Community engagement principles for implementation of Information and Communication Technology for Development Projects by Higher Education Institutions in South Africa

By

Jacquiline Mkombachoto

201103975

Research Dissertation

Submitted in fulfilment of the requirements for the degree

Master of Commerce

In

Information Systems

in the

Faculty of Management and Commerce

of the

University of Fort Hare

Supervisor: Dr Naomi Isabirye

Co-Supervisor: Prof Mamello Thinyane

2017

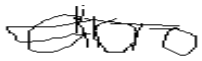
Abstract

Community engagement in South Africa is now recognised as an integral part of Higher Education Institutions' (HEIs) educational system. The South African Council on Higher Education requires HEIs to become equitable institutions of higher learning, whereby the activities of the HEI are mutually beneficial for both learners and their communities. This entails that, community engagement activities undertaken by HEIs should be reciprocal in nature. The HEIs should help solve issues affecting their communities, whilst also gaining knowledge through experiential learning. One such way is through undertaking Information and Communication Technology for Development (ICT4D) projects in communities outside the physical boundaries of the HEI. Over the years, HEIs in South Africa have been involved in undertaking ICT4D projects aimed at benefiting their communities. This is because ICTs have the potential to improve and contribute to the development of individuals, businesses, and communities in various ways, be it socially or economically. However, the ICT4D projects have failed or partially succeeded to attain their goals. This study, thus proposes a model for HEI researchers for the successful implementation of ICT4D projects through application of community engagement principles. The proposed model was formulated using the case study approach. Four cases of ICT4D projects were used as sample to help identify factors required for the successful implementation of ICT4D projects by HEIs. Data was collected using semi structured interviews, observations and literature. The data was then analysed using cross case analysis in the form of themes. The findings were that operational community engagement policies, understanding user needs, creation of long term partnerships, synchronisation of timelines and monitoring and evaluation are vital for the successful implementation of ICT4D projects by HEI researchers in the communities.

Declaration of Originality

I, Jacquiline Mkombachoto, hereby declare that

- The work in my dissertation is my own work.
- All sources used or referred to have been documented and recognized.
- This dissertation has not previously been submitted in full or partial fulfilment of the requirements for an equivalent or higher qualification at any other recognized educational institution.



___

Acknowledgements

I would like to sincerely express my gratitude to the following:

- My main supervisor, Dr Naomi Isabirye who provided continuous moral and professional guidance. Also for the financial contribution. I am forever grateful for having completed this dissertation under her supervision.
- My co-supervisor, Prof Mamello Thinyane, for his academic guidance and encouragement throughout this project and for the financial contribution.
- My family for the love, motivation and the sacrifices they made in order to make this possible
- The Govan Mbeki Research and Development Centre at the University Of Fort Hare, in collaboration with the National Research Foundation, for their financial contribution towards this research.
- All the IS staff and the masters and doctoral students for all their support and encouragement.
- My friends for all the support, love, prayers. I greatly appreciate all that you did for me.
- To my better half who was my pillar of strength, best friend and advisor, I am forever grateful for all the love and support.
- Above all as you said in your word, "**It's not by might nor by power but by my spirit," says the Lord**. If it wasn't for your spirit my Lord, this accomplishment would not have been possible. I will continually acknowledge your sufficient grace in my life. Thank you the King of Kings.

DEDICATION

I dedicate this dissertation to my late parents,

Mr & Mrs Mkombachoto

You will always be in my heart. I love you.

Table of contents

List of figures

List of Tables

List of Acronyms

HEI	Higher Education Institution
ICT	Information and Communication Technology
ICT4D	Information and Communications Technologies for Development
IDI	ICT Development Index
ITU	International Telecommunications Union
MDGs	Millennium Development Goals
SDGs	Sustainable Development Goals
TECH4RED	Technology for Rural Education Development
UTAUT	Unified Theory of Acceptance and Use of Technology

Chapter 1 – Background of Study

1.1 Introduction

The adoption of Information and Communication Technology (ICTs) is based on the assumption that ICTs have the potential to improve and contribute to the development of individuals, businesses and communities in various ways, be it socially or economically (Avgerou, 2010). Nevertheless, according to Coelho, Segatto and Frega (2015) the application of ICTs has not always been successful in underprivileged communities. Fengu and Krauss (2012) state that underprivileged communities have introduced technologies which have been successful in developed communities with the aim to yield the same benefits. However, some of the technology is not suitable for their context. This has led to the implementation of Information and Communication Technology for Development (ICT4D) projects which do not meet their objectives or have the intended impact (Mtsweni & Abdullah, 2014).

To address these problems there has been ongoing academic research by Higher Education Institutions (HEI) researchers on how ICT4D projects can be successfully implemented in underprivileged communities (Walton & Heeks, 2011; Mtsweni & Abdullah, 2014). Usually students and staff in departments such as Computer Science and Information Systems are involved in ICT4D research. This is because it is within their field of study. Other departments also involved in ICT4D include social work as they understand people dyanamics. In this study, the HEI communities being reffered to are those outside the HEIs' physical boundaries, this includes schools, townships and organisations that surround the HEI. Du Plessis and Van Dyk (2013) define a HEI community as a group of people the HEI is involved with whilst undertaking community engagement activities. Hence a community could refer to people belonging to a particular cultural group, people living in a certain georaphical area or women working together in a project (Du Plessis & Van Dyk, 2013). The HEIsunder focus in this study are limited to universities and not other institutions that are in the same category such as colleges.

Pade- Khene, Mallinson and Sewry (2011) argue that most ICT4D projects are prone to fail or have limited success due to sustainability issues among other challenges. Furthermore in South African HEIs, researchers are encouraged to undertake activities such as the ICT4D

projects in a manner that contributes to the community engagement imperatives of their institutions. Hence for theICT4D projects to contribute to the goals of community engagement in HEIs, they should demonstrate that they serve to benefit the HEI (in terms of research and teaching and learning) as well as the community within which they are undertaken (Carnegie, 2015). According to Carnegie (2015) the purpose of community engagement in HEIs is to create partnerships between the HEIs and the communities in order to:

- Enhance teaching and learning and research and help with creative activity
- Enhance knowledge and be integrated into the curriculum
- Strengthen civic responsibility and nurture educated and engaged citizens
- Solve critical issues and contribute to the wellbeing of the community (i.e. satisfy long term needs not immediate needs only)

Literature reveals that the objectives of community engagement are also aligned with the objectives of ICT4D research. For instance, Avgerou (2010) states that the objective of ICT4D is to generate or enhance knowledge about ICTs in the context of socio-economic development, while making a contribution to the wellbeing of the communities through the use of ICTs. Similarly, community engagement principles emphasise that community building activities initiated by universities should also contribute to the curriculum of the discipline (Petersen & Osman, 2013). Hence conducting research according to community engagement objectives requires that the learnings inform ICT curricula and consequently improve the state of learning in the ICT4D research area. This helps in solving some of the criticisms that have been identified with regards to ICT4D research. According to Van Biljon and Alexander (2014), little progress has been made in achieving the goals of ICT4D. One of the reasons cited as the cause is the failure of researchers to learn from the experience of others.

Furthermore, both ICT4D objectives and community engagement goals require that the practices involved in undertaking ICT4D projects in the communities improve sustainability (Pade Khene *et al.*, 2011; Du Plessis & Van Dyk, 2013). Sustainability is one of the outcomes in the successful implementation of ICT4D projects and also in community engagement one of the goals is to satisfy long term not immediate needs only. This also reflects on how both ICT4D and community engagement goals are aligned in terms of having long term positive impact in the communities.

1.2 Problem Statement

ICT4D researchers argue that ICTs have the potential to enhance underprivileged communities (Lin, Kuo, & Myers, 2015;Coelho,2015; Rislana, Good , Adams & Scott, 2016). According to Chilimo and Ngulube (2009); Musiyandaka (2013), ICTs are meant to develop underprivileged communities in various aspects such as economically and socially. For example, ICT4D projects are meant to improve information accessibility. By so doing they increase the socio- political awareness of the people in the communities, and enable them to participate in the global community (Musiyandaka, 2013). Furthermore, provision of ICTs through platforms such as e-commerce platforms aids people in underprivileged communities to have access to more economic opportunities.

However, in underprivileged community's ICT has not realized its full potential (Gomez & Pether, 2012; Motswana &Abdullah 2014; Tarus, Nicoya & Mumba 2015). Factors such as failure to understand user needs, poor collaboration, and poor community engagement policies hinder the success of ICT4D projects implemented in underprivileged communities by HEIs.

Marais (2011) states that ICT4D projects are usually implemented in underprivileged communities where there is lack of resources. Hence for the projects to succeed and achieve the intended outcomes, there is a need for proper planning and support through collaboration between the HEIs and communities. HEI researchers in South Africa are required to integrate the three pillars (teaching and learning, research and community engagement) of HEI educational system into their research activities (South African Council on Higher Education, 2010). Thus for ICT4D researchers to demonstrate a scholarship of engagement, their research activities must contribute to community engagement. For ICT4D projects by HEI researchers tocontribute to community engagement, they should be reciprocal in nature (Thinyane,2016; Thomson, 2011). This entails that both the HEI and the community should benefit. It is therefore the purpose of this study to investigate how HEIs can apply community engagement principles to implement mutually beneficial ICT4D projects. These projects should satisfy both ICT4D objectives in the community and the community engagement objectives of HEIs.

1.3 Research question and sub-questions

This section provides the research questions and sub-questions that will help in investigating the problem discussed in section 1.2

1.3.1 Main research question

How can HEI researchers apply community engagement principles for successful implementation of ICT4D projects?

1.3.1.1 Sub-questions

i. What factors should HEI researchers consider when implementing ICT4D projects to ensure success?

This section explores factors that HEI researchers need to consider in order to successfully implement ICT4D projects that satisfy both the community engagement objectives of HEIs and theICT4D objectives in the communities.

ii. What challenges are currently faced in terms of implementing ICT4D projects in communities by HEI researchers?

This section investigates the challenges HEI researchers face when implementing ICT4D projects in communities.

iii. How can community engagement principles influence the successful implementation of ICT4D projects by HEI researchers?

This section discusses community engagement in HEIs in South Africa and its underlying principles. Also included in the discussion is how these principles influence the successful implementation of ICT4D projects by HEI researchers in communities.

1.4 Objective of the study

The objective of this study is to determine how HEI researchers in South Africa can successfully implement mutually beneficial ICT4D projects in communities. This objective will be reached by understanding what community engagement is and how it influences implementation of ICT4D projects undertaken by HEI researchers. There will also be an investigation of the challenges HEI researchers face when undertaking ICT4D projects. This will be followed by an evaluation of the factors HEI researchers should consider when conducting these projects. From an extensive literature review and analysis of empirical

evidence gathered from four ICT4D projects undertaken by various HEI researchers, a proposed model for successful implementation of sustainable ICT4D projects by HEI researchers in their communities in South Africa will be developed.

1.5 Significance of the study

This study is important as it seeks to develop a model for the successful implementation of mutually beneficial ICT4D projects by HEI researchers in South Africa within communities. This model will help both the HEI researchers and communities where ICT4D projects are undertaken to engage in more beneficial partnerships to implement ICT4D projects. Successful implementation of ICT4D projects in the communities yields benefits such as better access to social services such as health care and educational resources (Chilimo & Ngulube, 2009). ICTs can also improve the quality of life of the community members as they acquire new skills from the use of ICT. Furthermore, some of the technologies implemented such as e-commerce platforms can create new economic opportunities (Avgerou, 2010). With regards to the HEI researchers, successful implementation of ICT4D projects can help them to acquire knowledge which enhances their research and informs their curriculum (Carnegie, 2015). This knowledge is vital for future projects that the HEIs will undertake in communities. Also from the knowledge they attain, HEIs can generate answers for real world problems. According to Maistry and Thakrar (2012), the students from the HEIs involved in community engagement projects also acquire knowledge through experiential learning. This knowledge improves their problem solving abilities of issues affecting communities. The following section outlines the key literature underlying this study.

1.6 Literature review

This section briefly discusses the theoreotical model and related literature upon which this study is based. The related literature examinesthe influence that community engagement principles in HEIs have on the successful implementation of ICT4D projects by HEI researchers. Also discussed are the challenges they face when undertaking these projects and the factors they should consider to ensure successful implementation of these projects. It also includes a section on similar studies.

1.6.1 Theoretical Model

This research will use the Hackathon Model and Infusion cross cutting model. The Hackathon model provides this study with the critical elements needed for successful implementation of ICT4D projects. Whilst the infusion cross cutting model reflects on how

community engagement should be undertaken effectively in HEIs in South Africa. The following section describes these models.

1.6.1.1 Hackathon Model

According to Mtsweni and Abdullah (2014), the Hackathon Model is an iterative model which shows elements that can be used to develop rapid and collaborative ICT solutions. The model has four main elements which need to be considered when undertaking ICT4D projects. These elements, needs assessment, collaboration, impact asssessment and sustainabilty can influence the successful implementation of ICT4D projects.

The Hackathon model will provide this study with the critical elements needed to conduct an in depth analysis of how HEI researchers can succesful implement ICT4D projects in communities. Accordingto Tapia, Gonzalez and Eliceui(2005) elements such as collaboration and impact assessment are critical for the successful implementation of community engagement projects. This research study seeks to investigate such elements using four case studies. This is because this study seeks to investigate how HEI researchers can apply community engagement principles for the successful implementation of ICT4D projects in communities. Hence it takes into consideration both community engagement and ICT4D. Therefore the Hackathon model provides a basis for this analysis as it includes some of the elements that are required for both objectives of community engagement and of ICT4D. This study could not apply some of the commonly used theories such as stakeholder theory and actor network theory. The researcher belives that due to its holistic nature, the Hackathon Model is the suitable model for this study. The stakeholder theory and actor network theory do include an important aspect of this study which is partnerships, the importance of stakeholders and social forces in projects. However these concepts are described in general whilst the Hackathon model provides specific constructs that influence the successful implementation of ICT4D projects which cover all aspects. These aspects include such areas as impact assessment and not only the social or stakeholder aspects. The following section diagramatically presents the Hackathon model in Figure 1.

Figure 1: Hackathon Model for successful implementation of ICT4D projects (Mtsweni & Abdullah, 2014)

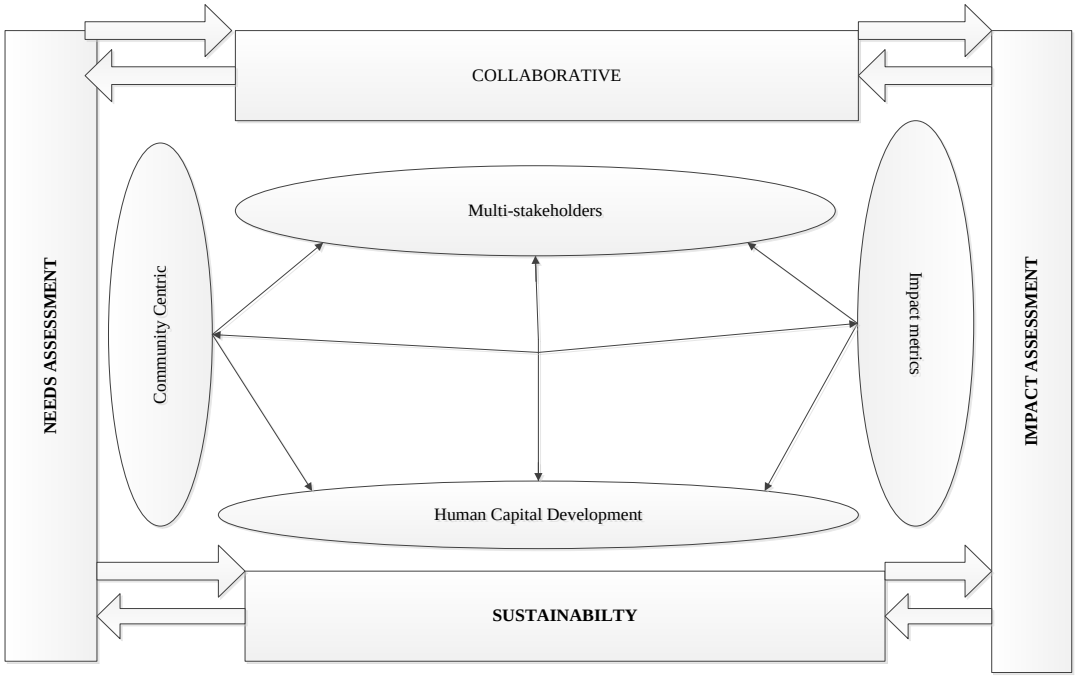


Figure 1: Hackathon Model for successful implementation of ICT4D projects (Mtsweni & Abdullah, 2014)

A brief description of the four main elements of the Hackathon model and what they entail is provided in the following section.

Needs assessment

For any ICT4D project to have the relevant social impact in the community in which it is implemented, there is need for a complete needs assessment (Mtsweni & Abdullah, 2014). Mtsweni and Abdullah (2014) further state that the needs assessment process needs to be more community centered rather than technology centered. This means that the technology being implemented should be based on understanding of the needs of the community, not for the community to adjust their needs to suit the technology being implemented.

Collaboration

Mtsweni and Abdullah (2014) state that ICT4D projects should be collaborative in nature involving different stakeholders such as community members, subject matter experts, project champions and others. When collaborating it is essential to have mutually benefical relationships that will be benefit all parties involved. Continous engagement and participation of the different stakeholders is vital as they can all contibute in different ways to the project (Mtsweni & Abdullah, 2014).

Sustainability

Mtsweni and Abdullah (2014) suggest that to ensure ICT4D projects implemented are sustainable, there is need for human capital development. There should be knowledge and skills transfer to the individuals who are going to use the technology (Mtsweni & Abdullah, 2014). This will help them in contionously using the technology when the subject matter experts are gone. Failure of some the ICT4D projects has been attributed to lack of proper training and skills required to use the technology by the users (Marais, 2011).

Impact Assessment

Impact assessment is one of the most important factors in ICT4D projects and it is very difficult to achieve (Mtsweni & Abdullah, 2014). Mtsweni and Abdullah (2014) state that it is essential to determine the effect the ICT4D project will have in the community at the initial stages of. This effect should be observed from the field in collaboration with all stakeholders using a prototype at the first stage of the project. In support of this notion Pade-Khene *et al.* (2011) states that monitoring and evaluation of ICT4D projects is a critical component for success.

1.6.1.2 Infusion (cross-cutting model)

In this model the HEI has two central roles which are teaching and learning and research. Community engagement is seen as an important concept that is integrated with teaching and learning and research (Bender, 2008a). With the infusion cross cutting model community engagement is provided equal importance as the other roles. Figure 2 shows the components of the infusion cross cutting model. It shows that when the three pillars of HEIs which are community engagement, teaching and learning and research are interlinked, the HEI will be able to work in collaboration with the community and create partnerships with them. These partnerships will lead to the undertaking of mutually beneficial community engagement projects.

