governments in Africa, embarked on the roll-out of ICTs, intending to empower local communities (Hashem, 2002). For the first time, ICTs worldwide were beginning to gain greater exposure, as well as support from local government and international bodies (Whyte, 2000).

In Africa it is generally accepted that telecentres are reputed to have opened their doors in 1998. The nature and functions of African telecentres vary slightly from country to country - so too do the names by which they are known (Etta, 2004).

Beginning in the mid 1990s, the International and Development Research Centre, amongst other organisations such as the International Telecommunications Union and UNESCO, invested time, effort and money to study this phenomenon of growing importance. In the earlier part of the engagement, because of the paucity of projects, much of the effort was spent in intervention-type projects, establishing telecentre-type facilities and structures in schools, rural settings and hospitals, for example, in a handful of African countries, to spread knowledge of the new information and communication tools (Etta, 2004).

Between 1997 and 2000, Acacia - an IDRC Programme Initiative launched in 1997 as Canada's response to the call and support for an African Information Society Initiative (AISI) - was among the first to embrace the idea of ICT centres in South Africa for enabling communities to gain access to information. From this beginning, Acacia has supported a total of 35 telecentres in seven countries in sub-Saharan Africa, five of which have been jointly funded with other international partners such as UNESCO and ITU. As the following list shows, initiatives from the South African government bear testimony to the realisation of the importance of the role that ICT centres play in the dissemination of information (Snyman & Snyman, 2001):

- o In 1995 a task group known as Comtask, was appointed to investigate and make recommendations relating to communications and its associated structures
- o In 1996 the findings of Comtask, resulted in Multi-Purpose Community Centres (MPCC) being launched
- o In 1997 Telkom embarked on the roll-out of a significant number of new access lines to under-serviced areas at the same time that the Post Office embarked on a nationwide installation of Public Information Terminals (PIT) in remote areas
- o In 1998 the Department of Communication launched a number of projects aimed at establishing a networked information community
- o In 1998 Universal Service Agency (USA) was tasked with installing 100 telecentres in developing areas

In November 1995 a workshop was held in Alexandra Township, South Africa, entitled 'Linking Development Resources with Development Needs', to investigate the criteria for establishing One-stop Multi-purpose Community Development and Information facilities (Troubridge, 2002).
Certain fundamental principles were identified at this workshop:

- o An ICT centre must be established and owned by communities themselves and not merely donated to or imposed upon
- o Duplication must be avoided. Therefore, all data providers, brokers and facilitators should share the facility as a constructive partnership in the same context of freedom enjoyed by users of the Internet
- o Information must not be controlled or monopolised by any one person, organisation or government department. Information is a community-owned facility that must be available to all
- o Sustainability is an essential medium to long-term goal. Therefore, every community must formulate an acceptable business plan that should consider the marketability of information
- o An ICT centre should combine complementary income-generating multimedia facilities such as telephones, faxes, photocopying machines, secretarial services, newspaper and book sales, career guidance, and social and legal advice

By the end of 2000, a total of 65 USA telecentres had been established, 11 "mini-telecentres" and 54 full telecentres. They were located in all nine provinces of South Africa, though primarily in the poorer provinces, and were established in disadvantaged areas of South Africa. The majority were situated in rural areas - specifically townships, informal settlements and rural communities. The understanding was that the programme would be funded through the Universal Service Fund and that the programme would be the principal mechanism for extending universal access. (Benjamin, 2002).

The 65 telecentres established by early 2001 were reviewed and the outcomes of the review were supplied by the national survey of Community ICT Projects and USA records, personal observation and interview, and are discussed below (Benjamin, 2002).

There was a surprisingly low level of Internet usage (which requires that both phone connections and computers be working). Only 49 % had telephones working of those that had access to telephones and 67% of the centres had access to workstations. In consultation with the USA fieldworkers, it was decided that the telecentres be allocated to one of four categories:-

Thirty two percent of the centres were not operating and had shut down. Of those that were still operating, 18% were used only because of the access to a telephone and they were in fact reduced to a telephone shop. Three percent were those centres that had workstations but no access to the Internet and were operating. Of the rest of the centres, 47%, had access to both telephones and workstations and were still operating with various degrees of success. It was also discovered that over one third of all the centres had never been in hardly been able to become operational.

Certain factors emerge from the more successful centres. These factors were good management, the ability to adapt to changing community needs, partnerships with organisations. The review also highlighted the problem with those centres that did not keep a record of users, usage or other problems, making it more difficult for an accurate assessment.

Despite these efforts from the South African Government, NGOs and other organisations, there is very little evidence of these initiatives realising their intended outcomes, and in many instances it appears that the many of these ICT centres were not sustainable (Etta, 2004; Troubridge, 2002; Benjamin *et al,* 2000; Conradie, 1998).

There are those who argue that telecentres are only part of the answer to the existing situation of uneven and unequal access to information and communication technologies in rural and or remote areas, and that governments have a duty to provide for and support the development of all citizens in a sustainable way (Gillwald, 2002).

Allen (2003) refers to four alternatives or approaches for addressing sustainability, based on experiences in South Africa. These are the commercial, non-profit, government and school approach. The commercial approach relies on the centre being purely demand driven from a pricing point of view and the focus being on profit and not necessarily on need. Here the centre would be managed or owned by an entrepreneur. The non-profit approach would rely entirely on support from NGOs, although Allen (2003) highlighted the danger of potentially

volatile funds. The government would effectively create a centre based on any other type of governmental service, which could be part of an existing service such as a post office or library. An example of this is when the postal services rolled out a service known a Public Information Terminal (PIT), which provided access to the Internet as well as enabling the public to pay for other services. The PIT project however enjoyed little success (Troubridge, 2003).

Finally, the school approach, in reality a subset of the government approach, differs in that it recognises that computers and technical skills are sometimes a part of the educational effort. This was also largely unsuccessful where it was implemented (Troubridge, 2003; Hulbert, 2002; West, 2002).

In essence, attempts at trying to achieve ICT centre sustainability in South Africa suggest that efforts to this end should not be taken lightly, especially given the high costs that such centres incur. ICT centre sustainability in general has not been successful (Ernberg, 1998a; Kamel, 2000; Short & Latchem, 2000).

2.6.1   ICT centre sustainability

Sustainability is generally accepted as meaning the capacity for continuance into the future (Pearce, 1997). Applied to ICT centres in this study, sustainability refers to the ability of the ICT centre to render services on a continual basis and being self-sufficient.

For ICT centres to be sustainable, they must be perceived as contributing in some meaningful way to the community. In other words, there must be a need for the community wanting to make use of the ICT centre on a regular basis and for the ICT to be able to maintain an acceptable provision of services. Sustainability of ICT centres is therefore dependant on the availability of sufficient income and support.

Whyte (1999) considers two types of sustainability in planning or evaluating ICT centres: social and financial. Social sustainability refers to the long-term contribution made by the centres in terms of social and economic development of the community, while financial sustainability refers to the income generated being equal or greater than the expenses of the centre.

Whyte (1999) suggests that social sustainability involves a variety of development targets, as follows:

o   The provision of information to the community that is useful, that can be used by local resources and local government, and is of general interest

o   The overall improvement of access to essential services and other social services

o   The creation of employment opportunities for all

o   The empowering of the community by allowing the community to participate in all aspects of the ICT centre

Financial sustainability focuses largely on the following aspects:

o   Costs and benefits of the centre, with the costs relating mainly to operational costs The capital costs are largely ignored as these are usually covered by donations or seeding money

o   The business model which is used to run the centre which ensures and tracks the financial health of the centre

o   The growth of the centre and plans for continued growth, which would include projects, further financing, incentives and how to grow the centre as a whole

In order to achieve ICT sustainability in general, the following must be considered (Ekins, 1997):

o   The environment – can the centre's contribution to human welfare and to the economy be sustained?

o   The economy – can today's level of wealth creation be sustained?

o   Society – can social cohesion and important social institutions, knowledge and skills be sustained?

In essence, an ICT centre must be able to contribute to the economy in order to maintain sustainable development.

These three ramifications of sustainable development highlight the importance of the social dimension in achieving ICT centre sustainability (Becker, 1996).

Although very little work has been done on indicators for telecentre sustainability, three loose measures have been identified to measure the sustainability of the centres, namely, the ability to pay salaries to the centre's staff, the ability to make a profit, and the perceptions of the people involved in the centre (Benjamin, 2000):

McNamara (1998) suggests the following guidelines for ICT development and sustainability in general which can also be taken into consideration:

o   Tools are just tools and should be used as a means to an end

o   One size does not fit all - deal with each project uniquely

o Use existing institutions where possible
o Stimulate demand and focus on training
o Be realistic about who you are providing access to
o Assess, adapt, assimilate
o Think about sustainability from the start
o Help consumers become producers
o Learn from - and support - each other

The findings in the Acacia II Conference (2003) identified eight key issues that must be dealt with to ensure sustainability:

o Policy and leadership from the highest levels of political leadership
o Community leader must champion the initiatives
o Private-public partnerships are a necessary condition for the continued existence of rural ICT projects
o Infrastructure and technologies must be in place
o Participation of the community
o Use technology to help with transformation
o Focus on the use of ICT for a variety of purposes, such as education, business, crafts and agriculture, and for personal ends
o Be sensitive to traditional disparities such as gender, age and illiteracy.

In Western Australia, for example, it is clear that there is not only one solution to sustainability for ICT centres to bring full profitability to these facilities. As with the environment, success with sustainability depends on numerous strategies running in parallel to make a real difference on reaching the goal of sustainability (Sabien, 2002).

Sabien (2002) identifies six major elements that should be in place for ICT centres to stand a reasonable chance of becoming financially sustainable. These are: community ownership and management, open and equitable access to the centre, flexible and innovative use of technology, collaboration, trust and respect within the network of the community and all stakeholders, partnerships to mobilise community resources and to ensure that the ICT centre remains viable and, finally, opportunities to enhance the wealth and wellbeing of the community at large.

To summarise, ICT centres need to be focused, and owned by the community and community leadership in order to become sustainable. Specific elements that could influence the sustainability of the ICT centre are acceptance by the community and partnerships. The ICT centre must also have access to the necessary technologies and infrastructure in order to be able to deliver the appropriate services that address the needs of the community (Amoako,

2003). These guiding principles provide a sound platform for other new and developing networks to consider.

Creating a receptive environment for ICTs in developing areas is key for success (Kirkman, 1999). Kirkman refers to factors which should be considered as guidelines for the creation of an environment conducive to the deployment of ICT centres in developing areas.

TABLE 2-1 Kirkman's factors for the creation of an environment conducive to ICT centres

Factor	Reasoning
Competition	Competition stimulates growth
Relevant IT solutions	Apply relevant IT solutions that are specific to the local needs
Encourage market solutions	Allow the private sector to play a significant role, as this addresses the local needs.
Partnerships	Consider using partners that will result in mutual benefit to both partners.
Education	The future of information and communication depends on the ability to make use of technology. This can be addressed through training and education.
Connectivity	Investigate affordable communication. The cost of telecommunication plays an important role in access to the Internet and the potential of ICT centres.

Source: (Kirkman, 1999)

ICT centre sustainability therefore appears to rely on an approach that addresses three major challenges. Firstly, the centre must provide a service based on community needs. Secondly, the centre must consider partnering with established bodies that are both sustainable and in a position to assist the centre. Thirdly, the community must play a significant role from the implementation phase through to the continued daily operations of the ICT centre.

The importance of providing a service aligned with community needs cannot be stressed enough and is possibly the most important single factor for ITC centre sustainability. Although this may not be seen by many as the most important factor for sustainability, there appears to be consensus by all who have been involved in ICT centres that alignment of services with the local communities needs is important to the centres' sustainability (Kirkman, 1999; Benjamin, 2000; Sabien, 2002; Fuchs, 2000; Thamizoli and Balasubramanian, 2001). Similarly, there is no indication to the contrary that partnerships between third parties and ICT centres and the close involvement by the community are key to the sustainability of ICT centres. In fact, there is strong evidence to suggest that ICT centres can only survive through partnerships and being part of the community (Kyle, 2002; Hutchison, 2001; Fuchs, 2000; Sabien, 2000; Short, 2000).

To ensure that these three challenges are met, ICT centres must be managed accordingly. ICT centres should therefore be staffed by those who have the ability to manage the centre by ensuring that the centre remains sustainable.

2.6.2 ICT centre management

ICT centre management plays a significant role in the centres' ability to render a successful service and, more importantly, to be able to sustain itself.

The management of ICT centres on a day-to-day basis requires the manager or management to have certain skills and attributes in order to ensure that the ICT centre is able to render an acceptable service (Rowan, 2000). Rowan (2000) maintains that financial and business skills are the essential attributes of a telecentre manager as these skills include business management, business planning and entrepreneurship. Although twelve attributes in the Cornel report (Rowan, 2000) are identified as crucial in a telecentre manager, the report stresses the importance of the centre manager's ability to adapt quickly to a rapidly changing environment.

Many sources provide guidelines for ICT centre managers (Benjamin, 2000; Kirkman, 1999; McNamara, 1998) and these are also summarised in the twelve attributes contained in the Cornel report (Rowan, 2000):

- o financial and business skills
- o personal skills
- o computer and technical skills
- o education and training skills
- o information management skills
- o research skills
- o needs assessment skills
- o local culture and social context knowledge
- o social networking and community participation skills
- o leadership skills
- o human resource management skills
- o communication skills

This list clearly highlights the importance of the need not only for skills which deal with technical issues, but also for the ability to deal with people and, ultimately, the community, in ICT centre management. Although not mentioned in the list, the ICT centre manager must in addition be able to manage the ICT centre after the project manager responsible for implementation the ICT centre has concluded his or her task.

Separation Anxiety Disorder (SAD) has been identified as a problem in technology transfer projects in developing areas in Africa (Minnaar, 2000). According to Minnaar (2000), work done by UNISYS Corporation SA in Southern Africa has identified symptoms of SAD at the end of a project. It is apparent that SAD is symptomatic in the project team responsible for the technology transfer and can include both the customer and the project manager. A person that show symptoms of this disorder can display the following characteristics:

- o Does not want to sign the sign-off certificate
- o Finds plenty of unfinished tasks and issues
- o Creates any delays possible to extend the project, normally without costs
- o Becomes aggressive, manipulative, unfriendly, distant, grumpy (characteristics which were not revealed during the project's duration)
- o Escalates unrelated issues directly to management or even the managing director
- o Complains that nobody is available to assist with trivial issues
- o Refuses to confirm or respond to issues in writing
- o Keeps cancelling scheduled steering committee meetings so that issues cannot be documented and finds any reason to keep the project manager on site.

Research has also exposed that hidden agendas from management can impact negatively on ICT centre development (Myers & Young, 1997). Myers questions why there have been so many attempts made at technology transfer through ICT centres and yet there is very little evidence of success. He suggests that it could it be as a result of hidden agendas. Myers and Young draw on earlier contributions to information systems development by other theorists in an attempt to help explain how political activity on the part of management can impact on technology transfer as management are more concerned with politics at the expense of the project. They attribute the lack of acceptance by the recipients of the technology as a problem not resulting from management of the project, but rather as a result of something the recipient did or did not do. In other words management lays the blame of unsuccessful technology transfer at the door of the recipients of the technology.

2.7 Lessons learned in ICT centre deployment

Many ICT centres are recognised as having been partially successful, although there have been centres considered to be failures. In the literature review it is important to identify the major contributing factors for either the success or the failure of ICT centres.

International development agencies need to understand the correlation between the adoption of ICT centres and economic development. In other words, there has to be a social investment in the community to allow the services of ICT centres to establish themselves, in order to benefit the developing world. Social investment through ICT is intended to build a

future in the information economy that is interactive, and which appears not to be happening in many communities in the developing world (Fuchs, 2000).

The following section discusses the lessons learned and suggestions made by means of studies in some of the developing regions of the world. The sections are grouped by region.

Western Australia:

Local champions strengthen the notion of community-owned ICT centres, and experience in Australia has confirmed that ICT centres managed and owned entirely by the community is the correct decision for ICT success (Short, 2000). Short (2000) maintains that by giving the local community power to make decisions and apply for finance, constitutes full ownership.

Short (2000) highlights the danger of seeding money. It must be made clear that the initial financial support is for a limited time only and that the ICT centre must be able to sustain itself financially. Targeting the correct market for the provision of services is critical, and research into this prior to the establishment of the ICT centre is key. It is strongly recommended that partnerships be central to the sustainability of ICT centres.

Further research in Western Australia has shown that there are a number of fundamental principles that should be adhered to when planning, implementing and managing an ICT centre. Briefly they are as follows (Sabien, 2002):

o   The centre must be guided by an overarching strategic plan, or at least an annual plan of activities; this is particularly important with not-for-profit community-based organisations that rely on a revolving cycle of volunteers to manage the organisation.

o   Managing relationships with key stakeholders is vital to the overall health of the ICT centre.

o   Having a sound business plan aligned - the strategic plan must be in place to ensure the overall operations of the facility are shared and understood by staff within the centre. In other words, the plan should indicate costs and form the basis for good budgeting and financial control.

o   All services must be effectively costed to ensure everyone is fully aware of the range of services offered and, most important, that the community can afford them.

o   Documentation of procedures for operational purposes is needed, especially if there is a steady turnover of centre staff.

- o Record the daily activities of the centre in order to justify and motivate accessing funds from donors and other partners.

- o Plan which technology will underpin the operation of the centre and how it will be used to align with the community's need.

- o Never lose sight of what the community needs.

ICT centres in Western Australia have a number of levels of participation as shown in the diagram below. At the community level there are community members, the managing body, staff, volunteers and clients. At the business levels are clients, sponsors and joint venture partners. At the government level is the State Government Department of Local Government and Regional Development providing support funding, and State and Federal Government departments delivering services through ICT centres, local government and clients. Although this model may not appear to be relevant in all regions of the world where ICT centres are deployed, what is important is the reliance on strong ties between the three major sectors of the economy (Clark, 2002). Even in a First World country like Australia, considerable emphasis is placed on partnerships and networking with all stakeholders.

Figure 2.4 Participation model applied in Western Australia for ICT centre deployment.
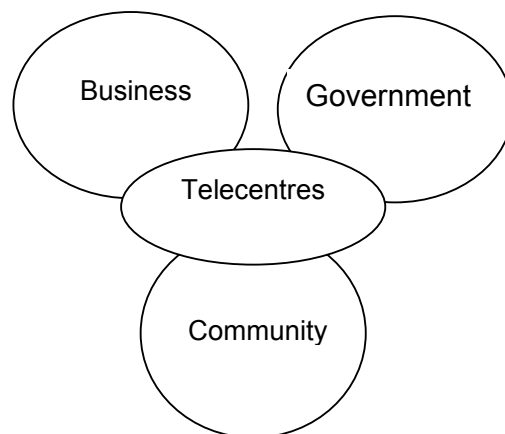
Source: Clark (2002)

India:

Lessons learned from ICT centres in India confirmed the importance of providing appropriate services for the villagers in order for these telecentres to become viable (Thamizoli and Balasubramanian, 2001).

Thamizoli and Balasubramanian (2001) noticed that the telecentres in their study in India defined the need to establish the sources, flow, interpretation and supply of information that were needed by the community and that demand-driven information is the essence of content creation. The ICT centres were encouraged to develop the content in a style that is adequate for their socio-cultural context. This was based on the belief that the centres should be part of a cultural information system, reflecting "the organisation of the community which shares a body of knowledge required for information-processing activities" (Hutchison, 2001).

Knowledge Management was the key theme of these ITC centres and it was found that the ICT centres identified four broad themes for provision and dissemination of knowledge (Thamizoli and Balasubramanian, 2001). These broad themes are: the creation of knowledge repositories, improving knowledge access to these repositories, enhancing the knowledge environment, and managing knowledge as an asset.

These ICT centres clearly indicate the need to focus on information requirements and, more importantly, the purpose for which the information is required and how it is to be used and accessed. Thamizoli and Balasubramanian (2001) stress that the ICT centres have evolved with certain perspectives on management of knowledge as an asset and in doing so have emerged as common property resources for the entire community. In other words, these ICT centres are moulded by local market-driven considerations, characterised by the local social norms and values.

Hungary:

A considerable amount of work was done in identyfing common needs for ICT centres in Hungary, specifically looking at effectiveness of service delivery. The findings of this work can be condensed into two main themes: firstly, the appropriateness of the service within the prevailing norms of the local culture, including access to the services; secondly, the quality of the ICT centres (Gáspár, 2002). According to Gáspár, ICT centres must play the role of culture synchronisation. ICT centres must fit into local culture and introduce the elements of the information society aimed at aiding the local population in such a manner that they do not suppress, but rather reinforce and strengthen the cultural aspects of the local community. These centres must also ensure the unhampered flow of information and be used only for the good of the local community.

With regard to the quality of some of the Hungarian ICT centres, they must be open towards anything that a community may conceive of as important and may need. This calls for a high degree of openness and adaptability to demands, but at the same time it is the strongest guarantee of sustainability (Gáspár, 2002).

Latin America:

The experience of Latin American ICT centres demonstrates that a single model of implementation cannot be applied uniformly across the region. In fact, the opposite is true. Success stories have been those based on a participatory process through which the community has a strong input into the development of the centre. The community's involvement corresponds with, and contributes to, the achievement of the social goal of ICT centres, which is to address the needs of the community, and undertaking actions based on the use of ICTs to improve the quality of life of the population (Gómez and Ospina, 2002).
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A major challenge faced by ICT centres in Latin America is the need to influence local, national and regional policies. Authorities must be made aware that communication and information is critical for improving the overall economy through empowering the community; this can only be done by allowing community access to information and knowledge (Gómez & Ospina, 2002). The role of the government is essential in the promotion of ICT centres and therefore it should provide a clear telecommunications strategy that promotes better connectivity, lower costs, equitable access and, in general, more venues to promote ICTs as tools of social empowerment and participation. Another challenge as a result of the ways ICT strategies have been implemented, is that they tend to benefit those with the most income, access and education. Thus far, the majority of Internet users in developing countries correspond to a minority of white males who are middle aged, earn high incomes, and are somewhat proficient in English (Gomez, 2000). This is at the expense of the poor sectors of the population.

Gómez and Ospina (2002) also point out the importance of continual training of ICT centre operators, as well as the training of users of the centre, and stress that ICT centres will only be effective if they focus on the broader social context and the meaningful use of the communication resources for human development..

Telecentros Brazil is a project aimed at the roll out of ICT centres in Brazil. The project identified a number of issues that could result in the in effectiveness of service delivery.

The selection of telecentre managers was found to be the most important process for ICT centre effectiveness (Kyle, 2002). Kyle (2002) emphasises the importance of the need to be particularly careful about the choice of community staff to manage and operate the ICT centre, and reliance on individuals with hands-on experience in community affairs to further

assist with the process. Telecentre managers must continually monitor each centre's progress to enable the regular assessment of effectiveness and success of the centre in order to efficiently change and adapt depending upon the circumstances of the community.

The funding of ICT centres relies on sponsorship, and Kyle (2002) is adamant about the positioning of the centre for high visibility in order to attract the community. The fostering of partnerships with other organisations has proved, in the case of these centres in Brazil, to be the most effective way of ensuring a sustainable ICT centre.

Kyle (2002) warns that one model or approach to ICT implementation does not always work and that given the particular nature of each community, implementation of the ICT centres vary widely.

ICT centres in Peru have realised that the notion of community ownership appears to be vague, yet it is frequently the alleged driving force behind telecentre experiments. Well-meaning donors who provide initial funding but let their projects start running on loose terms regarding ownership and control over resources, are courting disappointment and failure (Proenza, 2002). Proenza (2002) claims that like any organisation, a telecentre must have working rules to ensure sustained satisfactory operation; therefore its governance structure needs to be clear.
Establishing telecentres in rural areas can be a particularly daunting challenge in Peru, particularly where the landscape is irregular and the population is scattered. Both of these features make the cost of expanding the telecommunications infrastructure expensive (Proenza, 2002).

Africa:

Among the challenges that the implementation of ICT centres in Egypt faces include limited access to professional training and technical support and the language barrier, due to the limited knowledge of foreign languages among the population. (Arabic is the sole national language) (Hashem, 2002). Hashem (2002) maintains that in Egypt the lack of local information content (especially in critical sectors including commerce, trade, industry, small and medium size enterprises (SME), healthcare, education, tourism, culture, public services, environment, and agriculture) is possibly the greatest challenge of all.

The success of social investment begins with a demonstration on how the ICT centre can benefit communities where they are located. This includes the implementers of the ICT centre explaining to the community the value of information and the tools that can be used to access it. Fuchs (2000) bases his comments on research in Uganda and insists that the staff responsible for the running of the ICT centre must have the training and skills to keep abreast

of developments in software, hardware and networking technology. Identifying and training local champions who will nurture the ICT centre project, can make or break the success of such a service.

Three common reasons for some ICT centres in Uganda failing to deliver or show any indication of becoming sustainable, are given (Jellema & Westerveld, 2003). The first reason was due to a lack of funding and partnerships. ICT centres were not able to become commercially viable without public investment and interest from third parties who could potentially contribute in some way to their viability. The second reason was due to a weak infrastructure and poor service delivery of the national communication operator. Services that were available were unaffordable. Thirdly, the purpose of the ICT centres was not properly defined or linked to community needs, and subsequently had no community ownership.

South Africa

Research in rural areas in South Africa noted that those ICT centres that showed the most potential all had a number of common attributes. These were: the creation of information services, the improvement of information flow, the linking of the local economy to the broader economy of South Africa, and, most importantly, the centres were focused on financial sustainability (O' Farrel *et al,* 1999).

 It is important to point out that in South Africa , a number of projects aimed at providing information and basic computer training in rural areas, are the initiatives of large corporations. These corporations, mostly suppliers of information technology, provide expertise and considerable finance which maintain these information centres. Although these centres can be compared to ICT centres in terms of service provision, they do not adhere to the definition of ICT centres in this study, as the focus of these centres is not on self sustainability. The providers of the finance and expertise for these information centres have a social responsibility to fulfill and do so by providing ongoing support.

The USA project was aimed at deploying ICT centres in disadvantaged areas of South Africa, the great majority in rural areas. The USAs provided the same services as the ICT centres.

By the end of 2000, a total of 65 USAs had been established, 11 'mini-centres' and 54 full centres. Based on the problems and successes of these ICT centres, a condensed summary follows of the most critical issues pertaining to the functioning over a long period of time (Benjamin, 2000a)

Effective centre management was singled out as the single most important factor. The manager of the centre must be accepted in the community and be one who will drive the

centre relentlessly. Benjamin (2000a) stresses that the manager is not necessarily the highest educated person, as the these types of skills can be taught – drive and respect cannot.

The ICT centres that formed a network with other ICT centres in order to share experiences, ideas and solutions tended to be more successful than those which did not. For example, the network assisted in identifying the cheapest place for computer repairs.

Again, the centres that showed the most potential were those that clearly made a point of understanding what the needs of the community were and who adjusted their respective services accordingly. The ability to innovate and use the equipment as a tool to produce a needed service is crucial to the success of ICT centres.

Making use of partnerships proved to be useful for enhancing the chances of success of those centres that used this opportunity as opposed to those that did not.

A direct result of poor financial management meant that the medium to longer terms costs were not provided for. Those centres that tended towards sound financial management were able to deal with issues such the depreciation of equipment. The situation was often aggravated by poor income generation.

Benjamin (2000a) concludes by stating that the more successful centres tend to have a combination of competent managers, strong local demand, good location, the ability to innovate and develop services to meet local need, and linkages with supportive institutions.

Other factors impacting on some of the centres were: burglaries with no insurance or alternative sources of equipment, technical problems due to a lack of power and telephone lines, fire - resulting in damage to the centre, and community conflict between different factions over who should own the centre.

