# 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:

- 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
- The researcher assisted when ICT centres were failing to meet the original expectations as determined by the TSA
- 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
- The researcher was enabled, through TSA, to monitor centres and advise people who were and are involved in the management of the ICT centres
- 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:

- Access to the Internet
- E-mail
- Access to basic word processing, spreadsheets and other application software
- Printing of documents
- Telephone facilities
- 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:

- Infrastructure which includes, access to power, water, transport, telephonic communication, physical buildings, legislation and cultural norms
- Security of buildings that house the ICT centre
- 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:

- Suppliers and their operation record
- A supplier's overall business profile and strengths and weaknesses
- 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:

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

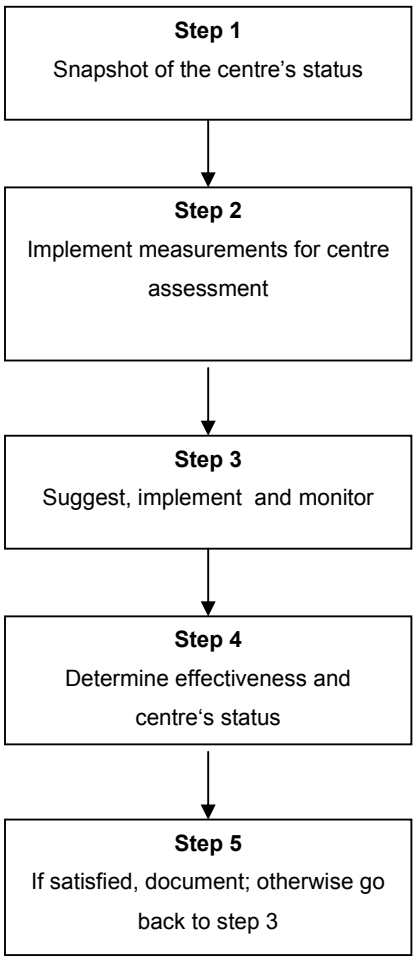



**Figure 1-1** The research process applied to ICT centres

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:

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

- Technological
- Economic
- Occupational
- Spatial (information networks)
- 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):

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

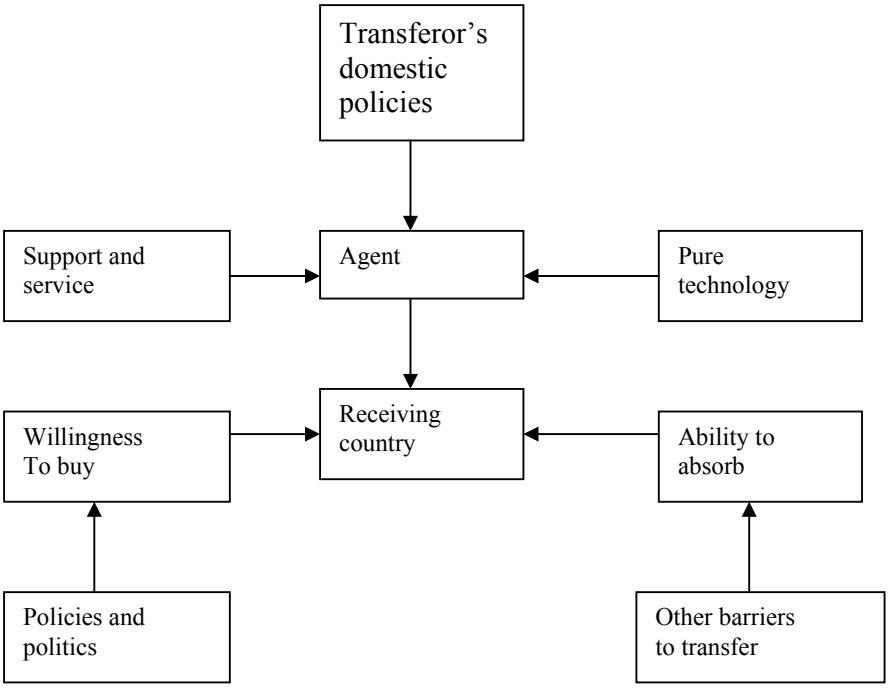
Yumba (2002) highlights the paradox confronting many African countries in that although the importance of information with respect to national development is recognised, severe constraints to information deployment exist. This is due to the lack of an overall national policy on information systems and 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*