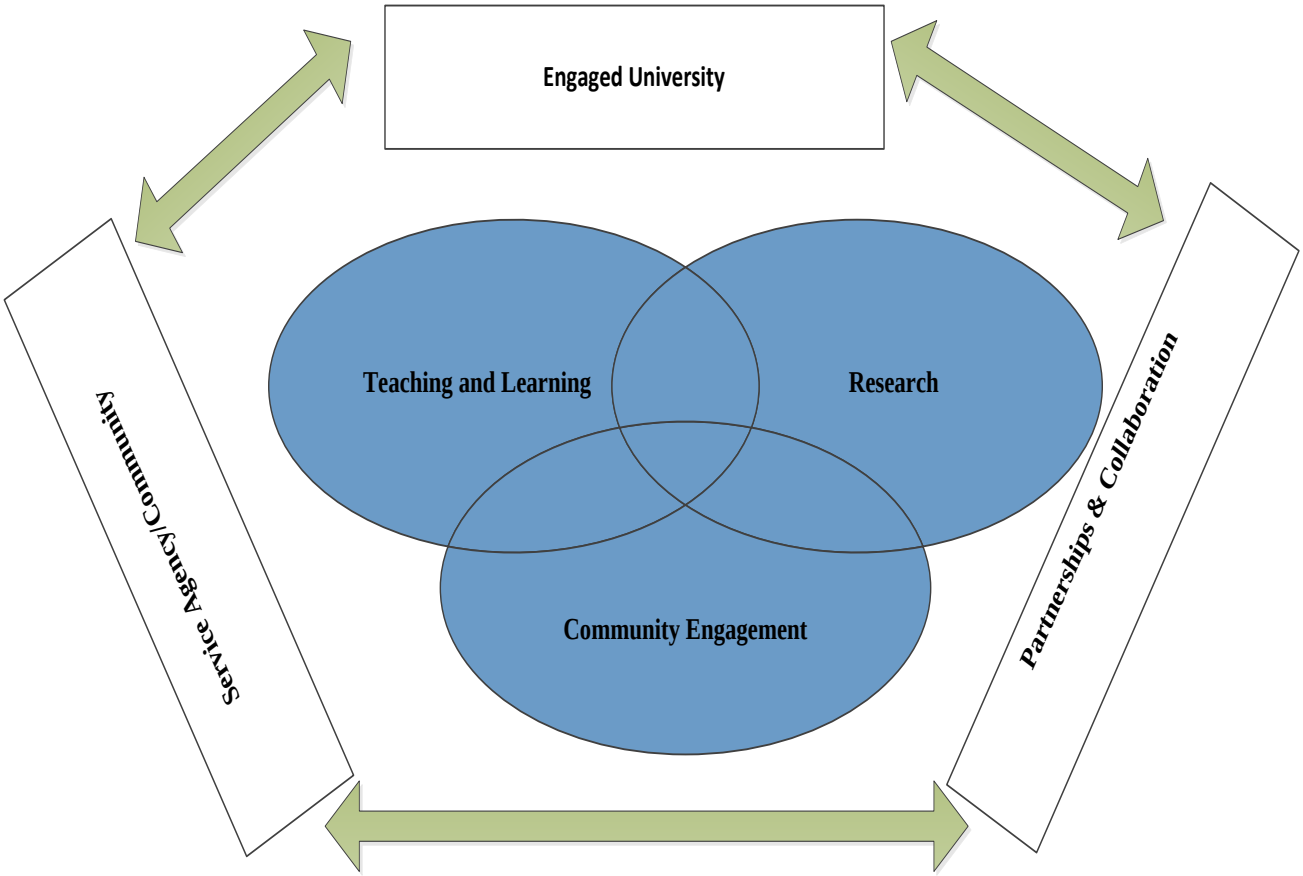


Figure 2: Infusion Cross Cutting Model for community engagement in HEIs (Bender, 2008a)

1.6.2 Related works

There are previous researchers who have looked at how ICT4D projects can be successfully implemented in underprivileged communities in South Africa. For example, a study conducted in 2011 investigated how to successfully implement sustainable ICT4D projects in rural communities (Pade Khene *et al.*, 2011). The study analysed the implementation of two ICT4D projects. The contribution of this study was in the form of a project life cycle model required for the successful implementation of ICT4D projects. The study found that there is need for significant participation of the community in the projects. Furthermore, the ICT4D projects should be implemented in an iterative manner, coupled with monitoring and evaluation. Pade Khene *et al.*, (2011) suggested six phases in which these projects should be implemented. These phases are project idea generation, feasibility, development, and implementation, close out and post implementation review.

Another similar study conducted in 2014 investigated how to implement ICT4D projects in rural areas to support development (Mamba & Isabirye, 2014). The contribution was a

framework that can be used to ensure that ICTs contribute to development in rural areas. The study established that, besides the involvement of the local community and proper coordination of project tasks, other aspects to consider are imparting skills to the community. Furthermore, Mamba and Isabirye (2014) mentioned that, benefits of ICT should be well communicated and demonstrated to the community in order for the project to succeed.

However, a gap in knowledge still exists with regards to how HEI researchers can successfully implement these projects in underprivileged communities (Rislana *et al.,* 2016). The previous studies were more generic; they did not specifically look at HEI researchers. Hence because this study investigates case studies specifically undertaken by HEI researchers, it will take into consideration the unique factors that they encounter when they implement ICT4D projects as HEI researchers. For example, the HEI researchers should undertake projects that are reciprocal in nature, in order for them to satisfy the pillars required by HEIs of integrating teaching and learning, research and community engagement. The outcome of this study is a model that puts into consideration both the factors required for successful implementation from the community perspective and HEI researchers' perspective. The following section briefly discusses related literature upon which this study is based.

HEIs through community engagement have been involved in ICT4D projects aimed at benefiting their communities. Community engagement is viewed as an integral part of HEIs in South Africa. Tapia *et al.* (2005) suggests that high quality service in community engagement should

- Satisfy the beneficiaries,
- Have measurable outcomes on the community's quality of life,
- Achieve medium and long terms goals, not immediate needs only
- Lead to development of partnerships to achieve sustainability of the community engagement projects.

In support of this notion, ICT4D literature reveals that most ICT4D projects need to shift from bringing technology to the users. The focus should be more on finding new and innovative ways to implement ICT4D projects that are user driven (Heeks, 2009). Pade-Khene *et al.* (2011) further state that there should be development of collaborative partnerships to help with successful implementation and sustainability of the ICT4D projects. This is whereby, the different parties involved can contribute through financial or non-

financial support. Without collaboration factors such as lack of understanding of user needs and sustainability issues are experienced and these factors also affect successful implementation of ICT4D projects among other challenges. Thus, for successful implementation of ICT4D projects by HEI researchers the success factors for both community engagement and ICT4D should be considered since ICT4D projects are also community engagement projects for them.

Brunello (2010) further mentions that most ICT4D projects in education are prone to fail.In support of this notion,Maistry and Thakrar (2012) argue that in HEIs some of the student researchers who engage in community based research have limited skills or knowledge regarding implementation of community based projects. Therefore it is important for the researchers to be trained before they engage with the communities. Heeks (2008) in support of this notion provides an example of the University of Manchester where Masters students have an ICT4D module that is meant to equip them with the necessary skills and knowledge to carry out successsful ICT4D projects. Pade- Khene *et al.* (2011) also state that some of the ICT4D projects that are successfully implemented in developing communities fail to realise maximum benefits as the people in the community are not fully trained and lack the proper skills and knowledge to use ICT.Due to the lack of exposure to technology of the users, what the developers view as natural might be difficult to understand for the user (Weber & Toyama, 2010). Thus training of both the researchers from the HEI and of the members of the community is a vital component for the success of ICT4D implementation by HEIs in their communities.

Besides proper training, another important factor to consider when undertaking ICT4D projects is encouraging local ownership and having clear objectives and goals set out for the project (Pade-Khene *et al.,* 2011). Encouraging a sense of ownership will make the community members feel more involved in the project and direct more effort towards its success. In support of this notion Swanzen and Rowe (2013) argue that the more involved and knowledgeable the members of the community are about the ICT4D project, the higher the chances of continuous use of the technology and hence sustainability of the project. Toyama (2011) also states that researchers fail to understand the norms and culture of the communities they develop ICT solutions for and this is a hindrance for successfully implementing ICT4D projects. Krauss (2009) argues that for an ICT4D project in the community to be successful it should fit the context and also reflect on the community's

societal values. It should incorporate their indegenous knowledge for successful adoption and continued use.

Furthermore Marais (2011) argues that most ICT4D projects are carried out in underprivileged communities with limited resources hence there is a major challenge regarding the sustainability of projects. Unwin (2009) further argues that the issue of sustainability of ICT4D projects is more intense in externally funded projects. There is no clear plan for continued support of these projects once the funders have left. These projects have a high chance of failure. Thus for HEI researchers to ensure success and sustainability of the ICT4D projects they undertake, there should be clear plans of how the project will be sustained in the long run. The following section describes the research methodology that was applied in this study .

1.7. Research methodology

Easterby-Smith, Thorpe and Lowe (2002) state that failure to understand the research philosophy has adverse effects on the outcome of the research. Thus researchers should carefully consider their research philosophy. Kulatunga, Amaratunga and Haigh (2007) further state that a research philosophy helps identify the type of evidence, data collection methods and the type of data analysis required for a research. The following section will provide a description of the chosen paradigm for this study, the research approach that will applied, data collection methods and data analysis methods.

1.7.1 Research paradigm

According to Saunders, Lews and Thornhill (2007) there are different philosphhies from which the world can be viewed and neither philisophy is essentially superior to the other. Instead they are better at understanding different phenomenon. Figure 3 shows the positivist and interpretivism paradigms as two extremes of a continuum (Collis and Hussey, 2009). This research leans more towards the interpretivist paradigm and reflects a view of reality as a social construction. Whereby emphasis is placed on deriving knowledge from peoples' experiences and how they interact with the environment, then interpereting this knowledge to come up with a solution for the phenomenon under study (Saunders *et al.*, 2007). The interpretivist paradigm is suitable for this research because it will help the researcher acquire knowledge from the people who have been involved in the implementation of ICT4D projects. The ICT4D projects are those involving HEI researchers and the community. The

knowledge acquired will then be used to come up with a solution that will help HEI researchers to successfully implement ICT4D projects in the communities.

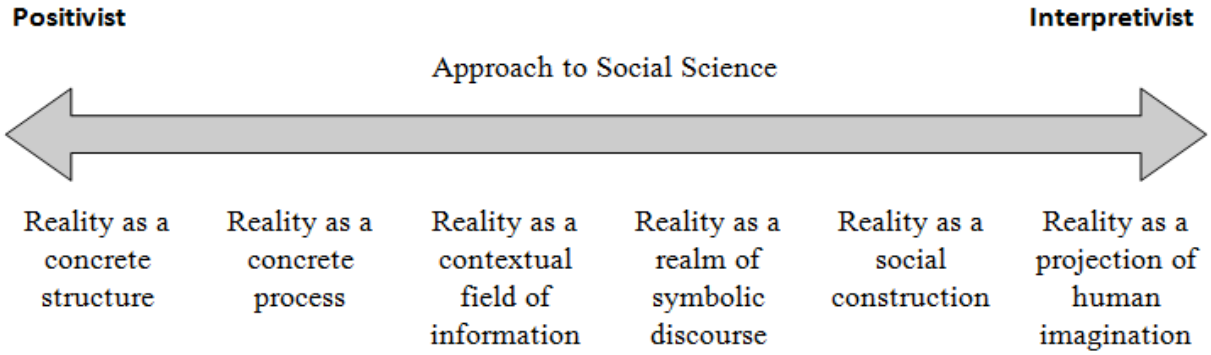


Figure 3: Typology of Assumptions on a continuum of paradigms (Collis & Hussey, 2009)

The qualitative research method will be used in this study. Qualiative reseach attempts to attain a deep understanding of the phenomena being studied and produce findings that were not determined before (Hancock, Windridge, & Ockleford, 2009). This will be achieved through inductive reasoning. According to Thomas (2006) inductive reasoning involves generating themes, concepts or models through interpretations made from raw data. The outcome of this research is hence a model for the application of community engagement principles for successful implementation of ICT4D projects in communities for HEIs in South Africa. The following section describes the research strategy that will be applied in this study.

1.7.2 Research strategy

This research uses the case study strategy to investigate the problem of how HEIs in South Africa can apply community engagement principles for successful implementation of ICT4D projects in the communities. According to Yin (2009) case studies are used when answering "how" and "why" questions. When answering how or why questions an in depth understanding of the problem being studied is required (Yin, 2009). The case study method therefore provides the researcher with an in depth understanding of the problem. With the case study method, the researcher gets to view the problem from a variety of angles using multiple sources of evidence such as archival records, documents, interviews and participant observation (Baxter & Jack, 2008). The sources of evidence used in this study will be discussed under the data collection methods section. According to Barratt, Choi and Li (2011) other important characteristics to consider when conducting case study research are the units of analysis, number of cases to be used, case selection criteria, data collection methods and data analysis techniques. These factors will be briefly described below.

Unit of analysis

Yin (2009) states that the unit of analysis is the case to be studied. In this research the unit of analysis is focused on investigating how HEI researchers can apply community engagement principles for the successful implementation of ICT4D projects in various communities.

Number of cases

This research uses the multiple case study approach. Yin (2009) states that by using multiple cases, the results of phenomena being investigated are more credible as compared to using a single case study. In support of this notion, Baxter and Jack (2008) state that a multiple case study method produces reliable and robust results. The aim of this research is to produce a model that HEI researchers in South Africa can use to ensure the successful implementation of ICT4D projects in underprivileged communities. Hence to ensure credible results 4 cases are used. The four cases selected are the Information and Communication for Technology for Rural Education Development project (ICT4RED), Siyakhula living labs project, Zenzeleni project and Aloe project which are discussed in the following section.

Overview of the cases

Information and Communication for Technology for Rural Education Development project (ICT4RED)

The ICT4RED project was launched with the aim to conduct a large scale pilot study that tested the use of tablets as part of teaching and learning in schools. The project aimed to introduce appropriate technology which would enhance teaching and learning and be aligned and integrated into the current teaching processes (Herselman & Botha, 2014). The targeted community is the Nciba school District in Cofimvaba in the Eastern Cape Province in South Africa. The pilot study was conducted over a period of three years (2012-2015) in 26 rural schools. The process was done in three iterations one school in the first iteration, 11 schools in the second iteration and 13 schools in the final iteration (Ford, Botha & Herselman, 2014). The sample of the pilot study consisted of three senior secondary schools with learners from grades 10 to 12 and 23 junior secondary and primary schools with learners from grade R to 9 (Ford *et al.*, 2014).

In terms of impact, other provinces in South Africa are using the training material used for the teachers in the Nciba district to train their own teachers. Global Universities in Morocco are translating the same material to Arabic to train their teachers as well (Herselman & Botha,

2014). The ICT4RED project also contributed into the field of research for ICT for Education and Rural Development Evaluation. Several published papers have been delivered in both local and international conferences and some published in various journals. Furthermore, in the Nciba school district Herselman and Botha (2014) state that the tablets have helped with better planning and improved the skills required for the 21st century learning process. Herselman and Botha (2014) cite that the teachers feel empowered with new knowledge and are applying this knowledge in their teaching strategies.

Siyakhula living labs project

According to Ranga, Thinyane and Terzoli (2010) the Siyakhula Living Labs project was initiated in 2005 with the aim to introduce ICT and its benefits to marginalised communities in South Africa. The project was launched from the University of Fort Hare and Rhodes University. The targeted community for the project was the Dwesa community in the Eastern Cape Province (Ranga *et al.*, 2010). To date, the project has managed to deploy computers in over 17 schools in the Dwesa community. The members of the community in Dwesa have obtained basic ICT literacy skills to a level that helps them to contribute to participatory work and research concerning ICT in their community (Dugmore, 2012). In 2009 the project adopted the living lab approach which involves developing user driven products and services that are introduced and tested in real life scenarios.

Zenzeleni project

The Mankosi project, now known as Zenzeleni, was launched in 2011 by the University of the Western Cape and the targeted community for the project was the Mankosi community in the Eastern Cape Province (Bidwell *et al.,* 2013). The aim of the project was to implement sustainable telecommunication services in rural communities which can be replicated to other rural communities. In Mankosi there has been deployment of solar charging stations and after discussions with the tribal authority in 2012, a wireless mesh network was also developed which led to the installation of solar powered public phones in various households in 10 villages (Rey-Moreno *et al.,* 2013). The network intends to provide cheaper voice services for the community and also the network could be easily used for providing Internet access to the community in the future.

Aloe project

The Aloe Voice Based e-market place project was launched with the aim to provide a platform where buyers and sellers of aloe can sell to each other through a voiced based

platform (Isabirye, Flowerday, Nanavati & Von Solms, 2015). The targeted community for this project was Albertina, a rural farming community in the Western Cape Province known to produce high quality aloe. The application was delivered through a voice based system, which enabled the community to access services found over the internet through voice driven commands (Isabirye *et al.*, 2015). The following section describes the case selection criteria for this study.

Case selection criteria

The most dominant sampling method in qualitative research is purposeful sampling (Patton, 1990). Purposeful sampling involves selecting information rich cases from which an in depth study can be conducted for the purpose of the research (Patton, 1990). In support of this notion Kuzel (1999) in Shakir (2002) states that when using a multiple case study, it is recommended that selection of cases should be based on appropriateness and adequacy. Appropriateness deals with identifying whether a case is relevant and fits the purpose of the research. Eisenhardt and Graebner (2007) also state that cases should not be randomly selected, but they should be selected according to the relevance of theoretical knowledge they have to the study. Rowley (2002) mentions that when selecting cases, factors such as the research purpose and theoretical context are vital in determining the case studies to use. The case studies used in this research were selected because they provide relevant theoretical knowledge that will help in investigating how to ensure successful implementation of sustainable ICT4D projects through application of community engagement principles by HEI researchers. The cases selected are all ICT4D projects undertaken by HEI researchers in South Africa in identifiable communities around them. These case studies are well documented cases in which the researcher has access to the core stakeholders such as the project leaders who are the HEI researchers and the community members.

Population and Sample

The study sample was four cases, from which six people were interviewed. Four of the people were the project leaders from various HEIs involved in the ICT4D projects of the cases being studied. The other two were community members in the various communities in which the ICT4D projects were implemented. The two community members were selected through the snowballing technique. The researcher asked the project leaders to help recommend the community members who can be interviewed based on the knowledge they have about the ICT4D projects. The community members interviewed all hold the position of

project champions for the ICT4D projects in their communities. The community members interviewed were from the Zenzeleni and ICT4RED projects. However, the sample was a limitation of this study as the researcher could not interview an equal number of community members as that of project leaders. This because the researcher did not manage to communicate with the community members from the other two projects.

1.7.3 Data collection method

According to Yin (2009) a decent case study uses a variety of sources to collect information. The most common data collection methods for case studies include interviews, direct observation, participant observation, archival records, physical artefacts and documents (Yin, 2009). This research used both primary and secondary data as sources of data.

1.7.3.1 Secondary data

Secondary data was collected to gain an insight into the cases under investigation. Research articles documenting the cases were examined from various sources. Sources reviewed included books, journal articles, conference proceedings, and scholarly documents from the internet. Literature regarding the implementation of ICT4D projects in underprivileged communities by HEI researchers was also reviewed.

1.7.3.2 Primary data

This study used the semi structured interviewing technique for its primary data collection. Project leaders from the HEIs and community members where the four ICT4D projects being investigated in this research were implemented were interviewed. According to Bryman (2004) interviews allow the interviewee to provide in depth information which cannot be obtained with other methods. Interviews also help in obtaining richer information as they provide room for clarity between both the interviewer and interviewee. The data gathered from the interviews hence provided the researcher with in depth information. Also to understand more on community engagement in HEIs in South Africa, the researcher used observation. The researcher attended two community engagement workshops in 2015 and 2016 respectively at University of Fort Hare. The workshops' main objective was to discuss how academics can integrate community engagement with the other pillars of HEIs of teaching and learning and research. The workshop was hosted by the community engagement department and it was attended by academics from various departments at the Institution. The workshop provided insight on issues academics need to consider in order to successfully engage in community engagement activities. The data acquired from the various sources was

then analysed in order to develop the model. The following section describes how the data was analysed.

1.7.4 Data Analysis method

According to Thorne (2000), data analysis is the most difficult part of qualitative research. It is a phase whereby the researcher generates the raw data into meaningful information through analysing it. This research used cross case analysis to analyse data. According to Yin (2009) this technique is ideal for analysing multiple case studies. Cross case analysis regards each case study as a separate study and then combines the findings from these studies (Yin, 2009). Goodrick (2014) states that cross case analysis involves analysis of the similarities and differences of more than one case that have a mutual goal. From the four case studies the individual strengths and weaknesses were identified in terms of successfully implementing the ICT4D projects . The findings in the individual cases were gathered through in depth document analysis, interviews and observations. From the individual strengths and weaknesses, the similarities and differences in these cases were established using thematic analysis. The findings from the the four cases were grouped according to themes. Using this data, a model that will help HEI researchers successfully apply community engagemnet principles to successfully implement ICT4D projects in communities was developed. The following section discusses the quality criteria for the case study design of this research.

1.8 Delimitation of the study

This study investigates ICT4D projects undertaken by HEI researchers in various communities. The study only looks at ICT4D projects undertaken by HEI researchers from universities and not other HEIs. The ICT4D projects being examined were all undertaken in the Eastern and Western Cape Provinces in South Africa only.

1.9 Ethical considerations

An ethical clearance approval has been applied for from the University of Fort Hare Research Ethics committee to enable the researcher to collect data for this study. The ethical clearance reference number is **ISA031SMK001** and it is attached as appendix 1 to this document. The researcher understands that exploiting the ethical rights of individuals taking part in a research is prohibited by the University Research Ethics Committee. It is hence the duty of the researcher to comply with all factors relating to ethical standards when conducting this research. According to Saunders *et al.* (2012) the following factors should be considered:

- Preserving the confidentiality of data and anonymity of the participants.