The Northern Province in South Africa had been identified by the Government of South Africa as a development priority, and consequently a number of ICT centres were deployed. Of these ICT centres, six were chosen for assessment in order that the effectiveness of the overall development priority could be measured. The research comprised of a number of days of field research on each study site, a training workshop, and local and provincial feedback and dissemination workshops. The research found that three of the six ICT centres in the study were not operational during the research. The first of these three had had all the equipment stolen. The second centre had not received the required equipment, and training had not been provided for the staff. The third centre had ceased its operations mainly due to an unpaid phone bill. Regarding the remaining six ICT centres, the conclusion reached by the research team was that none of them were found to be sustainable. Reasons for the inability

of the remaining three ICT centres to operate included the following (Telecentres in South Africa, 2003).

- o Cost of services were neither affordable nor competitive, especially as there were alternatives to some of the services in the area
- o The lack of power / erratic power supply, poor telephone line coverage, inadequate equipment and no Internet access were cited as major problems
- o A lack of security resulted in some equipment being stolen which impacted on part of the service provision
- o Poorly trained centre staff and inadequate staffing was seen as a major contributing factor to the perceived ineffectiveness of the centres
- o A lack of marketing exercised meant that few in the community knew or understood what the centres could offer
- o The physical location of the centres resulted some of the community members not being able to find the centres

Based on these experiences, it would appear that there are four major elements identified which appear to be crucial for success:

- o The Importance of including the community in all aspects of the centre, thereby entrenching community ownership.
- o Strong management of the centre and management's ability to reflect the needs of the community, together with the ability to effect these needs through adapted service provision on a continual basis.
- o Formation of partnerships and the realisation that centres will not be able to operate in isolation.
- o Each situation is unique and that chances are that the model used for ICT deployment will be different for each centre, determined by the unique requirements in each case.

The following steps to include community participation for participatory empowerment in technology transfer projects are suggested (Lillie, 2004):

- o Identification of solutions in such a way so as to share and obtain support from the community, as well as an appreciation of the project
- o Development of community structures to facilitate the process of technology transfer
- o Community education is essential to ensure community understanding of the process and benefits of the technology transfer
- o Group action for the general overall mobilisation of the community
- o Formation of alliances with third parties for support
- o Measurement and adjustment to indicate progress and benefit of technology transfer

o   Ability to function alone without reliance on donations, and the realisation that this is key to the success and sustainability of technology transfer

This last observation is supported by Servaes (1999) who asserts that there is no one single theory or paradigm on communication for development. When dealing with developing economies and technology transfer, therefore, the circumstances surrounding each community must be considered to ensure the most effective approach for technology transfer. Servaes argues that there is no single solution for successful technology transfer, but rather an approach that should centre around the unique circumstances of the recipient. The management of technology transfer, especially in developing economies, must be sensitive to the unique needs and differences of the recipient and modern society.

2.8   An approach for ICT centre deployment

ICT centres, considered by many as a way in which IT and information can be transferred to developing countries, require a methodology or approach to assist with their implementation as well as with sustaining them. Heeks (2002) sees information and knowledge at the core of enabling a developing country to become part of the Information Society, and believes that both these commodities can be made available through ICT centres (Castells, 2000; Webster, 1995; Conradie, 1998; Snyman & Snyman, 2002; Short, 2002; Clark, 2002; Hashem, 2002; Fuchs, 2000) From Heek's perspective, the importance of the role of information in development is clear, and this role can be seen in two parts, processes and outcomes. Processes really refers to the changing of the data into something useful in the form of information, by adding value to the data. Once the data has been transformed to meaningful information it must then be made accessible to the community. According to Heeks, this is the main role of the ICT centre. The outcomes that contribute to development from the process described above are learning and decision making. Learning is seen as the next stage after data has been converted to information, which is the transformation into knowledge. Decision making results from the information that is made available to the community via the centre. Heeks stresses the importance of the role of information in fully appreciating the potential of ICT centres. In other words, the relationship between knowledge and power is critical to the success of ICT centre deployment, and that information must be considered before technology (Heeks & Duncombe, 2001).

An example of a failed attempt to invest in IT in India was a project whose failure was due to the stakeholders' lack of understanding of the role of information (Heeks & Bahatnagar, 1999). Although the stakeholders were aware of the potential of IT, the project failed due to the fact that the stakeholders associated the IT technology with IT experts, and therefore tended to ignore IT. The success of the IT investment was therefore considered by those associated with the project as being in the hands of the IT staff. Another reason for some of

these projects in India not being successful was as a direct result of stakeholders seeing technology, as opposed to information, as been the most important tool for change. A concerted effort was evident in the implementation of these IT projects with little emphasis being laid on information. Bhatnagar (1997) does warn, however, that technology-driven projects in certain instances appear to be successful due to a single person. Should the person be removed, the project very often collapses due to the lack of skills and energy. Bhatnagar also gives an example of success in India when IT projects are approached with the realisation from stakeholders that information is the key.

Heeks also refers to the information chain and insists that all that ICT centres do is handle information. In order to appreciate the impact technology has on development and the contribution of ICT centres to socio-economic development, this appreciation must be founded on an understanding of [the role of] information in development (Heeks, 2005a).

Heeks (2005a) suggests that to understand the full range of activities and resources necessary for information to contribute to development there must be an understanding of the information chain, illustrated as follows:-

FIGURE 2.5   The information chain
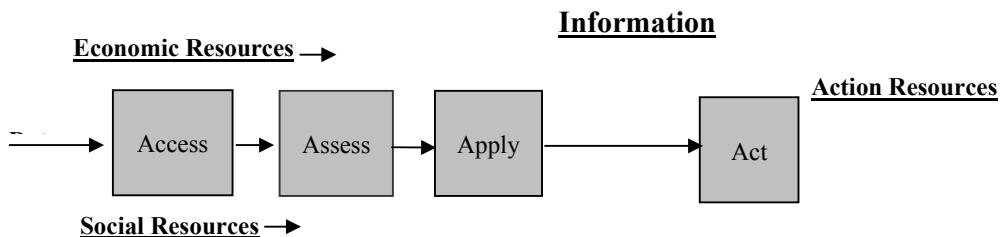
Source: Heeks (2005a)

Communities must be able to access data, assess its relevance, and apply it to a specific decision. Only then can it be counted as information and be considered to contribute to development.

Heeks maintains that all ICTs do is handle information, and that information is at the core of any attempt to deploy ICT centres in developing communities (Allen & Thomas, 2000). Heeks's understanding of a systemic view of communication and information technologies for the deployment of ICT centres in developing communities, is described in a model, commonly known as the onion ring model, as follows (Heeks, 2002):-

FIGURE 2-6 The Onion Ring model
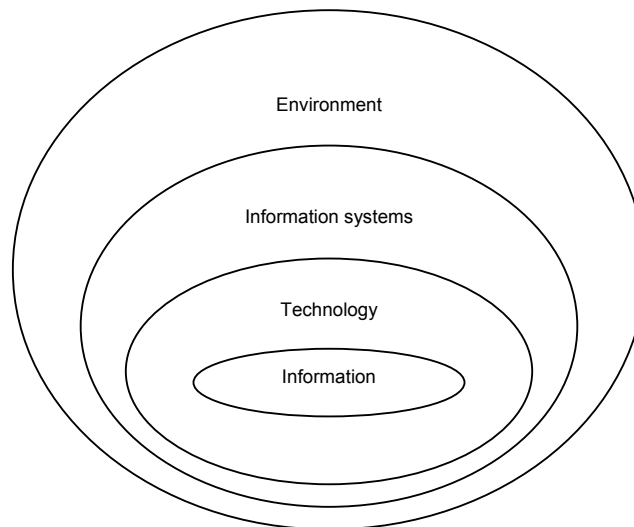
Source: (Heeks 2002)

Four major elements make up the model: the environment, information systems, technology and information. The environment includes markets, socio-cultural, political, economic and technical aspects, while the information systems element consists of the people and process aspects, with information and knowledge at the core.

The role of technology cannot be understood in development unless the information is understood within development (Heeks, 2002). In other words, the role that information plays in the lives of the community in development is key in determining how technology should be deployed. Knowledge is a product of information and should be seen as synonymous with information. Information systems refer specifically to the associated processes needed to facilitate the actual transfer and usage of information and which are seen by the community to add value. Information dissemination, not the deployment of technology must, according to Heeks, be the focus in developing areas. The environment is included in the model to emphasise those factors which could impact on the effective transfer of knowledge of information. Typically these include legislation, markets, socio-cultural and political issues.

Heeks's onion ring model attempts to highlight the importance by placing the focus on information as opposed to technology when attempting to bridge the digital divide, and speaks of an information centred approach (Heeks & Duncombe, 2001).

Heeks stresses that solutions for the deployment of information and ICT centres in one region may not be successful in another region, and maintains that every context is different and the approach must be adjusted to address the system and context (Heeks, 2005).

Many support Heeks's suggested information centred approach by highlighting the role of information through aligning ICT services with community needs. Although it may appear that community ownership and participation are key, this should be seen as another way of indicating that the community will make use of the services provided that the services are deemed useful. There is a common consensus to the actual role of ITC centres which is simply a way in which information is made available to communities. ICT centres could be considered as information brokers. Lessons learned from both developed nations and developing regions of the world - and in particularly in South Africa - have shown that sustainability of ICT centres is linked to appropriate services which translate to appropriate access to information.

It should also be clear that the process or approach applied to ICT implementation and management is linked to other factors to be successful. Gáspár (2002) talks of the role that centres must play in culture synchronisation and that ICT centres ensure the flow of information for the good of the local community. Maintaining the alignment of information needs is the other crucial element in the sustainability of the centre and it is imperative to ensure continual monitoring of a centre's progress to enable the regular assessment of its effectiveness in order to efficiently change and adapt depending upon the circumstances of the community (Kyle, 2002).

2.9 Conclusion

Since the mid-1990s, much has been said about the importance of making use of technology to address the steadily growing gap between the developing parts of the world and Westernised society.

In general, many attempts through the deployment of ICT centres have been made to improve the socio-economic status of developing areas, through the deployment of ICT centres. It would appear that these attempts have not always realised the expectations of those responsible for their implementation.

It is evident that there are a number of variables that impact on technology transfer in developing areas, which are very often specific to the environment receiving the technology. It is also evident that there is an awareness of the challenges and factors that must be considered in technology transfer in developing areas. Despite this awareness, the incidence of sustainable technology transfer projects is infrequent.

It is becoming increasingly important that the process used for technology transfer be refined in order to minimise the risk of project failure. Technology is only effective if utilised and managed effectively.

This study therefore endeavours to consider alternative approaches, linked to other research, to suggest a flexible and effective approach for technology transfer in developing communities. The following chapter discusses the research methodology that was used in this research.

CHAPTER THREE

RESEARCH DESIGN

3.1   Introduction

The aim of this research is to add something of value to the body of accumulated knowledge with respect to the implementation and sustainability of ICT centres in South Africa. The research hopes to suggest a possible approach to address the challenge of achieving sustainable ICT centre implementation in developing areas in South Africa.

In this chapter, the research strategy, research approach and data collection methods used in the study will be discussed. Thereafter follows an in-depth discussion of the research methodology, which was designed specifically for this longitudinal study.

3.2   Research strategy

A researcher has to be able to convince an audience of the value and relevance of his or her research efforts and, in addition, needs to explain why the research should be considered important and of what use the findings are to the community (Remenyi, 1998). The researcher needs to be able to argue convincingly that something new and of value has been added to the body of knowledge (Greenfield, 2002).

When deciding on a research strategy, the first decision to make, is to determine whether the research is to be essentially theoretical or empirical.

The empiricist goes out into the world and observes, through experiment or even by relatively passive observation, what is happening. By studying these observations and collecting related evidence, the empiricist will draw conclusions and make the claim that something of value has been added to the body of knowledge (Phillips & Pugh, 1994). The research theorist, on the other hand, studies the subject through the writings of others and through discourse with learned or informed individuals who can comment on the subject area, usually without any direct involvement in observation of behaviour and the collection of actual evidence (Phillips & Pugh, 1994).

As this study relies heavily on the collection of data from the field, it is based on an empirical approach and will follow the steps outlined below:
  o   Establish a research question or problem
  o   Examine the major constraints imposed by the availability of resources
  o   Decide on a research strategy

o   Examine the constraints imposed by the research strategy

o   Choose a research approach

o   Choose a research method

The process outlined above is the research strategy that will be adopted by the researcher.

The research problem has been identified, together with the constraints imposed by the availability of resources. This has lead to the researcher choosing an empiricist's approach to the research and applying a qualitative case study as the research strategy. Empirical research and qualitative research are best suited to the social sciences, where results are produced through descriptive data as opposed to quantitative research, where statistical or other methods of quantification are used (Bouma & Atkinson, 1995).

Within the empirical approach to research, there are two major options or research orientations: positivistic, an approach which is essentially derived from the natural sciences; and phenomenological, an approach essentially derived from the social sciences (Burns, 1994).

The next step is to choose a research approach that supports the strategy to be employed by the researcher.

3.3   Research approach

As the study was to span a number of years and required intervention by the researcher, an action research approach was followed.

3.3.1   Action research

This choice of approach is supported by the work of those who argue that action research is a long-term process that involves both intervention and research (Reason, 2000). There are some who argue that this research approach should be considered as participatory action research, since participatory action research sets out to explicitly study something in order to change and improve it. It most often arises from an unsatisfactory situation that those most affected wish to alter for the better (Wadsworth, 1998).

Action research usually involves a small-scale intervention on the part of the researcher in the phenomenon being studied. The action researcher becomes actively involved with the situation or phenomenon that is being studied (Alan, 1991). Action research was developed

during the 1960s and has proved particularly useful in the area of managing change (Alan, 1991).

French and Bell (1990) have defined action research as

> The process of systematically collecting research data about an ongoing system relative to some objective, goal or need of that system; feeding these data back into the system; taking action by altering selected variables within the system based both on the data and on hypotheses; and evaluating the results of the actions by collecting more data.

There are, however, issues that action researchers must be aware of in order to ensure objectivity. Action researchers doing research in developing countries, for example, are often criticised by social scientists for three reasons (Higson-Smith, 1995):

- o Extraneous project variables are difficult to control, therefore results sometimes can be a result of the researcher
- o Objectivity can become an issue due to the close relationship with subjects
- o Some communities may have specific problems narrowing the focus of the research, which prevents the researcher from generalising findings from other communities

It was critical for the researcher to be aware of these issues when working with the role players in each ICT centre.

3.3.2   Methods of data collection

Henning (2004) refers to three data collection methods, namely participant observer, interviews and document analysis, that are often used in action research. All of these methods were used in this study by the researcher.

3.3.2.1   Participant observation

Participant observation has its roots in ethnographic studies and originated through the studies done by early anthropologists such as Malinowsky, Mead and Boaz (Denzin & Lincoln, 2002). These anthropologists became part of the communities they were studying and participated in the routines and activities of the communities. The aim was to gain an insider's understanding of what was being researched.

Meyer (2000) quotes one definition of participatory observation as

> ..a field method whereby the researcher is immersed in the day-to-day
> activities of the community being studied…The objective of this method is to
> minimise the presence of the field worker as a factor affecting the responses of
> the people and to provide a record of observed behaviour under varying
> conditions.

One of the key issues in participant observation is the researcher's ability to observe and participate without impacting on the outcome of the research. In other words, the researcher must be able to objectively record the findings of the research whilst partaking in the study without influencing the responses from the people in the research. Henning (2004) refers to this type of participation on a continuum from 'observing only' to 'full participatory observation'.

Observation can be broken down into structured and unstructured observation (Henning, 2004). Structured observation follows the positivist approach, where the aim is to accurately measure human behaviour. Unstructured observation focuses on people's ideas, attitudes, motives and intentions during participative observation. It can also make use of data from other methods such as interviews and documentation to produce a rounded picture of the phenomenon being studied. The researcher, therefore, has to have an open mind in order to gain the full benefit of an unstructured approach (Foster, 1996).

The researcher relied on the participant observer method for the majority of the data collected for the study. This was mainly done in an unstructured way, especially when trying to assess the effectiveness of the ICT centres and commitment of the role players involved in the managing of the ICT centres.

A recent example of a researcher using the participant observer approach for data collection involved research conducted into the management of design and manufacturing processes in small textile companies in central England. Remenyi (1998) describes the research as follows:

> The student conducted research in two companies and spent some time working as an
> employee in these organisations. The researcher participated as a complete participant
> of the organisation, gathering information on how the design and the production
> process was managed by working alongside the mainly female workforce. The data
> collected in this manner was then written up in the evening when the researcher left
> work. The eventual outcome of the work was the production of two case studies.

This example is similar to the approach used by the researcher in all of the case studies in this study.

3.3.2.2   Interviews

The interview method for data collection, is a direct way of obtaining data as the interviewees are obliged to answer questions whilst in a discussion with the interviewer (Bless & Higson-Smith, 1995).

The interview usually involves the researcher asking questions and can take place face to face, telephonically or, where possible, through the Internet (Thomas, 2003). Thomas (2003) highlights tactics applied through interviews, including the following:

- o   Loose questions uses broad questions which allow the respondent freedom in terms of their response to the question

- o   Tight questions focus on a more rigid set of questions designed so as to elicit specific responses from the interviewee

- o   Converging questions makes use of both loose and tight questions in an attempt to identify what is on the interviewee's mind and then to focus on the issue which emerges from the first question

- o   A response-guided approach is based on a question designed to investigate a related issue through follow-up questions based on the respondent's answers

Interviews can be structured, semi-structured or unstructured. Semi-structured and unstructured interviews can only be used in qualitative research. For this reason, semi-structured interviews were used in the study as it enabled the interviewer to adjust the questions during the interview (Merriam, 1988). In other words, there is a list of questions that serve as a guideline but the exact ordering and questions are not determined ahead of time so allowing the interviewer more freedom in the data-gathering process. Merriam (1988) warns of the limitations of interviews by highlighting that honest responses may not always be forthcoming from the interviewees as they cannot remain anonymous.

3.3.2.3   Document analysis

Data derived from documents forms a major source for social research. Documentation includes reports, official and unofficial records, private papers and literature reviews (Finnegan, 1996). Documentary resources can be classified as primary and secondary according to the document's source. Finnegan (1996) defines a primary source as those documents that originated by those people directly involved with the period being investigated. In other words, primary sources form the basic and original material for providing the researcher's evidence. Secondary sources, on the other hand, comprise those sources that discuss the period being studied but are brought into being at some time after the period.

It is important to appreciate that the interpretation of documentation can be affected by the researcher's aims and point of view.

3.4   Case studies

A case study is an ideal methodology when an in-depth investigation is needed, particularly in sociological studies (Feagin *et al,* 1991). Case studies are designed to bring out the details from the viewpoint of the participants by using multiple sources of data (Stake, 1995; Yin, 1994b).

Yin (1994) lists four applications for a case study model:

- o   To explain complex causal links in real-life interventions
- o   To describe the real-life context in which the intervention has occurred
- o   To describe the intervention itself
- o   To explore those situations in which the intervention being evaluated has no clear set of outcomes

Each case study or centre was subjected to the same process through the research instrument. The process was dependent upon an external view of the ICT centres and involved a number of steps, outlined below:

- o   Taking a static picture of the ICT centres
- o   Formulating hypotheses based on each ICT centre
- o   Making adjustments to the ICT centres based on the respective hypotheses
- o   Re-evaluating – taking a second static picture of the ICT centres
- o   Drawing conclusions

The diagram below illustrates the action research process which was followed in the investigation of the ICT centres.
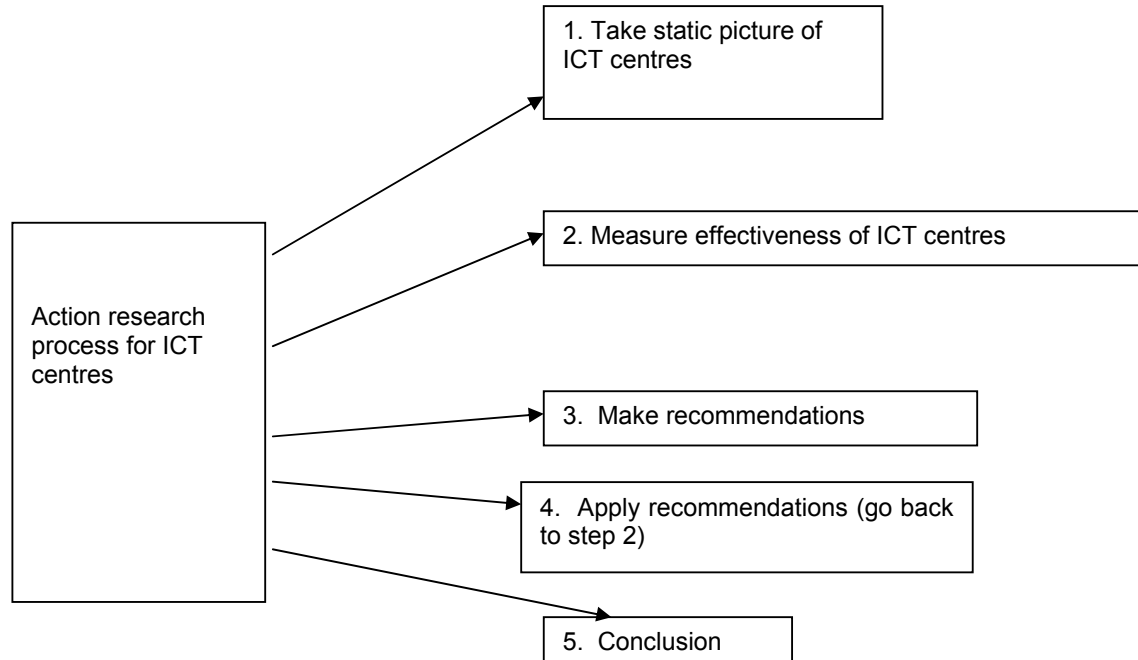
FIGURE 3-1 Research process

This research process was applied to each ICT centre or case study through a research instrument, which is described in detail in the next section. The data collection methods used to operationalise the process described above are discussed next.

Documentation obtained during the research includes all documentation that referred to each centre. This typically included contracts, correspondence with stakeholders, registers, motivations and project plans, invoices and business plans.

Triangulation was used so as to increase the reliability of the interpretation of each case study. Triangulation is defined as a number of different approaches that is used to confirm confidence in an observation (Denzin, 1984).

Three outcomes may emerge from triangulation (Mathison, 1988):
- o Convergence: when data from different sources or collected with different methods **agree**.
- o Inconsistency: when data obtained through triangulation is **inconsistent**, not confirming.
- o Contradictory: when data from different sources or collected from different methods **contradict** each other.

3.5   Research instrument

Through the research instrument each ICT centre was measured over time in order to identify changes and determine effectiveness. The intention was to make the instrument flexible enough to cater for the peculiarities of each centre. It was expected that due to the different environments, each centre might have had unique issues to deal with that could have had an influence on sustainability. Although these differences could have proved significant, the aim was to use criteria that was common to all centres.

The research instrument (Refer to Table 3-1 in the appendix, page i) consists of the following four broad phases:

  o   Conceptualisation
  o   Implementation
  o   Evaluation and adjustment
  o   Sustainability

The conceptualisation phase examined the motivation for the centre and the reasons for deciding on the physical location. It is also examined the community needs that were to be addressed by the ICT centre.

The implementation phase dealt chiefly with the actual deployment of the centre and selection of the role players responsible for the centre's functioning. This phase also examined the impact of the involvement of third parties in the implementation of each ICT centre, including the project manager's role in each centre.

The evaluation and adjustment phase concentrated on the effectiveness of each centre. The suggested changes and the associated measurements made by the researcher were recorded in this phase.

Finally, the sustainability phase was applied in order to establish the potential of each centre's ability to operate without additional resources. The sustainability phase is dependant on the continual measurement of the previous phase.

Each one of the four phases was broken down into smaller units and used to determine metrics for the measurement process. Before the measurement process is discussed in the next section, the following terms referred to in this discussion are defined:

o   Unit refers to what is actually being measured in the phase

o   Measurement refers to what metrics were applied to obtain the measurement

o   Data collection method refers to how the actual measurement was taken

Each phase is now discussed in detail.

3.5.1   Conceptualisation phase

Conceptualisation covers the process that was followed in deciding, planning and providing resources for the implementation of each centre. Table 3-1 defines in detail the units and their associated measurements, together with the type of data source that provided information for this study. The following units discussed below make up the conceptualisation section of the research instrument.

3.5.1.1   Site selection

Site selection refers to the reasons for deciding upon a physical location for the ICT centre. In order to understand why the physical site was chosen, the following measurements were used and data was collected from the associated sources:

o   The overall need of the community which could be addressed by an ICT centre. Documentation used by the TSA staff to motivate the choice of location and to satisfy the donor was used as a resource, as this would include information about the community's needs

o   Data regarding the size of the community that would benefit from the ICT centre, was obtained in the TSA motivation and other sources that describe the area

o   Access to other ICT centres in the area, which was in all cases determined through interviews with each centre's staff

o   Data regarding existing infrastructure, including access to telephones, power, transport and the physical building housing the centre was obtained through document analysis as well as interviews with each centre's staff

o   Community access to the centre and ease of access, information obtained through interviews with community members and each centre's staff

3.5.1.2   Role players

Role players include all people who had a hand in the implementation, operations and managing of the centre, as well as those who would benefit from the centre.

- o Community participation refers to what extent the community was involved with the initial stages of the centre and was determined through interviews with the centre's staff and the community
- o A profile of role players refers to the status of all role players within the community. This data was collected through documentation and interviews with each centre's staff and the project manager
- o Measuring the acceptance of the centre by the community was an attempt to establish whether there was community ownership. Interviews with the centre staff and the community were methods of data collection
- o The profile of centre management focuses on those people responsible for managing the centres in terms of their qualifications. Interviews with the project manager and other decision makers was the data collection method in this case

3.5.1.3 Community needs

The intention was to establish what the community needs were that could be addressed by the services of the centre. This included the typical services of an ICT centre such as access to e-mail, the Internet, IT training, telecommunications and research facilities. This data was obtained through interviews with community members and those responsible for identifying the location of the centre, if the data was not available in the TSA documentation motivating the deployment of the centre.

3.5.1.4 Business plan

The intention of looking at the business plan was to assess how those responsible for the conceptualisation of the centre had planned to ensure that each centre would be financially viable. This could only be determined by examining actual business plans or other related documentation. The elements comprising the business plan were the following:

- o Funding and how the funding was sourced
- o Income generation and how this was to be achieved over the medium to long term
- o Marketing of the centre and proof of a marketing plan
- o Support and maintenance of equipment used in the centre. Documents such as agreements with third parties served as sources for this data

The following table outlines the conceptualisation phase of the research instrument.

TABLE 3-1   Conceptualisation phase of the research instrument

UNIT	MEASUREMENT	DATA COLLECTION METHOD
Site selection	Overall need of the community	Documentation showing evidence of needs analysis; document analysis
	Size of community	Actual figures; document analysis and literature review
	Access to other ICT centres	Interviews with centre staff; document analysis
	Existing infrastructure	Interviews with centre staff; document analysis
	Access to centre	Interviews with centre staff; document analysis
Role players	Community participation	Interviews with centre staff and community
	Profile of role players not involved with managing of centre	Interviews with TSA role players and local leadership
	Acceptance by community	Interviews with centre staff and community
	Profile of centre management	Interviews with centre staff and TSA role players
Community needs	IT training	Interviews with role players[1]
	Telecommunications	Interviews with role players
	Internet access	Interviews with role players
	E-mail	Interviews with role players
	Research needs of community	Interviews with role players
Business plan	Funding	Proof of seeding money; document analysis
	Income generation	Forecasting criteria used; document analysis
	Marketing	Evidence of plan; document analysis
	Support and maintenance	Proof of contracts/SLA; document analysis

3.5.2   Implementation phase

The implementation phase, the next step in the research instrument, is now described and is summarised in Table 3-2.