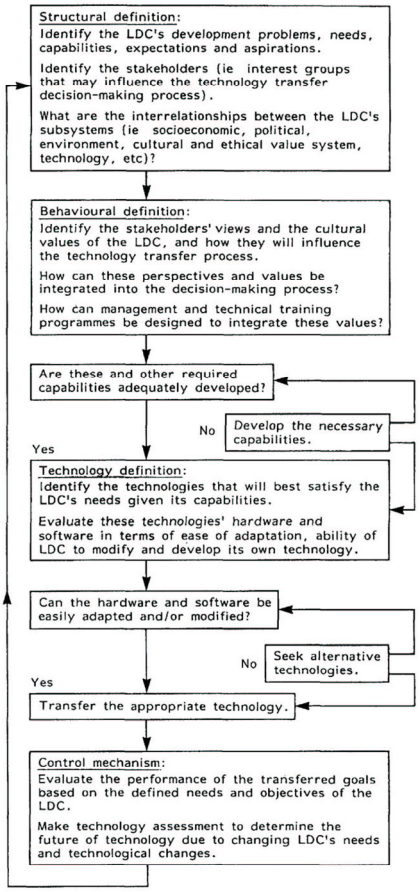



Figure 1. Prescriptive framework for technology transfers.

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):

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

- Consultants have an incentive to hide poor performance and have a greater ability to do so
- The organisation in effect outsources its technical skill to IT suppliers
- The organisation also outsources its management skill to the consultants
- 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

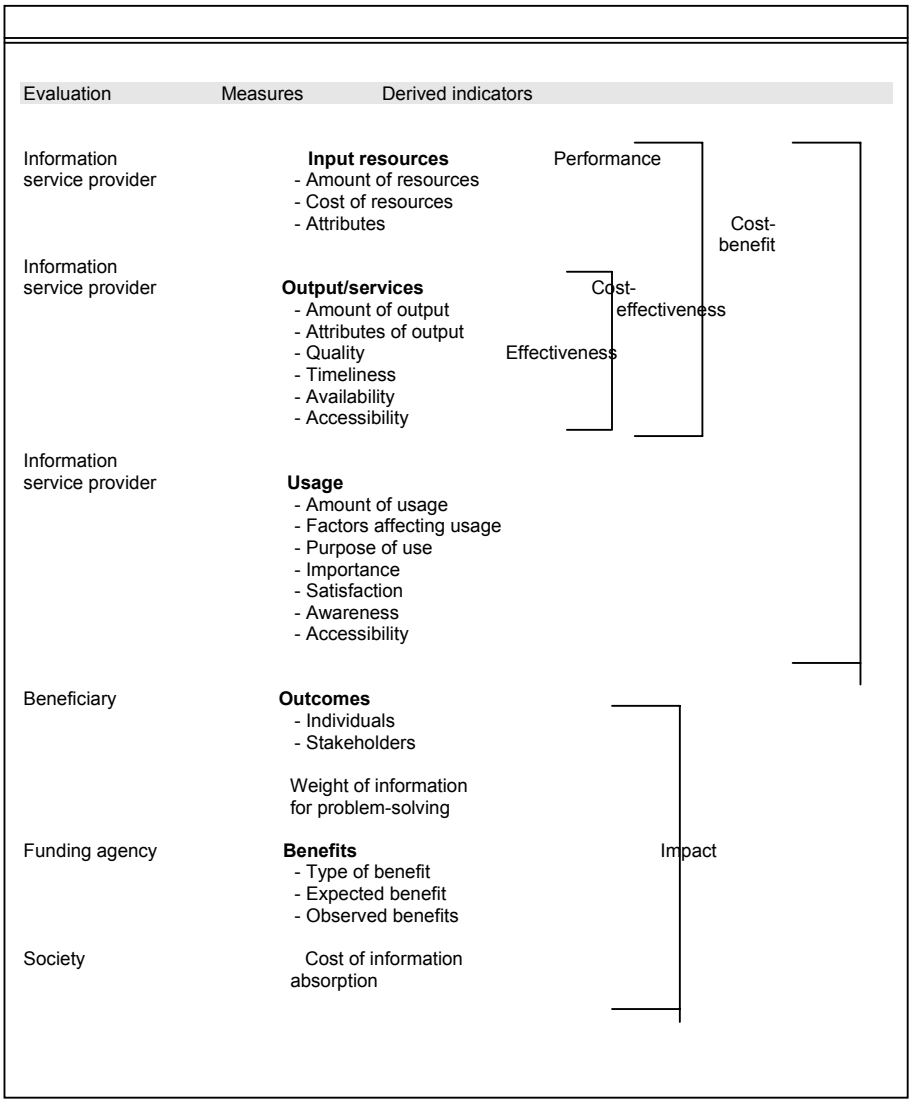
suggests, however, that community readiness is an important factor for technology transfer to be transferred successfully (Cohen & Levinthel, 1990). Berg (1993) refers to technical cooperation and suggests that authorities in developing economies focus on building capacity outside the public sector in 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:

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

- In 1995 a task group known as Comtask, was appointed to investigate and make recommendations relating to communications and its associated structures
- In 1996 the findings of Comtask, resulted in Multi-Purpose Community Centres (MPCC) being launched
- 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
- In 1998 the Department of Communication launched a number of projects aimed at establishing a networked information community
- 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:

- An ICT centre must be established and owned by communities themselves and not merely donated to or imposed upon
- 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
- 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
- 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
- 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:

- 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

- The overall improvement of access to essential services and other social services
- The creation of employment opportunities for all

- 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:

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

- The environment – can the centre's contribution to human welfare and to the economy be sustained?
- The economy – can today's level of wealth creation be sustained?
- 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:

- Tools are just tools and should be used as a means to an end
- One size does not fit all - deal with each project uniquely

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

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

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

- Does not want to sign the sign-off certificate
- Finds plenty of unfinished tasks and issues
- Creates any delays possible to extend the project, normally without costs
- Becomes aggressive, manipulative, unfriendly, distant, grumpy (characteristics which were not revealed during the project's duration)
- Escalates unrelated issues directly to management or even the managing director
- Complains that nobody is available to assist with trivial issues
- Refuses to confirm or respond to issues in writing
- 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):

- 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.

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

- 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.

- 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.

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

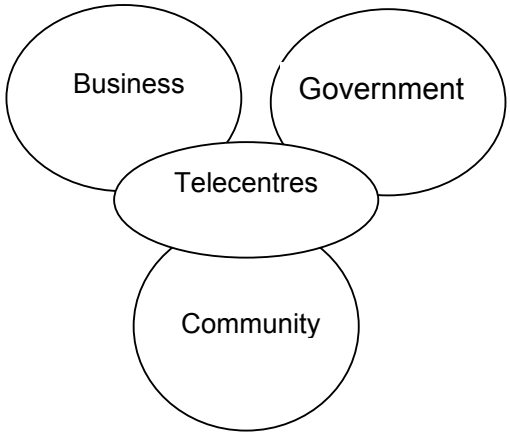
- Record the daily activities of the centre in order to justify and motivate accessing funds from donors and other partners.

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

- 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).
.
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).

- Cost of services were neither affordable nor competitive, especially as there were alternatives to some of the services in the area
- The lack of power / erratic power supply, poor telephone line coverage, inadequate equipment and no Internet access were cited as major problems
- A lack of security resulted in some equipment being stolen which impacted on part of the service provision
- Poorly trained centre staff and inadequate staffing was seen as a major contributing factor to the perceived ineffectiveness of the centres
- A lack of marketing exercised meant that few in the community knew or understood what the centres could offer
- 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:

- The Importance of including the community in all aspects of the centre, thereby entrenching community ownership.
- 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.
- Formation of partnerships and the realisation that centres will not be able to operate in isolation.
- 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):

- 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
- Development of community structures to facilitate the process of technology transfer
- Community education is essential to ensure community understanding of the process and benefits of the technology transfer
- Group action for the general overall mobilisation of the community
- Formation of alliances with third parties for support
- Measurement and adjustment to indicate progress and benefit of technology transfer

- 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).

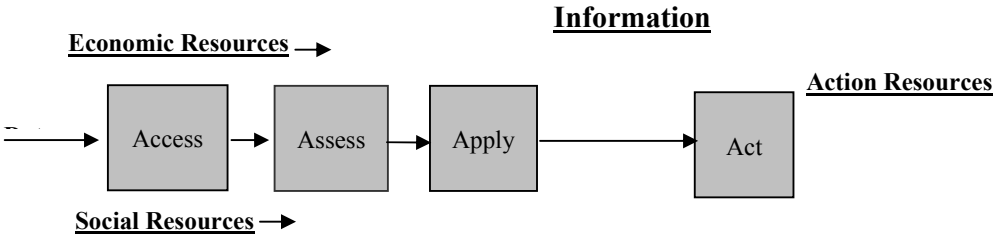
An example of a failed attempt to invest in IT in India was a project whose failure was due to the stakeholders' lack of understanding of the role of information (Heeks & Bahatnagar, 1999). Although the stakeholders were aware of the potential of IT, the project failed due to the fact that the stakeholders 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**