- Informing the participants of the voluntary nature of the study and their right to withdraw or participate in the study.
- Informing participants of how the data collected will be used as well as the third parties who might have access to the data.

The reseacher ensures that the above mentioned factors were complied with in this research prior to, during and after the collection of data.

1.10 Outline of proposed chapters

Chapter one is the introductory chapter to the research it provides the background to the study and identifies the main research question and sub questions. Chapter two identifies the factors that should be considered by HEI researchers in order to successfully implement ICT4D projects. Chapter three examines the challenges HEIs face in implementing ICT4D projects within their communities. Chapter four investigates the influence community engagement has on the successful implementation of ICT4D projects by HEI researchers. Chapter five is the research methodology chapter. Chapter six will be a discussion of the findings and an analysis of the information gathered. It also presents the proposed model. Chapter seven is the conclusion of this study.

Chapter 2: Factors HEI researches consider when implementing ICT4D projects to ensure success

2.1 Introduction

The previous chapter of this study discusses how community engagement principles can influence the successful implementation of ICT4D project by HEIs. The chapter includes defining community engagement and identifying the various factors that influence effective community engagement. There is also a brief discussion on ICT4D projects and factors that should be considered when implementing them. An analysis is made of how both community engagement principles and success factors for implementing ICT4D projects can influence the successful implementation of ICT4D projects by HEIs. This chapter further discusses the factors that HEIs should consider when implementing ICT4D projects in the community in order to ensure success and sustainability of the projects.

ICT is now regarded as a powerful developmental tool (Chilimo and Ngulube, 2009). In support of this notion ITU (International Telecommunications Union, 2015) states that ICT is an essential component towards meeting the Sustainable Development goals (SDGs). This entails that ICT can help achieve the SDGs by fostering economic growth and alleviating poverty in developing countries enabling them to become participative in the global economy (ITU, 2015). ITU (2015) further states that the number of people using the internet in developing countries between 2010 and 2015 has almost doubled. This reflects how much optimism people have in ICT as an agent for development. Due to the potential of ICT huge investments have been made in developing countries for the implementation of ICT4D projects which are aimed at improving the livelihood of the people (Chilimo and Ngulube, 2009). Therefore, a large number of ICT4D projects are currently being undertaken at national, regional and global level with the aim to boost socio-economic development in developing countries (Gumbo, Thinyane, Thinyane and Hansen, 2012).

According to Elommaa *et al.*, (2010) ICT4D is the use of ICT as an agent for development with regards to social, economic or human rights development. However, Chilimo and Ngulube (2009) further state that the role of ICT in enhancing development has been subject to debate over the years. This is because there has been a lack of a clear understanding of the relationship between ICT and development. Coelho and Segatto (2013) state that ICT is

viewed as a rapid and effective way to achieve development and is regarded as a tool that can be used for global development. The following section discusses ICT in relation to global development.

2.2 ICT and Global Development

The United Nations Development Program in 2001 depicted in a model known as the UNDP model how ICT can be used to influence development. The model was developed specifically to illustrate how technology influences development. According to the UNDP (2001) investment in ICT helps people acquire better tools that can enhance productivity and development. The model is shown in figure 4.

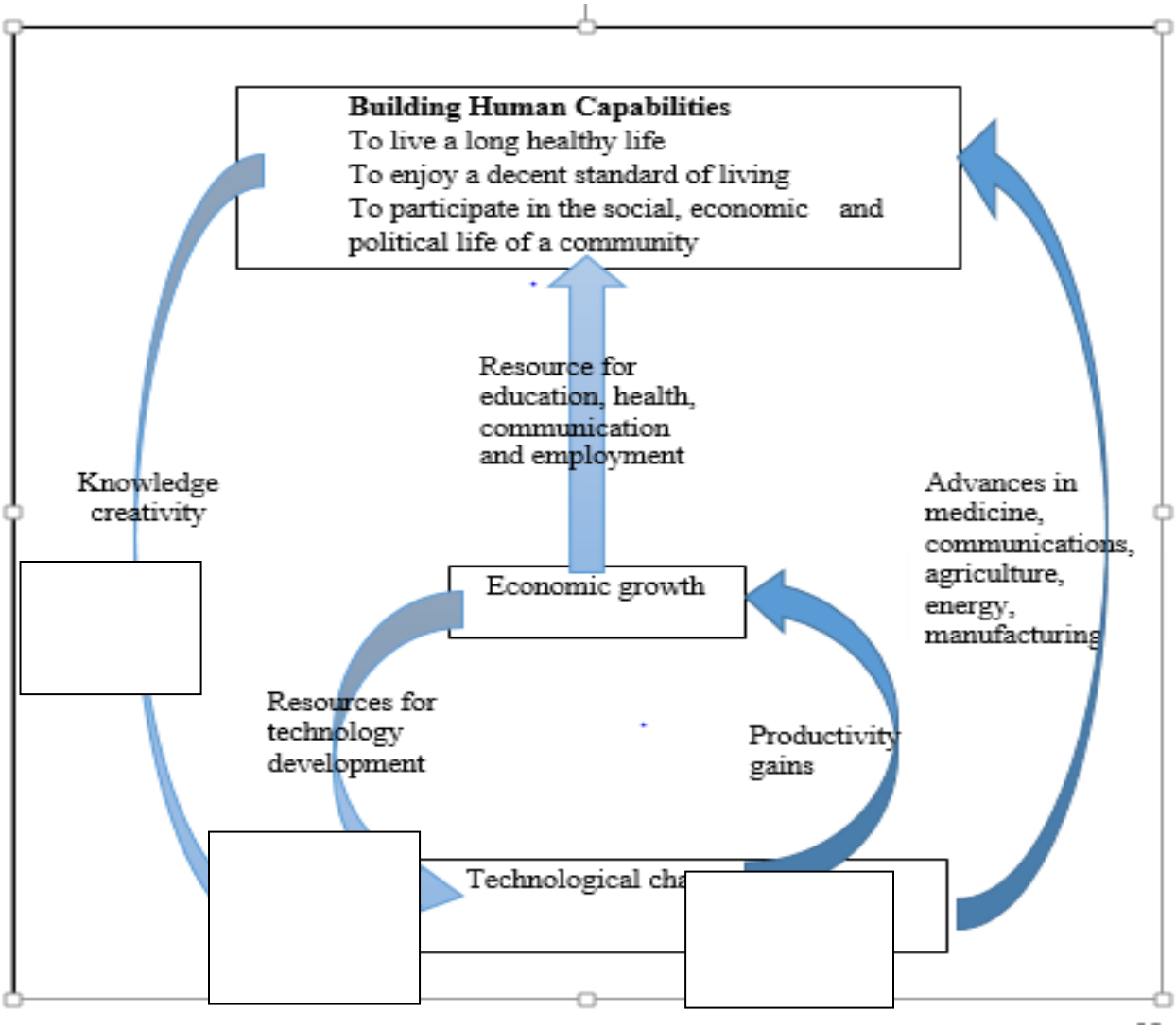


Figure 4: UNDP Model (UNDP, 2001)

Figure 4 illustrates that ICT can influence development in two ways. Firstly, ICT can improve the capabilities of the people, for example access to information through the Internet

can help people acquire more knowledge concerning issues such as health and education thus improves their living standards (UNDP, 2001). Access to information and communication can also lead to better participation by people in a community in issues regarding their social, political and economic wellbeing (UNDP, 2001). Secondly the model illustrates that ICT can enhance development through its effect on economic growth. This entails that by using ICT new activities and industries can be formulated which provide job opportunities, improve productivity and contribute to the growth of the economy (UNDP, 2001).Also the UNDP model depicts that ICT and development in terms of building human capabilities and economic growth is reciprocal in nature in the sense that growth in human capabilities can be invested back into ICT in form of knowledge and economic growth can help by providing resources which can be used for ICT advancement (UNDP, 2001).

Following the UNDP model of 2001, the United Nations as part of the global developmental plan has over the years come up with goals to help foster development globally and has constantly emphasized on how ICT is a major tool for achieving the developmental goals. ITU (2015) states that the UN realizes the great impact ICT has on development and is of the notion that ICT access should increase as it plays a vital role in supporting the implementation of both the MDGs and SDGs. From 2000 to 2015 the UN set 8 MDGs and from 2015 to 2030 the UN put in place 17 SDGs which build up from the MDGs. These goals are developmental goals which are set to be achieved globally. A discussion of the MDGs and SDGs and the role ICT plays in achieving these goals is provided in the following section.

2.2.1 ICTs role towards achievement of the UN developmental goals

The MDGs which were put in place in 2000 were meant to solve many issues such as alleviating poverty, improving healthcare and providing better access to water and sanitation. The MDGs have made tremendous progress towards meeting their set targets, hence showing the usefulness of having a unified agenda and set goals to meet targets as an effective method of dealing with some of the global problems (UN, 2015). According to UN (2015) the eight MDGs are:

- To eradicate extreme poverty and hunger
- Achieve universal primary education
- Promote gender equality and empower women
- Reduce child mortality

- Improve maternal health
- Combat HIV/AIDS malaria and other diseases
- Ensure environmental sustainability
- Global partnerships for development

With the MDGs concluding in 2015, there has been remarkable progress in most countries towards achieving the MDGs and ICT has played a significant role in the achievement of these goals. For instance, according to Statistics South Africa (2013) South Africa has made progress towards attaining the MDGs using ICT. In its 8th MDG report South Africa encourages for the diffusion of new technologies and increased access to ICT networks. This helps enhance development and thus South Africa has invested in research and development towards ICT. This reflects on how important ICT is towards achievement of the MDGs and development in general.

Dzidzonu (2010) states that ICTs make an impact across all sectors included in the MDGs, from providing new opportunities for economic growth to increasing efficiency in sectors such as education and healthcare. Kabanda (2012); ITU (2015) in support of this notion state that ICTs provide easier access to information on the market and opportunities to such platforms as e-commerce which reduces transaction costs. ICTs also help with the sharing and monitoring of health in remote areas and access to digital learning material (ITU, 2015). For instance, from the four cases being used in this research, ICTs are used to solve various issues facing underprivileged communities in South Africa. The way in which these ICTs are used is also in line with achieving some of the MDGs.

For example, the first project which is the ICT4RED project aims to introduce technology in marginalised communities in South Africa in order to enhance teaching and learning (Herselman & Botha, 2014). This project seeks to achieve one of the MDGs, which aims at providing access to universal education. Furthermore, as ICT4RED is part of a larger project TECH4RED. TECH4RED focuses on applying ICTs in other aspects as well, such as nutrition, sanitation and health. These aspects also help in achieving several MDGs such as eradicating poverty and ensuring environmental sustainability. The second and third case study which is the Siyakhula Living Labs and Zenzeleni Projects respectively, aim to use ICTs to improve access to information via communication platforms. With better access to information people can access information which can provide them with new opportunities. For instance, in Dwesa where the Siyakhula Living Labs project was implemented the people can now sell their products on an e-commerce platform. Furthermore, in the fourth project,

the Aloe project the community was provided also provided with a voice based e-commerce platform. These platforms create new economic opportunities and can help eradicate extreme poverty and hunger. This brief discussion only reflects on the four case studies in this research and how their use of ICTs helps in achieving the MDGs. There are various other projects also using ICTs for development within South Africa and the world over.

Thus from the previous discussion ICT has a significant impact towards achieving the MDGs and enhancing development globally. Hence ICT also has a vital role towards attaining the SDGs as they build up from the MDGs. The SDGs were built on the lessons learnt from the MDGs. SDGs aim to ensure that by 2030 they have identified and dealt with the root causes of poverty in the world and that they have a broader sustainability agenda for all the solutions to the problems being faced in the world (UNDP, 2016). The UNDP (2016), further states that SDGs also known as global goals came into being on September 25th 2015 at the United Nations Development Summit. In summary, these goals are meant to alleviate poverty and ensure prosperity to all the people in the world by fighting inequality and justice (UNDP, 2016). The new SDGs, and the broader sustainability agenda, go much further than the MDGs in addressing the root causes of poverty and the universal need for development that works for all people. ICT has been identified as a vital component in terms of meeting these goals (ITU, 2015). In support of this notion Kabanda (2012) states that the use of ICT in development has become inevitable, if used properly ICT has the potential to reduce the imbalance between the underprivileged and privileged people.

The Measuring Information Society Report of 2015 further states that ICT has great potential and there is need for improved access to ICT as it has an important role in the implementation of SDGs (ITU, 2015). ITU statistics reveal that there has been a significant improvement in the use of ICT in developing countries and since 2010 there has been a great improvement in the ICT Development Index (IDI) values of most developing countries (ITU, 2015). These statistics are encouraging as they prove that people believe in the potential of using ICT for development.

However, despite this improvement, the gap between developing and developed countries IDI values has increased between 2010 and 2015 (ITU, 2015). This gap has a negative impact on the developing and least developed countries as this impacts the potential to acquire development benefits from ICT. According to Raiti (2007) failure to acquire the desired benefits from ICT is caused by over optimism in terms of what ICT can do in terms of

achieving development. Walton and Heeks (2011) further argue that there is need to understand that in development ICT is an enabler or means of achieving development not the solution itself. Raiti (2007) provides a practical example by stating that ICT does not provide clean water or healthcare services but aids in solving issues relating to these problems by providing better access to such services. Failure to understand this concept might lead to failure to attain the desired benefits from using ICT.

Walton and Heeks (2011) further state that despite the use of ICT as a tool for social and economic advancement throughout the world, most ICT4D projects have experienced a huge failure rate and a lack of recognizable developmental impact in developing countries. The success of most of these ICT4D projects has been hindered by factors such as sustainability issues, lack of context and lack of sufficient resources (Pade Khene *et al.,* 2011; Isabirye *et al.,* 2013; Mtsweni &Abdullah, 2014). Hence when implementing these projects there is need for careful consideration of the factors that will help with the successful implementation of the ICT4D projects and ensure they have recognizable developmental impact. The following section discusses the factors that should be considered to ensure successful implementation of ICT4D projects in underprivileged communities.

2.3 Factors to Consider for successful implementation of ICT4D projects

Numerous studies have been undertaken with regards to the implementation of ICT4D projects. Models, framework and critical success factors to follow when engaging in ICT4D projects to ensure success have been suggested. However, failure of ICT4D projects still remains a prominent issue to date. According to Dodson *et al.* (2012) ICT4D projects have not made much recognizable impact. In support of this notion, Mtsweni and Abdullah (2014) state that most ICT4D projects partially achieve or totally fail to meet their developmental objectives. Failure of the ICT4D projects has been attributed to challenges such as using the top down approach to undertake the projects, this approach limits involvement of the community in the project and thus has adverse effects on success of the project (Dodson *et al.,* 2012; Walton & Heeks, 2011). Dodson *et al.* (2012) further state that other reasons for failure involve incompatibility between the resources available in the community and the technology implemented hence it will be difficult to sustain the project in the long run.

Thus in order to solve these challenges there is need for further study on how to implement successful ICT4D projects. According to Gichoya (2005); Musiyandaka, *et al.* (2013) to

determine factors for successful implementation of ICT4D projects there are critical determinants that need to be identified. Gichoya (2005) states that these determinants are subdivided into two categories, namely *drivers* and *enablers*. A definition of each of the two categories is provided in the following section.

- *Drivers – "these are factors that encourage or reinforce the successful implementation of ICT projects"*(Gichoya, 2005, p 179)
- *Enablers – "these are the active elements in the society, which help overcome the potential barriers"*(Gichoya, 2005, p 179)

From the above definitions success factors for ICT4D projects can either be in the category of drivers or enablers. The factors in these categories need careful attention when implementing ICT4D projects in order to achieve the desired results (Gichoya, 2005). In support of this notion, Krauss (2009) states that overlooking some of the factors that are considered as vital for the success of ICT4D projects leads to failure. For example, Krauss (2009) states that training of users in ICT4D projects is not usually adequately undertaken or even overlooked and this leads to ICT4D project failure. Figure 5 provides a diagrammatical illustration of the factors required for successful implementation of ICT4D projects.

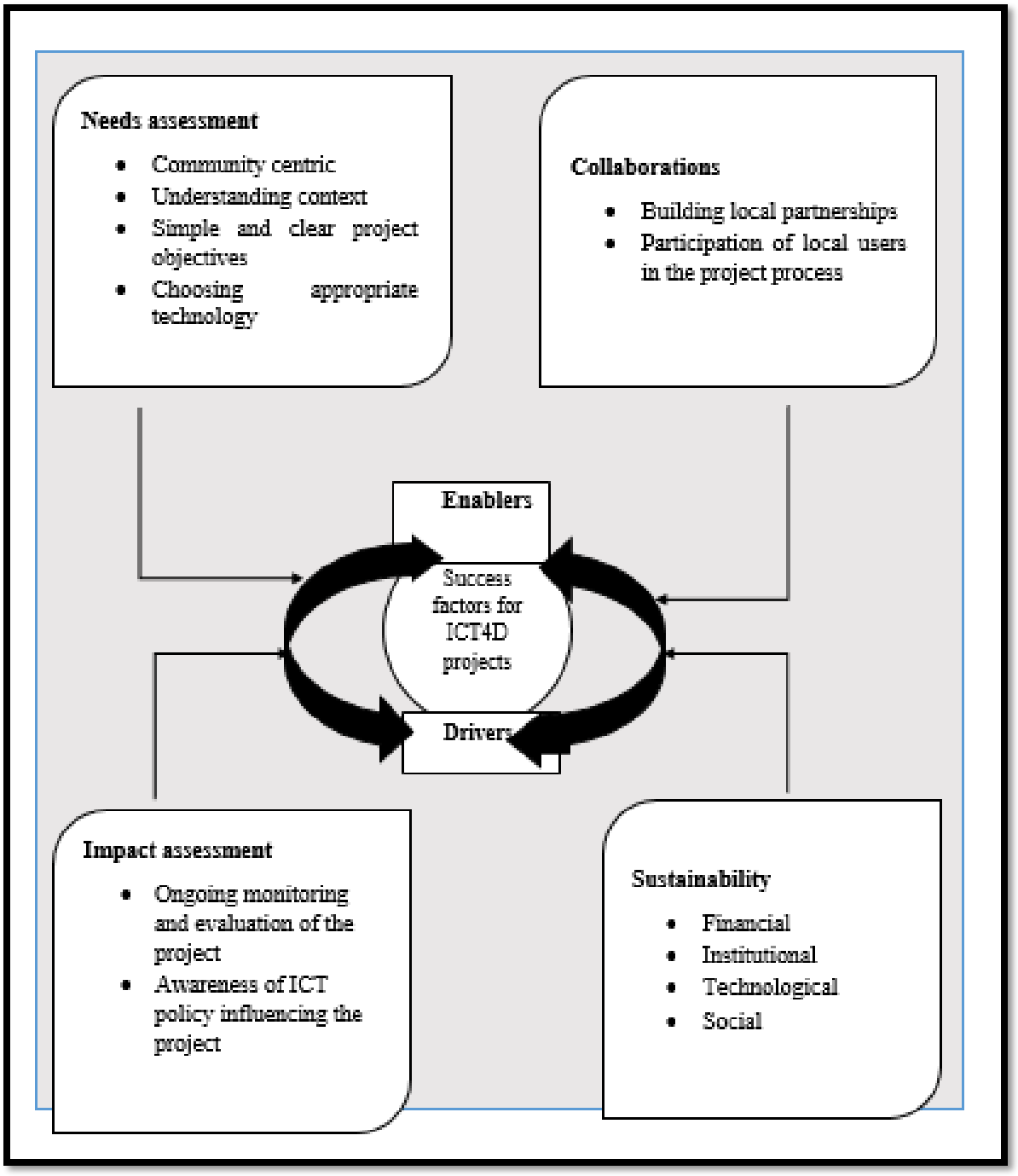


Figure 5: Success factors for ICT4D project implementation

Figure 5 is a compilation of factors from literature of past ICT4D research. It shows factors that need attention when implementing ICT4D projects and are critical for success. The following section discusses these factors in detail. The first factor to be discussed is needs assessment.

2.3.1 Needs assessment

ICT4D projects require a complete needs assessment for them to have the relevant developmental impact in the community in which they are implemented (Mtsweni & Abdullah, 2014). The needs assessment process should be community centric and not technology centred in order for the project to succeed (Mtsweni & Abdullah, 2014). Heeks (2008) states that one of the reasons cited as the cause for failure of ICT4D projects is most of the projects are laboratory innovations which are not user oriented. Walton and Heeks (2011) further argue that most ICT4D projects are technolgy centred and are delivered in a top-down approach which may not be the most effective approach for ICT4D project implementation.