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1 Roleplayers refers to people who were involved in identifying community needs. In some instances, it was TSA staff while in others, it was donors and centre management.

3.5.2.1   Selection of centre staff

Selection of centre staff refers specifically to the selection process used for the appointment of those people responsible for the running of each centre. Criteria considered important in the selection process included business skills, technical skills, local knowledge of the community, acceptance by the community and the ability to think laterally (innovation). This data was collected through a series of interviews with those responsible for the actual implementation of each centre.

3.5.2.2   Implementation process

The manner in which the centre was deployed was determined by examining a project plan or a similar plan. Interviews with the project manager were used to collect additional data.

3.5.2.3   IT suppliers and IT support

This refers to the selection process applied to IT suppliers as well as the IT support. The following questions were used to establish how the IT suppliers and support were selected.

- o   Was a formal process followed in selecting suppliers?
- o   How important is remote support?
- o   How important is on-site support?
- o   Does the supplier have other interests in the area?
- o   Does the supplier make use of third parties?
- o   Was a financial check done on the supplier?

3.5.2.4   Identification of community leaders

The identification of community leaders was examined through asking the centre staff and TSA staff a number of questions, listed below. As with the selection of the IT suppliers, the data was collected from any documentation that was available from the project manager as well as interviews with the project manager and centre staff.

- o   Were community leaders identified?
- o   Who were the community leaders?
- o   How would the community leaders contribute?
- o   Did the community leaders expect feedback?
- o   What did the community leaders expect from the centre?

3.5.2.5   Other support structures

Other support structures refer to other third parties and services that the centre would rely on for assistance in the implementation of the centre. As with the previous unit, the data was collected from documentation that was available from the project manager as well as interviews with the project manager and centre staff. Below are the questions relating to other third party resources.

- o   What other resources apart from IT are important?
- o   Are there back-up plans for the supply of electricity?
- o   What transport is readily available for centre access?

The following table outlines the implementation phase of the research instrument.

TABLE 3-2   Implementation phase of the research instrument

UNIT	MEASUREMENT	DATA COLLECTION METHOD
Selection of centre staff	Business skill	Interviews with TSA staff and centre management
	Technical skill	Interviews with TSA staff and centre management
	Knowledge of community	Interviews with TSA staff and centre management
	Acceptance within community	Interviews with TSA staff and centre management
	Innovation	Interviews with TSA staff and centre management
Implementation process	Project plan	Documentation analysis and interviews with the project manager
IT suppliers and IT support	Process followed	Documentation analysis; interview with centre staff and TSA role players
Identification of community leaders	Process used	Documentation analysis and interviews with centre staff and TSA role players
Identification of other support structures	Process used	Documentation analysis and interviews with centre staff and TSA role players

3.5.3 Evaluation and adjustment phase

Evaluation and adjustment was applied on an iterative basis to each ICT centre. The effectiveness of this part of the instrument was dependant on the ICT centre's management being able to effect the changes suggested to them. The first evaluation was an attempt to

ascertain a status quo of each ICT centre which was used as the initial benchmark for further assessment. After the initial evaluation, modifications to processes and the management of centres were suggested if deemed necessary. The implementation of these suggestions was assessed after a reasonable amount of time in order to measure effectiveness. Table 3.3 below reflects the third phase of the instrument:

The evaluation and adjustment phase focuses on four major areas in an attempt to determine effectiveness. These areas are represented by centre usage, centre reliability, the perceptions of users of the centres about the standard of the services and, finally, the income generated versus expenditure.

3.5.3.1 Centre usage

This unit relied on documentation that indicated the number of people using the centre, the number of training sessions offered and the usage of services, such as the Internet, e-mail and other services available at the specific centre. Registers that were kept as well as interviews with the centre staff responsible for the running of the centre were used for the data collection.

3.5.3.2 Centre reliability

Reliability examines the actual availability of services rendered by each centre. Reliability was also considered a function of the support that each centre received from third party suppliers and for this reason access to third party suppliers was considered important. Up time of the server and workstations were measured through registers kept by the centre and interviews with the centre staff. Access to the Internet, telephones and power was measured mainly through interviews with the centre staff and any available documentation pertaining to the status of access to these services. Back-up measures, such as the presence of generators and UPSes, were also noted.

3.5.3.3 Assessment of user perceptions of centre

All the measures, such as affordability, appropriate services, ease of centre accessibility, centre operating hours and awareness of the centre, were determined through interviews with the centre staff and community. Often, particularly in the rural areas, it was not possible to interview community members for a variety of reasons and the researcher had to rely on feedback from the centre staff about user perceptions.

3.5.3.4 Income generation and expenditure

Income generation and expenditure was determined through the documentation made available by the centre staff, which listed all income generated and how it was generated. All expenditures were recorded in a similar fashion. Data was extracted from the documentation. Interviews were used when the documentation was not up to date.

The following table outlines the evaluation and adjustment phase of the instrument.

TABLE 3-3 Evaluation and adjustment phase of the research instrument

UNIT	MEASUREMENT	DATA COLLECTION METHOD
Usage of centre	Number of people	Document analysis and interviews with centre staff
	Number of training sessions	Document analysis and interviews with centre staff
	Internet usage	Document analysis and interviews with centre staff
	E-mail usage	Document analysis and interviews with centre staff
	Other IT services	Document analysis and interviews with centre staff
Centre reliability	Up time of server	Document analysis and interviews with centre staff
	Up time of workstations	Document analysis and interviews with centre staff
	Connectivity to the Internet	Document analysis and interviews with centre staff
	Power availability	Document analysis and interviews with centre staff
	Access to third party suppliers	Interviews with centre staff
Assessment of user perceptions of centre	Affordability	Registers, accounts, interviews with community and centre staff
	Appropriate services	Document analysis and interviews with centre staff and community
	Ease of centre accessibility	Document analysis and interviews with centre staff and community
	Operating hours	Document analysis and interviews with centre staff and community
	Awareness of centre	Document analysis and interviews with centre staff and community

Income generation	Amount	Financial statements; document analysis and interviews with centre staff
Overheads	Amount	Financial statements; document analysis and interviews with centre staff

3.5.4 Sustainability

Sustainability was determined by the collection and analysis of the findings from the application of the third section of the instrument, namely evaluation and adjustment.

Sustainability of a centre was based on four factors, namely centre usage, income generated, expenditure and user perceptions. These factors were identified over the period of the study and the intention was to note any changes in order to determine growth or improvement. This was achieved by comparing figures that were measured each time against previous measurements.

The following table outlines the sustainability phase of the research instrument.

TABLE 3- 4 Sustainability phase of the research instrument

UNIT	MEASUREMENT	DATA COLLECTION METHOD
Centre usage	Actual figures based on users of the centre over a period of time	Evaluation and adjustment phase – figures and dates
Income generation	Actual figures over a period of time	Evaluation and adjustment phase – figures and dates
Expenditure	Actual figures over a period of time	Evaluation and adjustment phase – figures and dates
User perceptions	Identification of improvement	Evaluation and adjustment phase – dates of interviews and field notes

3.6   Conclusion

The research approach used in this study can be summarised as action research through case studies over an extended period of time and is considered a longitudinal study. A longitudinal study is in the context of this research is defined as a study over a six year period. Great emphasis was placed on participant observation and interviews as data collection methods. Triangulation was used in an attempt to increase the reliability of the findings.

The research instrument was designed to cover the four phases critical to the determination of the effectiveness of each centre. It consisted of the conceptualisation, implementation and evaluation and adjustment phases in order to arrive at the sustainability phase.

 The following chapter discusses each of the six ICT centres in detail.

CHAPTER FOUR

CASE STUDIES

4.1 Introduction

The chapter will deal with each of the ICT centres separately. It will include a description of each centre as well as the observations derived from the use of the research instrument as outlined in the previous chapter. The names of each ICT centre and the exact locality will not be documented, and the ICT centres will be referred to ICT1 through to ICT6.

4.2 The role of TSA in the implementation of the ICT centres

The role of Technikon South Africa (TSA) with respect to each ICT centre was determined by the individual circumstances and needs of each ICT centre. TSA appointed one of its employees to manage the deployment of all the centres, except for ICT2 and ICT6. Here funding from international donors was used to establish the centres. The schools that housed ICT2 and ICT6 asked TSA to assist with operational issues as well as with trying to make these two centres sustainable.

The following terms used in the text refer to the TSA role players that were involved in the ICT centres.

TSA project manager – the TSA staff member who was responsible for the conceptualisation and implementation of ICT 1,3,4 and 5. The TSA project manager was based in Johannesburg at TSA's main campus.

TSA regional director's – the most senior TSA officials who were responsible for the geographic area serviced by a TSA regional office. TSA had nine regional offices throughout South Africa with the intention of providing a better service to TSA students. The TSA regional directors were based at the respective regional offices.

TSA local representative – the person who was directly involved with the ICT centre which was situated in the same geographic area serviced by the local TSA regional office and who was employed by the local TSA regional office. The official was employed to work directly with students and to assist with the deployment of tutors for TSA students. This official usually was considered as the most knowledgeable employee at the regional office about the local region and for this reason was to assist in the deployment of ICT centres in the region.

4.3   Information and Communication Technology Centre one - ICT1

4.3.1   Background

ICT1 was the initiative of a large overseas private corporation and TSA. The overseas corporation was prepared to donate money to establish an ICT centre and relied on TSA to identify an area that would satisfy the donor's requirements for the establishment of an ICT centre. The donor's requirements are outlined below.

- o   The centre had to address the information needs of the community and to contribute to the overall economic growth of the community
- o   The centre had to be managed on business principles
- o   The ICT centre manager had to be selected on the basis of leadership qualities, entrepreneurship skills and acceptance within the community
- o   The understanding between the donor and TSA project manager was that the ICT centre had to be self-sustaining and that financial support from the donor and TSA would not be forthcoming, apart from the initial seeding money
- o   There had to be buy-in from the community through the community leadership

ICT1 had been in operation since March 2000 and was the second of TSA's ICT centres to be established. The centre had been the focus of much attention from TSA as well as the media because the community centre, of which the ICT centre is part, received an international award for innovation in July 2001. The award resulted in the promotion of the centre and continual interest being shown in the centre by various support groups. This interest has undoubtedly given impetus to the centre's existence, which may prove to be significant.

IMAGE 4-1 A view from ICT1 to the north

The centre is situated in the Limpopo province in a former homeland within a sprawling village. There are approximately 95,000 people living in the area from at least five different ethnic groups. The centre is 21 kilometres from the nearest town, which provides petrol, a few basic services and is on a national road. There is a Vodaphone kiosk within walking distance

of the centre, which is used extensively. There is no electricity supply in the area. Some of the schools have experimented with solar power with little success. Water supply is a problem to most as access to drinking water entails a considerable walk to the watering point. The community as a whole is relatively free of crime. There appears to be strong support for traditional authorities, especially the Chief of the local community. Headmasters are also considered leaders within the community.

4.3.2   Infrastructure of ICT1

ICT1 is situated within a community centre which contains the following services: a bank, a library, a sewing room, small supply shops, a small meeting space, a centre office, a kitchen, a gift shop (limited), toilets, and a traditional building display. Adjacent to the community centre are a health centre (quite comprehensive), a goat pen, chicken pens, a community garden (irrigated), a pig pen, a new orchard, a sports complex including a soccer field, an athletic track and even a tennis court.

The sole source of electricity for the entire community centre is a petrol-powered generator. It appears that the ICT centre is the greatest user of the generator. Problems occur when petrol is needed for the generator, as transport to the petrol station is costly and very inconvenient. ICT1 is expected to pay for the petrol for the generator. As a result the generator frequently runs out of fuel rendering the centre inactive. The manager of the centre remarked to the researcher, 'it is too far and expensive for us to get petrol. We do not have money, we do not

know what to do.'

IMAGE 4-2 The small petrol generator

4.3.3   Services offered by ICT1

ICT1 has six PCs, running Microsoft Office. They are connected to a small server. The small local area network is connected to a modem and a printer allowing each of the workstations access to both the Internet and printing facilities. There is a single telephone line, which is used by the community centre for e-mail and Internet access. These facilities are used

primarily to type and print letters, to recharge cellular phones, to photocopy and to teach a six-month-long computer course.

4.3.4 Application of the research instrument

The manner in which the instrument was applied to ICT1 is described here, detailing the process, the data sources, data and findings.

4.3.4.1 Conceptualisation phase

4.3.4.1.1 *Site selection*

The TSA project manager and ICT centre manger were interviewed about the centre's infrastructure and access (refer to table 4.1 in the appendix, page ii).
Apart from the donor's indication that the ICT centre should be in a rural area in South Africa, the TSA project manager was largely responsible for determining the site of ICT1. The TSA project manager selected the community centre to house ICT1 after a visit to the community centre prior to the donor's request, since it had been in operation for some time. The TSA project manager indicated that much groundwork had been carried out before the community centre was established and that the requirements for the establishment of a community centre were in line with those of the ICT centre. The project manager argued that the community centre was to assist with economic development in the community and it was therefore considered logical that ICT1 be part of it. There were no other ICT centres in the area. The community centre was meant to service several thousand people.

4.3.4.1.2 *Role players*

The community leaders, the community centre staff and the TSA project manager were identified as role players. As the TSA project manager considered the existing community centre key to the viability of ICT1, the community centre staff were also considered to be role players in the establishment of the ICT centre. The staff of the community centre were instrumental in identifying potential staff candidates for ICT1. Community leaders were identified by the TSA project manager through the community centre and were informed that an ICT centre was going to be established.

4.3.4.1.3 *Community needs*

The researcher tried to ascertain if there was any evidence of some form of research into the community's IT-related needs. There were no such findings and the response from the TSA project manager was that he had based the needs on ICT centres used elsewhere in

Southern Africa. The community needs identified by the TSA project manager were basic computer literacy; access to e-mail; access to the Internet for research purposes; facilities for faxing, typing and printing documents. The centre manager was in agreement with the TSA project manager assessment of the community needs. It was clearly evident that no communication with community leaders or the community itself was undertaken to establish these needs of this particular community. Needs were based on assumptions (refer to table 4.2 in the appendix, page ii).

4.3.4.1.4   Business plan

The TSA project manager indicated that he was responsible for the project plan and supplied the researcher with the necessary documentation. The documentation highlighted the understanding between TSA and the donor that TSA would address the donor's conditions. The donation was used to procure furniture, IT equipment, software and the first year's IT maintenance. Thereafter, the centre had to be self-sustaining and would have to rely on its own ability to generate funds. The TSA project manager had drawn up an expected forecast of income for three years, which showed a twelve per cent increase per year. No motivation for this figure was provided.

Marketing, contingency plans or maintenance were not mentioned in the project plan. The TSA project manager's indicated that the reason for not focusing on these issues was because the community centre was already established and successful.

Although not documented in the business plan, the main objective of ICT1, according to the TSA project manager and the centre manager, was to use technology to address the community's needs and stimulate local economic growth.

The project plan given to the researcher highlighted the importance of income generation in order for ICT1 to survive, although there were no suggestions for how it should be achieved (refer to table 4.3 in the appendix, page iii).

4.3.4.2   Implementation phase

The implementation phase focused on three main issues, namely: the selection of the centre management, third party support, and the actual implementation process.

4.3.4.2.1   Selection of centre management

During the interview with the project manager, it was confirmed that ICT1's manager was selected from a pool of people that were already part of the community centre. The selection

process for the appointment of the centre manager was based on two main considerations: firstly, the incumbent's ability to deal with basic IT issues; and, secondly, the incumbent's appreciation of business. The researcher then asked the TSA project manager a number of questions relating to the selection process (refer to table 4.4 in the appendix, page iii).

The responses to the questions indicated that the primary emphasis for selecting the centre manager was focused on technical ability and secondly, the ability to run ICT1 as a business. This focus was motivated because of ICT1's remoteness from large centres. The centre manager had to be able to deal with technical issues. The business acumen was important due to the intention of ICT1 being able to sustain itself.

The researcher then interviewed ICT1's centre manager whose response to the following questions are tabled below:

Table 4.1   Summary of interview with ICT1's centre manager regarding the management of ICT1

Issue	Response
Is it important to have business skills	B
It is important to understand the needs of the community	A
Is it important to be technically skilled	B
Is it important to have apps knowledge	A
It is important for the centre to make money	A
Is it important to have people skills	B
Is it important to market the centre	B

Legend A – Important; B – Not sure; C – Not important

From the responses tabled above, it was clear that the centre manager acknowledged the importance of understanding what the community needs were and that the centre could only be sustainable if it generated income. The indication was also that the community needed to develop skills on computer applications such as word processing and basic computer skills. Marketing of the ICT1 did not appear to be an issue due to the presence of the community centre.

4.3.4.2.2   *Third party support*

Third party support refers specifically to IT support and would be managed through a Service Level Agreement (SLA) between the supplier of the IT and ICT1 through the centre manager. The researcher dealt with the issue of third party support during an open discussion with the manager of ICT1 and the TSA project manager. Third party support is particularly important

for ICT1, because of the remote location of the centre. Third party support was considered crucial as both managers realised the risk of not having resources close to ICT1 being so far removed from large urban centres. Third party support for technical issues, including IT and the power generator, was seen as critical to the success of the centre.

The risk of IT failing was dealt with in a service level agreement with the supplier. Though the generator and the provision of petrol for the generator was considered a risk to ICT1, there was no contingency in place. It appeared that it was decided to deal with problems as and when they occurred.

4.3.4.2.3   Implementation process

The researcher needed to be assured that a project plan had been designed and followed for the implementation of the centre. There had to be evidence that a structured and managed approach was used. The TSA project manager could only show a limited number of documents that could be seen as part of a project plan. This included:

- o   Itemised IT equipment and costs
- o   Approval to proceed from TSA management
- o   Correspondence with the IT supplier for delivery of equipment
- o   A date for the official opening of the centre

There was no evidence of a properly documented project plan. The TSA project manager indicated that it was a relatively simple process to implement the centre and, as he himself was involved, did not deem it necessary to follow a strict project management approach. Any problems that were encountered were dealt with by the TSA project manager personally.

4.3.4.3   Evaluation and adjustment phase

The assessment of the evaluation and adjustment phase, part of the research instrument, was applied during three visits over a period of three years.

4.3.4.3.1   First site visit

The first evaluation was done in April 2001, after the centre had been in operation for nearly a year. The centre manager was warned of the visit and was asked, through the TSA project manager, to try and have some of the members of the local community available for an assessment of the services of the centre.

Usage of centre

The centre manager was asked to give an indication of the usage of the centre from the first day of operation to the present (refer to table 4.5 in the appendix, page iv).

The responses indicated that there was no tool in place to accurately measure the usage of the centre. There were problems with the e-mail usage due to the high prices that customers had to pay for sending e-mail. This was the reason for the decline in e-mail usage. Unreliability, which will be addressed later, was also a factor that the centre manger considered as a reason for the poor centre usage.

The following recommendations were proposed by the researcher:

- o Keep a log of centre usage by designing a register, which would include the usage per service, the date and the number of clients
- o The log of centre usage should also serve as a record for calculating income generated

Reliability

Due to the physical location of ICT1, reliability was considered by the researcher as a concern. It was, therefore, important to identify all issues related to the reliability of the IT equipment and the supporting infrastructure. The centre manager was asked to give an account of the overall reliability of the centre's infrastructure (refer to table 4.6 in the appendix, page iv).

All the problems that the centre manager highlighted could be traced back to the unreliable source of power. The power was not managed, in terms of an uninterrupted power supply (UPS). The result was that the petrol generator produced an irregular flow of electricity resulting in damage to the IT equipment. There were also times when the generator suddenly stopped operating. The effect on the IT infrastructure of the erratic power supply was severe. The server and workstations were damaged resulting in the centre being rendered inoperable. The suppliers of the hardware were not prepared to honour the SLA with the centre due to the nature of the power supply.

The situation was further aggravated by the lack of petrol available for the generator. Petrol was only available at the closest town, which was twenty kilometres from the centre. The cost of getting to the town and back was not taken into consideration in the implementation phase, which meant that there were no funds set aside for travelling to purchase petrol.

The following recommendations were proposed by the researcher:

- o The installation of a UPS, which would smooth out the uneven power and, in the event of a sudden power outage, would allow the centre manager time to power off the server and workstations thus avoiding hardware damage
- o The researcher communicated the need to TSA in order to obtain funding for the UPS
- o The centre manager was also urged to maintain a record of power outages and other incidents that have an impact on the reliability of the centre

User perceptions of centre services

The centre manger was then asked to give an indication of the perceptions of the community who made use of the centre. There were no members from the community available for interviews as the centre was experiencing power problems resulting in a broken supply of services. Interviews with the community were required by the researcher which could have helped to confirm the responses from the centre manager (refer to table 4.7 in the appendix, page iv).

The interview revealed that, because of the major problems with the supply of power, the service capacity of the centre was severely affected. It was thus apparent that the centre was not offering a service that could be considered effective, according to the centre manager. It was also clear that the community's problem with the expensive cost of e-mail usage was a result of a lack of planning during the conceptual phase. The centre manager based the cost of using e-mail on the equivalent alternative of using the postal service. Each e-mail message was billed at R10,00 per sent message and as a result the community was not prepared to use the service.

The following recommendations were proposed by the researcher:

- o The researcher recommended that the power problems be resolved as soon as possible and linked to a back-up plan to maintain a reliable supply of electricity
- o The second recommendation was to measure and document users' perceptions. This information could be used to help with the management of the centre and to determine whether the services rendered by ICT1 are in line with what the community really needs

Income generation

Income generation, as noted earlier, underpins the survival of the centre, and the centre manager was aware of its importance. The discussion with the centre manager revealed two noteworthy issues: firstly, there was no system in place to manage the finances of the centre; secondly, the centre manager showed symptoms of SAD (discussed in Chapter Two – 2.10).

The following recommendations were proposed by the researcher:

- o Put a simple system in place to record income

- o Record all expenditure and make use of the community centre management for assistance in this regard
- o Treatment of SAD

Summary of recommendations

The following is a summary of the recommendations made after the first visit and the intended effects suggested for improvement to the management of ICT1.

TABLE 4-2 Summary of recommendations after first visit to ICT1

FACTOR	RECOMMENDATION	INTENDED EFFECT
Usage of centre	Create a register that records the use of each centre, including date, time and number of people	To measure the usage of the centre in order to identify trends, growth and highlight problem areas
Reliability of services	Install a UPS; bring the hardware supplier back to honour the SLA	UPS will help to stabilise the centre
	Create a register to record downtime, with reasons	This will be used to track problems and can serve as an input for the creation of an improved model
User perceptions of centre services	Create a customer satisfaction survey	To measure the effectiveness of the centre so as to manage it better and to make adjustments in order to maintain satisfactory service delivery
Income generation and overheads	Install a simple book-keeping system to record income and expenditure	To manage the centre better and to determine the centre's financial viability

4.3.4.3.2 Second site visit

In September 2001, five months after the first site visit, the researcher arrived at the site unannounced. The centre manager was available for discussion. The focus of the second visit was to establish whether the recommendations were applied resulting in any noteworthy changes since the first visit. Positive changes would be in the form of increased usage, an increase in income, increased reliability of the centre and some indication of proof of user satisfaction.

Using the summary of the recommendations provided after the first visit as a point of departure, the researcher wanted to establish whether the suggestions that were made after the first site visit had been implemented, and to identify any other innovations or changes that the centre manager had made.

The following observations were made during the second visit:

The UPS had been installed, made possible with funding by TSA. This had a positive effect in terms of the stability of the power supply and also resulted in the hardware supplier being prepared to honour the SLA. The hardware supplier, however, only had to offer the service for two months as the SLA had expired and the SLA could not be renewed due to a lack of funds. The centre manager voiced his concern regarding the late installation of the UPS ' because the centre has not been able to function for so long because of the power problems. The community is not coming to use the centre as much as they did.'

There was no evidence of any attempts to implement the recommendations with regard to usage of centre, user perceptions and financial management. The centre manager argued that the downtime of ICT1 had resulted in a very low usage and therefore the centre manager did not see the benefit of creating a register.

Shortly before the second site visit, the TSA project manager who was responsible for the conceptualisation and implementation of ICT1 put forward ICT1 as an example for ICT deployment in rural areas, to an international body for consideration for an award. The result was that ICT1 received an award for innovation. This caused renewed interest from the TSA project manager. The ex-TSA project manager was no longer part of TSA and was working in the northern hemisphere. He realised that ICT1 was not functioning as was hoped based on discussions with the centre manager and therefore attempted to assist ICT1 remotely form the Northern Hemisphere. He managed to organize an audit of ICT1 conducted by an international consultant[2]. The findings of the audit revealed the lack of power as being the greatest challenge and proposed that the award could be used for motivating funding from TSA to resolve the power problem. It was clear that the consultant was aware of the community centre's crucial role in the survival of the ICT centre. Solar power was suggested by the consultant as an alternative to the generator. The suggestions provided in the audit are summarised below.

- o Investigate alternatives to the petrol generator for the supply of electricity
- o Investigate ways of training the centre manager in IT
- o Assist the manager of ICT1 in managing the centre by using proven business principles

The findings from the audit report supported the observations made by the researcher during the second site visit.

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[2] The researcher did obtain permission to reveal details regarding the consultant and audit report

Summary of observations made during second visit

- o The centre was still unable to provide a reliable service
- o There were indications of a decreased usage of the centre
- o The centre manager appeared not to be interested in making changes to streamline the processes for managing the centre
- o The hardware suppliers were no longer available for support
- o The centre would most certainly have closed down had it not been the recipient of the award for innovation

4.3.4.3.3   *Third site visit*

The third site visit took place in October 2002. The intention was to identify changes based on the recommendations made after the first site visit and to determine if the recommended suggestions by the audit had resulted in positive changes.

The visit revealed that:

- o There were still problems with the supply of power as the generator was still in use. The solar power that was suggested by the audit report was not implemented
- o The manager of ICT1 had resigned and left the daily operaitons of the centre to a young community member who had a rudimentary knowledge of IT
- o There had been a number of community members who had attended short courses at the centre, which generated some income for the centre
- o There was evidence of record-keeping of courses run and other income-generating services including basic computer training and e-mail usage
- o Usage of ICT1 did increase
- o The income generated over a six-month period averaged out to R1,100,00 per month

4.3.4.4   Sustainability phase

After applying the instrument to measure the centre in terms of growth, income, usage, management of costs and community feedback, the following observations were made:

- o The centre had shown a growth in income and usage
- o Although the change was small, there was a definite increase in usage, which resulted in an increase in income
- o The usage was also spread over six months as opposed to spasmodic use indicating a general, overall increase in use and perceived centre reliability
- o The control of costs could not be measured due to a lack of registers or proper documentation by the centre staff

o   There was still no evidence of customer feedback in terms of services

The researcher discussed the potential of ICT1 with an external consultant, who was appointed by the previous TSA project manager to assist with ICT1. The consultant asserted that:

> 'The ICT centre will never be sustainable. It must be seen as part of the
> community centre and the major reason for the deployment of an ICT centre is
> so that the community centre staff and leaders can feel good about themselves.'

ICT1 was functioning because of the community centre and had never shown real growth.

4.4   Information and Communication Technology Centre two- ICT2

4.4.1 Background

The data describing ICT2 was collected during interviews with the centre management, the TSA project manager and documentation compiled by the centre management.

ICT2 was the third ICT centre initiative of TSA and was established in July 2000. The TSA project manager responsible for the first ICT centre was also responsible for the planning and deployment of ICT2. It was initially located in an area that was considered by the project manager to be historically disadvantaged. Sensitive to the lack of infrastructure and the resulting challenges highlighted by the lessons learned from ICT1 and not wanting to face similar problems, the TSA project manager made the decision to establish the centre in the nearest town to this disadvantaged community. According to ICT2's manager, the decision to relocate the centre was supported by the community mainly because of a sound and affordable transport system to the town from the rural area. TSA management was concerned about the financial stability of ICT2 and was determined to have the centre close to transport routes and shopping centres, to enable easy access for users. The local TSA management intended also to make use of ICT2 as an additional support centre for TSA students.