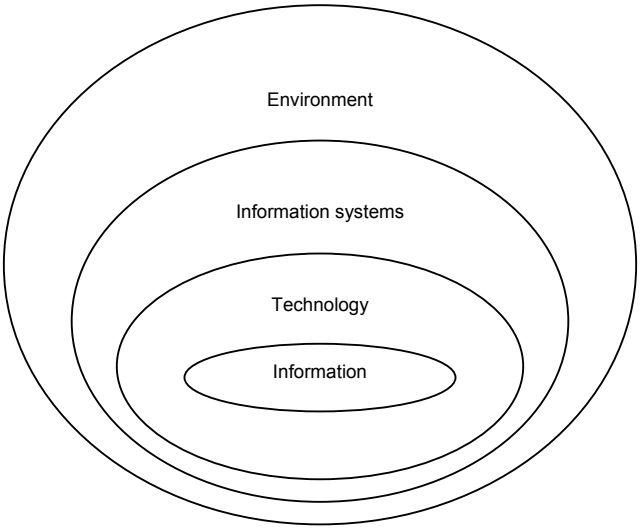



Source: Heeks (2005a)

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:

- Establish a research question or problem
- Examine the major constraints imposed by the availability of resources
- Decide on a research strategy

- Examine the constraints imposed by the research strategy
- Choose a research approach
- 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):

- Extraneous project variables are difficult to control, therefore results sometimes can be a result of the researcher
- Objectivity can become an issue due to the close relationship with subjects
- 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:

- Loose questions uses broad questions which allow the respondent freedom in terms of their response to the question
- Tight questions focus on a more rigid set of questions designed so as to elicit specific responses from the interviewee
- 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
- 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:

- To explain complex causal links in real-life interventions
- To describe the real-life context in which the intervention has occurred
- To describe the intervention itself
- 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:

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

The diagram below illustrates the action research process which was followed in the investigation of the ICT centres.

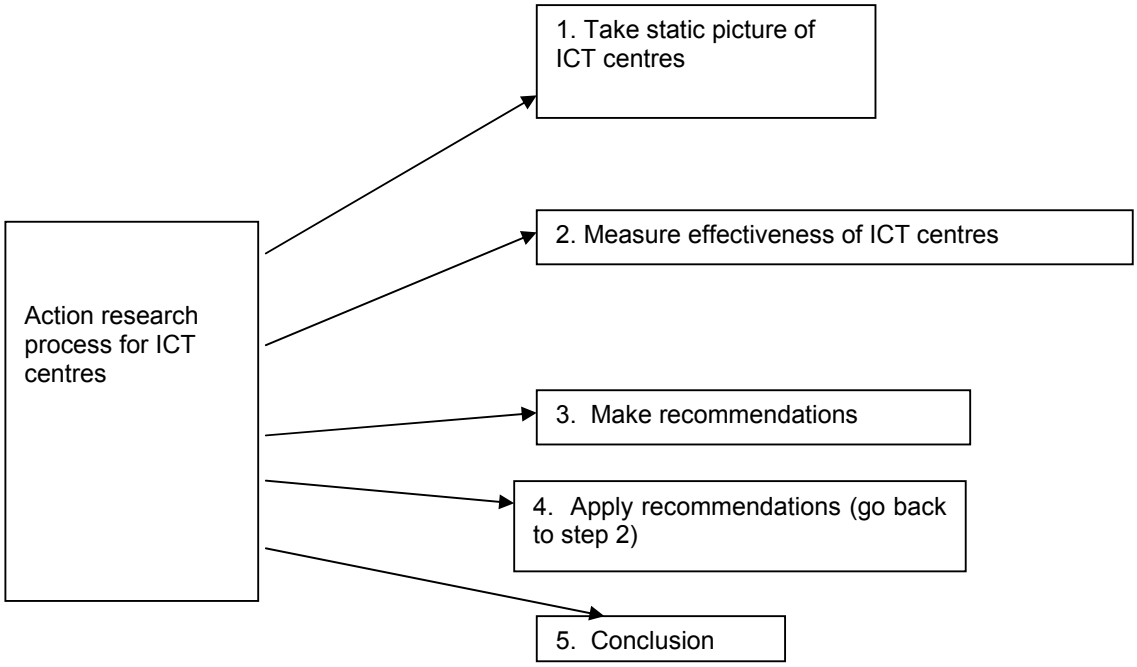



**FIGURE 3-1** Research process

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):

- Convergence: when data from different sources or collected with different methods **agree**.
- Inconsistency: when data obtained through triangulation is **inconsistent**, not confirming.
- 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:

- Conceptualisation
- Implementation
- Evaluation and adjustment
- 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:

- Unit refers to what is actually being measured in the phase
- Measurement refers to what metrics were applied to obtain the measurement
- 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:

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

- 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
- 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
- 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
- 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:

- Funding and how the funding was sourced
- Income generation and how this was to be achieved over the medium to long term
- Marketing of the centre and proof of a marketing plan
- 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.

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.

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

- Were community leaders identified?
- Who were the community leaders?
- How would the community leaders contribute?
- Did the community leaders expect feedback?
- 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.

- What other resources apart from IT are important?
- Are there back-up plans for the supply of electricity?
- 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.