Following a community centric needs assessment process, helps project implementors to understand the context in which the project is to be implemented and this aids in understanding user needs. According to Walton and Heeks (2011) and Isabirye *et al. (2013)* lack of context is a major cause for ICT4D project failure. Gomez and Pather (2012) in support of this notion states that some of the ICT4D projects implemented in underpriviledged communities have failed as they have implemented replicated ICT4D solutions which have been sucessful in developed communities whilst not suitable for their particular context. Gumbo *et al.,* (2012) mentions that to solve this issue there is need for meaningful engagement to develop innovative solutions with the end user communities for successful implementation of ICT4D projects.

Krauss 2009 further states that in order for an ICT4D project to succeed in underprviledged communities, there is need to ensure that the projects satisfy the needs of the communities involved, but still reflects on the communities unique social fibre. To safeguard a community's unique socail fibre project implementors should use the knowledge systems in the community such as indegenous knowledge acquired from the community to come up with innovative technology solutions. This knowledge is vital in needs assessment as it helps in determining needs of the community accurately. Literature reveals that, in projects where community members are given the leading role, they feel motivated to participate in the project hence increasing the chances of success of the project(Lavery *et al.,* 2010). Hence by making use of the information provided by the community members to implement the project, the project has high chances of success. In support of this notion Walton and Heeks

(2011) also state that participation of the beneficiaries helps with vital knowledge which contributes to system design and reduces the chances of design reality gaps. Participation of the local users also increases sense of ownership of the project which increases chances of sustainability of the project (Walton & Heeks, 2011).

Community centric needs assessment can also help the project initiators understand their context in terms of the resources available in the community. According to Pade Khene *et al.* (2011) and Heeks (2010), determining the amount of resources availablle during needs assessment is an important factor when implementing ICT4D projects. It helps in selection of appropriate technology which matches reality and the needs of the community and eliminates the problem of the design realilty gap. A design reality gap occurs when a project design does not suit the purpose for which it was designed and it can cause project failure (Heeks, 2002).

Lastly to ensure that the needs assessment process is a success, there is need to come up with clear and simple objectives for the project which are holistic in nature and are aligned to the developmental goals of the community (Pade Khene *et al.*,2011; Heeks, 2010). Approaching the project in this manner will ensure that the ICT4D project not only immediate needs of the community but it will provide lasting solutions which are in line with the specific needs and resource limitations of the community. Following the aforementioned procedures will help in successfully understanding the needs of the community which is vital for successful implementation of ICT4D projects. After the process of needs assessment there is need to ensure all stakeholders involved buy in to the project and this requires collaboration which is discussed in the following section.

2.3.2 Collaboration

With regards to collaboration, continuous engagement and participation of the stakeholders such as community members, subject matter experts, project champions and sponsors is vital for the success of an ICT4D project (Mtsweni & Abdullah, 2014). In order for successful implementation of a project it is required that all stakeholders are fully committed to the project, as lack of commitment from stakeholders can have adverse effects on the project (Mtsweni & Abdullah, 2014). Walton and Heeks (2011) state that appropiate localised technology can aid in the co

ntinued use of the technology. However to achieve this there is need for incorporation and continous engagement of the parties involved.

Pade Khene *et al.* (2011) further state that collaboration between the different stakeholders such as target groups of the community and the project developers helps speed up the decision making process and also aids in making better well informed decisions regarding isssues such as choosing the appropraite technology suitable for the particular community's context. Also collaboration helps in the formation of partnerships among the stakeholders. Pade Khene *et al.* (2011) argue that the essence of collaboration is that the various stakeholders have different competencies which can aid in the successful implementation of the project. For example the local community stakeholders may have a better understanding of the context as it is their community. The project developers may have knowledge on what kind of technolgy will be most appropriate for the the needs rasied by the community members and the the sponsors will provide the finacial resources required to solve this problem. Therefore it is vital for all the stakeholders to work together collaboratively as lack of commitment from any of the stakeholders involved can hinder the successful implementation of the project and its sustainability. Sustainability is discussed in the following section.

2.3.3 Sustainability

Sustainability is a major issue regarding the success of most ICT4D projects (Ali and Bailur, 2007; Pade Khene *et al.*,2011). Ali and Bailur (2007) state that sustainability has become a benchmark for ICT4D project success hence there is need to find ways to ensure that ICT4D projects are sustainable. Various definitions of sustainability can be found from literature. However for the purposes of this study sustainability will be defined in terms of development According to Ali and Bailur (2007) sustainable development is commonly defined by the UN Brutland commission as " *development that meets the needs of the present without compromising the ability of the future generations to meet their own needs."* This means that the notion of sustainability in terms of development is future oriented and emphasizes on that development should be maintainable in the long run (Kumar, 2004). For example, in terms of ICT4D projects, the projects should not only satisfy immediate needs of a community but long term needs as well in order to be deemed sustainable. Literature reveals that to ensure there is sustainability when implementing ICT4D projects there is need to take into consideration the different types of sustainability which are financial, technological,

institutional and social sustainability (Ali & Bailur, 2007; Kumar2004,). These types of sustainability are discussed in the following section.

2.3.3.1 Financial Sustainability

Financial sustainability refers to the ability of ICT4D projects to adequately generate income for the maintenance and operational costs of the project such as repairing and renewing of equipment (Ali & Bailur, 2007; Mamba & Isabirye, 2014). According to Unwin (2009) failure of most ICT4D projects has been attributed to lack of sufficient financial resources to sustain the project. In support of this notion Ali and Bailur (2007) state that the issue of financial sustainability remains a prominent challenge in most ICT4D projects as they are mostly funded by donor agencies. Marais (2011) further states that external funding is problematic because once the funders leave there is no proper plan ning in place on how the project will be sustained financially. Hence when implementing ICT4D projects there should be proper plans for financial sustainability of the project .

2.3.3.2 Technological Sustainability

Technological sustainability is the ability of existing technological infrastructure to exist for a long period without the need to do major alterations to the software and hardware (Ali & Bailur, 2007). Ali and Bailur (2007) further state that technological sustainability is achieved when technology used for the ICT4D project is capable of performing its functions and easy to maintain and there are people who are capable of maintaining the technology. According to Marais (2011) failure of some the ICT4D projects has been attributed to lack of proper training and skills required to use the technology by the users. This implies that there is need for adequate and proper training of the users on how to use and mantain the technology when implementing ICT4D projects. Weber and Toyama (2010) in support of this notion state that what the developers view as natural in terms of technology might be difficult to understand for the users. Hence training of the users is vital in technological sustainability and should not be overlooked.

Technological sustainability also ties in with financial stability in the sense that the technological equipment will need maintenance over time and this can be costly (Ali & Bailur, 2007). Usually costs of maintaining technological equipment are recurring thus there should be proper plans in place on how the costs for maintenance of equipment will be covered. Ali and Bailur (2007) state that lack of proper maintenance of equipment can lead

to the technology performing below standard and hence likely become less user friendly causing the users to not use it.

2.3.3.3 Institutional sustainability

Institutional sustainability is a factor which takes into account the various actors involved in the ICT4D project. It focuses on the core actors that are affected by the implementation of the project (Ali & Bailur, 2007). In this study the core actors are the HEI, the community in which the ICT4D project is being implemented, funders and policy formulators. Institutional sustainability places emphasis on ensuring that all the parties involved are satisfied in order for the project to be institutionally sustainable.

According to Ali and Bailur (2007) the implementation of ICT4D projects is political. Pade Khene *et al.* (2011) in support of this notion argue that there is need to understand the political context to ensure the project is sustainable. This is because implementation of ICTs can be seen as a threat to the authority of the officials such as traditional village leaders and without their support it is difficult to get community members involved in the project (Pade Khene *et al.,* 2011). Also with regards to ICT policy, the project implementers need to be aware of the specific ICT policies governing the area in which the project is being undertaken which might affect sustainability so as to mitigate or enhance the policy implications (Pade Khene *et al.,* 2011). Hence to ensure institutional sustainability Carnegie (2015) states that there is need for the formation of mutually beneficial partnerships when implementing ICT4D projects between all parties involved. Building of mutually beneficial partnerships fosters long term relationships and enables the various actors to work well together towards achieving a common goal hence ensuring the project has institutional sustainability. Institutional sustainability ties in with social sustainability as social sustainability also emphasizes on collaboration as a core component in ensuring sustainability. Social sustainability is discussed in the following section.

2.3.3.4 Social sustainability

Social sustainability considers the community as a whole and takes into account social equity (Kumar, 2004). Ali and Bailur (2007) state that social sustainability requires the participation of local users, taking into consideration their unique culture and differences, involving marginalized groups and ensuring the goals of the ICT4D project are aligned with the community needs. In support of this notion Pade Khene *et al.* (2011) state that to ensure

social sustainability for ICT4D projects there is need to encourage local ownership, human capital development, cultivating local and influential project champions, and involvement of socially excluded groups (Pade Khene *et al.*, 2011). These various elements of social sustainability are discussed in the following section.

2.3.3.4.1 Encouraging local ownership and including socially excluded groups

According to Pade Khene *et al.* (2011) encouraging local ownership of the project provides the local users with a sense of belonging to the project. This is a critical factor in ensuring sustainability of ICT4D projects as it boosts the willingness of the local users to invest effort to participate in the project. Pade Khene *et al.* (2011) also mention that when encouraging local ownership to ensure sustainability, there is a need to also consider socially excluded groups and account for the social cultural factors when implementing the projects. In support of this notion Toyama (2011) argues that failure to understand the norms and culture of the local community in which an ICT4D project is implemented can lead to project failure. Swanzen and Rowe (2013) further argue that the more involved and knowledgeable the local users are about the project, the higher the chances of sustainability and success of the project.

2.3.3.4.2 Nurturing an influential project champion

Another important element to consider in ensuring social sustainability is to nurture an influential project champion. According to Pade Khene *et al.*, (2011) the project champion should be able to motivate, inspire and encourage the targeted users to see the benefits of the ICT4D project, hence preferably it should be a local community member. Krauss (2009) argues that for an ICT4D project in an underprivileged community to be successful it should fit the context and also reflect on the community's societal values. Hence by having a local community member as a project champion who already understands the context and needs of the community, the ICT4D project is likely to be sustainable.

2.3.3.4.3 Human Capital development and local content Development

Ali and Bailur (2007) state ensuring that the goals of the project are aligned to community needs is an important element in ensuring social sustainability of ICT4D projects. Pade Khene *et al.*, (2011) provide one way of ensuring this type of social sustainability and that is by encouraging local content development. According to Pade Khene *et al.*, (2011) local content development refers to activities whereby the community is involved in coming up

with understandable and applicable knowledge for the development of technological innovations that are sensitive to their context. However, Marais (2011) states that in underprivileged communities people lack the proper skills and training in terms of using technology thus there is need for adequate training in order for them to be involved in local content development. In support of this notion Mtsweni and Abdullah (2014) state that human capital development is essential for the sustainability of ICT4D projects. There is need for adequate skills and knowledge transfer to the local users to enable continued use of the technology Mamba and Isabirye (2014) further argue that from their study on the implementation of ICT4D projects in rural commnnities the local users expressed that they require skills development in order to be able to use technology effectively. Local users should receive adequate training which helps with technical support and local content development which was mentioned earlier on (Pade Khene *et al.,* 2011). To ensure sustainability with regards to training, the training should be undertaken in such a manner that equips the local users with technical skills which provide them with job opportunities either within or outside their community (Pade Khene *et al.,* 2011). The following section discusses the last factor to be considered for successful implementation of ICT4D projects which is impact assessment.

2.3.4 Impact assessment

Impact assessment involves ongoing monitoring and evaluation of the project(Pade Khene *et al.,* 2011). Mtsweni and Abdullah 2014 state that this factor is difficult to attain but needs to be addressed from the beginning through to completion of the project. Mtsweni and Abdullah (2014) further state that impact assessment can be done using small samples known as prototypes at each and every stage of the project instead of rolling out the whole project. This will aid in the process of making adjustments as they arise and they will be easier to make if it is a prototype (Pade Khene *et al.,* 2011). Impact assessment through ongoing monitoring and evaluation helps mitigate problems or enhance the project before the whole project is implemented. This increases the chances of sustainability of the project. The process of impact assessment also involves understanding the ICT policies governing the area so as to ensure that the project is implemented without contradictions to the policies (Pade Khene *et al.,* 2011). Therefore, when HEIs implement ICT4D projects in underprivileged communities they should take into consideration all the factors that were discussed to ensure successful implementation.

2.4 Conclusion

ICT has the potential to improve the living standards of people living in underprivileged communities. However successful implementation of ICT4D projects in these communities is a major challenge. Most of the ICT4D projects that have been implemented have partially succeeded or totally failed to meet their goals. This chapter discusses the factors that HEIs should consider when implementing ICT4D projects in underprivileged communities. Some of the major factors that are discussed include needs assessment, sustainability, collaboration and impact assessment. The following chapter discusses the challenges that HEIs face when implementing these projects.

Chapter 3: Challenges currently faced in terms of implementing ICT4D projects in communities by HEI researchers

3.1 Introduction

The previous chapter of this study discusses the factors that need to be considered by HEIs in order to successfully implement ICT4D projects in underprivileged communities. Chapter two initially discusses the impact of ICT on development and how it can help in the achievement of the global development goals. It also discusses how there has been debate on the impact of ICT on development, whereby some researchers argue that ICT lacks recognisable developmental impact and others reveal that ICT is an important developmental tool. However, for ICT to have the desired impact on development there are certain factors which need to be considered when implementing ICT4D projects and these factors where the main focus discussed in Chapter two. The main factors identified were needs assessment, collaboration, sustainability and impact assessment. Therefore, in order to successfully implement successful ICT4D projects which have the desired developmental impact in underprivileged communities, HEIs should consider these factors. This chapter then discusses the challenges that HEIs face with regards to successful implementation of ICT4D projects in underprivileged communities and the following section provides a background of some of the challenges HEIs face when undertaking ICT4D projects.

According to Weber and Toyama (2010) successfully implementing ICT4D projects which have the desired impact in the community in which the project is implemented is a challenging endeavour. In support of this notion Walton and Heeks (2011) state that ICT4D projects have experienced high failure rates and lack of recognisable developmental impact. One of the major reasons cited as the cause for failure is the lack of context of ICT4D projects implemented in underprivileged communities (Isabirye *et al.*, 2013; Walton & Heeks, 2011). According to Fengu and Krauss (2012) some underprivileged communities have replicated ICT4D projects which have been successful in developed communities' contexts. This has led to partial success or totally failure of the projects as they do not fit the context in which they are implemented.

Context is a vital issue in implementation of successful ICT4D projects. Weber and Toyama (2011) further argue that the hype in the belief that ICT can be used as a developmental tool led to a rapid momentum in the implementation of ICT4D projects in underprivileged

communities. Huge investments were made towards the implementation of these projects, however the hype was not based on proper research and therefore most of these projects have not been successful (Coelho *et al.,* 2015). According to Weber and Toyama (2010) examples of the hype include the telecentre project in rural communities. The advocates of telecentre projects believed that by providing access to information via computers, the digital divide will be reduced and as a result alleviate poverty. Another example is of the one laptop per child project, which was meant to solve problems in existing educational systems in underprivileged communities. However according to Weber and Toyama (2010) technology itself cannot solve some of these problems, in this case the problems in the educational system might be with absentee teachers and lack of proper training of teachers hence providing the children with laptops will not solve the problem. In support of this notion Raiti (2007) also states that ICT is a means not a solution itself, thus when implementing ICT4D projects there is need for careful consideration of the needs of the community in which the project is to be implemented. This helps ascertain whether the ICT4D project is a feasible means of solving the particular community's problems.

Besides context other challenges that have hindered successful implementation of ICT4D projects in underprivileged communities range from lack of proper infrastructure, poor training of users and socio- political barriers (Weber and Toyama, 2010). In this study since the ICT4D projects are implemented by HEI researchers, challenges unique to a HEI when implementing ICT4D projects also need to be considered. For example, Maistry and Thakrar (2012) state that most of the students involved in ICT4D projects lack proper training with regards to the dynamics required for successful community engagement and this can hinder the success of the projects. Bidwell *et al.* (2013) also argues that in some cases the timelines the HEIs work with towards accomplishing the projects are not in line with the community timelines hence this makes it difficult to implement a successful project.

According to the South African Council on Higher Education (2010), HEI researchers in South Africa also face challenges in implementing successful ICT4D projects. This is because most HEIs in South Africa are still at a phase where they are trying to find a balance between their community engagement activities and their overall HEI mission and goals of teaching and research. Since the inception of community engagement as one of the three pillars of HEI educational system in 1997 HEIs in South Africa are required to shift from being historically inequitable institutions of higher learning to becoming socially responsible institutions. This entails that HEIs should serve both learners and the communities through

community engagement. Hence HEI researchers have been trying to be more involved in community engagement projects (South African Council on Higher Education, 2010).

South African Council on Higher Education (2010) states that although most HEIs in South Africa have considered community engagement as one of the core pillars of the HEI educational system and is reflected as such in their vision and mission statements. However, there has been difficulty with regards to undertaking systematic and coordinated community engagement projects. For any project to be successful it should be systematically planned and coordinated. Hence HEI researchers should ensure that when undertaking ICT4D projects as part of their community engagement activities they have proper plans in place as failure of proper planning can lead to sustainability issues regarding the project. According to Pade Khene *et al.* (2011), sustainability is a major challenge hindering ICT4D projects in underprivileged communities from having the desired impact. The remaining sections of this chapter will go in depth in terms of discussing the challenges regarding the successful implementation of ICT4D projects.

3.2 Challenges of implementingICT4D projects

There are various challenges which can lead to failure or partial success of ICT4D projects. According to Gichoya *et al.* (2005), ICT failure refers to the constraints or challenges that prohibit successful implementation of ICT projects. These can be categorised as either inhibitors or barriers. Gichoya *et al.* (2005) defines barriers as factors that hinder successful implementation. Whereas inhibitors are those factors that do not prevent implementation but affect advancement and sustainability of the project (Gichoya *et al.*, 2005). These factors are shown in Table 1 and are discussed in the section to follow.

Table 1: Challenges in implementing ICT4D projects

Challenges	
Barriers	**Inhibitors**
Lack of proper Infrastructure	Poor policies
Lack of finance	Poor collaboration
	Insufficient time
	Poor training

3.2.1 Poor Policies

A policy is defined as *"a set of ideas or plan of what to do in particular situations that has been agreed to officially by a group of people a business organization, a government or a political party."* (Cambridge University Press, 2016). From the definition, policies have an impact on the successful implementation of ICT4D projects. According to Gichoya *et al.* (2005), policies fall under inhibitors and as such affect the advancement and sustainability of a project and hence are a challenge that hinders successful implementation of ICT4D projects. Policy challenges in ICT4D will be further discussed from two facets that is the HEI side and the community side. The following section will provide policy challenges from the HEI side.

HEIs in South Africa currently undertaking ICT4D projects, face challenges with regards to their community engagement policies. According to Maistry and Thakrar (2012) the HEIs in South Africa have a mandate to be involved in community engagement projects that benefit both the HEI and the community. However, despite the clear policy instructions concerning community engagement, HEIs have been struggling to undertake these projects.

Tarus *et al.*, (2015) state that the reason why HEIs in developing countries have been struggling with community engagement is because most HEIs do not have clear policies regarding community engagement and in cases where the policies exist they are non-operational. This issue has led to HEIs undertaking uncoordinated projects which are not strategically planned and are more of individual projects (South African Council on Higher Education, 2010). South African Council on Higher Education (2010) further argues that most HEIs in South Africa reflect community engagement as part of their teaching and learning and research activities in their vision and mission statements; however, they do not practically have institutional policies which foster community engagement as part of the HEI learning structure. Tarus *et al.* (2012) also supports this notion by pointing out that in order to successfully engage in ICT4D community based projects HEIs should clearly define their strategic plans and implementation strategies for community engagement in their policies.

Besides the community engagement policy implications on the HEI side, HEI researchers also face challenges with regards to the social structures governing the community in which they implement their ICT4D projects. Pade Khene *et al.* (2011) further states that there is also need for the project implementers to understand the political hierarchy in the community in which the ICT4D project in order to ensure success. Raiti (2007) also argues that policies

regarding the politics of the community are also a challenge with regards to ICT4D projects. This is because external projects can be seen as threats to power by community leaders and this makes it difficult to convince them to buy into the project. Therefore, policies should be taken into consideration when implementing ICT4D projects to ensure success. The following section will discuss infrastructure as challenge to successful ICT4D implementation.