The town in which the centre is situated, is the largest in an area with a high population. There are five large secondary schools and seven primary schools in the surrounding area. According to the local government, the illiteracy rate in the neighbouring rural area is considered unacceptable, particularly in the mature group of the population. Unemployment is also a major concern. Access to tertiary education, computers and libraries is almost non-existent for the majority of the rural areas supported by the town.

Other potential users of ICT2 include staff from some of the local mines, local branches of government departments and rural schools.

4.4.2   Infrastructure of ICT2

The surrounding area has a poor infrastructure on every level. There are poor transport facilities; no electricity or easy access to water; and there is a weak communication infrastructure. There are no telephone lines, no cellular phone reception and an absence of newspapers. This forces the community to rely on the town for news and information.

4.4.3   Services offered by ICT2

The centre consists of ten networked PCs connected to a server. The centre initially made use of a thin client architecture which meant that the workstations were really dumb terminals and relied on the server for processing and storage. This proved later to be impractical. There are two networked printers, a fax machine, photocopying and scanning facilities. There is a dial-up Internet connection to a pay phone, so e-mailing facilities are also available. The centre also offers a number of other services which include career guidance, Pre-Registration Assessment (PRA), typing services, registration courses offered by TSA and computer training. The intention was to have TSA play a significant role in the support and rendering of services. Below is a list of TSA services available to the community through ICT2.

- o   Introduction to PCs
- o   Public management courses
- o   Training for trainers
- o   Customer care
- o   Other computer programmes as requested by the community
- o   Basic public financial management courses
- o   Capacity-building training
- o   Basic management courses
- o   End user computing

ICT2 was part of a community centre, which provided a number of services and was already established.

IMAGE 4-4 The secure environment at ICT2

4.4.4 Application of the instrument

4.4.4.1   Conceptualisation phase

The researcher relied heavily on the TSA regional director for information regarding ICT2's conceptualisation phase, as the TSA project manager had resigned from TSA. The regional director also gave approval for the local TSA staff members to become involved in the managing of ICT2. The documentation that the TSA project manager had put together focused mainly on the motivation for the relocation from the original proposed site in the rural area to the town.

4.4.4.1.1   Site selection

The following reasons were given for the selection of the current second site for ICT2:

- o   There was no existing ICT centre or similar services in the area
- o   There is a sound and reliable infrastructure
- o   There is easy access for TSA students with no transport options. Thus ICT2 could serve TSA students as well

The contracted centre manager was interviewed with respect to the physical infrastructure and access (refer to table 4.8 in the appendix, page iv).
It was clear that the physical location for ICT2 was ideally situated in terms of transport systems and therefore easily accessible by the community. It also did not appear to have problems with power supply, access to telephones and the internet. The building housing the centre was secure.

4.4.4.1.2   Role players

Due to the current location of ICT2, the people responsible for the management and running of the site are part of TSA's staff establishment. There was no indication of any other inputs or involvement of stakeholders from the community or other quarters in the initial stages. The first centre manager of ICT2 was a contractor who was appointed from the local community after the centre had been in operation for eighteen months. The contract centre manager was later replaced by a permanent TSA staff member who also had responsibilities at TSA to manage.

The contracted centre manager did indicate that the TSA students had made it known, through the local Student Representative Council (SRC), that they were appreciative of the centre being established in the town. The researcher also identified TSA students as important role players in the success of the centre.

ICT2 had the benefit of local TSA staff and a potential client base comprising of TSA students in the area. The management and running of ICT2 was firmly in the hands of TSA.

4.4.4.1.3   Community needs

The researcher interviewed the contracted centre manager in an attempt to identify his perception of the community needs (refer to table 4.9 in the appendix, page v). According to the contracted centre manager of ICT2, no analysis was undertaken to determine the needs of the community for the old or new site for ICT2. The TSA project manager based his idea of the needs of the community on two assumptions: firstly, there was no other alternative to an ICT centre in the area; and, secondly, the centre should accommodate TSA students. These assumptions according to the contracted centre manager, was the motivation used for choosing both the initial location as well as the relocated site for ICT2.

The centre manager felt that there was a need for basic services such as typing, printing, and access to telephones. He assumed that there was a need for IT training, with his idea based on ICT2 serving TSA students in this regard.

No community needs assessment was undertaken for either the initial location or the relocated site for ICT2. Assumptions were used to base the services that were to be made available for the community. It was also evident that the local TSA students were seen as part of the potential client base which could support ICT2.

4.4.4.1.4   Business plan

The TSA project manager submitted a motivation for the establishment of ICT2 to the management of TSA. The documentation also contained specific information, such as the process to communicate with the community leaders, the resources needed and a financial forecast in terms of expected income generation and expenditure. There was however no evidence of communication with the local community leaders.

The financial forecast was aimed at convincing TSA management that ICT2 would be able to survive and would show real growth. The motivation showed a potential growth over a three-year period of 12 %. The figure of 12 % growth appeared in all of the forecasts for all of the

ICT centres handled by the TSA project manager, even though there was no other supporting documentation available to substantiate this figure. TSA management did not insist on a more concrete motivation to support the TSA project manager's growth figure. The documentation that was forwarded to TSA management showed no provision for marketing, contingencies or maintenance.

The researcher used a set of questions in an interview with the contracted centre manager, (refer to table 4.10 in the appendix, page v) to establish whether the contracted centre manager had done anything to remedy the absence of a business plan which would assist with the stabilisation of ICT2. The results from the interview indicated that the contracted centre manager was of the opinion that:

- o Marketing the centre was essential for the generation of funds
- o Offering relevant courses to the community was essential to the viability of ICT2
- o There was a need to address support issues, as the original support agreement had expired
- o Human resources were being provided by the TSA regional management to maintain ICT2
- o TSA would have to assist with funding in order to stabilise the centre

4.4.4.2   Implementation phase

4.4.4.2.1   Selection of centre management

The TSA regional director decided to make use of TSA staff and to take responsibility for the appointment of the centre manager, particularly as the intention was to also use ICT2 to service TSA students. The contracted centre manager was appointed primarily to stabilise the centre. The researcher interviewed the TSA regional director about the selection process followed for the appointment of the contracted centre manager (refer to table 4.11 in the appendix, page vi).
The responses are summarised below.

- o Business acumen is considered critical for staff responsible for ICT2
- o Technical ability is considered important, but can be acquired from another source
- o Local knowledge is not considered critical and the centre manager need not be accepted by the community as a leader
- o The manager must, ideally, be a problem solver

4.4.4.2.2   Third party support

Third party support was broken down into two major areas: IT support, and academic and training support.

Academic and training support was considered – by the contracted manager and regional director – as the key to a financially viable solution for ICT2. This was due to the number of TSA students needing practical exposure to IT and IT knowledge. The quality of training to be provided by the centre had to be at a level that would result in the centre being used continuously.

Third party support for IT was addressed in a one-year contract with the supplier of the IT equipment. Thereafter it was assumed that the centre should be able to fund third party support. The third party support could be on a time and materials basis or a SLA could be renegotiated, as the initial SLA would expire after a year. In time, the contract manager and assistants would be expected to have sufficient knowledge gained through hands-on experience, to deal with technical issues. The technical expertise at TSA could serve as their back-up.

4.4.4.3   Evaluation and adjustment phase

This ICT centre was measured three times over a period of three years.

4.4.4.3.1   First site visit

The first evaluation was done in June 2001, after the centre had been in operation for over a year, under the control of the contracted centre manager. The contracted centre manger was aware of the impending site visit. The visit preceded a telephonic interview with the regional director. The telephonic interview was an informal discussion which highlighted the regional director's concern regarding the contracted centre manager's inability to manage the centre effectively, and the reliability of the original hardware. The regional director was trying to gain more support from TSA in the form of technical expertise and funding for the replacement of the hardware and software. Reasons given for the contracted manager's inability to manage the centre were vague, and appeared to relate to wanting a person in the position who was more sensitive to the community.

Usage of centre

The contracted centre manager was asked to give an indication of the usage of the centre from the first day of operation to the present. The findings are summarised below.

o   The number of people using the centre was promising to start with, but was decreasing

98

- There were five short IT courses on offer
- Internet usage was low and appeared not to be a requirement of the community
- E-mail was used initially but was found not to be a community requirement
- No other services at the centre were used

The responses indicated that there was no tool in place to accurately measure the usage of the centre other than a record of the courses given and attended. E-mail usage was not as popular as was hoped by to the contracted centre manager.

The following recommendations were proposed by the researcher:

- Design a register for usage to determine what services are used
- Try to identify what the community needs are

Reliability

The contracted centre manager was asked to give an account of the overall reliability of the centre's infrastructure, with special emphasis on the IT infrastructure (refer to table 4.12 in the appendix, page vi).

Because of the location of the centre, it was assumed that electricity would not be a threat to the functioning of the centre. The overall response from the contract manager was positive, although there was an acute awareness of the possibility of the server crashing and rendering the centre inoperable.

The system architecture used, was the TSA project manager's suggestion for all the ICT centres. He mentioned during interviews on a number of occasions that he felt that thin client (dumb terminals linked to a server) is the way to go as the user is not sophisticated enough to deal with a fat client (PC) and there is less of a risk to the system as a whole.

The contracted centre manager was also concerned about the type of software that was installed on the server. The software was not widely used and could not be considered a standard. Third party support for the software was limited. The TSA project manager was also responsible for the choice of the software, and when asked by the researcher to motivate his choice, the reply was: 'It is my decision and I have tested it and feel that it is the way to go.'

Although ICT2 was supplied by a reliable power source (ESKOM), TSA regional office insisted that a UPS be connected to the server to allow an uninterrupted flow of power, and act as a back-up. This decision was supported strongly by the suppliers who were also responsible for the support of ICT1.

The following recommendations were proposed by the researcher:

- o That while the IT equipment was still functioning reliably, the contracted centre manager should decide what IT equipment and software would be ideal for the environment
- o That the contracted manager should build a business case which detailed the costs of replacing the equipment with the relevant infrastructure, should the need arise

User perceptions of centre services

The contracted centre manager and centre staff were asked to give an indication of users' perceptions of the services rendered by ICT2 as the researcher was unable to interview users of ICT2. The general consensus was that the users were satisfied with the services. The only issue of significance was that the TSA students believed that the services should be free. There was a perception that ICT2 was part of TSA and, therefore, the student's fees should cover ICT2 services (refer to table 4.13 in the appendix, page vi).

Income generation and overheads

The contracted centre manager's concerns regarding the future of the centre revolved around the marketing of services. The manager was confident that with a higher usage, the centre would be able to generate sufficient income to sustain itself. Although there was no supporting documentation or other evidence to substantiate the comment, the contracted centre manager was adamant that marketing was the key to success.

The following recommendations were proposed by the researcher:

- o The contract manager was to conduct regular surveys that recorded users' perceptions
- o The contracted centre manager should design a marketing plan to motivate the need for additional funding from the local TSA regional office
- o A model for income generation by identifying services should be put in place that could be considered relevant for the environment

Summary of recommendations

The following table lists the recommendations made after the first visit, and the intended effects for the improvement of the management of the centre.

TABLE 4-6 Summary of recommendations after first visit to ICT2

FACTOR	RECOMMENDATION	INTENDED EFFECT
Usage of centre	Create a register that records the use of each centre, including date, time and number of people	To measure the usage of the centre in order to identify trends, growth and highlight problem areas
Reliability of services	Investigate alternative IT and software options	To determine as accurately as possible what IT infrastructure would be best suited to the environment and users
User perceptions of centre services	Create a customer satisfaction survey	To measure the effectiveness of the centre so as to manage it better and to make adjustments in order to maintain satisfactory service delivery
Income generation and overheads	Develop a marketing plan	To assist with the motivation for advertising the centre's services
	Design a model for income generation based on customer needs	To assist in income generation

4.4.4.3.2   Second site visit

A second visit took place in December 2001, approximately six months after the first visit. The contracted centre manager's contract had lapsed and the centre was being managed by one of the senior academic staff members from the local TSA regional office, who will be referred to as the centre manager. He was the second centre manager. This was viewed as a temporary measure which would end as soon as funding became available for the appointment of a permanent centre manager. The researcher established that the new centre manager had been informed of the interviews between the researcher and the contracted centre manager, as well as the recommendations that were made and agreed to by the contacted centre manager.

The researcher approached the centre manager to establish whether or not the recommendations had been effected, and to assess the status of the centre.

General
The second visit revealed the following:

- o   ICT2 staff were professional in their dealings with clients
- o   The centre was busy and this was considered by the centre manager to be an indication of growth

- o There were problems with unique IT equipment and corresponding software due to a lack of support as the choice of IT equipment and software were not generally used. This was aggravated by the fact that the supplier's SLA had expired, and there was no other affordable support available. Upon further investigation, it was discovered that the supplier had closed down

- o The contracted centre manager had been trying to lobby for funds in order to replace the IT equipment and software with standard software that was commonly used in South Africa

- o The TSA regional director and the centre manager needed funds for the appointment of a permanent or contacted centre manager. These funds were not forthcoming from TSA

Usage of centre

The register was not needed as the accounting records served as a register.

There was no indication of growth.

Reliability

The centre manager highlighted the lack of funds for the replacement of the IT equipment.

Although there were no documented problems, the lack of support indicated a risk.

User perceptions

The centre manager did not think a user satisfaction survey was needed, and relied on the comments made by clients and TSA students.

Income generation and overheads

The manager did not agree that a marketing plan was needed, and appeared to be under the impression that word of mouth, and the fact that TSA students were making more use of the centre, was sufficient to ensure usage and growth.

Growth and sustainability

On the second visit to the centre, an interview was conducted with the centre manager about issues surrounding the growth and sustainability of the centre. Below is a summary of the manager's responses.

- o TSA needs to understand that the centre manager should be on TSA's payroll and needs training and more guidance. The centre manager needs to be accountable for the centre so as to encourage responsibility

- o The centre can grow, but needs to be able to reposition itself to cope with changing needs. More courses should be made available, as well as the subsequent resources

required. The manager is aware of the important role of TSA students, who are the greatest users of ICT2

The centre manager stated to the researcher that:

'… the only possible way an ICT centre can be viable, is if it is part of another organisation or support centre that is itself sustainable. The notion of an ICT centre in less developed areas being sustainable without financial support through subsidy or other means is doubtful.'

The following recommendations were proposed by the researcher:

o   Replace IT equipment and software
o   Appoint a permanent centre manager who will be accountable for the centre's performance
o   Provide more services for TSA students
o   Seek alternative ways of making services to TSA students affordable

Summary of observations made during second visit

o   The centre had definitely shown an improvement since the first visit
o   The importance of having an ICT centre linked to a stable body that could subsidise the centre was apparent
o   The manager was aware of the importance of offering services that were relevant and considered industry standard, especially as far as IT training that satisfied community needs was concerned
o   The importance of the needs of TSA students was realised, and the potential for the centre to serve TSA students was being considered

4.4.4.3.3   Third site visit

A follow-up interview with the centre manager took place in July 2003. There were two major factors that contributed to a significant, positive change in ICT2.
Firstly, the centre manager had obtained permission from TSA management to create a community centre, of which ICT2 was part.
Secondly, ICT2 started to focus more on the TSA students in the area and was primarily running courses that were part of TSA official qualifications.

The community centre, now referred to as TSA's Information Community Centre, provided the following services:

- o Seminar rooms
- o Access to the Internet
- o Printing and faxing facilities
- o Extension of the services provided by the local TSA regional office to TSA students
- o Facilities for Vista distance education students
- o A second computer room consisting of proper PCs, as opposed to the thin client architecture, enabled larger training classes. These PCs were donated to the centre by Vista University

There were also three new permanent staff members that were on the TSA payroll working at the information centre. They were responsible for the overall running of the centre. The registers indicated that the centre was being utilised between 70 % and 85 % of the time. The centre was advertised on signs in the vicinity. The income generated by the TSA Information Community Centre and ICT2 covered the rent and all other costs, excluding the salaries of the three TSA staff members.

The one concern that the centre manager did have, was the lack of funds for the replacement of the IT equipment.

4.3.4.4   Sustainability phase

In the six months leading up to the third site visit, there was a significant growth in income and usage of the centre. The following changes were evident:

- o Registers indicating centre usage were implemented
- o A proper accounting system was in place
- o The TSA internal audit team had done a thorough audit of the financial controls of the centre and was satisfied that the centre had all the necessary controls in place
- o Community feedback was measured by the staff responsible for training

ICT2 showed real growth and focused management. TSA played a significant role in supplying the manpower needed to assist with the running of ICT2 and realised the potential of rendering a service to its own students living in the area.

4.5   Information and Communication Technology Centre three - ICT3

4.5.1 Background

ICT3 was initiated by a commercial company that donated a computer laboratory to a school in a deep rural area in South Africa. The donor did not play any role after the IT equipment

was installed in January 2002. It was because of this that the headmaster contacted TSA for assistance with the centre. No other information regarding the donor of the IT infrastructure was available.

The school is a secondary school that has been in operation for a number of years. The school management was aware of the importance of having a computer laboratory and realised the potential of the centre. The headmaster, through the head of the science department, appointed two of the teachers in the science department to run the centre and to instruct the learners in the use of IT. The intention was to extend this service to school-leavers and to train the local community in IT-related skills, such as basic computer literacy, word processing, spreadsheets and typing. The headmaster was also aware of the fact that his staff members were not qualified and had very little exposure to IT.

TSA had a reasonably high profile in the area, as the TSA project manager had previously tried to establish an ICT centre (ICT4) in the vicinity and had made contact with community leaders, including the school's headmaster. The headmaster contacted the TSA regional director for the region, who then sent one of the TSA local senior academics to meet with him and to report back to the regional director. The local TSA regional director contacted the researcher and a visit to the school was organised.

IMAGE 4-3 A view of the school showing some of the classrooms

4.5.2 Infrastructure of ICT3

The school hosting ICT3 is nearby the border of Mozambique, in a large rural settlement. The settlement supports the farming industry and has a number of primary schools. The settlement is also on a major road linking the northern part of Swaziland with Komatipoort and, therefore, the residents have access to a reliable transport system.

4.5.3   Services offered

The purpose of the centre was to provide computer training to the senior pupils of the school and the community at large. Training would consist of basic computer literacy courses up to advanced training in standard desktop applications, such as word processing, spreadsheets, a presentation application and computer based training (CBT) software. The CBT software was geared towards basic mathematics, physical science and biology and was to be used for community members who wished to improve their qualifications. The IT infrastructure included a server, twelve workstations (normal PCs) and a printer. All of these were networked and all levels of software were current and standard. There was no Internet connection, although it was hoped that this could be installed at a later stage.

The services offered at ICT3 were not typical of those of an ICT centre, and were focused more on the needs of the school pupils than the community. In other words ICT3 was really a PC laboratory geared for the training of school children in CBT with a limited number of IT related courses.

4.5.4   Application of the instrument

Although TSA was not involved with the conceptualisation of ICT3 as TSA was contacted after ICT3 was implemented, the research instrument was applied in the same manner as with the other centres that were part of TSA's ICT project.

4.5.4.1   Conceptualisation phase

4.5.4.1.1   Site selection

In an interview the headmaster indicated that the school had been contacted by a donor who wished to make a donation to the school as part of his social responsibility.

The headmaster was interviewed about the site's physical infrastructure, and the following information was obtained:

- o   ICT3 has access to electricity
- o   ICT3 has access to water
- o   ICT3 has ablution facilities
- o   The school has telephone lines, but ICT3 does not

- o ICT3 is a part of the school, which is situated close to main the transport routes for taxis and buses
- o ICT3 is secure and safe from the elements

4.5.4.1.2   Role players

Role players included the school staff who dealt with ICT3 and TSA staff members who were expected by the headmaster to assist with ICT3. The school's role players included the headmaster, the head of the science department and two teachers. The TSA role players were the local TSA regional office representative and some TSA academics from the IT programme group.

4.5.4.1.3   Community needs

According to the headmaster, there was no evidence that a process had been adopted by the donor to ascertain the needs of the community. The donor expected the headmaster to make use of the IT equipment in the most effective manner to assist the school pupils and the community at large. The donor had laid down no conditions for use. No other support would be forthcoming from the donor.

The headmaster had expectations for ICT3 to fulfil the following needs of the community:

- o To make use of the centre's potential to generate income from service provision
- o To provide programmes for school-leavers
- o To provide programmes for TSA students
- o To provide services to school children
- o To offer e-mail, typing and faxing facilities, and possible telephone access

4.5.4.1.4   Business plan

Apart from a number of ideas, and the headmaster's intention for the centre to be able to generate income, there was no indication of a business plan for ICT3. The headmaster was sensitive to the importance of a business approach in order for ICT3 to be sustainable. The headmaster acknowledged the fact that his staff who were allocated to the centre needed training in order for them to become effective.

The researcher was made aware of the teachers' dissatisfaction regarding the fact that they had to undergo training when one of the teachers remarked: 'I have taught myself a little about IT. I am now able to train members of the community as I know more than they do.' There appeared to be a culture within the school teaching staff that a teacher did not require a qualification in a discipline, but only some basic knowledge, in order to teach that discipline.

The questions relating to a business plan and responses were documented by the researcher and are summarised below (refer to table 4.14 in the appendix, page vii).

- o That a financial model for income generation would be based on community needs
- o Marketing would depend initially on word of mouth
- o A number of staff would be used to in the running of ICT3 ensure consistency
- o TSA would assist the headmaster in ICT3's planning

It was clear that the headmaster had considered the importance of skills within the centre as well as including TSA and its students in the plan.

4.5.4.2   Evaluation and adjustment phase

4.5.4.2.1   *Second site visit*
The researcher, together with the TSA regional academic, met a second time in November 2002 with the headmaster and the centre staff. The focus was on the IT infrastructure, support and the capabilities of the school's support staff.

The following observations were made:

- o The centre had burglar proofing and was secure
- o There was no danger of dust, rain or any other damage from the elements
- o Cabling for the network was neat and had been done by professionals
- o Power was considered stable and no problems were experienced, but there was no UPS
- o Workstations were acceptable and standardised
- o Printers and servers were acceptable
- o Operating software was acceptable
- o Client software was standard
- o Support was not seen as an issue because of the modern and new equipment
- o Problems were experienced with using the software due to a lack of knowledge
- o Of major concern was the fact that although the teachers were trained in the sciences, they had very little knowledge of the software, operating system and hardware

These observations were discussed with the headmaster, who indicated that he was aware of the issues regarding the teachers' lack of IT knowledge. The headmaster's expectation was that TSA would assist in supporting the teachers as well as provide general IT support.

ICT3 had not been used.

The following recommendations were proposed by the researcher:

- o Offer certified training courses with recognised diplomas/certificates
- o Try to satisfy the needs of TSA students in the area
- o Have the teachers trained and certified in IT as soon as possible
- o Establish what is needed for CBT for the schools pupils
- o Speak to the relevant people at TSA to obtain help with the above recommendations.

Table 4.4 Summary of recommendations

FACTOR	RECOMMENDATION	INTENDED EFFECT
Usage of centre	Offer certified training courses with recognised diplomas/certificates. Speak to the relevant people at TSA to obtain help. Establish what is needed for CBT for the schools pupils	To address needs of users of the ICT3 Establish how many TSA students live close to ICT3 and identify needs that can be addressed by ITC3. To assist pupils with some subjects offered at the school
Reliability of services	Have the teachers trained and certified in IT as soon as possible	To ensure that the services and training are up to standard

4.5.4.2.2   Third site visit

The follow-up meeting took place nine months later, in July 2003. The headmaster had resigned and the school was under the leadership of the head of the science department, in an acting capacity. The researcher used the recommendations made on the second visit as a framework for assessing the status of ICT3.

Table 4-5 Outcomes of recommendations suggested for the improvement of ICT3

RECOMMENDATION	ACTION
Contact TSA academic staff	Contact was\made and problem discussed.
Train the trainer	Three teachers were nominated and underwent training on TSA's end user computing as well as basic computer maintenance
Certify the trainers	Two out of the three passed an examination and were seen by TSA's academia as able to train.
Make use of TSA students in the area	Had trained twenty eight TSA students

Enquire about CBT software	Had not done this as the headmaster had been driving the project and then left.

<div align="center">Table 4.3</div>

The TSA academic staff made it clear to the school that TSA would only give training to the nominated school staff, test the staff for competency and would be available telephonically for support relating to the specific training given, but would not be involved further.

The number of people that had made use of ICT3 had increased from a few to 28. The acting headmaster was more concerned about the stability of ICT3 in terms of usage, recognition by the community and throughput of students than about the income generated. The acting headmaster told the researcher: 'once we are sure that we can offer a service that is seen by the community as worthwhile, only then will we look at the generation of income.'

A major concern was the cost of the course. People within the community could not afford the fee charged and were comparing the cost of the course with similar courses offered in urban areas. The researcher established that the academic staff added a twenty per cent surcharge to the normal cost of the course. The normal cost was the same as the course offered by TSA. The surcharge had to be passed on to the end user who then also had to pay an additional fee to cover the school's overheads.

4.5.4.3 Sustainability phase

The instrument could not really be used effectively to determine whether ICT3 had the potential to become sustainable as the new centre management was not driving ICT3 with the same enthusiasm as the headmaster had. There appeared to be apathy on the part of the new centre management which seemed to effect the other centre staff.

ICT3 showed no growth after the initial indications of potential and in fact the centre appeared to be in a state of stagnation.

4.6 Information and Communication Technology Centre four - I CT4

4.6.1 Background of ICT4

ICT4 was the third of four ICT centres that was managed by the TSA project manager. TSA was prepared to set aside an amount of money that would cover the procurement of IT equipment. As with the previous ICT projects, the TSA manager had to find a rural area that was considered in need of an ICT centre. The original site that was decided upon was in a rural area.

The supplier of the equipment voiced concerns about the site, so ICT4 was relocated to the largest town in the province. The supplier's concerns will be discussed in detail later.

4.6.2   Infrastructure of ICT4

Electricity was not available at the time of the first site visit, but was within 50 metres of the centre. Although there was no telephone connection, there is a satellite telephone system 700 metres away from the centre. The centre is opposite a secondary school and close to a village. There is access to water at the centre which is within walking distance from a tarred road.

4.6.3   Services offered at ICT4

One of the more critical considerations for choosing the location of the centre, after interviewing the project manager, was the issue of sustainability. The centre had to be sustainable and, therefore, the services offered by the centre had to be in demand. The staff and pupils of the eight secondary schools and twenty primary schools were seen as potential clients to which services such as Internet access, e-mail, copying and typing of documents would be useful. The centre would also be used as a provider of faxing, photocopying and telephone facilities.

In addition to these services, the centre would offer basic computer training, in the form of end user computing, typing skills and elementary word processing.

4.6.4   Application of the instrument

4.6.4.1   Conceptualisation phase

4.6.4.1.1   Site selection

The project manager identified a community centre as the site in a rural area close to the border of Mozambique which satisfied the conditions of TSA. According to the documentation compiled by the project manager, the centre was to be located in an existing community centre. The region to be serviced by the ICT centre was considered deeply rural and the culture of the community was influenced by strong tribal values. The tribal authorities played a significant role in the lives of the people living there. The population of the rural area was estimated to be 249,591, of which 84% were unemployed.

The site satisfied the conditions defined by TSA management in that it was in a rural area that did not have access to any similar type of services offered by an ITC centre. The local TSA

representative was interviewed about site selection, and the responses are summarised below.