3.2.2 Lack of proper Infrastructure

Infrastructure plays a key role in the implementation of ICT4D projects (Geldof, 2011; (Dodson 2012; Tarus *et al.,* 2015). Infrastructure includes components such as computers, network and internet connectivity. In order to successfully implement an ICT4D project there is need for adequate infrastructure. However, Marais (2011) states that ICT4D projects are usually implemented in underprivileged communities where there is poor infrastructure and this is a challenge with regards to the success of ICT4D projects. In support of this notion Brunello (2010) argues that most of the ICT4D projects are donor funded, and equipment such as computers and printers which are part of the infrastructure are donated by the funders. In some cases, the equipment is not suitable for the long run sustainability of the project. For example, if the equipment encounters problems it might be difficult to repair as the parts might not be easily accessible or available locally to the people in the community or the cost of repair might be too high (Brunello, 2010). This a major challenge in ICT4D projects as underprivileged communities already have limited resources. Hence when such problems arise the community members might decide to stop using the equipment completely. Musiyandaka, Ranga and Kiwa (2013) further state that the failure of most ICT4D projects is attributed to the lack of basic infrastructure and this has a negative impact on the motivation of the community towards the project and its long term sustainability of the project.

Brunello (2010) with regards to infrastructure mentions that, due to the lack of sufficient knowledge about technology of the people in the community; technical teams who set up systems in underprivileged communities tend to implement highly automatic systems which are easy to use, in order to reduce complexity of use for the users. However, problems exist when the system encounters a problem because due to its sophistication it will be hard to fix. The challenge is that usually problems occur when the technical experts are gone and the only option the community has is to either stopping using the equipment e.g. computer, router

or printer or to get a local technician who can repair it and get it work but not at full capacity (Brunello, 2010).

Heeks (2005) in Brunello (2010) further argues that Project implementers tend to underestimate human capital development by assuming that the infrastructure is too complex to explain or teach the local users on how to use it. Therefore, they implement systems they hope will not give problems to the community, and hence when a problem arises with regards to infrastructure it is difficult for the community members to solve it. Marais (2011) argues that technology cannot be used as a substitute for minimal capacity such as lack of education to the users, therefore making the system easy to use and trying to make sure it does not fail when implementing it without educating the users on how to repair it can hinder the success of an ICT4D project. Musiyandaka *et al.,* (2013) on the same notion also states that from their study of implementing ICT4D projects in rural schools in Zimbabwe the shortage of skilled technical staff to maintain infrastructure can lead to the shutting down of a whole computer laboratory due to a small problem with the computers leading to total failure of the project.

3.2.3 Poor Training

According to Tarus *et al.* (2015), proper skills and knowledge transfer is recognised as a major challenge for the successful implementation of ICT4D. In support of this notion Weber and Toyama (2010) argue that ICT has the potential but there is lack of sufficient knowledge and skills necessary for ICT to be fully utilised in underpriviledged communities. During the implementaion of ICT4D projects proper training to equip the users with the necessary skills required for the success of an ICT4D project is often overlooked or not adequately undertaken (Krauss 2009). However according to Weber and Toyama (2010) due to the lack of exposure to technology of the users, what the developers view as natural might be difficult to understand for the user. Hence proper training is vital for the success of an ICT4D project. Pade- Khene *et al.* (2011) and Mtsweni and Abdullah (2014) also state that some of the ICT projects that are successfully implemented in developing communities fail to realise maximum benefits as the people in the community are not fully trained and lack the proper skills and knowledge to use ICT.

Maistry and Thakrar (2012) with regards to proper training on the HEI side argue that in HEIs some of the students who engage in community based research have limited skills or knowledge regarding implementation of community based projects. Therefore it is important

for the researchers to be trained before they engage with the communities. Heeks (2008) in support of this notion provides an example of the University of Manchester where Masters students have a community engagement module that is meant to equip them with the necessary skills to carry out successsful ICT4D projectsin their communities. Pade- Khene (2015) also states that teaching students about ICT4D is vital for the success of the projects they undertake in surrounding communities. She argues that an ICT4D module can provide the students with the necessary skills and knowledge which they can practically apply when undretaking the projects. Thus training of both the people from the HEI and of the members of the community is a vital component for the success of ICT4D implementation by HEIs in the community.

3.2.4 Lack of finance

The success of any project is highly dependent on the availability of sufficient resources required for the completion of the project. In this study resources required for successful implementation of an ICT4D project include but are not limited to adequate infrastructure, experts who have knowledge about ICT4D projects and adequate funding. According to Marais (2011) most ICT4D projects are implemented in communities where there is lack of sufficient resources and this is a major challenge.

Unwin (2009); Musiyandaka *et al.* (2013) and Tarus *et al.* (2015) further argue that lack of sufficient financial resources hinders the success and sustainability of an ICT4D project. For the long run sustainability there should be generation of sufficient funds which cater for expenses regarding the maintenance and repair of the various ICT equipment. However, in most cases the ICT4D projects are funded by donors who once the project is implemented leave and there is no clear plan in place on how to sustain the project financially (Marais, 2011).

3.2.5 Poor collaboration

Carnegie (2015) and Chauhan (2015) state that collaboration among the various stakeholders in an ICT4D project is vital for the success of the project. However, collaboration is very challenging because it requires for the formation of mutually beneficial relationships that benefit all parties involved (Mtsweni & Abdullah, 2014). According to Brunello (2010), most ICT4D projects implemented in underprivileged communities usually prioritise the donors' goals as opposed to prioritising the needs of the community. This is a major challenge because for the success of ICT4D projects the community members need to feel a sense of ownership in the project thus motivate them to put effort towards its success (Pade-

Khene *et al.,* 2011). Hence their needs should be prioritesed as well. Hence this is a challenge because Walton and Heeks (2011) state that the top down approach in ICT4D projects hinders the success of the projects. HEIs should ensure that when engaging with the community in community based projects, the community members also feel like their ideas are considered and they carry equal importance. There is need to use a more encompassing approach such as grassroots innovation whereby ICT4D projects are initiated by the community, done within the community and are for the community in which they are implemented. In support of this notion Heeks (2008) argues that there is need to desist from laboratory innovations and conduct ICT4D projects which involve the community more.

Another challenge with regards to collaboration is that it requires commitment from stakeholders involved. According to Ali and Bailur (2007) implementation of an ICT4D project in a community can be viewed as political and a threat to authority by the leadership. Hence to get them to buy in to the project and convince the other community members to participate in the project can be challenging. Also considering the ICT4D projects which are the focus of this study are undertaken by HEIs, all stakeholders from the HEI such as students, staff, departments, faculty and institution should be fully committed to the project from initiation through to completion and evaluation for the success of the project. However, the challenge with most HEIs in South Africa is that there are no clear policies to guide these projects (South African Council on Higher Education, 2010). This means the projects are undertaken more as projects of individual endeavour and hence commitment from the whole institution is a problem.

3.2.6 Time

Time is a major component of any project. There is need for sufficient time to complete the project. According to Rey- Moreno *et al.* (2013), issues that seem small from the developer's perspective might not be small on the community side. Rey- Moreno *et al.* (2013) further state community owned projects require sufficient time to negotiate and resolve issues. In communities where collaboration among the communities' members is valued the planning of meetings and consideration of the community members' opinions with regards to decisions about the project takes time (Bidwell *et al.,* 2013). The challenge is that on the developer's side in this case the HEI there is also need to balance the constraints on the time they have for example project funding and expertise availability (Rey- Moreno *et al.,* 2013). Most of the projects undertaken by HEIs are donor funded hence the donors also have timelines set with regards to the completion of the project. On the other hand, students involved in ICT4D

projects from the HEI side have strict timelines to complete them researches in order to attain their degrees. Therefore, the mismatch between the community's timelines and the HEI timelines can hinder the success ICT4D projects.

In support of this notion Brunello (2010) states that usually developers in ICT4D projects underestimate the time required for the implementation of an ICT4D project in a community. Brunello (2010) further argues that under estimation can occur with regards to the time required for effectively training the community members to use the technology. This entails that the developers might set aside a training period which they think is sufficient but in reality the training period will fall short. According to Brunello (2010) the underestimation of time required to complete the project results in the developers bearing unrealistic expectations and if there are no proper plans in place to mitigate such challenges the project is negatively affected. Tarus *et al.* (2015) states that developers of ICT4D projects should know that ICT4D projects require a long time to complete.

3.3 Conclusion

This chapter discusses the challenges that HEIs face when implementing ICT4D projects in the community. These challenges can either be categorised as inhibitors or barriers. The challenges that are discussed include lack of proper infrastructure, lack of finance, poor training, insufficient time to undertake the project and lack of proper co-ordination among the various stakeholders. Therefore, HEIs should find ways to mitigate or address these challenges in order to implement successful ICT4D projects in the community. The following chapter of this research discusses the influence that community engagement principles have on the successful implementation of ICT4D projects in the communities by HEI researchers.

Chapter 4: Community engagement principles influence on the successful implementation of ICT4D projects by HEI researchers

4.1 Introduction

The involvement of Higher Education Institutions (HEIs) in community based projects that expand from their normal activities of research and teaching and learning is a topic that has been of interest to different sectors such as academics, funders, policy makers, HEIs leadership and the community globally (Gonzalez-Perez, 2010). This emanates from the perception that community engagement has been recognised as an important and integral part of HEIs educational system and a key determinant for innovation and economic advancement in underprivileged communities (Avgerou, 2010).

Community engagement is referred to by HEIs using different terms such as community service and service learning in various countries (Tapia *et al.*, 2005). In this research however the term that will be used is community engagement as this is how it is referred to in South Africa. Since community engagement has been recognised as an important factor for HEI educational systems, HEIs in South Africa have been involved in community engagement projects aimed at benefiting their communities (Maistry & Thakrar, 2012). Examples of these projects include ICT4D projects undertaken by HEI staff and students in communities around them and law or dental clinics set up by students to help their communities. The following section will provide a brief background and definition of community engagement.

4.2 Definition of community engagement in HEIs

(Tapia *et al.*, 2005; Bender, 2008a; Bernardo, Butcher & Howard, 2011) state that there are different terms used in various countries to refer to community engagement. Expressions such as service learning, community based learning and active learning are used to describe community engagement. However, despite using different terms to refer to community engagement the concept is the same. According to Tapia et *al.*, (2005) the roots of community engagement can be traced back to the concepts of "learning by doing" or "learning through experience". The other term regularly used for community engagement is service learning. Service learning is defined as activities undertaken by students that are aimed at solving real issues affecting the community and are performed in a planned way that

enhances the quality of learning of the students and meet community needs (Tapia *et al.*, 2005; Bringle & Hatcher, 2009). Tapia *et al.* (2005) further explains that service learning:

- Should be initiated by the community and coordinated by an elementary school, HEI or secondary school.
- Should be carried out in an identifiable community
- Should help develop civic responsibility
- Should meet the needs of the community in which the project is undertaken and have measurable outcomes on their quality of life
- The project should be integrated into and be able to enhance the curriculum of the students involved.
- The service learning projects should be organised in such a manner that they provide the students with enough time to reflect on their service learning experience.

In comparison to the previous definition of service learning, Bender (2008b) defines community engagement in HEIs as activities and processes through which HEI students and staff use their knowledge of teaching and learning and research to solve issues relevant to their communities. In support of this definition, Jacobs, Sutin, Weidman and Yeager (2015) state that community engagement involves partnerships and activities undertaken collaboratively by HEIs and communities at local national and regional level aimed at satisfying community needs and developing civic responsibility of students. Carnegie (2015) further elaborates on community engagement and states that the purpose of community engagement in HEIs is to create partnerships between the HEI and community that

- Enhance teaching and learning and research and help with creative activity.
- Enhance knowledge and are integrated into the curriculum
- Strengthen civic responsibility and nurture educated and engaged citizens
- Solve critical issues and contribute to the wellbeing of the community

From the above comparison from literature it is evident that despite being termed differently, the objectives are all the same for the different concepts of community engagement. The summary of the different terminologies is depicted in Table 2.

Table 2: Summary of community engagement terminologies

Term	Service Learning	Community Engagement
Definition	Activities undertaken by students that are aimed at solving real issues affecting the community and are performed in a planned way that enhances the quality of learning of the students and meet community needs	Activities and processes through which HEI students and staff use their knowledge of teaching and learning and research to solve issues relevant to their communities
Objectives	• Should meet the needs of the community in which the project is undertaken and have measurable outcomes on their quality of life • The project should be integrated into and be able to enhance the curriculum of the students involved. • The service learning projects should be organised in such a manner that they provide the students with enough time to reflect on their service learning experience.	• Solve critical issues and contribute to the wellbeing of the community • Enhance teaching and learning and research and help with creative activity. • Enhance knowledge and are integrated into the curriculum • Strengthen civic responsibility and nurture educated and engaged citizens

However, it is important to note that the degree to which HEIs engage with the community varies. HEIs have strong community engagement in some activities in some projects and poor community engagement in others (Jacobs *et al.,* 2015). This is because HEIs have been struggling to gain a common understanding of what community engagement entails. This lack of understanding has led to the partial success or total failure of some of the community engagement projects including ICT4D projects. Hence a clear understanding of community

engagement is required in order to ensure these projects succeed. In the following section there is a brief discussion of community engagement in the South African context.

4.3 Community Engagement in HEIs in South Africa

According to Lazarus, Erasmus, Hendricks, Nduna and Slamat (2008) community engagement is an integral part of learning in HEIs. As such HEIs are persistently seeking to ensure that their knowledge has an impact on the social, cultural and economic problems faced by the society (Bender 2008b). According to the South African Higher Education act of 1997, to attain these goals HEIs have three core pillars which are research, teaching and learning and community engagement which they use to solve these problems. However, of these three pillars community engagement is an integral part of HEIs educational system as it encompasses both teaching and research, by adding value to the significance and context of these pillars through engaging with community (South African Council on Higher Education, 2010). HEIs in South Africa are thus required to transform from inequitable institutions of higher learning and lean towards becoming institutions where the educational system serves both the learners and communities. This requires a clear understanding of what community engagement should entail in South Africa.

Community engagement is an experiential form of learning where students learn by engaging with the community. Community engagement helps students develop skills which help them to become better at solving real issues affecting their communities (Hart & Northmore, 2011). Bringle and Hatcher (2009) further state that community engagement is not only for developing academic skills but can be used to nurture students to become more responsible citizens. According to Carnegie (2015) the community engagement projects undertaken by Higher Education Institutions should be undertaken within a time period which allows students to benefit through reflective learning and also the activities should contribute to their curriculum. Chauhan (2015) in support of this notion states that community engagement should be aligned to the learning outcomes and have a bearing on the assessment criteria of the students involved. It should also contribute to the other pillars of HEIs educational system which are teaching and learning and research, and the contribution should lead to knowledge creation capacity. Tapia *et al.* (2005) states that HEIs should strive for community engagement to be at an effective level where there is high quality learning for the HEI researchers and high quality service being offered to the community. This concept is depicted in Figure 6 and will be described in the following section.

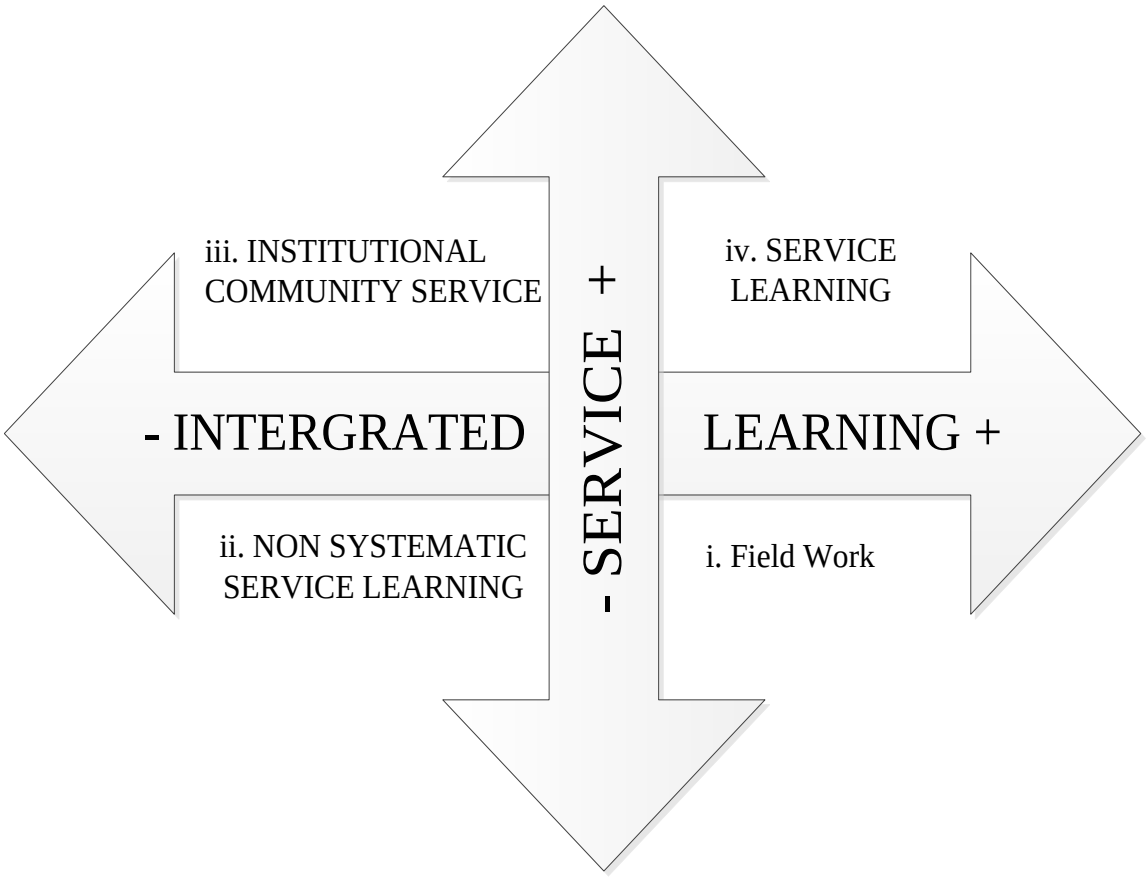


Figure 6: Service learning quadrant for community engagement in HEIs (Tapia et al., 2005)

The goal of service learning or community engagement is to undertake activities that benefit both the learners and the community. However, this is a difficult task as HEIs engage with the community at different levels (Jacobs *et al.,* 2015). Tapia et *al.* (2005) explains some of these levels of community engagement using the service learning quadrant in Figure 6. The vertical axis of the graph shows the greater or lesser level of service provided to the community, and the horizontal axis indicates the level of integration the service performed has on learning. According to Tapia *et al.* (2005) quality in terms of service to the community refers to:

- The effective satisfaction of the needs of the community
- Measurable outcomes on the quality of life of community members
- The ability to satisfy medium and long term goals with regards to the community and not only satisfying immediate needs

- Creating long term partnerships that will be a basis for future community engagement projects between the HEI and community and also ensure sustainability of these projects

Figure 6 shows the different levels of service HEIs can offer to the community and also the extent that this service is integrated with learning outcomes. These levels are explained in the following section.

4.3.1 Service learning quadrant levels

The four levels of the service learning quadrant are field work, non-systematic service projects, institutional community service and service learning which are briefly explained in the following section.

4.3.1.1 Field work

Field work involves less of service and more of learning (Tapia *et al.,* 2005). Field work is whereby students undertake research activities which involve the community but the community will be under study. The purpose of such activities is to study the particular community not offer a service. For example, an organized visit to an industry by a department at a HEI in order to learn more about the industry is considered field work. Field work places emphasis on learning and not changing the way the community carries out their activities. Hence there is low quality service being offered to the community and high quality learning to the students involved (Tapia *et al.,* 2005).

4.3.1.2 Non-Systematic service projects

Non-Systematic service projects as depicted in figure 6 involve both less learning and less service (Tapia *et al.,* 2005). These projects have little or no link with formal learning. The activities are not well planned and are usually carried out in response to a specific need of the community. They are voluntary activities which students' academic performance is not evaluated on. Common examples of such activities involve visits to elderly people's homes or orphanages. Tapia *et al.* (2005) states that non- systematic service projects have low quality service because the chances of these activities in providing lasting solutions to the problems in the community are little. With regards to learning, quality is considered poor because although students learn to solve issues affecting their community, the activities are not integrated into their curriculum hence they cannot be assessed on them (Tapia *et al.,* 005).

4.3.1.3 Institutional community service

Institutional community service unlike the non-systematic service projects involves more of service however it has less integration with learning (Tapia *et al.*, 2005). The activities are well planned and the decision to undertake them is made at institutional level. Whether involvement in the activities is voluntary or compulsory, the institution in this case the HEI considers participation in the community based projects as part of their goals. However, the challenge with some of these activities is that since some of them are voluntary, not all of the knowledge the students acquire in the activities can be effectively incorporated into the curriculum.

4.3.1.4 Service learning

Tapia *et al.* (2005) defines service learning as activities that provide both high quality service and a high degree of incorporation of these activities with formal learning. The difference between institutional community service and service learning is that, with service learning there is a clear link between the community service and the academic curriculum of the students. Tapia *et al.* (2005) states that service learning or community engagement is effective when

- It planned in line with the goals of the educational institution and not only according to the needs of the community
- Participation in these activities is by the whole educational institution from leadership, administration, faculty and students and all parties involved are committed from the initial stages of the activities through to completion and evaluation
- The project is undertaken at the service of the community and is productive and the HEI researchers acquire knowledge that enhances teaching and learning and research.
- There is equal emphasis placed on responding to community needs and high quality learning for the students.

From the discussion of the service learning quadrant in figure 6, HEIs should aim to undertake projects that provide both high quality learning and high quality service to the community. The effective level of community engagement occurs where both service to the community and learning yields mutual benefit. However, most HEIs are struggling to attain this level due to the differing opinions they have on community engagement. The following section describes the different models of community engagement HEIs adopt when

undertaking community engagement and how these models differ and influence the effectiveness of community engagement by HEIs.

4.3.2 HEI conceptual models for community engagement

4.3.2.1 The silo model

The Silo model shows that the HEI has three roles, teaching and learning and community engagement. Figure 7 shows that each role is independent of the other roles and thus community engagement is considered as a separate activity carried out by the HEI (Bender, 2008a). The HEI in this case views community engagement as a voluntary activity to the community, it is regarded as more of community service. Community service within the context of the silo model involves community based activities which are not necessarily used as performance indicators for both the HEI students and staff (Bender, 2008a). Thus despite the benefits to the community, HEI staff and students undertake most of these activities as voluntary activities so they do not have any scholarly benefit integrated into the curriculum. The silo model regards community engagement as more of outreach programs such as voluntary law or dental clinics run by HEI students but do not have a bearing to their curriculum. These activities are not regarded as having the potential to have scholarly contribution to teaching and learning, and research (South African Council on Higher Education, 2010). This stems from the perception that, historically community engagement was inspired by the notion of community benefit and not necessarily HEI benefit as well (Thinyane, 2016).

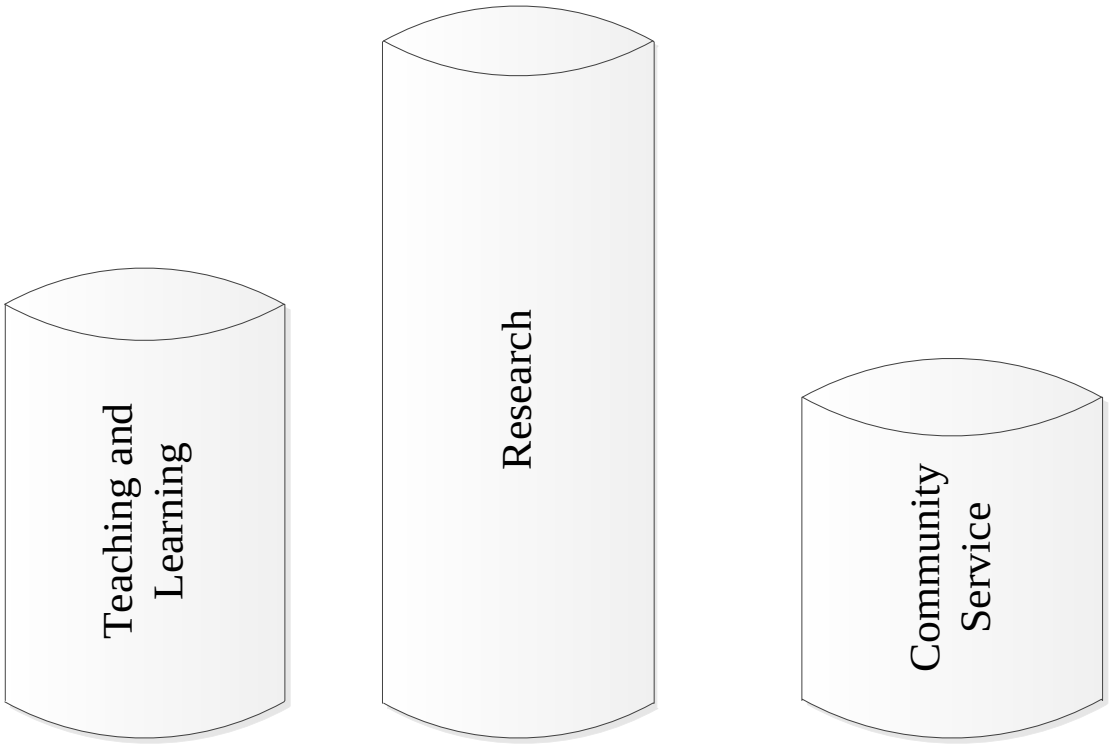


Figure 7: Silo Model for community engagement in HEIs (Bender, 2008a)

With the inclusion of community engagement as a core pillar of HEIs in South Africa, a lot has been done to ensure that community engagement is no longer viewed as a separate activity. The Higher Education quality committee introduced accreditation instruments which require HEIs to report on their community engagement activities in their audits (Thinyane, 2016). However, HEIs have been finding it difficult to introduce and operationalize relevant community engagement policies. Most HEIs are failing to balance community engagement with the already established activities of teaching and learning and research. Therefore, there is still need to ensure that community engagement reaches a level where it integrated with the other activities. For example, when community engagement was introduced, a minority of the South African HEIs had a comprehensible and structured approach to community engagement. Of the 36 HEIs then, only one had managed to operationalise it and others only reflected it in their vision and mission statements (South African Council on Higher Education, 2010). Over the past decade the HEIs have been working towards improving their understanding and approach to community engagement, however they have still encountered difficulties. These difficulties can be attributed to several reasons such as considering the three pillars of HEIs as three separate activities and not have sound policies to inform community engagement. This has led to HEI researchers undertaking most of the community engagement activities as individual endeavours. Some

researchers are managing to undertake activities which qualify as community engagement which are mutual beneficial. Whilst some of the researchers are still at a level where their activities are more of voluntary activities and hence are following the silo model for community engagement. HEIs in South Africa need to ensure that their three core activities are integrated and this can be reached by using the following model known as the infusion (cross- cutting) model.

4.3.2.2 The infusion (cross-cutting) model

In this model the HEI has two central roles which are teaching and learning and research. Community engagement is seen as an important concept that is integrated with teaching and learning and research (Bender, 2008a). With the infusion cross cutting model community engagement is provided equal importance as the other roles. Figure 8 shows the components of the infusion cross cutting model. It shows that when the three pillars of HEIs which are community engagement, teaching and learning and research are interlinked, the HEI will be able to work in collaboration with the community and create partnerships with them. These partnerships will lead to the undertaking of mutually beneficial community engagement projects.

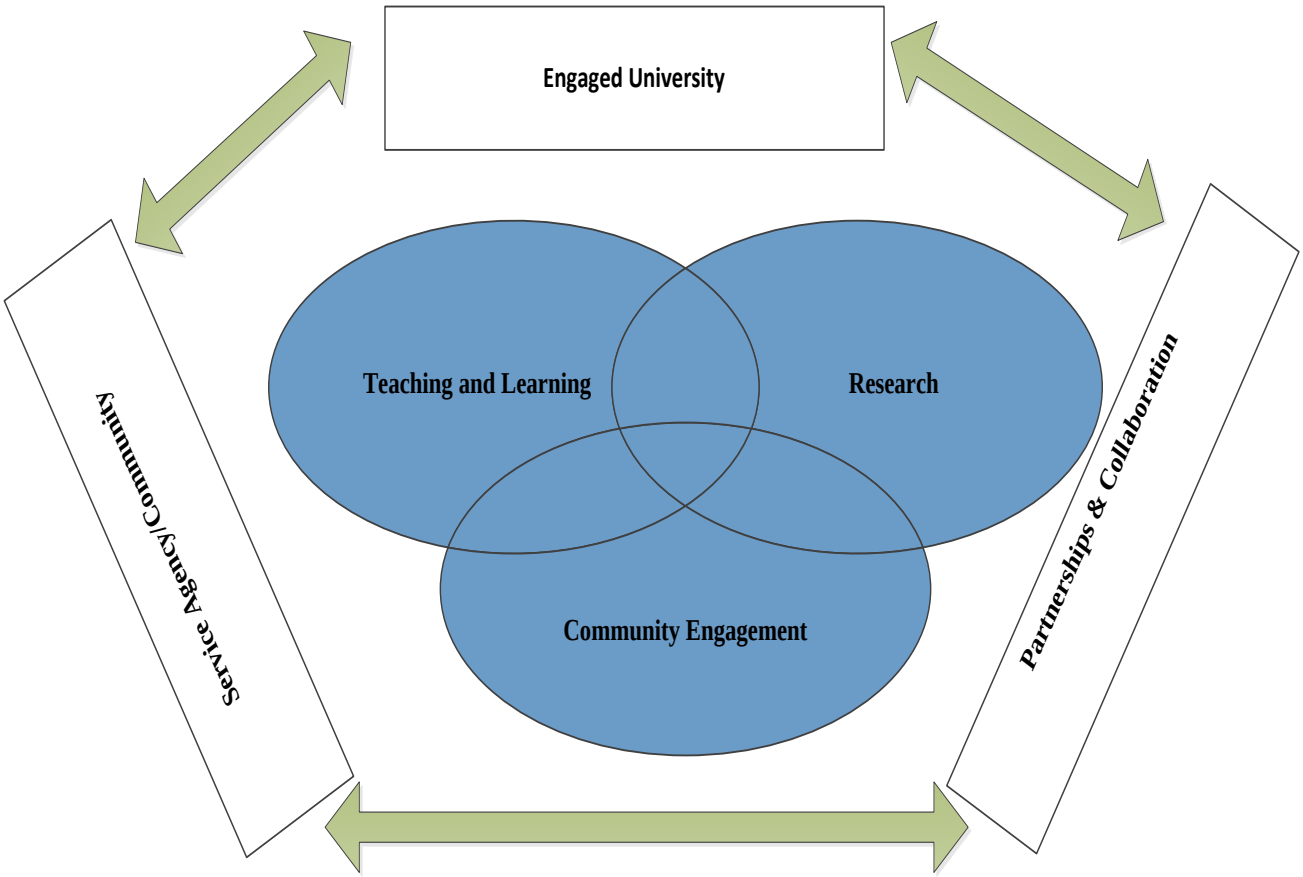


Figure 8 : Infusion Cross Cutting Model for community engagement in HEIs (Bender, 2008a)

The infusion crossing cutting model reflects the requirements of the South African Education Act of 1997, which states that HEIs should have a system whereby their activities benefit the learner and the communities involved and lead to mutual benefit between them. The outcomes of community engagement in line with teaching and learning and research should be able to solve the various issues affecting communities. For instance, when undertaking ICT4D projects HEI researchers need to ensure that the projects they undertake are not categorised in the silo model. To ensure the success of community engagement projects such as ICT4D projects there is a need to adopt the infusion cross cutting model approach. This means that HEIs need to have policies and structures in place to foster these activities. Furthermore, the projects need to ensure they satisfy the basic principles required for community engagement. These include working in partnership and collaboration with the community in order to offer them high quality service. Whilst also acquiring knowledge which informs research and curriculum. The following section further explains how the principles of community engagement influence the successful implementation of ICT4D projects by HEI researchers.

4.4 ICT4D projects and community engagement

According to Heeks (2009), future economic and social livelihood will depend on Information and communication technology (ICT). In support of this notion, Avgerou (2010) states that ICT has the potential to improve the social and economic conditions of individuals and businesses in underprivileged communities which will lead to better living standards. Pade-Khene (2015) further argues that ICTs impact on socio-economic development is unavoidable. This view of ICT has led to the implementation of ICT4D projects in many underprivileged communities with the aim to improve their quality of life. However most of these projects have either partially achieved their goals or failed (Heeks, 2007; Pade Khene *et al.*, 2011; Coelho *et al.*, 2015). Factors such as lack of context and sustainability issues have hindered the successful implementation of these projects (Brunello, 2010; Isabirye, Flowerday & Von Solms, 2013).

Community engagement literature also reveals that in order for community based projects to succeed there is a need to undertake them in such a manner that they satisfy community needs by considering such factors as the indigenous knowledge (Gorjestani, 2000). According to Gorjestani (2000) indigenous knowledge is a vital component of any developmental process as it can help improve effectiveness and ensure sustainability. By considering such factors problems such as lack of context and lack of resources will be minimised increasing chances

of success for community based ICT4D projects undertaken by HEIs. Thus for successful implementation of community based ICT4D projects by HEIs, community engagement principles should also be considered as they have an influence on these projects. The following section will elaborate on this concept in detail.

4.4. 1 Definition of ICT4D projects

According to Fengu and Krauss (2012) ICT includes all the technology that enables the processing, transmission and exchange of information and communication services. Examples of ICT technologies include radios, televisions, computers, mobile phones, printers, fax machines and software (Mtega & Malekani, 2009). ICTs have evolved from a period where they were a needless luxury to being seen as an important developmental tool (Gomez & Pather, 2012). Development with regards to ICT involves using ICT technologies to help reduce the digital divide between the underprivileged and privileged communities. ICT4D aims to provide access to information technology for underprivileged communities in a way that will enhance social and economic development (Heeks, 2010). According to Heeks (2009), there are three ways in which ICT4D projects can address the needs of people in underprivileged communities and these are by being

- Inclusive- ICT4D projects should provide opportunities and services which benefit all the members of the underprivileged communities.
- Enabling- ICT4D projects should be context specific and be in line with the policies and objectives of the community they are being implemented in.
- Focused- ICT4D projects should be undertaken in such a manner that they satisfy and serve the interests of the particular community where the technology is implemented.

Heeks (2009) further states that most ICT4D projects need to shift from bringing technology to the users and focus more on finding new and innovative ways to implement ICT4D projects that are user driven. Pade- Khene *et al.* (2011) also argue that there should be development of collaborative partnerships to help with successful implementation and sustainability of the ICT4D projects whereby, the different parties involved can contribute through financial or non-financial support. Without collaboration factors such as lack of understanding of user needs and sustainability issues occur and these factors affect successful implementation of ICT4D projects among other challenges. In support of this notion, Mtsweni and Abdullah (2014) state that there are four main elements which need to be considered when implementing ICT4D projects. These elements are needs assessment,

collaboration, impact asssessment and sustainability. They are depicted diagramatically in figure 9 and will be used as the guideline for required success factors for ICT4D implementation for the discussion of how community engagement principles influence successful implementation of these projects. These elements are discussed in detail in chapter 2 which discusses the factors that HEI researchers need to consider for successful implementation of ICT4D projects.

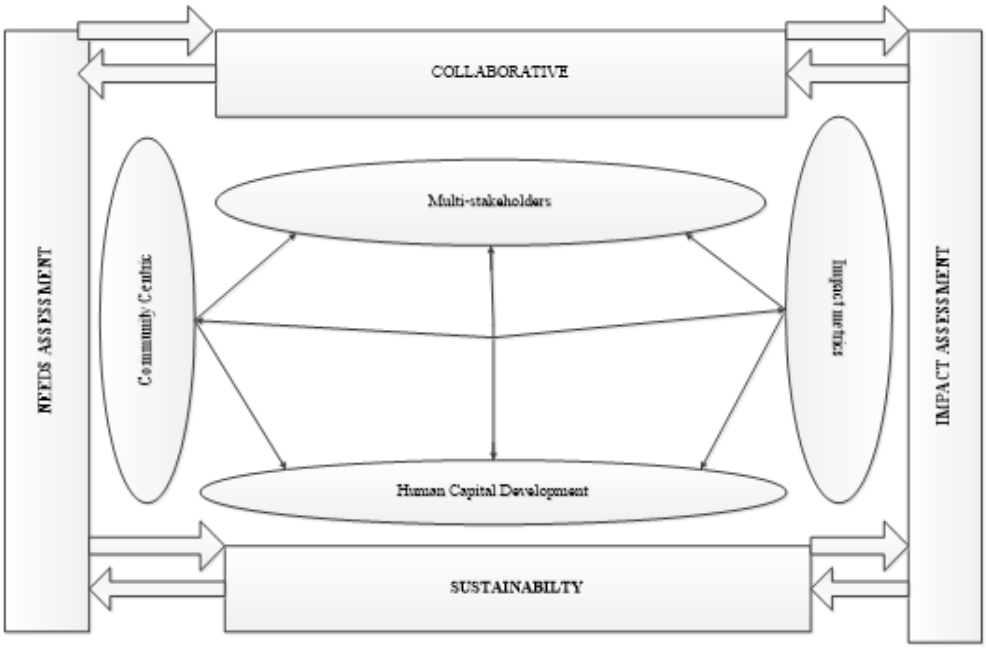


Figure 9: Hackathon Model for successful implementation of ICT4D projects (Mtsweni & Abdullah, 2014)

4.4.1.1 Collaboration

According to Mtsweni and Abdullah (2014) ICT4D projects should be collaborative in nature in order to be successful. They require the participation of different stakeholders from the community members subject matter experts and project champions. In this scenario there is need for effective collaboration between the HEI researchers and community to ensure mutually beneficial relationships when undertaking ICT4D projects that will benefit all parties involved.

Community engagement literature on the other hand also reveals that for successful implementation of community based projects between HEIs and the community, there is need for the HEI researchers and community to work together and build long term relationships (Lavery *et al.,* 2010). These partnerships should be formed over a period of time so that when the community and HEI researchers engage in projects such as ICT4D projects there is already an established relationship. According to Pade Khene *et al.* (2011) partnerships formed over a long period help in the implementation of successful community based projects as they reduce occurrences of issues such as failure to understand user needs which hinder the successful implementation of ICT4D projects.

4.4.1.2 Sustainability

Another major factor identified as critical for the successful implementation of community engagement projects from ICT4D literature is sustainability (Mtsweni and Abdullah 2014). Pade Khene *et al.* (2011) argues that most ICT4D projects undertaken by HEI researchers do not have proper plans in place on how to sustain the projects in the long run, hence they do not achieve the desired outcomes. Marais (2011) further states that there is lack of proper planning and skills training for users with regards to how to use the technology. This tends to have adverse effects on the use of the technology by the community members and this can lead to failure of the project. Thus there is need for proper planning with regards to sustainability of ICT4D projects to ensure success. In support of this notion community engagement literature reveals that the projects should satisfy both immediate and long term goals of the community in which the project is implemented (Lavery *et al.,* 2010). This means that the project should be undertaken in such a manner that it has lasting solutions for community problems in order to be deemed as a successful community engagement project.

4.4.1.3 Needs Assessment

ICT4D literature reveals that for successful implementation of ICT4D projects in the community there is need for a complete needs assessment of the specific community (Mtsweni & Abdullah, 2014). Lack of context due to failure to understand user needs has been one of the major factors hindering successful ICT4D project implementation (Isabirye *et al.,* 2013). Mtsweni and Abdullah (2014) further argues that the needs assessment process should focus more on the community rather than the technology being implemented. One way of doing this is by encouraging local ownership of the project. This has a positive effect on the chances of success of the project as the community members will feel involved in the project and be willing to participate. Encouraging local ownership can help the project

initiators gain access to the indigenous knowledge of the community which is a driver for effective development process in underprivileged communities (Gorjestani, 2000). By using this knowledge, the project initiators, in this scenario the HEI can implement an ICT4D project that meets the needs of the community. Indigenous knowledge can help provide access to accurate information about the capacity of resources available in the community. These resources can include skills, knowledge and financial resources the community is equipped with. In support of this notion, community engagement literature reveals that a community based project has high chances of success if the project provides for opportunities of ownership and control to the community (Lavery *et al.,* 2010). This helps in improving the level of commitment the community members will have to the project and there are higher chances of this project being successful.

4.4.1.4 Impact assessment

According to Mtsweni and Abdullah (2014) impact assessment is one of the most critical components of succesful ICT4D implementation. Impact assessment involves determining the impact the project will have on the community at the initial stages. The effect should be observed from the field and it requires commitment from all stakeholders involved (Mtsweni & Abdullah, 2014). Impact asssessment for ICT4D projects in the community does not only require commitment on the community side, but also on the project implementers' side, which in this case is the HEI researchers. Community engagement literature reveals that in order for a community based project to be successful and have mutual benefit, there is need for the project to be in line with the HEI mission and goals (Tapia *et al.,* 2005). Participation should involve the whole educational institution from management, faculty, department and the students involved. Lack of proper support or commitment from one of the parties involved will hinder the success of the project.