- o The site for the ICT4 would have access to electricity through the community centre within a month as the community centre was waiting for the local electricity supply commission to connect the centre to the main supply grid
- o The site has access to water
- o The site has ablution facilities
- o There is no telephonic access at the community centre but the understanding from the local TSA representative was that there were plans for the centre to be connected in the future
- o There is a Telkom satellite connection within 700 metres of the centre
- o The site is close to a transport infrastructure, which includes taxis and buses
- o The centre is in a secure building: it is part of community centre and safe from the elements

4.6.4.1.2 Role players

According to the project manager, the role players included top management from TSA, the local TSA regional director, the local TSA representative and the community. The community role players included the local tribal authority, who represented three major tribal groups. The TSA role players include the TSA project manager, the local TSA representative and the local TSA regional office.

4.6.4.1.3 Community needs

Community needs were identified in discussions with the TSA project manager and the local TSA regional office. The project manager worked through the local TSA staff to identify the relevant community leaders and to set up communication channels with them. The senior management of TSA visited the proposed site in July 2000, before the community leaders were approached. Senior management wrote letters to the local tribal authority indicating TSA's commitment to community development. The understanding was that the ICT centre would provide a number of services and that the community could expect to see benefit of the centre in economic development. TSA management stated in one of the letters to the local tribal leadership that 'It is TSA's belief that since technology is the way to go these days, rural communities should not be left behind in this interesting and powerful route in life.'[3]

There were also TSA students in the vicinity that could benefit from the centre, according to the TSA's senior management. The researcher discussed the content of these letters with the

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[3] Source of documents in the care of TSA archives and may not be made available

local TSA regional director, and understood that an immense expectation was created that was shared by the community at large.

4.6.4.1.4   Business plan

The researcher recovered documentation which included the business plan for ICT4. As with two of the other ICT centres that TSA funded, the process followed by the TSA project manager was to submit a motivation for the funding to TSA management. The funding was approved after the site selection, community needs assessment and identification of role players were documented. The document describing the business plan revealed the following:

- o   The centre would be managed on the same principle as ICT1, i.e. it would be self-sustaining
- o   TSA would only donate the start-up funds for the centre
- o   The local TSA regional office would provide 'distance' supervision
- o   Based on the large number of schools in the area, the assumption was that there would be large client base to draw from
- o   Services required were assumed to be Internet access, e-mail access, telephone, typing and faxing facilities

A projected income statement was included in the plan, which showed a 14% growth per annum with a projected profit of 3.2 % after the second year and 6.6 % at the end of the third year. There was no other evidence to support the projected income statement other than a reference to the large number of schools and the number of people living in the community. The business plan highlighted the importance of income generation in the survival of the centre.

As the local TSA representative was involved in the conceptualisation of ICT4 with the project manager, he was asked a number of questions pertaining to the business plan and in particular to the sustainability of the centre. The responses to which are summarised below.

- o   The centre has no financial model
- o   The centre has no marketing plan
- o   Third party support and succession planning would be left to the centre staff
- o   Communication with the community would take place through the identified community leaders
- o   ICT4 would be staffed by members of the community with assistance from the local TSA office

4.6.4.2   Evaluation and adjustment phase

The plans for ICT4 were not implemented because of the hardware supplier's concern about the lack of power. Therefore, the implementation phase of the instrument could not be applied to the initial site as there was no implementation took place. The researcher took the opportunity to visit the proposed site to assess the situation and better understand the decision not to implement ICT4.

4.6.4.2.1   *First site visit to the initial site for ICT4*

The first visit took place in March 2001 and the TSA local representative was interviewed. According to the local TSA representative the TSA project manager had made use of an external consultant to assist in trying to determine whether ICT4 would be financially viable at the initial site. The consultant's report[4] given to the researcher was negative and advised against the proposed model of ICT4 being implemented as there was no proper business case to support the financial viability of the centre.

The local TSA representative, when interviewed by the reseacher, was concerned about the approach that was used by the TSA project manager in the initial setting up of ICT4, and commented that 'TSA must be cautious, as we have come in with a technology push and are creating expectations in the minds of the community which we may not be able to satisfy.'

The TSA representative was also concerned that the community would not be able to satisfy the expectations of TSA by sustaining the centre. The TSA representative understood the community well, as he had grown up there, and made the following comments regarding the needs of the community and the potential of an ICT centre:

o   The community needed IT training in general, and especially for school-leavers
o   IT programmes would need to be defined based on guidance from experts
o   The community was definitely aware of the importance of IT
o   General services offered by ICT centres, such as e-mail, typing facilities, lamination and photocopying, were always in demand
o   There were a substantial number of TSA students who would benefit from the centre
o   Community members would pay for the centre services if they were affordable
o   The centre could investigate the possibility of partnerships

4.6.4.2.2   *Second site visit*

The second contact made by the researcher with the local TSA representative took place in September 2001, six months after the original meeting. The meeting again took place at the

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[4] Consultants report may not be made available

proposed site of ICT4. The community centre was operational but there was no ICT centre. The TSA representative confirmed that the centre had been moved to the largest town in the province and was housed in the local TSA regional office. The ICT centre, however, was not operational.

According to the local TSA representative, when interviewed by the researcher, on the instruction of the project manager, the tribal authorities and community leaders were simply informed by the TSA representative of the decision to relocate ICT4. The representative said to the researcher: 'It was terrible; the community leaders were so upset that I am afraid to show my face in the community.'

IMAGE 4-4 The community centre in the original location for ICT 4

The researcher asked the TSA representative how the community would react, should TSA decide to try and erect an ICT centre in the area in the future. The reply was: 'the community would not consider speaking to us until the centre was physically there and functional.'

The researcher proceeded to the regional office to investigate the relocated ICT4. The researcher noted that the centre had hardly been used. The regional director was then interviewed.

The regional director confirmed what the local TSA representative had said about the relocation of ICT4. The regional director indicated that the TSA project manager had donated two old PCs that TSA had deemed old technology to the community in an attempt to apologise to the local authorities for the sudden relocation of ICT4. The local TSA staff had no idea if the PC's had been used or even where they were.

Other information from the interview with the regional director is noted below.

o   The relocated centre was to be used for TSA students

- o The intention was to use the relocated centre to produce income for the TSA regional office and it was to be used as a PC laboratory
- o It was understood that there would be no further financial assistance form TSA and therefore the relocated centre had to ensure that all overheads accruing to the centre would be covered by the generation of income
- o Challenges identified by the regional director were
  - o a lack of technical expertise, especially as the IT equipment was not considered standard
  - o a lack of available expertise to run an ICT centre
  - o no business model for the centre
- o The physical site
  - o was secure
  - o had access to all the amenities not normally found in the rural areas
  - o had access to telephones
  - o was easily accessible due to the relocated centre being situated in the middle of the town, close to a sound transport system
  - o Third party support could be dealt with remotely due to the availability of connectivity

4.6.4.2.3 Third site visit

The researcher visited the centre (still referred to as ICT4) at its new location and was granted a second interview with the regional director in September 2003.

ICT4 had not been used for the following reasons:

- o The IT equipment was unstable
- o There was no available support for the IT equipment
- o No funding was available for the replacement of the workstations, and until the equipment was replaced, the regional director would not be prepared to use ICT4
- o The competition in the town was also a concern. According to the regional director, in order to compete with the other ICT centres in the vicinity, TSA would have to change its way of dealing with courses that were to be used for income generation at ICT centres and make them affordable

4.6.5 Sustainability of ICT4

The researcher had to focus on the relocated site for ICT4 as the initial site was never used for the ICT centre. The relocated site showed very little indication of use and no indication of

growth. There was also no evidence of a plan for the relocated site. Due to the relocation and little use of ICT4. the researcher was not able to ascertain the potential of the ICT4.

From what would appear to have been a sound approach applied by the project manager when identifying and communicating with the local leadership for the initial site for ICT4, the initial site may have proven to be ideally situated especially as there seemed to be local support.

4.7   Information and Communication Technology Centre five - ICT5

4.7.1   Background of ICT5

ICT5 was the only ICT centre that was outside the borders of South Africa. It was the first ICT centre to be implemented by TSA and was the initiative of the TSA project manager due to an international company wishing to donate money for an ICT centre as part of their social responsibility. The donor's conditions were that it should ideally be placed in an area that did not have the means to deploy an ICT centre. The donor wanted the centre to be used to assist a previously disadvantaged university by offering ICT services to the university and surrounding community. The donor also indicated that the funding for ICT5 would only be sufficient to keep ICT5 in operation for three months thereafter the donor's expectation was that ICT5 had to be able to sustain itself after the seeding money from the donor had been exhausted.

4.7.2   Infrastructure of ICT5's environment

ICT5 is located at the local university. Although the country has been independent for many years, the infrastructure is typical of a developing country in Africa with little indication of growth.

The national provider for communication which has the monopoly, was slow to react to requests for new data and communication lines. In the main town, there is one cyber café which provides access to the Internet through a normal telephone line. The university has a connection to the Internet which was unable to satisfy any Internet need due to the low bandwidth. The town is considered the economic hub of the country and has a population of 400,000.

4.7.3   Services offered

The TSA project manager supplied the researcher with information about the centre's proposed services and conditions. The main driver for the creation of ICT5, apart from the donor's requirements, was the desire to create a profitable, self-sustaining centre through the alignment of service provision with local needs. This was emphasised when the initial discussions with the role players took place, when it was made clear that the majority of clients should be small businesses and the town community.

IMAGE 4-5 ICT5 students busy with a course

The following is a list of services that were to be offered by ICT5:

- o Basic computer training
- o Typing of documents
- o Faxing facilities
- o E-mail facilities
- o Internet facilities
- o Telephone communication
- o Lamination of documents
- o Printing of documents

4.7.4   Application of the instrument

4.7.4.1   Conceptualisation phase

4.7.4.1.1   *Site selection*

The following points are a summary of the interview with the project manager pertaining to the site selection of ICT5:

o The site addressed the donor's requirements that a previously disadvantaged university in a developing area within Southern Africa should host the centre
o The centre was secure
o There were amenities available typical of a small university
o The site was easily accessible to the community because of the location of the university within the town
o The site had access to telephonic communication
o There were no problems with power

4.7.4.1.2 Role players

The role players consisted of some of the university staff and the TSA project manager. It was decided that the university would be responsible for the appointment of the centre manager and for the running and maintenance of the centre and that the centre manager would be paid a salary based on the income that ICT5 generate.

4.7.4.1.3 Community needs

The TSA project manager indicated that ICT5 would facilitate an effective way of training through the use of CBT and would offer other services and benefits such as access to photo copying, lamination and telephonic services. This information, as well as the process to be followed for the implementation of ICT5, was conveyed to the role players from the university and community at a workshop. It was essential that the role players understood how the donor's funds would be spent and what the expectations of the donor and TSA were, especially in terms of ICT5 becoming independent after the first three months.

More interviews were conducted at the workshop with some of the community representatives who were identified by the university role players on request of the project manager. The purpose of these interviews was to establish whether there was a formal needs assessment process. The responses are summarised below.

o The centre is considered to be a provider of programmes for school-leavers in an attempt to stimulate economic growth
o There were no computer facilities at the university
o There appears to be very little awareness of IT within the community
o Services such as typing, photocopying and e-mail would be used by small businesses

o   TSA students could use the centre, although the number of local TSA students resident in the town was not known

o   There was no indication of the needs of schools for IT

o   The centre could help with the university's outreach programme to other areas within the country

4.7.4.1.4   Business plan

There was no evidence from the documentation of a business plan, apart from a motivation written by the project manager to the donor and TSA management. The TSA project manager made it clear that the university would be responsible for the creation of a business plan. The TSA project manager communicated this expectation to the donor as well. It was also communicated to the role players at the workshop.

The documentation supplied by the TSA project manager confirmed that TSA would be responsible for the   procurement of all the furniture, IT equipment and the first year's IT maintenance for ICT5. The documentation also highlighted the donor's expectation that ICT5 would be self-sustaining. The TSA project manager had drawn up an expected forecast of income for three years, which showed a 12% increase per year. No reason was given for this figure.

No provision had been made for marketing, contingencies or other issues. The motivation made it clear that establishing a common understanding between all the stakeholders of the centre's objectives was key. The main objective of ICT5 was to provide access to IT and telecommunications for the local community and the university students.

There was also no evidence of a financial model for income generation. During the workshop, the project manager was interviewed to find out what was considered to be the most suitable approach for ICT5. The outcome of the interview is summarised below.

o   There is no financial model, but it is suggested that the outreach programme will be used as input for the deployment of courses currently run by the IT department at the university

o   The centre should provide services, including faxing, laminating, photocopying, Internet use, e-mail and typing services

o   The income generated will be an indication of the effectiveness of the centre

o   Marketing of the centre will be done through the university

o   Staffing of the centre would be the responsibility of the university and, hopefully, with the assistance of the TSA project manager

o   The main objective, as far as the project manager was concerned, was for ICT5 is to be self-sustaining

The workshop took place at the university under the chair of the TSA project manager. Senior representatives from the university were present, as well as members of the community. The project manager used the workshop to communicate the conditions for the donation and to entrench the understanding of sustainability.

4.7.4.2   Implementation phase of ICT5

4.7.4.2.1   *Selection of centre management*

One of the issues discussed at the workshop was the identification and appointment of a person who would act as the centre manager and it was decided that the university would identify a student who was studying an IT course at the university to run the centre. The salary of the centre manager would be funded by the donor for the first three months, after which the centre managers salary would come from income generated by ICT5. The TSA project manager also indicated that during the first three months, he would keep in contact with the centre and assist where possible.

A student from the university was identified to run the centre. The selection process was investigated through an interview with the project manager and the outcomes summarised below.

- o Business acumen is considered imperative, especially as the centre had such a high profile and is expected to be self-sustaining within three months
- o The incumbent needed to be technically capable, as there was no immediate technical support
- o Knowledge of the community was not seen as a real issue, but could be important from the community's point of view
- o Problem-solving skills were not considered a requirement

4.7.4.2.2   *Third party support*

Third party support was not regarded as an issue, according to the TSA project manager, as the company which supplied the equipment to the ICT centre had a one-year SLA with the centre. The supplier had negotiated with a local IT company in the town who would act on its behalf.

4.7.4.2.3 *Implementation process*

The implementation process was one of the outcomes of the workshop. The TSA project manager took it upon himself to deal with the implementation of ICT5, which included the procurement of the equipment and furniture, investigation of alternatives to connectivity to the Internet and, finally, the installation of the IT equipment by the supplier.

Some of the university staff who attended the workshop indicated to the researcher that they were concerned about the expectations of the donor. One of the senior university staff members made a remark to one of the TSA staff members which conveyed their concern:

> 'TSA must make one thing understood: if this project is a failure, do not even
> attempt to bring in similar projects in the future as we will not be interested.
> Remember, even though it is a sound idea, the project must be sensitive to the
> needs of our country and the resources at our disposal.'

4.7.4.3 Evaluation and adjustment phase

4.7.4.3.1 *First site visit*

The first site visit took place in April 2000 with the local TSA representative, six months after the centre opened its doors. The student who was appointed as the centre manager no longer worked at the centre and had been replaced by the daughter of one of the senior managers of the university. The reason for the replacement of the centre's manager was because there was no money for a salary for the centre manager, according to the local TSA representative, as no funds had been generated by ICT5 under the management of the student.

The visit also revealed that the centre was not being used for its initial purpose; the only service that was used was the telephone. The PC's were idle, there was no Internet connectivity and no e-mail facility. The researcher asked the TSA project manager what actions the TSA project manager would take to address the situation. The TSA project manager also had a responsibility to report back to the donor on the progress of the centre.

The TSA project manager indicated that the following steps had been taken:

o As the national provider was not responding to the demands for connectivity, the manager had contacted a company that dealt with radio links that could be used to establish connectivity from South Africa

o The centre was idle mainly because the outreach programme of the university was not making use of the centre

o He suggested that TSA students resident in the area make use of the centre

o He suggested that the local TSA regional office try to assist in getting the centre operational from a technical perspective

The university staff confirmed the problems with service delivery from the national telecommunications supplier and that there was little likelihood of the centre getting a connection within the foreseeable future.

4.7.4.3.2 Second site visit

The follow-up visit took place in May 2001. Although the centre had been used a few times for practical exercise by IT students at the university according to the centre manager. Connectivity was still an issue, as the suggestion made by the TSA project manager was illegal. The national telecommunications body did not allow communication through any other body. The researcher suggested that the centre make use of the South African tertiary network, UNINET, through the university. The university was a member of UNINET.

The local TSA regional office, close to the border of the country where the centre was located had managed to attract TSA students who were studying subjects that had an IT practical component and were able to do use the centre for the practical component. Although the students were few, this was a source of some activity for the centre.

The researcher proposed the following recommendations.

o Market the centre in the town in an attempt to attract more clients

o Encourage the centre manager to make use of the local TSA representative to market the centre to local TSA students

o Make use of UNINET for connectivity to the Internet

Table 4.6 Summary of recommendations

FACTOR	RECOMMENDATION	INTENDED EFFECT
Usage of centre	Market the centre Market centre through TSA	Attract users from the community and small business as intended initially to use ICT5. TSA students living close to ICT5 could use ICT5 thereby increasing usage.
Reliability of services	Make use of UNINET	Ensure a reliable and managed connectivity to the Internet.

4.7.4.3.3   Third site visit

A third site visit, in November 2002, revealed that the centre had not made progress since the second site visit. The TSA project manager in an other interview made it clear to the researcher that the centre was managed by the university and that it had been given an opportunity to make the centre work. The TSA project manager told the researcher:

> '…I am not taking responsibility for the centre. The centre together with the
> university had a golden opportunity to generate funds and make use of
> technology. They were also told that they had to make it work. It is their problem.'

The local TSA regional office tried to assist, by making local TSA students aware of ICT5, but a political incident between South Africa and the country where ICT5 was located, made it difficult for South Africans to work in the country. The local TSA representative confirmed that ICT5 was not operational by saying:

> '…you will not find a single fingerprint on any of the keyboards of the centre. In
> order to make the centre break even, it would have to be used 43% of the day
> for thirty days a month.'

4.7.5   Sustainability of ICT5

ICT5 showed a steady decline in usage since its implementation. There was no indication of growth and the situation was aggravated by difficulties in trying to connect to the internet and the political situation. No business plans were in place to assist with management of the centre. Even with the intervention of the local TSA regional office, there appeared to be evidence of the centre being able to show an improvement.

4.8   Information and Communication Technology Centre six- ICT6

4.8.1 Background

The centre is situated at a secondary school in a rural area close to the Swaziland border. A large computer company donated an entire computer laboratory to the school in February 1998. The donation included 40 workstations, two servers and two printers, all of which are networked. Each workstation is based on a thin client architecture and was connected to a communication system which can be used by a tutor. The purpose of the laboratory was to assist in the education process of the pupils of the school The intention was to have a tutor assist each individual PC user, should the need arise, without disruption to the rest of the

class. The application software included programs for word processing, spreadsheets and a number of CBT packages that dealt with physical science, mathematics and biology.

According to the headmaster, the computer vendor donated the IT infrastructure and equipment to the school for two reasons: firstly, the IT equipment was to be used for teaching IT skills to pupils in the senior classes; and, secondly, the centre was to be used for teaching basic computer skills to school-leavers. School-leavers were to be trained after school hours and would be expected to pay a nominal fee. The community centre adjacent to the school would be instrumental in marketing the services of the ICT centre and would manage the administrative side of ICT6.

A teacher from the school was nominated, together with two colleagues, to maintain the centre and to deal with all training issues. ICT6 was secure, had no problems with unreliable electricity and was supported by a well-installed infrastructure of cabling servers and printers.

The headmaster was made aware of the presence of TSA by the local TSA regional office. The TSA office was contacted by the headmaster for assistance in two areas: technical expertise, and the possible formation of a partnership. TSA had no input into the conceptualisation or implementation of ICT6 and was only contacted in July 1999 by the headmaster for assistance.

4.8.2   Infrastructure of ICT6's environment

The school is within walking distance of a community centre and is easily accessible by a good tar road. The community centre was an initiative of the local government to assist with the region's economic development. There are no other ICT centres in the area, including at the community centre. Power is available, although ICT6 has no connection to a telephone line. There is a Vodaphone kiosk within walking distance of the school, which is the closest public telephone to the school. There is a clinic nearby and six schools in the area. The population that is serviced by the community centre is approximately 30,000, of which the majority of people are below the age of twenty.

IMAGE 4-9 The view of the community centre from the school.

IMAGE 4-6 Some of the senior pupils making use of the centre

4.8.3   Services offered by ICT6

The services available to the community were originally focused on the school-leavers and the senior pupils of the school. Pupils would make use of the centre to improve their skills in the sciences, mathematics and English. The community members would be able to make use of the centre for basic computing, including word processing, spreadsheets and typing skills. There was no computer related subject that was offered by the school when the centre was opened. There was also no intention to offer access to the Internet or include other typical services of an ICT centre such as faxing, typing of letters or telephonic communication.

4.8.4   Application of the instrument

The local TSA regional office requested that TSA's central campus do an assessment of ICT6 and make recommendations to the local TSA office as well as the school principal in July 2000. The visit was made by the local TSA regional office representative, the researcher, TSA technical staff and the school's management staff.

4.8.4.1   Conceptualisation phase

TSA was not involved in the conceptualisation of ICT6 and the donor was not available for interviews. The instrument was used to assess the actual site, role players' involvement as well as the expectations of the school's headmaster. The headmaster and the local TSA representative were interviewed.

4.8.4.1.1   Site selection

According to the headmaster the donor's only requirements for the location of ICT6 were that:

- o   The site must have access to a reliable supply of electricity
- o   The site must have access to water and ablutions
- o   There is no telephone line connected to the centre, but the school does have connectivity
- o   The site is close to a community centre
- o   The site is close to a transport system: taxis, bus stops and main roads

4.8.4.1.2   Role players

Initially the role players and stakeholders were the school staff and pupils. The school headmaster did, however, indicate that there was a possibility that the school may extend the services of the centre to the community through the community centre. The management of ICT6 was given to the science teachers who were to make use of the system to assist pupils in mathematics and science. The teachers were also expected to run the centre from a support aspect and deal with technical issues.

4.8.4.1.3   Community needs

There was no documentation to suggest an attempt to determine the community needs. There was also no evidence of any marketing of ICT6. The headmaster was interviewed about the centre's potential in the community (see table 4.15 in the appendix, page vii).

It was evident from the interview with the headmaster that he believed that the centre could play an important role in economic growth in the area through the provision of education for school leavers in particular. The emphasis according to the headmaster was on IT training. The headmaster also indicated that his views were based on the potential of other ICT centres.
The schools pupils would also make use of the centre but acknowledged that the centre needed to generate income to maintain service provision.

4.8.4.1.4   Business plan

Although there was no business plan, the headmaster was sensitive to the potential of a computer centre but admitted that he needed assistance to realise the potential of an ICT centre. The researcher asked the headmaster a number of questions to try and ascertain what was understood and seen as important to ensure the financial viability of the centre. The responses are summarised below.

- o There is no financial plan, but this can be dealt with later by asking the community centre for assistance
- o There is no marketing plan, but the community centre and word of mouth will be used for marketing
- o IT support is an issue. It is hoped that the equipment will last for a few years before maintenance is needed; guidance is needed from TSA
- o Partnerships with TSA and the community will be discussed
- o Staffing is not seen as a problem, as the science teachers will be involved
- o Services will focus on basic computer training for the community and the CBT software for the school pupils

4.8.4.2   Implementation phase

4.8.4.2.1   *Selection of centre management*

As indicated by the headmaster, the school's science teacher would manage the centre. The instrument was used to try and understand the headmaster's views on the profile of the person who would run the centre on a commercial basis. The responses are summarised below.

- o Business acumen is important if the centre is to make money
- o Technical ability is considered the most important attribute, especially considering the centre's remote location
- o Local knowledge is not seen as an issue but the community must respect the centre staff

4.8.4.2.2   *Third party support*

The teachers responsible for the centre made it evident that they were not confident enough to train the community, although they were able to assist pupils with the CBT software. The researcher also ascertained that the teachers were not technically skilled at all and had never been exposed to computers before. They were in the process of teaching themselves.

4.8.4.3   Evaluation and adjustment phase

Although TSA was not involved with ICT6, the researcher was informed by the local TSA regional director that TSA would assist the school in getting ICT6 to an operable level.

4.8.4.3.1   First site visit

In July 2000 the researcher was asked by the local TSA regional director to make recommendations that could assist ICT6 in becoming operable.

The recommendations proposed by the researcher are listed below:

o   Ensure that the teachers are able to master the software products that were used for CBT including the basic word processing and spreadsheet software
o   Technical problems could be phoned through to the TSA computer services department in an attempt to resolve them telephonically together with the school staff
o   Identify possible ways in which the community centre could assist with marketing the centre to the community
o   Keep records of usage
o   Ensure that the community can afford the services offered by ICT6

Table 4-7 Summary of recommendations ICT6

FACTOR	RECOMMENDATION	INTENDED EFFECT
Usage of centre	Keep records of usage. Identify possible ways in which the community centre could assist with marketing the centre to the community	To record usage to indicate growth or a decrease in usage. To increase ICT6 usage and to assist with the centre sustainability.
Reliability of services	Ensure teachers are able to use the CBT software and are also able to use the other software used for training. Technical problems should be phoned through to the TSA computer services department.	Ensure that users can be trained and assisted by teachers responsible for the running of ICT6. So as to maintain an acceptable uptime of equipment.
Income generation and overheads	Ensure that the community can afford the services offered by ICT6	To sustain usage of ICT6

4.8.4.3.2   Second site visit

The researcher returned for a follow up visit in January 2001, six months after the initial visit. The headmaster had resigned and was replaced by one of the teachers in an acting capacity. The teachers responsible for ICT6 and the acting headmaster were interviewed so that the

researcher could assess the progress of the centre (refer to table 4.16 in the appendix, page viii).

Very little usage of ICT6 was evident. There appeared to be a need for the internet and e-mail. The pupils were hardly making use of the ICT6's CBT software either. It was clear that the centre was not being used by the community and pupils at the school were not taking full advantage of the centre.

During the discussion on usage it became apparent that the centre had experienced a number of technical problems resulting in downtime. The staff were unable to deal with the technical problems. TSA had sent technical staff in an attempt to resolve these problems. However, according to the technical staff, the equipment was so outdated that, even in a large town, expertise would be difficult to come by.

The acting headmaster requested that TSA assist with continued technical support. A technical audit carried out by the TSA technical staff revealed that the servers were unstable and that as the technology was outdated the operating systems were no longer supported by industry.

The researcher recommended that to the acting headmaster the following:

o   Try to get additional funding so as to replace the equipment with modern technology
o   Investigate making use of the community centre for assistance
o   Consider the recommendations made after the first site visit

4.8.4.3.3   Third site visit

The third visit took place in January 2002, one year after the second visit. The acting headmaster had been replaced by a permanent headmaster, who was interviewed by the researcher. The following observations were made.

The centre had hardly been used, as the teachers were not able to deal with the demands of maintaining the technology. The headmaster indicated that for the centre to become functional it needed permanent technical staff who understood the technology. The school could not rely on the science teachers to fulfil this role. They had no formal training and were unable to get training.

The school had been without electricity since the local authorities had cut the power when the account was not paid. The headmaster indicated that the annual grant received from the Department of Education for running the school was not enough to cover the electricity account. The Department expected the school to cover all expenses not covered by the grant

from the Department of Education with school fees. This was a problem, as the majority of pupils were unable to pay.

The focus had shifted away from the centre, according to the headmaster, mainly because of the change in leadership at the school, problems with power and a lack of expertise.

4.8.5   Sustainability

ICT6 was chosen by a donor because it appeared that the physical location was stable in terms of security and power. The school was also located in a rural area with no other access to ICT services.

The school had received the technology with no guidance on how to use the technology. When the schools management realised the possibility of realising ICT6's potential for income generation, there appeared to be an expectation that TSA would play a more active role in assisting the school.