In support of this notion ICT4D literature reveals that most of the ICT4D projects undertaken by HEI researchers in communities are not properly integrated and included in the HEI mission and goals and curriculum (South African Council on Higher Education, 2010). Maistry and Thakrar (2012) further argue that most community engagement projects undertaken by HEIs are not properly planned and are more of individual endeavours. This is a major challenge with the regards to impact assessment as it hinders the ability to have proper evaluation and follow ups on the ICT4D projects which can lead to failure. One of the ways in which to motivate proper evaluation and monitoring of ICT4D projects is by

rewarding the HEI researchers whose projects make great impact. The University of Fort Hare and Rhodes University have such an award for the best community engagement project.

Thus, for successful implementation of ICT4D projects both success factors for community engagement and ICT4D should be considered since ICT4D projects are also community engagement projects. From the previous discussion it is also clear that ICT4D success factors and community engagement principles have the same goal. That is, implementing successful projects which meet community needs. The following table provides a summary of the factors that where discussed in the previous section.

Table 3: ICT4D success factors and community engagement principles

ICT4D success factor	Community engagement principle	Authors
Collaboration	• Building of long term relationships between the stakeholders (HEI and community) that will be a basis for future projects • Engage in mutually beneficial projects	(Mtsweni & Abdullah, 2014; Carnegie, 2015; Tapia *et al.*, 2005; Jacobs *et al.*, 2015).
Sustainability	• Community engagement projects should satisfy both immediate and long term goals of the community • The projects should have measurable outcomes on community and enhance the knowledge and curriculum of the students involved.	(Mtsweni & Abdullah, 2014; Tapia *et al.*, 2005; Marais, 2011; Pade Khene *et al.*, 2011; Lavery, *et al.*, 2010)
Needs assessment	• The community engagement project should satisfy the needs of the community, which is solve critical issues affecting the community. • The project should be productive and be initiated by	(Mtsweni & Abdullah, 2014); Tapia *et al.*, 2005; Heeks, 2009); Lavery *et al.*, 2010; Gorjestani, 2000).

	the community.	
Impact Assessment	• All stakeholders should be committed to the project from the initial stages through to evaluation.	(Mtsweni & Abdullah, 2014; Pade Khene *et al.*, 2011; Tapia *et al.*, 2005)

4.5 Conclusion

This chapter discusses how community engagement principles influence the successful implementation of ICT4D projects by HEIs in communities. A background on community engagement and the different models that HEIs apply for community engagement is discussed. This was followed by a detailed discussion of the ICT4D success factors using the hackathon model and how they relate to community engagement principles. The outcome of this discussion is that ICT4D projects implemented in communities are also community engagement projects. Hence for them to succeed both ICT4D success factors and community engagement principles should be applied when undertaking them to ensure successful implementation. The following chapter discusses the research methodology guiding this study.

Chapter 5- Research Methodology

5.1 Introduction

Chapter one of this research identifies and provides the background for the problem being investigated in this research. The research investigates, how HEI researchers can apply community engagement principles for the successful implementation of ICT4D projects. The preceding chapters (two, three and four) are literature review chapters which help in answering the main research question. Chapter two discusses the factors that HEIs need to consider when implementing these projects. Chapter three provides the challenges that HEIs face when undertaking ICT4D projects and Chapter four discusses community engagement principles in relation to the successful implementation of ICT4D projects. This chapter, which is Chapter five of this research provides a detailed description of the research methodology applied in undertaking this research study. The chapter includes a detailed description of the research process followed in this study. Areas to be covered include a discussion of the philosophical research paradigm applied in this research, the research strategy, data collection and analysis methods. In the following section an introduction of what research methodology entails is provided.

5.2 Research Methodology

According Kinash (2012), research methodology refers to the discipline or body of knowledge that provides practices or techniques that improve how research is conducted. In support of this notion Hofstee (2006) states that the purpose of a research methodology is to provide a clear and unambiguous roadmap of how a research reached a conclusion. Hofstee (2006) further mentions that through the research methodology an independent reader should be able to understand the process by which a conclusion in a study was drawn. Researchers therefore design a process that shows what data is required for the study, then they decide on how this data will be obtained and also mention the procedures that will be used to analyse the data (Saunders & Tosey, 2012). The research methodology applied in this study is thus depicted in a metaphor of a research onion in Figure 10.

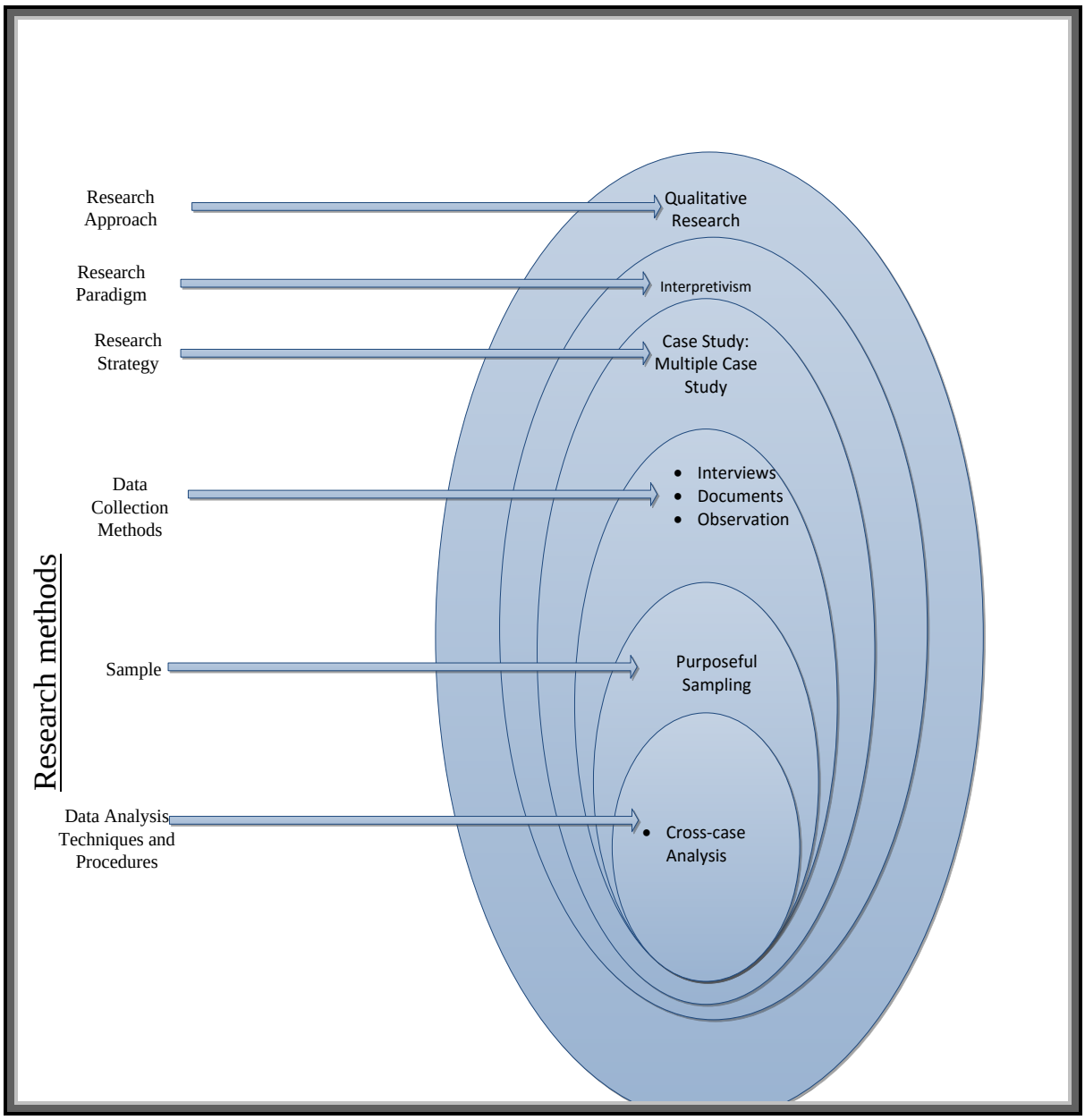


Figure 10: Research Onion Adapted from (Saunders, et al., 2012)

The research onion in Figure 10 diagrammatically illustrates the different techniques and procedures that make up the research methodology of this study. In summary, this study uses the qualitative research approach to answer the research question which is "*How can HEI researchers apply community engagement principles for the successful implementation of ICT4D projects?* "Qualitative research is the chosen research approach because it helps the researcher establish facts about the identified problem through providing an in depth understanding of the phenomenon under study. The research paradigm is interpretivism, and the researcher views reality as a social construction. This entails that the researcher aims to

gain in depth knowledge from people's experiences that is the people involved in the ICT4D projects and use this knowledge to come up with a solution for the problem under study. The research approach applied is the case study method specifically the multiple case study. The data collection techniques are secondary data gathered through from sources such as books and electronic sources and primary data is gathered through semi structured interviews and observation. The data is analysed using cross case analysis. The final outcome is a model that will help HEI researchers successfully implement ICT4D projects in communities by applying community engagement principles. The following sections will describe the research methodology in detail. These sections include the discussion of the research paradigm, research strategy, data collection methods, sample and data analysis techniques and procedures.

5.2.1 Research Paradigm

According to Saunders *et al.* (2012),there are different philosophies from which the world can be viewed and neither philisophy is essentially superior to the other. Instead they are better at understanding different phenomenon. Figure 11 shows the positivist and interpretivism paradigms as two extremes of a continuum (Collis and Hussey, 2009). It depicts the variance of views of reality between positivism and interpretivism and illustrates that the research is rarely positivist or interpretivist, but leans towards either paradigms based on the way the researcher views reality.

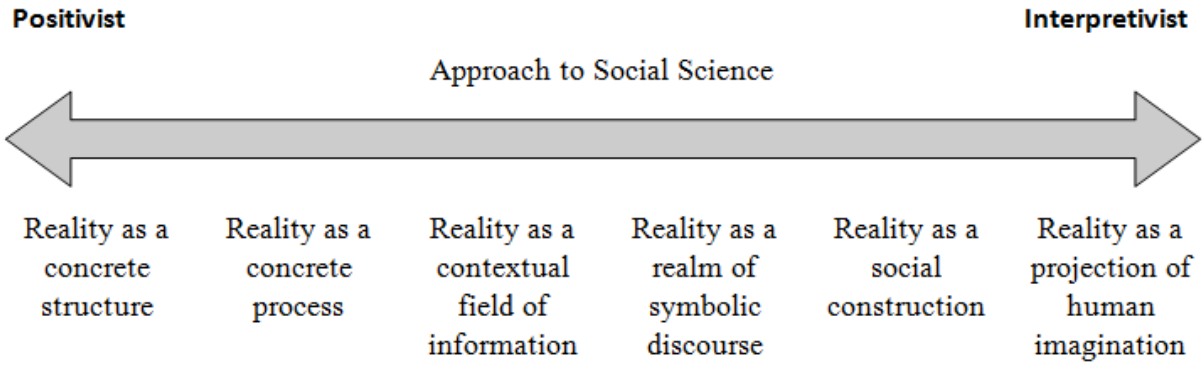


Figure 11: Typology of Assumptions on a continuum of paradigms (Collis & Hussey, 2009)

This study views reality as a social construction which places emphasis on deriving knowledge from peoples' experiences and how they interact with the environment, then interpereting this knowledge to come up with a solution for the phenomenon under study (Saunders *et al.*, 2012). Hence the research study leans more towards interpretivism. The interpretivist paradigm is suitable for this research because it will help the researcher acquire

knowledge from the people who have been involved in the implementation of ICT4D projects involving HEI researchersand the communities. This knowledge will then be usedto come up with a solution in the form of a model that will help HEIs to successfully implement ICT4D projects in the communities.

Oates (2006) further states thatintepretivism does not aim at proving or disproving a theory as is the case with positivism, but rather at identifying and understanding the interactions and interelations within a given setting. Creswell (2014) also states that unlike positivism where explanations for human behavior are based on observable empirical evidence, interpretivism focuses on how meaning is constructed by individuals in a social context. Hence in this study the researchers' aim is not to prove or disprove a theory but rather to come up with a model that will help HEIs successfully implement ICT4D projects in the communities. This will be done through understanding how the projects where implemented based on the knowledge and experiences of the people in the communities and the project leaders from the HEI within a particular setting. In order to attain the desired results from this study which aims to answer a "How" question of "*How can HEI researchers apply community engagement principles for successful implementation of ICT4D projects?"* there is need for the use of the interpretive approach as it provides in depth exploration. Creswell (2003) states that interpretivism provides a greater depth of exploration before theories or variables can be analysed . Whilst positivism already has variables and theories in place which can be tested and verified. The research approach is discussed in the following section.

5.2.2 Research Approach

There are three common approaches used in research which are quantitative, qualitative and mixed methods. The qualitative research method will be used in this study. Qualiative reseach attempts to attain a deep understanding of phenomenom being studied and produce findings that were not determined before (Hancock *et al.*, 2009). The qualitative approach to research uses inductive logical reasoning to answer questions and construct meaning from social experiences (Hancock *et al.*, 2009). Thomas (2006) states that inductive reasoning involves generating themes, concepts or models through interpretations made from raw data. Hence from the raw data generated from the interviews the outcome of this research will be a model for successful implementation of ICT4D projects in the communities for HEIs in South Africa. The following section describes the research strategy that is applied in this study.

5.2.3 Research strategy

According to Yin (2009) a research strategy is a logical plan which shows how to get from here to there, where here is the initial set of questions, and there are the answers or conclusions about these questions. The research strategy is the roadmap that shows the basis for the methodology through which the research is undertaken. This research will use the case study strategy which is discussed in detail in the following section.

5.2.3.1 Case study

Yin (2009) states that case studies are used when answering "how" and "why" questions. In this research the question being investigated is *"How can HEI researchers apply community engagement principles for successful implementation of ICT4D projects?* "When answering how or why questions an in depth understanding of the problem being studied is required (Yin, 2009). The case study method therefore provides the researcher with an in depth understanding of the problem. With the case study method, the researcher gets to view the problem from a variety of angles using multiple sources of evidence such as archival records, documents, interviews and participant observation (Baxter & Jack, 2008). Yin (2009) further states that case studies are a useful method of research as they provide real-life information and evidence. According to Barratt *et al.* (2011),other important characteristics to consider when conducting case study research are the units of analysis, number of cases to be used, case selection criteria, data collection methods and data analysis techniques. These factors will be briefly described in the following section.

Units of analysis

Yin (2009) states that the unit of analysis is the case to be studied. In this research the unit of analysis is focused on investigating how HEI researchers can apply community engagement principles for the successful implementation of ICT4D projects in various communities.

Number of cases

This research uses four cases, meaning that it employs the multiple case study approach. Yin (2009) states that by using multiple cases, the results of phenomena being investigated are more generalizable as compared to using a single case study. In support of this notion, Baxter and Jack (2008) state that a multiple case study method produces reliable and robust results. The multiple case study method allows for close collaboration between the

researcher and participants. Collaboration enables the participants to be able to share their stories and describe their own views of reality, thereby providing the researcher with the much needed knowledge and experience which helps them understand the participants' actions better (Baxter & Jack, 2008). This helps the researcher produce information rich results for the phenomenon under study. The four case studies selected for this research are the ICT4RED project, Siyakhula Living Labs project, Aloe project and Zenzeleni Project.

Case selection criteria

The most dominant sampling method in qualitative research is purposeful sampling (Patton, 1990). Purposeful sampling involves selecting information rich cases from which an in depth study can be conducted for the purpose of the research (Patton, 1990). In support of this notion Kuzel (1999) in Shakir (2002) states that when using a multiple case study, it is recommended that for the research to be of high quality, selection of cases should be based on appropriateness and adequacy. Appropriateness deals with identifying whether a case is relevant and fits the purpose of the research. Eisenhardt and Graebner (2007) also state that cases should not be randomly selected, but they should be selected according to the relevance of theoretical knowledge they have to the study. Rowley (2002) mentions that when selecting cases, factors such as the research purpose and theoretical context are vital in determining the case studies to use. The case studies used in this research were selected because they provide rich and relevant theoretical knowledge that will help in investigating how to ensure successful implementation of sustainable ICT4D projects by HEIs in the communities. The cases selected are all ICT4D projects undertaken by HEI researchers in South Africa in identifiable communities around them. These case studies are well documented cases in which the researcher has access to the core stakeholders such as project leaders and community members.

Population and Sample

The study sample was four cases, from which six people were interviewed. Four of the people were the project leaders from various HEIs involved in the ICT4D projects of the cases being studied. The other two were community members in the various communities in which the ICT4D projects were implemented. The two community members were selected through the snowballing technique. The researcher asked the project leaders to help recommend the community members who can be interviewed based on the knowledge they have about the ICT4D projects. The community members interviewed all hold the position of

project champions for the ICT4D projects in their communities. The community members interviewed were from the Zenzeleni and ICT4RED projects. However, the sample was a limitation of this study as the researcher could not interview an equal number of community members as that of project leaders. This is because the researcher did not manage to communicate with the community members from the other two projects.

5.2.5 Data Analysis method

According to Thorne (2000), data analysis is the most difficult part of qualitative research. It is a phase whereby the researcher generates the raw data into meaningful information through analysing it. This research used cross case analysis to analyse data. According to Yin (2009) this technique is ideal for analysing multiple case studies. Cross case analysis regards each case study as a separate study and then combines the findings from these studies (Yin, 2009). Goodrick (2014) states that cross case analysis involves analysis of the similarities and differences of more than one case that have a mutual goal. From the four case studies the individual strengths and weaknesses were identified in terms of successfully implementing the ICT4D projects . The findings in the individual cases were gathered through in depth document analysis, interviews and observations. From the individual strengths and weaknesses, the similarities and differences in these cases were established using thematic analysis. The findings from the the four cases were grouped according to themes. Using this data, a model that will help HEI researchers successfully apply community engagemnet principles to successfully implement ICT4D projects in communities was developed. The following section describes how the interview guide was developed.

5.3 Development process of the interview guide

Yin (2009) states that, a case study should have a mental framework that the researcher aims to describe using the data collected. This entails that the interview questions developed for this study had to answer specific questions. For the purpose of this study the development of the mental framework was guided by the literature review. During data collection the researcher had to ensure that the interview questions answer the following questions.

- What factors should HEI researchers consider when implementing ICT4D projects to ensure success?
- What challenges are currently faced in terms of implementing ICT4D projects in communities by HEI researchers?

- How can community engagement principles influence the successful implementation of ICT4D projects by HEI researchers?

The study aims to develop a model that will help HEIs successfully implement apply community engagement principles for the successful implementation of ICT4D projects in the communities. Hence, to attain the desired outcome the three questions above had to be addressed. The interview guide was designed with two different set of questions, one for the project leaders who are HEI academic researchers. The other one was for the community members with the role of project champions from the respective communities where the projects were implemented. The interview guide is attached as **Appendix 2.** In the following section a detailed overview of the case studies and analysis of the primary data is provided. The following section discusses the quality criteria for the case study design of this research.

5.4 Case study quality criteria

Yin (2014) states that the quality of a research design can be evaluated using certain tests. The concepts that have been used for such tests include trustworthiness, confirmability, credibility and data dependability. However, for social empirical research such as case studies, four tests are commonly used namely construct validity, internal validity, external validity and reliability (Yin, 2014). These tests help reduce the shortcomings that positivists have with regards to the interpretive approach (Oates, 2006). Therefore, this research study employs the four tests for case study quality criteria. Table 4 shows the tests, case study tactic and phase of research in which tactic is employed for this study.

Table 4:Case Study Tactics for Four Design Tests (Yin, 2014)

Tests	Case Study Tactic	Phase of research in which tactic occurs
Construct Validity	• Use multiple sources of evidence • Establish chain of evidence • Have key informants review draft case study report	• Data collection • Data collection • Composition
Internal Validity	• Do pattern matching • Do explanation building • Address rival explanations • Use logic models	• Data analysis • Data analysis • Data analysis • Data analysis
External Validity	• Use replication logic in multiple case studies	• Research design
Reliability	• Use case study protocol • Develop case study database	• Data collection • Data collection

According to Yin (2014) the four tests in Table 4 should be given attention throughout the conduct of the study. Yin (2014) states that construct validity refers to identification of the correct operational measures for the concepts being studied. Therefore, to enhance the construct validity of this study, data is collected from multiple sources which are interviews, observations and document analysis, this helps in that the information gathered through interviews is supported by information from literature gathered through document analysis. This research further enhanced construct validity by ensuring that after compiling the draft case study reports they were reviewed by the participants so as to verify the information that was captured.