ICT6 had three major setbacks which impacted significantly on its potential, these were, outdated technology, a changing school management and a lack of funding to maintain the basic needs for the school.

4.9   Conclusion

The physical location of each of the six ICT centres were in areas that had no access to ICT services. In all cases there was no evidence that the respective communities had asked for ICT services. It was also apparent that there was an appreciation expressed by the respective centre staff and community leaders of the potential of ICT centres especially in the enabling of people through IT training.

Challenges that the centres were faced with included identifying people with the ability to manage the centres, being able to become sustainable within a relatively short period of time. Challenges with respect to the actual locations of the centres were largely confined to remote support, a reliable supply of electricity and access to the internet and e-mail.

In all instances, the ICT centres were located in areas with a population large enough to have a significant impact on each centre if the centre was operable consistently and could maintain service delivery. All centres were close to or part of a community centre, in a town or school. All centres were physically secure and safe from the elements.

The following chapter will discuss the findings of each ICT centre.

CHAPTER FIVE

FINDINGS and DISCUSSIONS

5.1   Introduction

This chapter will examine and interpret the data collected from each ICT centre, as detailed in the previous chapter. The factors that lead to each centre's success or failure will be identified. These factors will be grouped together and used as indicators of each centre's potential to become sustainable. The research instrument will form the broad framework according to which findings for each centre will be discussed.

5.2   ICT1

5.2.1   Analysis of data

5.2.1.1 Conceptualisation

It was evident that there was little need for an ICT centre in the region, a fact confirmed by the lack of buy-in from the community. There was no evidence suggesting that the community required an ICT centre, but rather it appeared to be a case of an IT push from TSA.

An income generation forecast was compiled based on the assumption that the community's use of the centre would generate sufficient funds to support it. An assumption was made that the large number of schools in the area would result in a demand for the centre services.

The choice of location for ICT1 was the result of a donor wishing to put an ICT centre in an area where people did not have access to such a centre. There was no demand for such services in the area at the time.

The decision to house ICT1 in an existing community centre meant that ICT1 was able to take advantage of the community centre's amenities as well as the fact that the centre was known to the greater community.

5.2.1.2 Implementation

One of the problems that ICT1 faced from the beginning was the lack of a reliable power source. This impacted severely on the service provision of the centre, as it was rendered inoperable for long periods of time. This also had an effect on the reputation of the centre, as the community considered ICT1 to be unreliable.

The staff responsible for ICT1 were not trained to deal with business issues. A lack of business understanding and appreciation of the importance of a competitive approach meant that the centre did not charge market-related prices for the use of e-mail and would not lower prices to become more competitive.

No real consideration was given to the supply of electricity during the implementation phase, even though it was evident that the unreliable electricity supply had a negative effect on ICT1 in its early stages. At this time, ICT1's success was also hampered by the lack of expertise shown by the centre staff, who were not able to manage and run the centre. Both these issues were apparent to the project manager responsible for the conceptualisation and implementation of ICT1.

5.2.1.3 Adjustment

The power supply problem could have been partially resolved through the provision of fuel for the generator. Although this was made known to TSA, the problem was not addressed and there was still no reliable electricity source.

A lack of technical expertise impacted on the training of people working at the centre and support of IT equipment, especially as one of the conditions for the success of ICT1 was the local expertise. Again, this was communicated to TSA with no result.

Issues fundamental to the centre's operation were identified quickly and communicated to TSA. No attempts were made by TSA to remedy the situation.

5.2.1.4 Sustainability

There was no indication of sustained usage of the ICT centre or income generation. There was no indication that the centre was properly managed. The only indication of change was the fact that the community centre received an award for innovation, which had the effect of renewing interest from third parties.

5.2.2 Factors for success or failure

The factors listed below influence the centre's potential to become sustainable.

Factors for success :

o   The position of ICT1 at the community centre meant that ICT1 was able to remain in operation longer than it may otherwise have been able to. Although there was no official partnership between the community centre and ICT1, the latter was able to take advantage of the infrastructure and get exposure from its position within the community centre

Factors for failure:

o   A lack of a reliable supply of electricity resulted in lengthy down times for the centre. The unreliable power supply also damaged the IT equipment. These two factors alone contributed significantly to ICT1's inability to render a service
o   No community needs assessment was carried out, which meant that the services that ICT1 provided may not have satisfied the community's needs. There was no guarantee that the community had committed to and shared a need for ICT1
o   There was no business plan, which meant that there was no real indication of the potential of ICT1 and whether the idea of implementing an ICT centre in the region was viable
o   A lack of proper planning of the day-to-day operations of ICT1 was also evident in the staff's inability to deal with the managing of the centre
o   Employing staff with no training aggravated ICT1's inability to operate smoothly and this was especially apparent in crisis situations
o   A 'box drop' approach was used by the initiator, who did not ensure that the centre could run independently without a third party's assistance; ultimately, ICT1 could not operate alone

5.2.3 Conclusion

Based on the above-mentioned factors at ICT1, the following pertinent points have emerged:

o   ICT1 showed that it was not able to be financially viable
o   The community's needs were not identified and therefore could not be addressed with any certainty
o   There was no indication of community involvement

- o The centre's lack of usage pointed to its inability to become viable and sustainable
- o ICT1's business plan and motivation was based on assumptions and, therefore, the types of services made available at the centre were more than likely inappropriate
- o The staff received no training, resulting in ineffective deployment of technology at ICT1
- o Although the donor's expectations were that the centre be independent and functional after the seeding money had been exhausted, there was no proper assistance from a third party to help achieve this result
- o The community centre proved to be crucial to ICT1's survival as it provided an infrastructure. The community centre had a relatively high profile within the community, resulting in a steady flow of people who were then exposed to ICT1. ICT1 also attracted international attention via the community centre

ICT1 could not be considered effective or sustainable.

5.3 ICT2

5.3.1 Analysis of data

5.3.1.1 Conceptualisation

The decision to locate ICT2 at its current site was based on the site's sound infrastructure, secure building and ease of access to the centre for TSA and Vista students. ICT2 was also part of an existing community centre, thus ensuring a greater degree of stability and exposure to existing patronage.

No community needs assessment was undertaken because it was assumed that the centre would service TSA students and the community, since there was no other equivalent service provider of ICT services in the area.

Staff at the centre were dependent on the local TSA regional office for assistance in terms of first line support for centre management and the day-to-day running of the centre. The appointment of a centre manager with business sense helped to stabilise the centre initially.

No evidence of a business plan was available due to the change in the intended site. This shortcoming was managed by the centre manager, who identified ways to make ICT2 operable.

After the relocation from the original proposed site, ICT2 appeared to have made the best use of the available resources and had the benefit of support from the local regional TSA office.

5.3.1.2 Implementation

As a result of the decision to relocate ICT2, no marketing to the potential market or communication with the community in the new location was undertaken. This impacted upon the community's use of ICT2.

Another immediate problem that ICT2 had to overcome was that the IT equipment was not standard and required training for use, which was not locally available. As ICT2 was relocated to the town during the conceptualisation phase, the centre would have had to try and render a service on a 'hit and miss' basis, a fact confirmed by the absence of a business and marketing plan. Third party support from local IT vendors, as well as the support from TSA, assisted the centre to a small degree. The contracted centre manager, however, proved to be inadequate in running the centre. A permanent centre manager was appointed from the local TSA regional office who appeared to make a difference to the centre's stability.

The staff from the local TSA office understood the importance of a business approach for the implementation of ICT2 and began focusing on TSA students as potential clients for the centre.

The staff, not faced with problems with respect to power and having a sound infrastructure surrounding the centre, could concentrate on the running of the centre.

5.3.1.3 Adjustment

The partnership with TSA and Vista University, which resulted in the establishment of an information centre, appeared to be another reason for the improvement in the centre's usage. ICT2 continued to improve when a market was identified and the necessary resources provided to satisfy its needs. The staff of ICT2 were then trained with the necessary skills.

The adjustment and evaluation phase of the centre was a continual process, managed by ICT2's staff and supported by the local TSA regional office.

5.3.1.4 Sustainability

ICT2 showed real growth and potential as a reliable provider of relevant services to the community. Although the centre was not able to operate independently, it was evident that the centre was considered a viable option within a partnership.

5.3.2 Factors for success or failure

The following factors influenced the centre's sustainability.

Factors for success:

- o   ICT2 was located in an existing community centre in an area that had access to transport
- o   TSA assisted on a continued basis with technical support and the day-to-day running of ICT2
- o   Local vendors provided third party support
- o   A permanent manager was appointed for ICT2 who had an understanding of business and knowledge of the community and TSA
- o   Partnerships with TSA and VISTA were developed
- o   The staff employed to work at ITC2 were trained
- o   TSA and Vista University students were identified as a potential market

Factors for failure:

- o   There was no business plan
- o   No indication of community involvement or needs community needs assessment was evident
- o   Non-standard IT equipment was installed

5.3.3 Conclusion

ICT2, after a difficult start due to a lack of direction, a lack of a needs analysis and a lack of skills, managed to become viable and proved that there was a strong possibility of sustainability. The major contributing factors for the turnaround were the following:

- o   The local TSA regional office took responsibility for ICT2
- o   An information centre was created that included third partners, TSA and Vista University
- o   The local TSA management outlined a focus and a clear vision for the centre, identifying and defining issues that were understood by ICT2, such as the target clientele and the need to offer relevant services
- o   The formation of a partnership meant that TSA could channel a steady flow of clients to ICT2 through the local student base

    o   ICT2 was ideally situated in a secure environment in an area with a good infrastructure, access to power, protection from the elements, and access to IT support

ICT2, through the adoption of the approach outlined above, could be considered sustainable.

5.4 ICT3

5.4.1 Analysis of data

5.4.1.1 Conceptualisation

The conditions imposed by the donor of ICT3's IT equipment resulted in a physical location that was secure, provided access to electricity and a potential client base, namely the school and the local community. It was also understood that the school would take responsibility for the management and running of ICT3.

Even though there was no business plan or any further assistance form the donor, the headmaster attempted to build ICT3 around possible opportunities that would lead to income generation.

5.4.1.2 Implementation

As the headmaster was considered part of the local leadership, he also had the respect of the community. The headmaster had an understanding of the needs of the community as well as the profile of the average school-leaver. He was also sensitive to the challenges that might render the centre inoperable, such as an absence of the skills and support required for the delivery of a service within the local environment.

A key factor in the initial success of the centre was the fact that the headmaster realised that the centre needed specific resources to be able to deliver a service. He therefore made use of a third party to assist with the training of teachers, who were in turn to train the community members and TSA students, using existing TSA-accredited training programmes.

The headmaster was also aware of the need for marketing to ensure a steady stream of clients and thus ensure a source of income.

5.4.1.3 Adjustment

The key to the initial success of ICT3 was the fact that the headmaster adopted a business-oriented approach within the context of the local constraints.

The greatest setback to ICT3 was the resignation of the school headmaster. This slowed down ICT3's momentum. Based on the original planning and groundwork that had been spearheaded by the headmaster, ICT3 managed to limp along, although it was clear that it was not showing any signs of growth and there was a steady decline in the number of clients. The high costs of the course offered by ICT3 also impacted on potential clients. The replacement for the headmaster appeared to lack the profile needed to drive ICT3.

5.4.1.4 Sustainability

ICT3 showed the potential in the early stages to grow and generate income. ICT3 never realised this potential.

5.4.2 Factors for success and failure

The following factors influenced the centre's sustainability.

Factors for success:

- o The physical location of ICT3 (a school) was secure, had access to electricity and was accessible
- o A significant contribution was made by the headmaster in terms of
    - o leadership
    - o vision
    - o an appreciation of the need to run ITC3 on business principles
- o A partnership was formed with TSA
- o ICT3's trainers were trained and evaluated
- o There was an understanding of the community's needs

Factors for failure:

- o The centre was poorly managed after the departure of the headmaster
- o Non-competitive prices were set for some services
- o Marketing and the search for potential clients were discontinued

5.4.3 Conclusion

It is clear that the centre's initial success was due solely to the manner in which the headmaster managed ICT3. The contributing factors that had the greatest impact on ICT3 are:

- o   The headmaster was part of the local leadership, understood the environment and had an appreciation for the community's needs. Therefore, the ICT centre had ownership and buy-in at an influential level
- o   The business-oriented approach identified the importance of partnerships and making use of a product (IT course designed by TSA) that would address part of the community's needs
- o   The headmaster insisted that the centre staff be qualified and had the centre staff assessed, thereby ensuring a recognised standard
- o   The school that housed ICT3 was part of an existing infrastructure in the village, which meant that ICT3 was accessible and that access to communication and shops was not an issue for potential ICT3 clients

ICT3 showed the potential to grow and to become sustainable. The impact of the resignation of the headmaster meant that the necessary skills and drive needed for ICT3's continued growth had left with him. ICT3 cannot be considered viable or sustainable.

5.5 ICT4

5.5.1 Analysis of data

5.5.1.1 Conceptualisation

ICT4's initial location was to be in a remote part of South Africa, close to the Mozambique border. As the decision to relocate the site for ICT4 was made after the conceptualisation phase, the discussion will focus on the conceptualisation of ICT4 and therefore on the initial site.

The role players at the original site proposed for ICT4 were identified and comprised the local leadership. There was good communication between the TSA management and local leadership which also resulted in community expectations of the potential benefits of ICT4. According to the local TSA representative, there was buy-in from the community and local ownership of the project.

No community needs assessment was carried out for ICT4. TSA management communicated with the local tribal leadership and informed them of the benefits of an ICT centre.

5.5.1.2 Implementation

The result of the sudden relocation of ICT4 left doubt in the minds of both the tribal leadership and the community members who were aware of the deployment of the centre. A lack of trust was perhaps the greatest issue which would surely manifest itself should TSA or any other party attempt to establish an ICT centre in the area again.

The research revealed that the new site for ICT4 had hardly been used. As the centre was relocated at the last possible moment, no needs assessment or feasibility study was carried out. There could be no justification for the deployment of ICT4 in the town, especially as there were other providers of ICT services in the town close to the relocated ICT centre.

5.5.1.3 Adjustment

The site visits to the new location of ICT4 revealed no activity. The site could therefore not be evaluated and adjusted according to the research instrument. The reason given for the inactivity of ICT4 was that the hardware was not stable and, as a result, the local regional director was not prepared to use the technology.

The local regional director was aware of the competition in the proximity of ICT4 and gave no indication of how it would be possible to generate income from ICT4. The local regional director's argument was based on the lack of a business plan, unstable technology, a lack of personnel to assist with the running of the centre and the competition from the existing suppliers of ICT services in the town. It appeared that there was no desire from the local regional director to carry on with the implementation of ICT4.

Competition was an issue for TSA for the first time in the implementation of ICT centres. The new location had shown no evidence of planning for the relocation of ICT4 and appeared to be a last-minute attempt by TSA to make use of the technology as it had paid for.

5.5.1.4 Sustainability

ICT4 showed no signs of usage and therefore cannot be considered as potentially sustainable.

5.5.2 Factors for success and failure

The following factors influenced the centre's sustainability.

Factors for success:

The initial location for ICT4 had potential for the following reasons:

- o   There was an effort to identify the local authorities
- o   There was buy-in from the local community and its leadership
- o   The local authorities were made aware of the potential and benefits of an ICT centre
- o   The centre was to be located in an exciting community centre

Factors for failure:

- o   No needs assessment was carried out
- o   ICT4 was suddenly relocated
- o   There was no ownership of the relocated centre

5.5.3 Conclusion

The ICT4 conceptualisation phase highlighted a number of significant issues, which are listed below.

- o   A landscape audit was not carried out, which would have reported that the community was in a deep rural area that did not have access to a solid infrastructure in terms of transportation, electricity, housing or running water, and this proved inadequate for ICT4
- o   The initial motivation for ICT4 was based on the assumption that the number of schools and potential school-leavers would constitute a steady flow of users who would pay for the services. A proper needs assessment would have revealed that this was not the case. A community profile could have indicated what was needed and how best to approach the implementation of a centre in the community
- o   A certain amount of trust had been built between TSA and the community leaders, which lead to expectations, on the part of the community, of the potential benefits of ICT4. The impact of relocating ICT4 before the centre went live was significant. The community as a whole felt betrayed and was not likely to participate so readily in the future, should another ICT centre be attempted by TSA or any other organisation wanting to implement an ICT solution

ICT4 must be considered as a total failure.

5.6 ICT5

5.6.1 Analysis of data

5.6.1.1 Conceptualisation

The approach used was typical of organisations that use the 'box drop' approach. The 'box drop' implies that a basic IT infrastructure would be installed and the recipient would be left alone to make use of the IT equipment and software without further assistance from the donor. There was no attempt to determine community needs. There was also no business plan, financial forecast, or landscape audit to determine services and risks. Role players to assist in the implementation of the centre were identified through the local university.

5.6.1.2 Implementation

The issues that proved to be challenges to the implementation of ICT5 are outlined below.

- o TSA chose non-standard software to be used in the centre and support was not available in the country for that software
- o There was an absence of service providers for IT support in general, as well as no providers of access to the Internet and other services
- o Legislation governing connectivity to networks for all types of communication was strictly the domain of the national communications supplier, and applications made to this governing body for connectivity to ICT5 would take an unreasonable length of time
- o TSA lacked exposure to the local culture and an understanding of the community as a whole and, therefore, the approach used to communicate with the role players was not suitable
- o There was no evidence that a landscape audit was carried out

5.6.1.3 Adjustment

Attempts were made to get an Internet connection through the university but were unsuccessful. Attempts were also made to make use of the partnership agreement with the local TSA office. This partnership, however, had no effect on the centre because it was located in another country, which made communication and site visits costly and time consuming.

5.6.1.4 Sustainability

ICT5 at no time showed any evidence of effectiveness or sustainability. This was aggravated by the fact that the centre was located in another country, where the legislation and culture were different to that of other areas in South Africa that TSA had been exposed to when implementing the other ICT centres.

5.6.2 Factors for success and failure

The following factors influenced the centre's sustainability.

Factors for success:

- o Locating the centre at the local University guaranteed a secure environment for ICT5
- o The location of ICT5 meant there was the potential to form partnerships with the university and to take advantage of the student population of the university

Factors for failure:

- o No landscape audit was carried out that would have identified the unique environmental factors which impacted on ICT5's ability to become viable
- o There was no understanding of the unique conditions within the country
- o No business plan was drawn up
- o Non-standard software was deployed in the centre
- o No community ownership of ICT5 was evident
- o There was no community involvement in or buy-in of ICT5

5.6.3 Conclusion

ICT5 perhaps illustrates the worst-case scenario of ICT centre deployment in a developing community. There was a lack of understanding and appreciation on the part of the initiators of ICT5, especially of local conditions and culture. There were no business plans or a framework that could be used by the recipients of ICT5 to assist with the managing of ICT5.

ICT5 showed no potential to grow or to become sustainable.

5.7   ICT6

5.7.1   Analysis of data

5.7.1.1 Conceptualisation

There appeared to be a number of similarities between ICT6 and ICT5 in the approach that was used for the implementation of these centres. Although TSA was not involved in the project until two years after the implementation of ICT6, it was revealed that ICT6 was a result of another 'box drop'.

5.7.1.2 Implementation

There was no indication that a needs analysis had been carried out. No partnerships were formed or had been considered. It would appear that the donors only considered the location in terms of security and access to the community. The recipients of ICT6 had received no guidance, business plan, or project plan to assist with the running of ICT6.

5.7.1.3 Adjustment

The school's management was aware of the possibility of using ICT6 to generate income and to contribute to the economic growth of the community. Suggestions had been made that the school build partnerships with the local community centre and TSA, but these had fallen through. This situation was aggravated by the continual replacement of the headmaster, who appeared to be the only individual able to drive the centre. The staff were not properly trained or skilled, rendering the centre even less effective. No attempt was made to address this situation.

5.7.1.4 Sustainability

It would appear that ICT6 had the potential to become effective and sustainable due to its location, as it was close to main transport routes and within walking distance from the community centre. The school employed staff who could be trained and who showed enthusiasm for the centre. The centre, however, did not show usage and subsequently had no chance of sustainability.

5.7.2 Factors for success and failure

The following factors had an impact on the centre's sustainability.

Factors for success:

o The physical location of ICT6 within the school meant that it was secure and had access to electricity

o The learners from the school and the community had easy access to ICT6

o Some members of the school management was aware of the importance of using ICT6 to generate income and of making use of partners to assist with the running of ICT6

Factors for failure:

o School management was replaced on a regular basis

o There was a lack of drive and direction for ICT6

o Non-skilled staff were managing ICT6

o Outdated technology was deployed at ITC6

o There was no third party support for the technology

o There was a lack of funding to run the school

5.7.3 Conclusion

The organisation that made the donation indicated to the school that the donation was part of its social responsibility and that no further assistance would be forthcoming. The initial audit revealed that the donated IT infrastructure had already been outdated at the time of the donation and one could conclude that the organisation was more concerned with its image and perceived goodwill towards the community than with the recipient benefiting from the donation.

ICT6's situation was aggravated by an ever-changing school management, a lack of technical skills among the staff, a lack of ownership of ICT6 and the absence of partnerships.

ICT6 had the potential to become known and used within the school and the community. The location of ICT6 was ideal in terms of the proximity to a well-established community centre and transport routes and because it was housed in a secure location.

ICT6 was never used to assist the community and never showed any significant usage and, therefore, cannot be considered sustainable.

5.8   Overall conclusions for all six ICT centres studied

Five out of the six attempts to effectively deploy ICT centres proved not to live up to the expectations of the initiators of those centres. The only centre that did show signs of

becoming sustainable was still unable to operate completely independently and had to rely on some support from TSA.

The following is a summary of factors that contributed to the success and failure six ICT centres and thus their potential for sustainability.

5.8.1 Factors for success

- o Two centres, ICT2 and ICT3, formed partnerships with third parties that could assist with running the centres, training of centre staff and addressing the needs of the third party through the use of the centres
- o A sound infrastructure, in terms of the physical location of the centre, that ensured security, a reliable supply of power and access to telephones for support, was a necessity
- o In the case of ICT3, the community leadership owned the centre
- o In the case of ICT3, an informal needs analysis was carried out by the headmaster
- o Service provision was aligned with the needs of the community through partnerships in terms of support, as in the case of ICT2
- o There was a realistic business approach based on the realities that faced the centres as in the case of ICT2 and ICT3
- o Centre staff were trained, in the cases of ICT2 and ICT3
- o ICT1 and ICT2 became part of an existing community centre

5.8.2 Factors for failure

- o No community needs analysis was undertaken for any of the ICT centres. The community needs were assumed by the initiator and therefore it would have been highly improbable that alignment of services provided by the ICT centres with community needs could have taken place
- o A landscape audit was never carried out in order to ascertain what the status was in terms of electricity supply, access to telephone lines, cultures, local legislation, or other issues which could impact on the success of an ICT centre implementation
- o Those who implemented the ICT centres did not involve community authorities to get ownership from the community and its influential members
- o No business plans were in place to assist with the managing of the centres, including proper financial forecasts based on community needs. There was also no guidance for those left to do the day-to-day managing of the ICT centres
- o No partnerships with service providers or local government were formed, which could have assisted with ensuring that the centres were utilised

5.9   Conclusion

This chapter examined and interpreted the data collected from each ICT centre. The data related to each ICT centre was analysed and factors influencing each centre's success or failure were identified. These factors were grouped together as factors for success and for failure. The factors mentioned had the greatest influence on each centre's ability to become sustainable.

The chapter concluded with a final summary of the significant factors that impacted on the sustainability of all the centres.

The following chapter will attempt to address the research question based on the findings.

CHAPTER SIX

SUMMARY and CONCLUSIONS

6.1   Introduction

This chapter will attempt to address the research question and the aims of the research. The chapter will also pose questions as to why many attempts at deploying ICT centres in Southern Africa have met with failure and why the expectations for ICT centres have not been realised.

6.2   Addressing the research question and research sub-aims

The extent to which the research question and sub-aims of the research have been addressed will now be discussed. The conclusion reached will be used to suggest an approach (which will be outlined in Chapter Seven) that can be used for the implementation of ICT centres, specifically in developing areas in Southern Africa.

6.2.1 Sub-aim one

Sub-aim one of the study was to establish how each ICT centre was implemented and to identify what criteria were used for the deployment of each centre

Chapter Four describes in detail how each centre was implemented including the criteria used for the establishment of each centre. Below is a summary of the most significant criteria used for the implementation of each ICT centre.

- o   The donors' requirements should be satisfied. These requirements were
    - o   that an ICT centre must be deployed in a rural area
    - o   that there must be no other ICT centre in the area
    - o   that the centre had to be housed or be part of an existing infrastructure, as was
    - o   the case for ICT1, ICT3, ICT5, ICT6
- o   The regions identified for the implementation of the six ICT centres are considered developing areas
- o   All ICT centres had to be self-sufficient once the centre was implemented or, in certain instances, once the seeding money or part of the donation had been used up

There was no indication that for any of the six ICT centres that a community needs analysis or a detailed landscape audit was carried out. It is highly unlikely that an ICT centre will be successful in a rural area unless the deployment of the centre is aimed at addressing specific

community needs that have been identified by the initiators of the centres which was confirmed by the findings of this study.

No proper business plans were evident and in the cases where a financial forecast was used to motivate the implementation of centres, it was based on assumptions.

ICT3 and ICT6 are examples of organisations adopting a 'box drop' approach in order to satisfy their social responsibilities. In both these cases, the intention was that the schools would be able to make use of the donations and that the surrounding communities and schools would benefit accordingly.

ICT1, ICT2, ICT4 and ICT5 were implemented by the same individual over a number of years. The question that must be asked is why the individual had not altered the implementation model especially as three of the four centres were failures and the third was successful only because of a partnership with TSA and Vista University. Peled (2001) maintains that the continued transfer of IT to developing communities by organisations and individuals through ICT centres that showed very little evidence of success, could be as a result of hidden agendas on the part of the individuals involved. This observation is also supported by work done by (Clark, 2002; Myers and Young, 1997; Berg, 1993).

It should have been apparent to those who were responsible for the implementation of the four ICT centres noted above, that there was a need for reevaluating the implementation strategy, especially as the implementation of the centres took place over a number of years and that there was sufficient evidence to suggest that these centres were failing to live up to expectations. Much criticism has been leveled at donors responsible for the financial contribution to ICT centre projects as well as those consultants appointed by the donors. The arguments centres mainly around the question of how the donor and consultant will benefit as there is no ownership or any long term interest for the donor or consultant (Schoen. 2002; Pahad, 1998; Heeks, 2002; Colle & Raul, 1999; Berg, 1993).

6.2.2   Sub-aim two

Sub-aim two was to determine how effective the ICT centres are perceived to be and to evaluate the level of success or failure of these projects.

The standards used in this study to determine the effectiveness of each centre over time were derived from usage and income generation which is considered by many as an acceptable measure (Benjamin, 2003). Benjamin (2003) also refers to the ability to pay salaries to ICT centre staff and the perceived effectiveness of the centre by the community and centre staff as additional features by which to assess the effectiveness of the ICT centre.

Sustainability in the context of this study was seen as essential in the medium to long-term and that the ICT centre should be able to continue operating without major intervention from third parties (Troubdridge, 2003;Hulbert, 2002; West, 2002).

Indicators of success or failure, as applied to the six ICT centres, are described here. ICT4, ICT5 and ICT6 never showed any signs of usage or income generation. Although these three ICT centres had the potential to offer services, they must be considered failures, according to this standard.

ICT1 and ICT3 both showed signs of usage. ICT1 also showed the ability to generate a little income. Both these centres, after what could have been described as a promising beginning, did not continue to show growth.

ICT2 had a modest beginning in terms of usage and did not generate much income. However, ICT2 then increased its usage and the income generated increased accordingly. Although not sustainable on its own, ICT2 can be considered effective because it continued to show growth (see Table 6.1 in the appendix, page viii).

Criteria such as quality of service could only be measured at ICT2 because of the stability of the centre. The quality of service rendered by ICT2 was a function of the standard of the courses offered and the perceived capabilities of the centre staff and the centre itself. Interviews with some of the ICT2 centre users revealed that quality was not an issue, although the costs of some of the courses was identified as a concern.

6.2.3   Sub-aim three

Sub-aim three was to identify the factors that contribute to the success or failure of the identified projects.

This is possibly the most critical issue for the formulation of an approach for the implementation of ICT centres. With the exception of ICT2, all the other ICT centres were failures. Had TSA not assisted ICT2, in all likelihood it would also have failed.

The factors common to the failed ICT centres are the following.

- o   No community needs analysis was undertaken and so the centre did not know if the services it was to render would be appropriate
- o   No landscape audit was carried out in order to identify obstacles such as legislation constraints, cultural factors and infrastructure shortcomings, all of which would impact on how the ICT centres should have been implemented
- o   There was never any community involvement

- o There was no request from any community for an ICT centre and consequently no buy-in from or ownership by the community of the centres
- o Little emphasis was placed on training the centre staff, resulting in the inability of the centre to render an acceptable service
- o The centre staff did not display any business acumen, with the exception of those at ICT2 and ICT3
- o No business plan was evident.
- o In most cases, no beneficial partnerships were formed

6.2.3.1   Needs analysis and landscape audit

The landscape audit should ideally be carried out once the needs analysis has been completed. When the needs of the community are understood, then only should the obstacles, challenges and profile of the community be identified and analysed in order to be used as input for a framework for the design of an ICT centre.

The importance of a needs analysis before an ICT centre is implemented and the need to focus on people as opposed to IT for technology transfer is supported by many (Grossberg *et al,* 2001; Acacia II Prospectus, 2001; Schoen, 2002; Sharhan, 2000; Ouma-Ongango, 1997; Venkatesh *et al,* 2003). Much has been documented regarding the importance of understanding the local conditions with respect to infrastructure, legal requirements, access to communication and the Internet when deploying ICT centres in developing areas. It is also clear from literature that conditions in seemingly similar environments can differ significantly form each other and that each project aimed at setting up ICT centres should considered as unique. This means that the project team responsible for the deployment of the centres must be fully aware of the prevailing conditions and adapt their respective approaches to ICT implementation accordingly. Not only is a thorough understanding the local condition crtical for effective ICT centre deployment but possibly more importantly is the identification and understanding of community needs that should be addressed by the ICT centre. There is overwhelming evidence throughout the developing world that the rendering of appropriate services is key to the centres long term viability and sustainability. (Sabien, 2002; Fuchs, 2000; Thamizoli & Balasubramanian, 2001; Conradie, 1998b; Pahad, 1998; Nulens & Van Audenhove, 1999; Kirkman, 1999; Benjamin, 2000;).

The findings of this study showed no intention by those responsible for the centre implementation to address either the unique local conditions or the identification of community needs. The only exception was in the case of ICT2 where the centre management acknowledged the need for being sensitive to local conditions and community and this showed in the partial success of this centre.

It is evident that when planning the implementation of ICT centres, a significant amount of consideration must be given to a needs analysis of the community and their involvement, failing which, ICT centres seem likely to fail.

The research highlighted that services provided by ICT centres must be aligned with the needs of the community, especially if they are to be paid for. Although it is generally accepted that IT enables economic growth and development, IT must also be seen in terms of other priorities and, more importantly, must be linked to opportunities. TSA had assumed that services provided by the centres would be used by the community. It seems as if the question that arises is 'why should services be paid for if there is no need for them?'

ICT1 through to ICT6 all showed that there was no evidence of a proper needs analysis being conducted. It appeared that communities were being given a solution to a problem of which they were never aware. The fact that developed countries are guilty of selling solutions to problems that marginalised communities did not perceive as problems in the first place, is one of the major reasons for the low incidence of successful ICT centres (Schoen. 2002; Pahad, 1998; Heeks, 2002; Colle & Raul, 1999).

6.2.3.2 Local ownership and the formation of partnerships

The community's ownership of and involvement in ICT projects are key to their success. Communities that are given an ICT centre may feel that the centre will be managed for them and may show no intention of involvement (Conradie *et al,* 2003). Therefore, a centre must be driven by the local community (Khumalo, 1998). The danger of the 'box drop' approach is has shown clearly there is no real ownership by the community, which manifests itself in the failure of the centre. Communities should be able to decide for themselves, with guidance, what they need.

There were no initial partnerships put in place to assist with the implementation of each ICT centre.

ICT centre partnership with existing organisations or bodies in developing areas is considered essential in order for ICT centres to become sustainable in the medium to long term (World Summit, 2003). Partnerships which address skills transfer in the initial stages of an ICT centre are key and this was evident with ICT3 (Whelan, 2002).

The importance of identifying and forming strong partnerships when dealing with advancement projects in developing countries was highlighted in the final report of the outcomes of the World Summit on Sustainable Development, hosted in Johannesburg in 2002 (Whelan, 2002; Kyle, 2002; Hutchison, 2001; Fuchs, 2000; Sabien, 2000; Short, 2000).

There is strong evidence to suggest that ICT centres can only survive through partnerships and being part of the community (Kyle, 2002; Hutchison, 2001; Fuchs, 2000; Sabien, 2000; Short, 2000). Although the study revealed no indication of partnerships in the early stages of all six ICT centres, the three centres that attempted to form partnerships showed an improvement in service delivery. Again the only two centres that were still operating were those that had indeed continued to be part of a partnership.

6.2.4 Sub-aim four

Sub-aim four was to implement suggested changes in order to address the problems of ineffectiveness of ICT centres.

ICT2, ICT3 and ICT6 were the only centres that reacted to suggestions made by the researcher. In the case of ICT3, the headmaster implemented suggestions which resulted in a positive start and set the centre up for growth. ICT2 showed significant changes, while the attempts of ICT6 were thwarted by an absence of leadership and funding. Although TSA was aware of problems, it did not react and move to resolve these issues. Some of the centres could have been rectified and become effective. For example in the case of ICT1, fixing the unreliable supply of electricity could have stabilised the centre and enabled it to offer a continual service. Such interventions are stressed by Burgelman (1992), who maintains that the project manager, or the body responsible for IT implementation, must proactively address problems as soon as possible after they are identified (Lillie, 2004).

6.2.5 Sub-aim five

Sub-aim five was to monitor and review those ICT centres that have made changes for effectiveness.

The research instrument measured those centres which reacted to the suggestions made by the researcher and, in the case of ICT3, where the headmaster initiated changes.

ICT2 and ICT3 showed the greatest number of the suggested changes implemented, while ICT1 and ICT6 showed minor changes.

6.2.6 Sub-aim six

Sub-aim six was to draw up a conclusion that will indicate whether ICT centres can be sustainable in Southern Africa.

ICT2 showed the strongest indications that an ICT centre could become sustainable.

Using criteria such as usage and income generation to measure success, it was proven that an ICT centre can become sustainable. An ICT centre could be part of a community centre or have strong alliances with a third party. In these cases, the ICT centre must be able to show sustained usage and income generation. The centre could then be considered partially sustainable.

An example of an ICT centre that was considered sustainable more recently, is the Universal Service Agency centre (USA) that opened its doors in Gaseleka in the Northern Province of South Africa. This centre was able to address the community needs which were determined before the implementation of the centre and which resulted in services that the community wanted to use and were prepared to pay for. The centre was profitable to the extent that it was able to cover all expenses (Latchem & Walker, 2001).

6.3   Conclusion

This chapter attempted to determine how the research question and its sub-aims were addressed through the research. The chapter identified criteria that were considered by the researcher to be most significant in determining the success or failure of ICT centres.

In conclusion, the most important contributing factors identified that may lead to the realisation of the potential of an ICT centre in a developing area are the following:

- o   A comprehensive identification of the community needs that will be serviced by the ICT centre (Conradie *et al,* 2003; Heeks, 2002; *Gáspár, 2002*)
- o   An understanding and knowledge of the environment in order to identify potential obstacles that may appear when implementing and running the centre (Etta, 2004; Schoen, 2002; Vaihia, 2002; Zelkowitz *et al,* 1998)
- o   Buy-in and ownership from all stakeholders within the community (Jellema & Westerveld, 2003; Sabien, 2002; Short, 2000; Grossberg et. al., 2001)
- o   Partnering with local organisations in order that the ICT can benefit from additional and already established resources so as to maintain the centre (Mphahlele & Maepa, 2003; Clark, 2002; Whelan, 2002)
- o   IT and managerial skills as a prerequisite for the centre staff to enable them to manage the ICT centre effectively (Rowan, 2000)

The following chapter will suggest an approach that could be used to implement sustainable ICT centres in Southern Africa.

CHAPTER SEVEN

RECOMMENDATIONS

7.1   Introduction

This chapter will address the final aim of the research, which is to create an informative instrument that could be used to assist in the establishment of sustainable ICT centres in developing areas in Southern Africa. The findings of this research as well as the model that will be proposed are developed from the basis of the research and views of the theory presented in Chapter Two.

7.2   The recommended model

Based on the literature review and the findings of the research, it was decided to take Heeks Information-Centred Approach as a departure point order to propose a model for sustainable ICT centre implementation in rural Southern African (Heeks, 2002). Although no empirical evidence could be found to indicate that the Heeks Information-Centred Approach has been applied successfully, the Heeks Information-Centred Approach is based on a dialogical/participatory approach that recognizes the role of the community in the implementation of ICT centres. The Heeks Information-Centred Approach also addresses most of the problems regarding ICT centre implementation as highlighted in this study and provides a framework that can be meaningfully adapted to develop an approach for ICT centre deployment in developing areas in Southern Africa.

The purpose for the deployment of an ICT centre is to enable users of the centre to gain access to relevant information, access to communication and, in some instances, access to IT training and IT services. Heeks maintains that information is at the core of any attempt to deploy ICT centres in developing communities (Allen & Thomas, 2000).

The factors that were identified as contributors to effective ICT centre deployment are largely supported by Heeks as critical in ICT centre deployment. The factors, as presented in the research findings and supported by the Heeks Approach, are listed below (Heeks, 2002a).

- o   An awareness of the notion that many people and donors consider ICT centres as the means to permit leapfrogging to the information economy resulted in ICT 'hype'
- o   Money appears to have been the incentive for many consultants, vendors and academics to be part of ICT centre implementation
- o   The plethora of writing on ICT centre implementation has not factored development realities into the process of ICT centre implementation

o ICT centres can only be understood together with the role of information within development
o Information must be considered before technology in ICT centre deployment
o The strong influence of specific local socio-cultural factors which can impact on the deployment of ICT centres
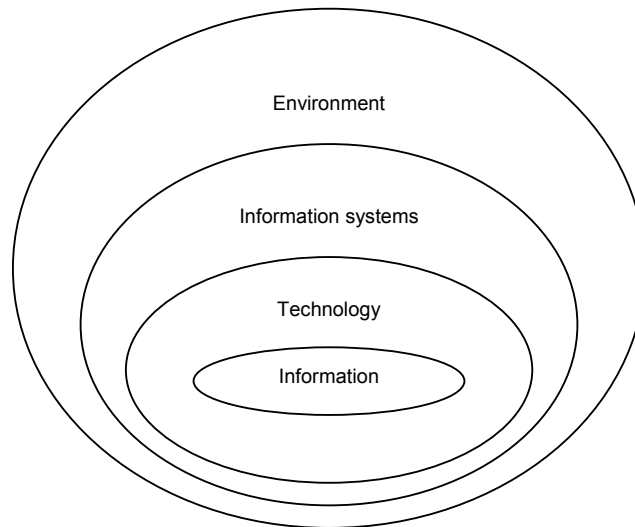
FIGURE 7-1 The Heeks Model

The Heeks approach is based on the community's needs for information and consists of four elements. In the centre of the model is information, which Heeks maintains is the driving force when attempting to transfer technology to developing countries. Heeks (Allen & Thomas, 2000) stresses the importance of information in decision making and the role of information in knowledge and knowledge transfer.

The second element is the appropriate technology required to give access to the information and includes ICT centres, networks, software, hardware, etc.

Information systems, the third element in the Heeks Model refers to the manner in which the information is made available through people and processes. In other words it is the bringing together of technology, people and community needs in the building of a solution to address the community needs.

The environment is the final element and refers to markets, socio-cultural, political, economic and technical aspects which influence the way in which the model will be applied (Heeks, 2000).

Challenges identified in the literature review with respect to technology transfer to developing economies have to some extent been identified by the Heeks model. Through the Heeks model, factors that should be considered as crucial for successful technology transfer are included. These factors include assessing environmental factors, (referred to in chapter 2, page 24), organizational factors (referred to in chapter 2, page 29).

Although the Heeks model stresses the importance of information and sees information as the centre of the suggested approach for ICT centre deployment, it places no emphasis on community involvement in ICT centre deployment. Yet, the findings of this study in all instances indicated that because the community was neither involved in the needs assessment nor at a later stage of the centre's life, there was a corresponding lack of ownership. The study indicated that ICT4 and ICT6 were examples where the lack of community involvement in the needs assessment was a major contributing factor to the failure of the two ICT centres.

The study has also shown that a thorough understanding of environmental and socio-cultural issues is also necessary for the planning of an ICT centre. For example, in the case of ICT5, ICT4 and ICT1, a lack of knowledge of the physical location as well as the community leadership played a significant role in the failure of these centres to become effective. Although the Heeks approach recognises the importance of socio-cultural factors, it does not consider these factors by determining community needs.

The researcher made the decision to adapt the Heeks Approach in order to suggest an approach for ICT implementation in Southern Africa. This recommended model intends to place community involvement as the driver for the initial phase of the needs assessment. It is also the intention of the recommended model to identify those factors that could influence the identification and understanding of community needs. In other words, the identification of environmental and other factors in the initial phase must be used to structure the solution for information and ICT service delivery.

The following diagram is a graphical representation of the recommended model adapted from the Heek's model.

Implementation, operations and evaluation

Technology and training

Environmental factors

Community needs

Community involvement
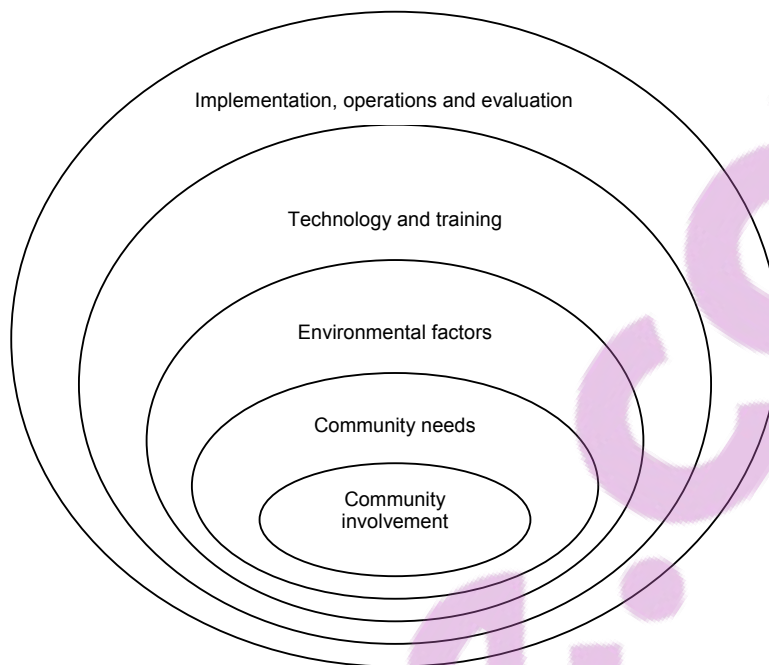
FIGURE 7-2 Recommended model adapted from the Heek's Model

The adapted model, based on Heeks, suggests an approach that could be used for the implementation of an ICT centre. This approach extends from the conceptualisation of an ICT centre through to the evaluation of the ICT centre in an attempt to assist with maintenance of the centre. The following section describes each stage of the model in more detail.

7.2.1 Community involvement

The placement of community involvement at the centre of the recommended model shows how necessary it for successful ICT centre implementation. The literature review, as well as the results of the research, have indicated that the community has to play a critical role in the determination of the community's needs (Freire, 2004; Conradie, 1998a; Heeks, 2002a; Malan, 1999; Snyman & Snyman, 2002). The community, in the initial stages of the planning and conceptualisation of the ICT centre, must take ownership of the centre and understand how it will address the community's needs (Snyman, 2002; Conradie, 1998a). In other words, the potential of the ICT centre must be communicated to and accepted by the community (Brown, 2001).

Identification of influential people in the region who can assist in the conceptualisation of the centre is the first step to achieving community involvement. The research findings showed that the exclusion of influential people and stakeholders can result in the failure of an ICT centre.
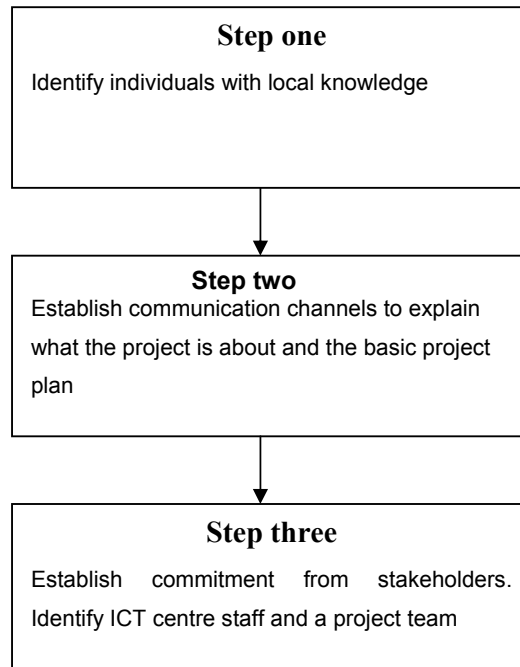
In the case of ICT3, the headmaster's involvement contributed largely to the initial success of the centre. The headmaster was an influential member of the community and was able to get community involvement. ICT4 showed huge potential because the community was involved in the planning stages. ICT5 and ICT6 were examples of centres where the community was not involved in the initial stages and neither of these two ICT centres showed any indication of being able to operate effectively. In all other cases, where there were no stakeholders included in the conceptualisation phase, the centres struggled from the beginning to establish themselves.

The process of ensuring community involvement consists of three steps.

- o **Step one** is the actual identification of people that would be considered local leadership in the region and other individuals who will add value to the conceptualisation phase by sharing local knowledge. These individuals could, for example, point out pertinent issues relating to the culture and customs of the community which may have an impact on the implementation of an ICT centre

- o **Step two** focuses on the setting up of reliable communication channels between the initiators of the centre and the stakeholders. The purpose of reliable communication channels is to ensure a regular and open transfer of ideas and to ensure that the ICT centre project progresses smoothly

- o **Step three** focuses on acceptance of the ICT centre project through discussions with the community. It is at this stage that the potential benefits of the ICT centre are made known to the community. Once commitment to the project is in place, the intention would be to identify the ICT centre staff and put a project team together consisting of the community centre leadership, ICT centre staff and the project initiator

The following figure is a graphical representation of the process used to ensure the community's involvement.

| **Step one** |
| Identify individuals with local knowledge |

| **Step two** |
| Establish communication channels to explain what the project is about and the basic project plan |

| **Step three** |
| Establish commitment from stakeholders. Identify ICT centre staff and a project team |

FIGURE 7-3 Process of ensuring community involvement

If it is not possible to reach the third step, it is unwise to continue with the project. Instead, alternative regions should be identified that would benefit from an ICT centre.

The success of this stage of the model can be measured by the levels of commitment of the local stakeholders, the community's understanding of the outcomes and potential benefit of the centre, and an appreciation by the local community and leadership of the work involved. In order to identify those factors which could indicate a lack of commitment from the community, the following signs should be looked for:

o   The community does not react to requests from the project team
o   The community does not attend regular project meetings
o   The community is hostile towards the project and shows a lack of enthusiasm
o   The community shows signs of SAD syndrome

7.2.2 Community needs

As the community needs analysis is crucial to the conceptualisation of an ICT centre, a great deal of time should be set aside to do a proper needs analysis. The success of the centre depends on its accuracy (Benjamin, 2003).

It is important that the findings of the needs analysis are agreed upon by the ICT centre task project team and the community, and that the value and benefits of the ICT centre are communicated to the community. It is critical that the needs analysis is done by the project team together with members of the community.
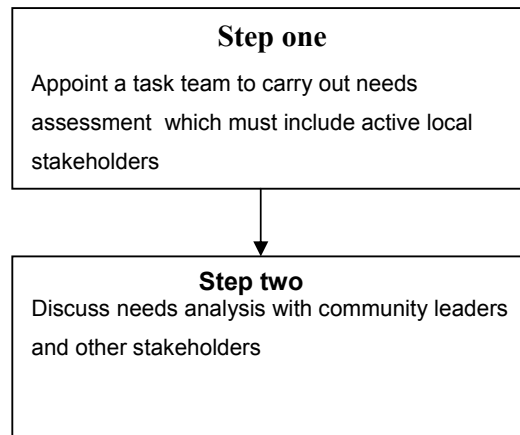
The research findings have shown that because no needs analysis was undertaken in any of the six centres, there was no reliable way to ascertain how effective the centre's services were. A centre's lack of usage is usually the result of its inability to provide a needed service and cause the centre' to struggle to become viable and sustainable (Annan, 2000; Van Audenhove, 1999). In other words, first identify the needs and then use ICT to help with addressing the needs.

The process of needs analysis can be split up into two steps.

o   The **first step** deals with the selection of the task team that will carry out the needs analysis. The ICT project team does not necessarily have to do the actual needs analysis, although the community must represented on the team selected to carry out the needs analysis

o   The task team could make use of guidelines to assist with identifying needs. These guidelines may suggest the following elements and the team must give reasons for the need if it is identified:

o   The need for access to telephones
o   The need for access to the Internet
o   The need for access to e-mail
o   The need for access to library services
o   The need for access to IT training (specify what kind of training)
o   The need for access to printing and photocopying services

o   The guidelines should also record the frequency of each service need (refer to Table 7.2 in the appendix, page ix).

- o The task team is encouraged to make use of open discussions and open-ended interviews with the community in order to allow the people to voice needs that the project team may not have identified.

- o The **second step** in the needs analysis ratifies the findings of the needs analysis with the community leadership.

The following figure is a graphical representation of the process used to do a needs analysis.


```
┌────────────────────────────────────────────┐
│              Step one                       │
│  Appoint a task team to carry out needs     │
│  assessment  which must include active local│
│  stakeholders                               │
└────────────────────────────────────────────┘
                      │
                      ▼
┌────────────────────────────────────────────┐
│              Step two                       │
│  Discuss needs analysis with community      │
│  leaders and other stakeholders             │
│                                             │
└────────────────────────────────────────────┘
```

FIGURE 7-4 Process of identifying community needs

After the community needs are understood and agreed upon by the community and those responsible for implementing the ICT centre, the information required to address those needs is then defined (Benjamin, 2003). It is important for the task team to ensure that the community understands the role an ICT centre plays in information within development (Heeks, 2002).

The research findings determined that ICT2 and ICT3 were able to identify and understand the community information needs after the implementation of the two respective centres. ICT2, the most successful of the six ICT centres, was able to deliver a service which was needed by the community. This was achieved after the centre's management had specifically focused on the community's needs, even though the centre had been in operation for some time. ICT3 was also able to identify and understand what was required by the community in a similar manner to ICT2 and showed indications of success in the initial stages.

7.2.3 Environmental factors

Environmental factors that could impact on the project plan for the ICT centre implementation have to be identified. This should take place once the community needs analysis has been completed and agreed upon.

Environmental factors are identified in order to establish what obstacles, challenges and areas of assistance are present for the implementation of an ICT centre **(**Mphahlele & Maepa, 2003). Although much has been written about the importance of factors such as culture, legislation, and physical issues relating to the deployment of technology in developing areas (Sassen, 2002; Wjinbeek 2000; Bidoli, 2003; Jensen, 2002; Mancome, 2002; Melody, 2003), there is very little evidence in the literature to suggest how this should be achieved.

The research findings indicate that a landscape audit should be carried out to identify the environmental factors which will impact upon the implementation of an ICT centre. A landscape audit is a process used to identify those factors that could impact on the operations and effectiveness of an ICT centre. Typically, a landscape audit would examine the physical location intended for the deployment of the centre regarding the support structures, infrastructure, legislation, and cultural issues in which the centre would operate (refer to Table 7.3 in the appendix, page ix).

The research identified a need for a complete landscape audit in all cases studies. ICT1, for example, showed that the poor supply of power resulted in the centre's inability to render a reliable service, which also impacted on the third party's lack of willingness to honour the service level agreements for the hardware. ICT3, ICT5 and ICT6 did not have access to third party support and ICT5 was not able to connect to the internet. ICT4, ICT5 and ICT6 were not able to make use of partners. The ability of ICT1, ICT2 and ICT3 to form partnerships proved to be a major contributing factor in the partial success of these centres.
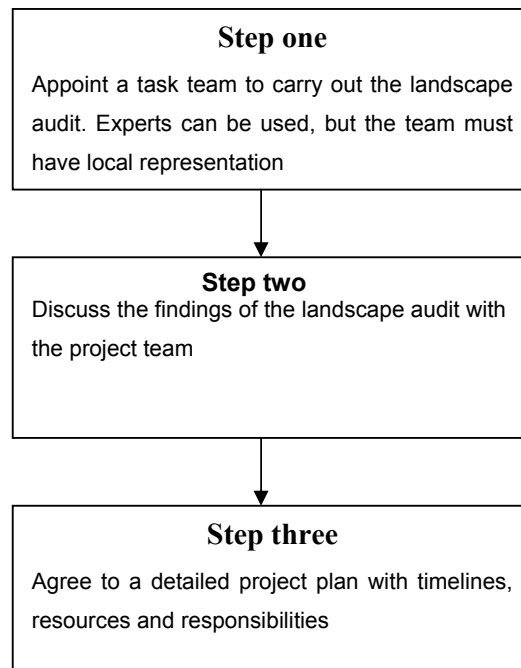ICT5 was unable to address the Internet connectivity problem due to legislation constraints which were never identified prior to the implementation of the centre.

The landscape audit comprises three steps.

- o **Step one** is the identification of the team to carry out the landscape audit. Third parties can be used as this can be a faster way to complete the process. However, the team that will carry out the landscape audit must be aware of the community's needs. The most critical points to investigate during the audit are the following:

    - o The community profile, which gives an indication of the distribution of age, qualification and income

- o The infrastructure supporting the region in the proximity of the proposed location for the ICT centre in terms of access to the centre, power supply to the centre and the building that would house the ICT centre
- o The number of service providers and what services they provide as well as their physical location
- o Legislation and laws that may impact on the operations of the ICT centre
- o The culture and customs of the community which could influence management styles and training methodologies and the way services will be used
- o Possible partners, such as other organisations in the area or community centres.
- o For example, should an ICT centre be located close to an existing community centre, the community centre could be used to attract the people to the ICT centre ICT1 and ICT2 showed the importance of being in a partnership. ICT centre partnership with existing organizations or bodies in developing areas is considered essential in order for ICT centres to become sustainable in the medium to long term (World Summit, 2003). Partnerships can also address skills transfer in the initial stages of an ICT centre (Kusakabe, 2004), a fact illustrated by ICT3

- o **Step two** refers to the presentation of the findings to the project team in preparation for the third step. In step two, the project team must be satisfied that the findings of the landscape audit are understood and must highlight any potential problems. In other words, the findings of the audit must be evaluated and analysed to ensure that when implementating the ICT centre, all the factors are considered that could influence its effectiveness

- o The **third step** flows from the previous two steps and results in the drawing up of a project plan with the required resources, responsibilities and timelines for the implementation of the ICT centre

The figure on the following page is a graphical representation of the process used to carry out a landscape audit.

Step one

Appoint a task team to carry out the landscape audit. Experts can be used, but the team must have local representation

↓

Step two

Discuss the findings of the landscape audit with the project team

↓

Step three

Agree to a detailed project plan with timelines, resources and responsibilities

FIGURE 7-5 Process of carrying out the landscape audit

7.2.4   Selection of technology and training

The selection of the appropriate technology and training will depend on the outcomes of the needs assessment and the landscape audit. The technology best suited to the environmental factors should be put in place to facilitate the information needs of the community (Rowan, 2000).

Procurement of equipment and training of centre staff should be a mechanical exercise, provided the outcomes of the previous steps are used as a framework. The framework should serve as guidelines for the specific types of equipment and software that must be obtained, as well as the scope and kind of training to give the centre's staff.

The process of selecting technology and training comprises three steps.

- o **Step one** refers to the actual procurement of the IT equipment. Critical factors to consider when purchasing the IT equipment and especially the software are listed below.

    - o Software must be the standard for South Africa. In other words, the software must be considered the norm and be in general use

o   Software that is considered specialist software for CBT (computer based training), must also be standard but, more importantly, must be serviceable. There must be support available within reasonable time frames, taking the physical location of the centre into consideration

The hardware must be standard so that any hardware vendor can support it. The choice of PCs, as opposed to thin client solutions, will be dependent on the requirements identified in the needs analysis and on the level of local expertise. The support for the hardware should also be readily available within the context of the centre's physical location.

In the cases of ICT1, ICT5 and ICT6, the choice of technology was not considered standard and was difficult to support. This was aggravated by the location of the three ICT centres. Software and applications must also be standardised in order for the community to benefit from standard practice with regard to the choice of applications.

The research found that the ICT centres making use of IT equipment and software not considered the norm were faced with support issues, which impacted on the ability of the centres to render reliable services. Guidance may be needed and should be sought through the project team who can contact third parties for advice should they not have the technical skills to determine what technology should be purchased. This is also the step where third parties are identified who can support the technology.

o   **Step two** deals with the selection and training of the centre staff about how to use the technology and how to identify and communicate technical problems to third party support and suppliers. The suppliers of the technology should be used for the training.

The centre staff must be chosen as early as possible, trained and should participate in the implementation process. The research confirmed the need for training of the centre staff, especially when dealing with technical issues and the need for a business approach. ICT1, ICT5 and ICT6 were examples of centres that did not have the technical expertise and business skills necessary because of a lack of staff training. This contributed to an initial lack of progress in these three centres.

The criteria for selecting the centre staff should focus on the following elements (refer to Table 7.1 in the appendix, page viii):
o   An appreciation for a business focus in order that the centre is to be managed on business principles

- o An ability to understand technical problems so as to identify and describe technical problems to remote technical support
- o The ability to work with people and to have networking skills with in the community
- o Acceptance by the community

The training of the centre's staff is critical to its continued operation. Each staff member must undergo training and assessment after training to ensure that he/she is able to perform. Provision should also be made for redundancy and back-up and continued training should also be considered as part of the normal operations of the centre.

- o The **third step** is where the centre staff are assessed after training. Again, the trainers of the staff should also be used to assess the centre staff. ICT3 was the only centre that insisted on training of the staff including as well as the evaluation of the staff after the training was completed. This was evident in the quality of the services offered to the users of ICT3. ICT2 was fortunate in that the staff were already trained and, therefore, able to render quality services as well.

The following figure is a graphical representation of the process used for the procurement of hardware and software as well as the selection, training and assessment of the centre's staff.
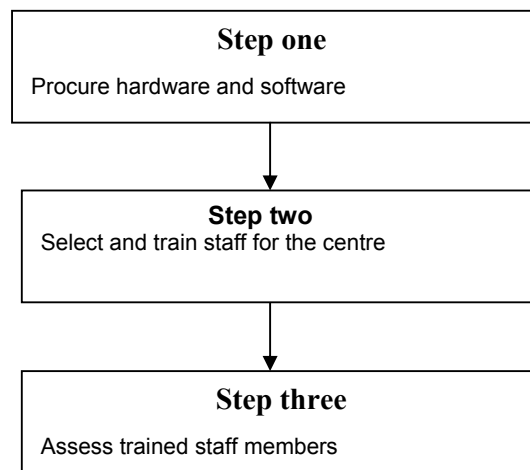
FIGURE 7-6 Process of procuring technology and training

7.2.5 Implementation, operations and evaluation

In the evaluation stage of the proposed model, the effectiveness of the ICT centre is measured from time to time during the centre's life.
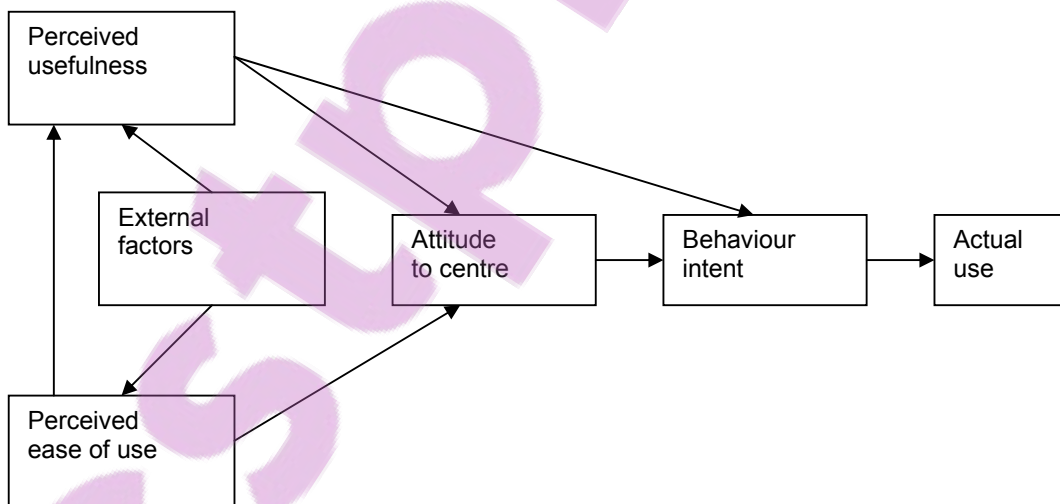
The CSIR Information Economy Model, shown below, is one of the more relevant approaches that could be used to determine the effectiveness of an ICT centre within the Southern African context, as it was developed in South Africa (Van Rensberg, 1997).

The CSIR model highlights the importance of the ICT centre's ability to add value to the user of the centre. In other words, the community must be convinced that there is something to be gained from using the centre and have a requirement that needs to be satisfied. The recommended model addresses this through the community involvement and community needs analysis stages, as the community will only use the centre's services if the perception is that the services are what the community wants.

The CSIR model also illustrates the link between actual usage of the centre and the reason for wanting to use the centre's services. The model clearly shows how perceived usefulness and perceived ease of use translate into the user's attitude towards the centre and the eventual actual usage. The recommended model determines the usage of the centre through the evaluation phase.

External factors which can have an influence on the centre's perceived usefulness and ease of use by the user are the environmental factors discussed above. The landscape audit is the approach in the recommended model to identify the environmental factors in order for the centre to manage these factors.

The following figure illustrates the CSIR Information Economy Model.

FIGURE 7-7 The CSIR Information Economy Model
Source: (Van Rensberg, 1997)

The model is based on the actual usage of the centre, as influenced by its perceived usefulness and ease of use by the community. Once the community considers the centre services to be useful and easy to access, the attitude of the community towards the centre impacts on the usage of the centre.

The importance of being able to monitor the perceived ease of use and usefulness of the centre is key in the determination of why the centre is not delivering a service. Information relating to these two measurements can be used to adjust the reasons for the community's perceptions in order to increase the centre usage.

ICT2 was the only centre which measured usage of the centre and also attempted to establish reasons for the increased usage. Although none of the other ICT centres showed that attempts had been made to identify problems in the community, they showed an awareness of the need for this feedback.

Information gathered in the evaluation phase can be applied to the marketing of the ICT centre, and the formation of partnerships can also assist in the marketing of the centre.

The centre's operations should adhere to the template designed for the specific management of ICT centres, which should be used in the evaluation process to measure services. For example, sensible and practical considerations relating to the prices of services rendered must be considered, as services must be competitively priced and affordable. The following should be done when managing an ICT centre (refer to Table 7.4 in the appendix, page x):

- o Measure and manage the income generated linked to the actual services rendered
- o Record all expenditure against the specific related cost
- o Monitor and record the usage of the centre's services individually
- o Keep a register of the types of problems and the frequency of these problems

It is important to hold regular meetings with the local leadership and the community centre management to monitor progress and growth, so as to maintain general support for the centre. The centre manager must be responsible for arranging these meetings.

7.2.6 Conclusion to the recommended model

In conclusion, the recommended model deviates from the Heeks approach by placing the community at the centre. With community involvement, the needs assessment is carried out, which is supported by a complete and thorough understanding of the environmental factors. The project plan is then drawn up which must address the findings of the needs assessment and landscape audit. After this, the procurement of the technology is aligned with the findings

of the needs assessment. Thereafter, the centre's staff are selected, trained and assessed. Finally, the evaluation of the ICT centre should take place on a continual basis. The community should play a significant role throughout the entire process.

The recommended model is aimed at improving the manner in which ICT centres have been deployed in Southern Africa by taking into account those factors which have been identified as obstacles to successful ICT deployment (Sassen, 2002; Bidoli, 2003). Norms of the prevailing culture and local conditions must also be considered (Adedeji *et al,* 1991; Ouma-Onyango, 1997; Melody, 2003; Jensen, 2002; Vaihia, 2002) when attempting to transfer technology in developing areas. By including the community's involvement, the model intends to address these issues from the initial stages of the life cycle of an ICT centre and ensure that the deployment of the ICT centre should not be transferred in a mechanical way (Mohan, 1990; Davis *et al,* 1998; Wjinbeek, 2000; Macome, 2002). The model uses the community's involvement to ensure that the ICT centre services are adapted to meet the needs of the local community and that its contribution is best suited to meaningful development (Michel, 1997). Finally, the model uses a bottom-up approach which has been shown to be more successful than a top-down approach (Colle, 2001). Many theorists support the notion of a bottom up approach when attempting to bridge the digital divide and using a modified Heeks approach and that the research has intended to show that community needs should be seen as the point of departure when given priority when deploying technology for economic improvement in developing areas (Whelan, 2002; Kyle, 2002; Fuchs, 2000; Sabien, 2000; Short, 2000).

7.3   Limitations of the research

There were two major limitations of this research. Firstly, very little communication with the users of the six ICT centres meant that the determination of the effectiveness of the centres was based on the amount of centre usage by the community and income generation. Due to the inability of most of the centres to render a continual service, the community was not available for interviews. It would have been useful to document the perception of the community in an effort to gain a user perspective, as this may have contributed to the findings of the research.

Secondly, the subjective position of the researcher due to the researcher's association with TSA, may have impacted on the findings of the research. This appears not to be a major concern, as it was evident that five of the six ICT centres were failures due to the lack of usage, activity and growth. Reasons for ICT failure identified from the findings of the study are also supported by the literature review.

7.4   Opportunities for further research

Further research could focus on the community in terms of its values, needs and aspirations and how people perceive the intended usefulness of ICT centres. This could be linked to a study that attempts to determine why organisations implement ICT centres. Further research could also try to determine how organisations make provision for sustainability centres, especially as there are so many failed attempts at ICT centre implementation (Snyman and Snyman, 2004).

7.5   Conclusion

In conclusion, this longitudinal study has identified the following factors as important for ensuring ICT centre sustainability in developing areas in South Africa:

- o   The identification and understanding of community needs
- o   Provision of relevant ICT services to address the community needs
- o   A thorough understanding of the environment
- o   Formation of partnerships
- o   Local ownership of the ICT centre
- o   The adherence to sound management principles
- o   The appointment of the appropriate staff

Adhering to these factors will assist in the long-term success of the centre.

Local knowledge underpins the understanding of the environment. Therefore, it is of concern that so many attempts at implementing ICT centres by organisations are not successful, especially as a considerable amount of documentation relating to ICT centres in developing areas exists.

APPENDIX

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APPENDIX

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TABLE 3-1 Overview of the research instrument

PHASE	UNIT	MEASUREMENT	METHOD
Conceptualisation	Site selection	Overall need of the community	Documentation/interviews
		Size of community	Documentation
		Access to other ICT centres	Documentation/interviews
		Existing infrastructure	Documentation
		Access to centre	Documentation
	Role players	Community role players	Documentation/interviews
		TSA role players	Interviews
		Acceptance by community	Interviews
		Profile of centre management	Interviews
	Community needs	IT training	Documentation
		Telecommunications	Documentation
		Internet access	Documentation
		E-mail	Documentation
		Research	Documentation
	Business plan	Funding	Documentation/interviews
		Income generation	Documentation/interviews
		Marketing	Documentation/interviews
		Support and maintenance	Documentation/interviews
Implementation	Selection of role players and Centre management	Business skill	Documentation/interviews
		Technical skill	Documentation/interviews
		Knowledge of community	Documentation/interviews
		Acceptance within community	Documentation/interviews
		Innovation	Documentation/interviews
	Third party support	IT suppliers	Documentation
		Community	Interviews
		Other support structures	Interviews
	Implementation process	Project plan	Documentation
Evaluation and adjustment	Usage of centre	Number of people	Interviews/documentation
		Number of training sessions	Interviews/documentation
		Internet usage	Interviews/documentation
		E-mail usage	Interviews/documentation
		Other IT services	Interviews/documentation
	Reliability	Up time of server	Interviews/documentation
		Up time of workstations	Interviews/documentation
		Connectivity to the Internet	Interviews/documentation
		Power availability	Interviews/documentation
		Access to third party suppliers	Interviews/documentation
	Assessment of user perception of centre	Affordability	Observation/interviews
		Appropriate services	Observation/interviews
		Reliability	Observation/interviews

		Centre staff support	Observation/interviews
		Ease of centre accessibility	Observation/interviews
		Operating hours	Interviews
		Awareness of centre	Interviews
		Centre staff attitude	Observation/interviews
	Income generation	Amount	Documentation
	Overheads	Amount	Documentation
Sustainability	Growth	Income change	Documentation/ observation
		Usage change	Observation/interviews
		Costs control	Observation/interviews
		Community feedback	Observation/interviews

TABLE 4-1 Site selection of ICT1

SITE SELECTION	RESPONSE
Physical Amenities	
Does the site have access to electricity?　If not are there alternatives?	No, petrol generator
Does the site have access to water, if not how is water accessed?	Yes
Are there ablution facilities?	Yes
Does the site have access to telephone lines?	Yes, one line
Physical Location	
Is the site close to or part of a community centre, and if so how is it patronised by the community, if not how close is the site from a community centre?	Yes, growing numbers of community but still difficult to ascertain
Is the site easily accessible by the community?	Yes on the main road through the area, on bus and taxi routes
Is the site close to a transport system such as taxis, bus stops, railway stations or main roads?	See above
Actual site	
Is the centre in a building, if not how will the centre be housed?	In a secure building
Is the site secure from theft?	Yes
Is the site safe from the elements?	Yes

TABLE 4-2 Community needs assessment for ICT1

NEEDS ASSESSMENT	RESPONSE
Educational and training needs	
Is it important to have programmes for mature people (school leavers)?	Yes for economic growth and income generation
Will students be interested in IT training?	Yes, response based on other centres
Will school children want to make use IT related training?	Yes, response based on other centres
Are there specific needs for Computer Based Training (CBT) to address needs such as basic	Yes (assumption)

mathematics, reading and science?	
Is there an awareness of IT and if so is there a need for basic computer literacy?	Possibly
Services	
Is there a need for e-mail?	Yes, response based on other centres
Is there a need for Internet usage and research?	Possibly
Is there a need for typing facilities?	Yes, response based on other centres
Is there a need for copiers, faxing or lamination of documents?	Yes, response based on other centres
Is there a need for telephonic communication?	Yes
TSA students	
How many TSA students are there likely to be that could make use of the centre?	Not sure but is of the opinion that there is potential
Could the centre be used for an assignment depot?	Could be but would need confirmation
General	
What will the profile of people from the community look like that would want to make use of the centre? • Age • Profession • Level of education • Income level	School leavers mostly that may have a some form of income, No other information
Would the community be willing to pay for services?	Yes, response based on other centres
Are there any other IT related services that may be considered as a need?	Not sure
Are there any local organisations that would be interested in using the centre?	Not sure

TABLE 4-3 Business plan for ICT1

BUSINESS PLAN QUESTION	RESPONSE
Is there a financial model for income generation?	No, based on a feel and the community population
Is there a marketing plan?	No, but will rely on the community centre for marketing
Is there a way of measuring effectiveness of services?	No, will bring in later
How will third party support be managed?	Through SLAs
Is there a succession plan for key staff?	No, will deal with the problem when it arises
How will collaboration with the community be executed?	If necessary will work through the community centre
Alignment of plan with the objectives	No objectives set
Staffing of the centre	Had been decided upon with community centre
Types of services to be offered	Had been decided upon by TSA project manager based on other centres
Dealing with limited resources	Will deal with when need arises

TABLE 4-4 Selection of centre management for ICT1

QUESTIONS	RESPONSE
How important is business acumen?	Important due to the centre being viable only a self sustainable basis
How important is technical ability?	Very important as there is no immediate technical support
How important is local knowledge	Not really a concern
Is it necessary that the community at large accept the person in the position?	Possibly but not seen as a concern
Must the person be a lateral thinker and	Would be a recommendation due to

display innovation?	unforeseen problems

TABLE 4-5 Usage of ICT1

CRITERIA	RESPONSE
Number of people using centre	Not sure
Number of short courses run	One
Internet usage	Not sure
E-mail usage	Not sure but tapering off
Other services	Hardly used

TABLE 4-6 Centre reliability of ICT1

FACTORS DETERMINING RELIABILITY	RESPONSE
Up time of server	Poor
Up time of workstations	Poor
Connectivity to Internet	Not really an issue
Availability of power	Problem
Access to suppliers	Unwilling to help

TABLE 4-7 User perceptions of ICT1

USER EXPECTATIONS FOR ACCEPTABLE SERVICE LEVELS	RESPONSE
Affordability	Users did complain about e-mail usage
Appropriate services	No complaints
Reliability	Power problems resulted in down time for weeks
Service from centre staff	No complaints
Accessibility of centre	No complaints
Operating hours	No complaints
Awareness of centre	Good

TABLE 4-8 Site selection for ICT2

SITE SELECTION	RESPONSE
Physical Amenities	
Does the site have access to electricity? If not are there alternatives?	Yes
Does the site have access to water, if not how is water accessed?	Yes
Are there ablution facilities?	Yes
Does the site have access to telephone lines?	Yes
Physical Location	
Is the site close to or part of a community centre, and if so how is it patronised by the community, if not how close is the site from a community centre?	No, however it is in a commercial part of the town which is also supported by people from the outlying areas.
Is the site easily accessible by the community?	Yes, as it is close to bus terminals and taxi ranks.
Is the site close to a transport system such as taxis, bus stops, railway stations or main roads?	See above
Actual site	
Is the centre in a building, if not how will the centre be housed?	In a secure building
Is the site secure from theft?	Yes
Is the site safe from the elements?	Yes

TABLE 4-9 Community needs for ICT2

NEEDS ASSESSMENT	RESPONSE
Educational and training needs	
Is it important to have programmes for mature people (school leavers)?	Not sure, but there appears to be a need.
Will students be interested in IT training?	Yes, as this is also encouraged by the regional director.
Will school children want to make use IT related training?	Probably but unsure,
Are there specific needs for Computer Based Training (CBT) to address needs such as basic mathematics, reading and science?	Yes, more than likely
Is there an awareness of IT and if so is there a need for basic computer literacy?	Possibly, but will try and determine in the future
Services	
Is there a need for e-mail?	Yes
Is there a need for Internet usage and research?	Possibly
Is there a need for typing facilities?	Yes, very definitely
Is there a need for copiers, faxing or lamination of documents?	Yes
Is there a need for telephonic communication?	Yes
TSA students	
How many TSA students are there likely to be that could make use of the centre?	A growing number, marketing of the centre will certainly help.
Could the centre be used for an assignment depot?	Yes it will be
General	
What will the profile of people from the community look like that would want to make use of the centre? • Age • Profession • Level of education • Income level	School leavers and TSA students mostly. Most have some form of income. All are literate
Would the community be willing to pay for services?	Yes, all though some TSA students do not understand why they would have to pay, especially as TSA is involved in the centre.
Are there any other IT related services that may be considered as a need?	Not sure yet
Are there any local organisations that would be interested in using the centre?	Possibly, that is being looked at by the regional director.

TABLE 4-10 Business plan for ICT2

BUSINESS PLAN QUESTION	RESPONSE
Is there a financial model for income generation?	Yes, the idea is to run courses, avail typing services for income generation.
Is there a marketing plan?	Not as yet but will definitely be a consideration. Need funding to launch a marketing drive.
Is there a way of measuring effectiveness of services?	Not yet will consider this later
How will of third part support be managed?	Problem as the vendor is no longer available

	due to the lapse in SLAs need funding
Is there a succession plan for key staff?	Unsure as this is the domain of the regional director. The regional director did indicate to the researcher that there was.
How will collaboration with the community be executed?	This has been investigated by the regional director.
Alignment of plan with the objectives	No objectives set other than income generation.
Staffing of the centre	Is been planned by the regional director.
Types of services to be offered	Focus on training, typing services and TSA service to TSA students.
Dealing with limited resources	Hoping for funding from empowerment funds from TSA.

TABLE 4-11 Selection of centre staff for ICT2

QUESTIONS	RESPONSE
How important is business acumen?	Important due to the centre being viable only a self sustainable basis
How important is technical ability?	Not too much of an issue, first line support important but access to second line IT support available in town.
How important is local knowledge?	Not really a concern as incumbent will focus community needs after opening of centre.
Is it necessary that the community at large accept the person in the position?	No, but incumbent must be sensitive to the community.
Must be person be a lateral thinker and display innovation?	Would be a recommendation due to unforeseen problems

TABLE 4-12 Centre reliability of ICT2

VUNERABILITY	RESPONSE
Up time of server	Good
Up time of workstations	Good
Connectivity to Internet	Not really an issue
Availability of power	No problem
Access to suppliers	Have not had to make use of them for IT-related problems.

TABLE 4-13 User perceptions of ICT2

USER EXPECTATIONS FOR ACCEPTABLE SERVICE LEVELS	RESPONSE
Affordability	TSA students said the service should be for free
Appropriate services	No complaints – subjective opinion
Reliability	No issues
Service from centre staff	No issues
Accessibility of centre	No problems, better than the official regional office
Operating hours	Wanted longer hours – night
Awareness of centre	Thought it could be a major concern

TABLE 4-14 Business plan for ICT3

BUSINESS PLAN QUESTION	RESPONSE

Is there a financial model for income generation?	No formal model but will be based community needs.
Is there a marketing plan?	will rely on word of mouth initially
Is there a way of measuring effectiveness of services?	Not considered important
How will of third part support be managed?	Once money is generated will then apportion. Equipment still new.
Is there a succession plan for key staff?	Yes, that is why there are three staff with a science background
How will collaboration with the community be executed?	Through a network of people
Alignment of plan with the objectives	Will rely on TSA for input
Staffing of the centre	People with a science background is the criteria
Types of services to be offered	Basic IT training and at a later stage will use CBT for the school's pupils.
Dealing with limited resources	No response

TABLE 4-15 Community needs for ICT6

NEEDS ASSESSMENT	RESPONSE
Educational and training needs	
Is it important to have programmes for mature people (school leavers)?	Yes, for economic growth and income generation
Will students be interested in IT training?	Yes, response based on other centres
Will school children want to make use IT related training?	Yes, response based on other centres
Are there specific needs for Computer Based Training (CBT) to address needs such as basic mathematics, reading and science?	Yes (assumption)
Is there an awareness of IT and if so is there a need for basic computer literacy?	Possibly
Services	
Is there a need for e-mail?	No
Is there a need for Internet usage and research?	No
Is there a need for typing facilities?	Yes, response based on other centres
Is there a need for copiers, faxing or lamination of documents?	Yes, response based on other centres
Is there a need for telephonic communication?	Yes
TSA students	
How many TSA students are there likely to be that could make use of the centre?	No
Could the centre be used for an assignment depot?	No
General	
What will the profile of people from the community look like that would want to make use of the centre? • Age • Profession • Level of education • Income level	School leavers mostly that may have some form of income, no other information
Would the community be willing to pay for services?	Yes, response based on other centres
Are there any other IT related services that may be considered as a need?	Not sure
Are there any local organisations that would be interested in using the centre?	Not sure

TABLE 4-16 Usage of ICT6

CRITERIA	RESPONSE
Number of people using centre	Not sure
Number of short courses run	One, basic MS word
Internet usage	No connectivity
E-mail usage	No connectivity
Other services	Typing service not used, no other services
CBT programmes	Used a little bit by the school pupils

TABLE 6-1 Effectiveness of the ICT centres

ICT CENTRE	EFFECTIVENESS
ICT1	• In the first years ICT1 showed very little use • Slight growth after international award bestowed upon ICT1 • Not effective
ICT2	• Slow start • Last two years showed real growth • ICT2 busy • Income generation good • Has realised potential
ICT3	• Good start • Slowed down, growth not evident, appears to have shown a negative growth • No longer effective, has not realised potential
ICT4 (before relocation)	• Non-starter • New location ineffective, low patronage
ICT5	• Poor start • Never realised potential • ICT5 stagnant
ICT6	• Slow start • In the last four years has hardly been used • Did not realise potential

TABLE 7-1 Criteria for selection of centre staff

SELECTION CRITERIA	RESPONSE

Centre management:
  - Business acumen
  - Technical schools
  - Knowledge of the community
  - Standing within community
  - Network (contacts) within the community
  - Education	

Technical staff:
  - Technical skills
  - People skills
  - Education
  - Problem solving	

TABLE 7-2 Centre needs analysis

ITEM	REASON	FREQUENCY
Access to telephones		
Access to e-mail		

Access to the Internet		
Access to printing facilities		
Access to typing facilities		
Need for word processing		
Need for spreadsheet skills		
Need for programming languages		
Need for basic computer literacy		
Need for library		
Need for research facilities		
Other IT related training or services		

TABLE 7-3 Landscape audit

ITEM	DESCRIPTION
Community profile: - Age distribution - Highest qualification distribution - Literacy rate - IT skills rating distribution - Income per capita - Income per household	
Infrastructure: Community centre's access to: - Transport - Electricity or alternative - Water ICT building - How secure is the centre? - How secure against the elements is the centre?	
Service providers: - Access to IT suppliers - Access to ISP's - Access to shops and banks - Access to transport - Access to other communication	
Legislation: - Any laws that may be significant - Other laws or rules	
Cultural issues: - Customs to be considered - Other role players to be consulted	
Financial issues: - How does community pay? - Is the community centre viable? - Are their costs likely to be passed onto the ICT centre and if so what?	
Number of schools: - Primary schools - Secondary schools - Other education institutions	
Partners in the region: - What business is there? - What governmental organisations are there? - Are there any other developmental projects? - Are there any NGO's?	

TABLE 7-4 Operational guide

ACTION	FREQUENCY

Financial management:
  Income generation
    -   E-mail usage
    -   Internet usage
    -   Courses offered
    -   Typing services
    -   Telephone usage
    -   Other services
  Costs
    -   ISP
    -   Hardware support
    -   Software support
    -   Academic support
    -   Stationary
    -   Wages
    - Other	

Centre usage:
    -   E-mail usage
    -   Internet usage
    -   Courses run
    -   Typing services
    -   Printing services
    - Other IT usage	

Problem register:
    -   Hardware faults with description
    -   Software faults with description
    - Other issues with description	