With regards to internal validity, Yin (2014) mentions that internal validity is the extent of pursuing the establishment of casual relationships, whereby certain situations are believed to lead to other situations. For internal validity this study uses pattern matching and explanatory building through cross case analysis of the four cases.

Furthermore, Yin (2014) states that external validity refers to defining the context to which the findings of the study can be generalized. This entails that external validity aims to

identify whether the findings are generalizable beyond the case study. In this study multiple cases regarding the implementation of ICT4D projects by HEIs in South Africa are used to help come up with a model for successful implementation. By using the multiple case study method this study aims to ensure that the model will be generalizable to all HEIs in South Africa who are implementing ICT4D projects.

Lastly the fourth test for case study quality criteria is reliability. According to Yin (2014), reliability aims to validate that, the way the study was conducted such as the data collection processes can be repeated with the same results. In the context of this study attempts to increase the reliability of this study was made by ensuring that there is a full description of the way the data is collected and analysed. This will help ensure that the processes can be followed through and still attain the same results. The following section discusses ethical considerations.

5.5 Ethical considerations

For the purpose of this study, the researcher interacts with the participants using a semi structured questionaire as a guide. As such Creswell (2011)states that the researcher is obliged to respect the rights and values of the participants. Therefore to ensure that the rights and values of participants are upheld, the reseracher applied foran ethical clearance approval from the University of Fort Hare Research Ethics committee to enable the researcher to collect data for this study. The reference number of the ethical clearance certificate is **ISA031SMK001**. Furthermore, the researcher understands that exploiting the ethical rights of individuals taking part in a research is prohibited. Hence the researcher complied with all factors relating to ethical standards when conducting this research. According to Saunders*et al.*(2012) the following ethical considerations should be considered during data collection

- Preserving the confidentiality of data and anonymity of the participants,
- Informing the participants of the voluntary nature of the study and their right to withdraw or participate in the study.
- Participants should be informed of how the data collected will be used as well as the third parties who might have access to the data.

The reseacher made sure that the above mentioned factors will be complied with in this research prior to, during and after the collection of data.

5.6 Conclusion

This chapter provides a detailed description of the research methodology applied in this study. Figure 12 shows a diagrammatical representation of the different methods, techniques and procedures that guide the research methodology. The following chapter provides discusses the findings based on the primary data gathered through the interviews and literature review.

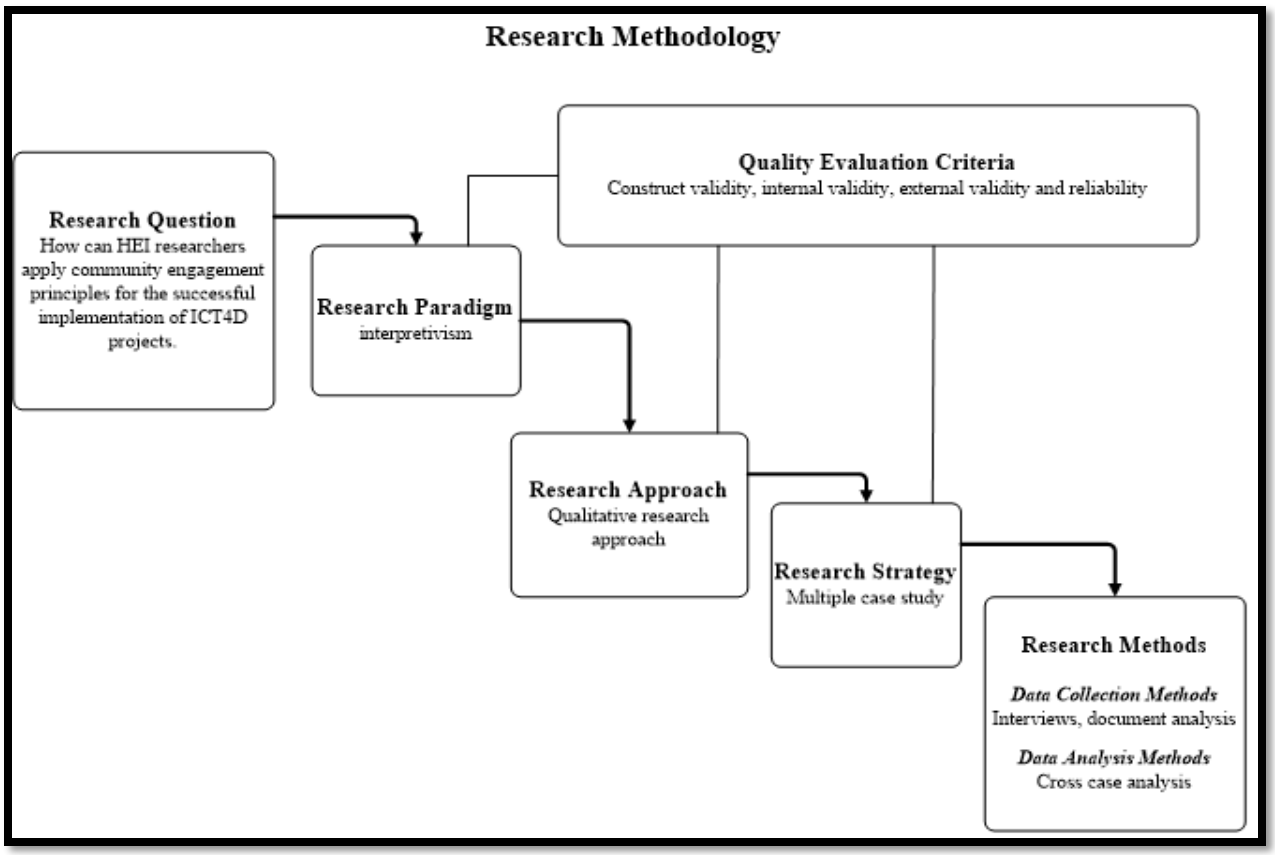


Figure 12: Summary of Research Methodology

Chapter 6- Analysis of Empirical findings

6.1 Introduction

Chapter one of this research identifies and provides the background for the problem being investigated in this research. The research investigates "*How can HEI researchers apply community engagement principles for the successful implementation of ICT4D projects in the community*" The preceding chapters (two, three and four) were literature review chapters which help in answering the main research question. Chapter two discusses the factors that HEI researchers need to consider when implementing these projects. Chapter three provides the challenges that HEI researchers face when undertaking ICT4D projects and Chapter four discusses community engagement principles in relation to the successful implementation of ICT4D projects by HEI researchers. Chapter five of this research provides a detailed description of the research methodology applied in undertaking this research study. The chapter includes a detailed description of the research process followed in this study.

This chapter, chapter six, provides a detailed analysis of data gathered from the four cases of ICT4D projects used in this research. The process that was followed during the analysis of the data in this study is detailed in the following sections. The researcher used semi structured open ended interviews to attain the primary data. Primary data was also gathered from observations made during a community engagement workshop the researcher attended at her institution. Furthermore, literature on the ICT4D projects was also used as supporting evidence. The primary data was then transcribed and analysed using supporting literature in the process of coming up with themes that informed the development of the model which is the artefact of this study.

The interview process consisted of a total of six participants. The participants were selected using purposeful sampling. All of the six participants were very knowledgeable and had been involved in the ICT4D projects used as case studies in this research. Four of the participants were academic researchers who assumed the role of the project leaders in the ICT4D projects. The other two participants were community's members who assumed the role of the project champions from the respective communities where the projects where implemented.

The participants selected for this research study helped the researcher attain in depth information required in the development of the model. The model will help in the successful implementation of ICT4D projects by HEI researchers through application of community engagement principles. The model is presented in the last section of this chapter. The following section describes the analysis process that was applied. It then discusses the findings from the primary data together with related literature to come up with themes for this research which informed the factors that were included in the model.

6.2 Overview of case studies

This section provides a detailed overview of the 4 cases that were used in this study.

6.2.1 ICT4RED Project

The ICT4RED project was launched with the aim to conduct a large scale pilot study that tested the use of tablets as part of teaching and learning in schools. The project aimed to introduce appropriate technology which would enhance teaching and learning and be aligned and integrated into the current teaching processes (Herselman & Botha, 2014). The project was implemented in the Nciba school District in Cofimvaba in the Eastern Cape Province in South Africa. The various stakeholders involved in the project besides the community included the CSIR Meraka, Department of Science and Technology, Department of Rural Development and Land Reform, Department of Education and the HEIs such as Rhodes and Fort Hare who were involved through their students. The pilot study was conducted over a period of three years from (2012-2015) in 26 rural schools. According to Ford *et al.* (2014), the project was implemented in four phases:

- Phase zero- Desktop research from 2011 to 2012
- Phase one- Test project in one school (2012-2013)
- Phase two- Redesign project and implement lessons learnt from phase one in 11 schools (2013-2014)
- Phase three- Final redesign including lessons learnt from phase two and implement project in 14 schools (2014-2015).

To ensure the successful implementation of the project, in depth desktop research was undertaken to acquire knowledge from similar projects (Herselman & Botha, 2014). The project was planned in such a manner that there were different project champions who were experts in different domains for various components of the framework for the project. The project framework had a total of 12 components. For example, there was a champion for ICT

infrastructure, project management, research, stakeholder management, change management, and community engagement among others (Williams, Marais & Rampa, 2013). The team responsible for change management and stakeholder management went to the Cofimvaba district to conduct needs assessment and to ensure community involvement before the project was initiated. The community members were invited to meetings where the project was explained to them in their local language. They were also provided with the opportunity to put forward suggestions and pose questions with regards to the project.

According to Ford *et al.* (2014), initially the steering committee for the project had included the funders and the implementers, but not the beneficiaries. It was then discovered that there was need to have more interaction with the beneficiaries and this led to the inclusion of the community engagement and stakeholder management component in the project. Furthermore, sound research and implementation of the project in iterations helped the project team incorporate the lessons learnt in each iteration towards improvement of the project (Williams *et al.,* 2013). An evaluation report was used to help in this process and interviews with the various stakeholders such as the teachers, learners and district officials in each phase helped in the improvement of the design of the framework used for the project (Williams *et al.,* 2013).

Proper skills transfer was also an important component in the success of the ICT4RED project. For the teachers to acquire the necessary skills required, the project team employed the incentive of earn as you learn approach to motivate the teachers to learn how to use the tablets (Herselman & Botha, 2014). The teachers were trained on using the tablets for teaching and learning, and if they successfully completed training they would receive their own tablet. The teachers would receive a badge for every module they completed and once they had earned enough badges they would be awarded the tablet. The badging system helped for timeous identification of further technology needs and for champions to be recognised (Botha & Herselman, 2015). These champions were provided with the opportunity to train the other teachers and some of them could issue badges as well. All the teachers worked hard and managed to pass the modules required for training and earn their tablets (Herselman & Botha, 2014). Besides acquiring skills for the use of technology in the classrooms the teachers also acquired skills they could use for their personal and professional duties (Williams *et al.,* 2013).

For long term sustainability of the project, there was need to ensure that all the schools had sufficient ICT infrastructure in place such as better access to electricity, satellites and Wi-Fi for internet access that they used to download content, security, storage and charging stations for the devices (Herselman & Botha, 2014). However, there were challenges faced with regards to, the state of the buildings which needed upgrades to safely secure the equipment and also the quality of electrical infrastructure was poor. There was also an issue of financial sustainability in terms of operational costs and cost of electricity to sustain the equipment for long term operations (Herselman & Botha, 2014). Consequently, the project team with the help of the province and circuit manager, developed a sustainability plan to support the teachers and learners after the project was completed (Herselman & Botha, 2014). However, funding still remains a challenge with regards to long term sustainability of the project.

In terms of impact, other provinces in South Africa are using the training material used in the Nciba district to train their own teachers. Global Universities in Morocco are translating the same material to Arabic to train their teachers as well (Herselman & Botha, 2014). The ICT4RED project also contributed to the field of research for ICT for Education and Rural Development Evaluation. Several published papers have been delivered in both local and international conferences and some published in various journals. Furthermore, in the Nciba school district Herselman and Botha (2014) state that the tablets have helped with better planning and improved the skills teachers have which are required for the 21st century learning process. The teachers feel empowered with new knowledge and are applying this knowledge in their teaching strategies.

6.2.2 Siyakhula Living Lab Project

The Siyakhula Living Labs project was initiated in 2005 with the aim to develop and field-test a prototype of multifunctional, distributed communication platforms that could be implemented in marginalized communities in South Africa (Ranga *et al.*, 2010). The project was launched by the academia of University of Fort Hare, Rhodes University and other stakeholders. The targeted community for the project is the Dwesa community in the Eastern Cape Province in South Africa.

In 2009 the project adopted the living lab approach which involved developing user driven products and services that were introduced and tested in real life scenarios. The Siyakhula Living Lab Project has benefited the Dwesa community in a variety of ways. The community members have acquired computer skills that have provided them with better access to

information that helps them to contribute to participatory work and research concerning ICT in their community (Dugmore, 2012). Besides that, the ICT platforms support other value adding services such as e-commerce which help the local people involved in the arts and craft industry to sale their products to global customers. With over 60 percent of South Africans not having internet access and not knowing how to use it to enhance their lives, the Siyakhula Living Labs has made tremendous progress in improving their quality of life (Dugmore, 2012). Since its initiation in 2005 the Siyakhula Living Labs has since expanded. The project has managed to deploy ICT network access to more than 17 schools in Dwesa and the user base for the Siyakhula Living Labs was approximately 200 community members and 4500 learners in the 17 participating schools (Dalvit, Sieborger & Thinyane, 2011).

In order to successfully undertake an ICT4D project of such magnitude, Dugmore (2012) states that the research for the project started in 2002. The research started with students who were researching towards developing software systems suitable for rural communities such as e-commerce and e-health platforms. In 2005, to help ensure a complete needs assessment process and to establish a more concrete relationship with the community, members of the project team actually lived in Dwesa, and would take turns to do monthly trips and stay there (Gumbo *et al.*, 2012). Needs assessment is an important component of the successful implementation of projects in the community.

With regards to skills transfer, the researchers would take turns and conduct computer literacy training in the Dwesa community. Gumbo *et al.* (2012) states that teachers and community members who were competent were trained and then they would train the others. Gumbo *et al.* (2012) further mentions that when the community members where trained in their local language they showed more interest. The computer literacy training course was based on ICDL and after completion they would get a certificate of competence. However, some of the community members expressed concern in relation to having accredited certificates. Fortunately, the Siyakhula Living Labs Project generated a lot of interest among various stakeholders and this resulted in the Department of Education getting involved in the project. The department of Education funded the Advanced Certificate in Education (ACE) specialising in ICT. According to Dalvit *et al.* (2011) this Certificate was a huge achievement in the project and is a two-year course done at Rhodes University which prepares teachers to use ICT in teaching. From a technical perspective, the system is robust and less prone to problems such as viruses and crashing or freezing which is important where

technical expertise is not always available. These factors discussed provide the project with the required technological sustainability.

In the academic field in South Africa, the Siyakhula Living Labs Project has made recognisable impact. Dugmore (2012) states that the project was awarded the distinguished Vice- Chancellors' community engagement award at Rhodes University for its contribution to mutually beneficial and socially important projects in the community. At both HEIs involved in the Siyakhula Living Labs project, students involved through research have their learning outcomes assessed according to their work on the project. In terms of informing research, the Siyakhula Living Labs has made a lot of publications over the years which could help other project implementers learn from them. One of the community members who acquired ICT skills from Siyakhula had a documentary which was aired on national television in order to inspire other people in underprivileged communities to acquire such skills as well (Dugmore, 2012). Furthermore, to keep the various stakeholders well informed about the state of the project, the Siyakhula Living Lab project team hosts workshops with the various stakeholders where they discuss about the future direction of the project.

However, although the project can be deemed successful, there have been various challenges faced during its implementation. From the onset of the project the researchers and project implementers faced various infrastructural challenges such as poor electricity and huge temperature variances which could affect the equipment (Dalvit *et al.*, 2011). Dalvit *et al.* (2011) also mentions that with the expansion of the project there were social challenges regarding getting community buy in with regards to the criteria of expansion of the project. Furthermore, with the expansion of the project and its potential to impact more underprivileged communities in South Africa, funding was observed as another issue (Dugmore, 2012). The initial project in Dwesa was funded by Telkom, but if the project was to expand the government had to come on board. However, the project team had not yet acquired funding from the government.

6.2.3 Zenzeleni Project

The Zenzeleni project, previously known as the Mankosi project, was launched in 2011 by the University of Western Cape and the targeted community for the project is the Mankosi community in the Eastern Cape Province (Bidwell *et al.*, 2013). The aim of the project is to implement sustainable telecommunication services in rural areas which can be replicated to other rural communities. In Mankosi there has been deployment of solar charging stations

and after discussions with the tribal authority of Mankosi in 2012, a wireless mesh network was also developed which led to the installation of solar powered public phones in various households in 10 villages (Rey-Moreno *et al.,* 2013). The network intends to provide cheaper voice services for the community and also the network could be easily used for providing Internet access to the community in the future. The project was motivated by the fact that the people in Mankosi

- Battle to charge their phones because there is not a lot of mains electricity, you have to walk a long way, leave the phone somewhere overnight, pay someone to get them to charge you phone.
- Even though they have a lot of network coverage it is very expensive for them to sue the normal service operators and it takes a very significant chunk of their income which comes from a variety of sources, which is not very much.

In order to identify these problems, the academic researchers had been working with the Mankosi community since 2004. Hence the needs of the community were determined using ethnographic action research **(**Rey-Moreno *et al.,* 2013). Since the researchers started working with the community they would each take turns to stay within the community. Rey-Moreno *et al.* (2013) further states that at one point the lead researcher stayed in Mankosi for more than 16 months. Furthermore, Bidwell *et al.* (2013) mentions that there are local researchers who are part of the team and have stayed in Mankosi since birth who helped in bridging the gap between the team and the community. This was done in order to have an in depth understanding of how the community lived and become part of the community. Through this insight the Mankosi telecommunications project was developed. Another important factor that the HEI researchers observed was the recognition of the hierarchy or political setting of the Mankosi community. The researchers knew they had to follow the community's values, hence the project was first discussed with the tribal authority. According to Bidwell *et al.* (2013) the first discussions on the project were with the tribal authority in order to seek approval. The tribal authority then informed the community members and the project was discussed with them in order to get their buy in as well.

Skills transfer was provided in the most interactive way possible. The community members were taught about solar charging and network management in a hands on manner **(**Bidwell *et al.,* 2013). They were responsible for setting up the solar stations as well as installing and

upgrading the various network components themselves. This was done in order to encourage ownership of the project with regards to social sustainability. Furthermore, in terms of the technical aspect the training provided the community members with sufficient skills to enable them to not only construct but maintain the hardware themselves.

For financial sustainability of the project, the community has a cooperative known as Zenzeleni Limited. The cooperative acquires income through revenue generated from charging phones and helps in covering maintenance costs **(**Rey-Moreno *et al.,* 2013). Rey-Moreno *et al.* (2013) further states that the board members of the cooperative have the responsibility of deciding how much it cost to charge phones, make calls, collect the revenue and allocate it for various purposes. Besides money from the cooperative, the project has also been able to attract several small grants and recently the Internet society financed for the upgrading of the network. The major aim of the project is to reach a point where sufficient income is generated from charging phones, making voice calls and data. This will help ensure that the community can sustain the project themselves and do not require capital from external parties.

In terms of impact the Zenzeleni Project has made a lot of impact both within and outside the Mankosi community. The community members have been empowered and the project helps in reduction of communication costs for them. They have also acquired knowledge and skills that help them in maintaining their project. In the academic community, there has been various publications and conferences where information about the project is shared.

However as with many ICT4D projects, the Zenzeleni project has experienced various challenges. Firstly, there is the issue of funding, it is very expensive to finance the project and a lot of funding is required for it. Rey-Moreno *et al.* (2013) also states that there have been social challenges with regards to the ownership of the project. In 2013 data collected showed very limited use of the public phones. This was partly due to the belief that the community members did not understand the public nature access of the phones. They were of the notion that the phone was meant for the tribal authority and they could only charge their phones (Rey-Moreno *et al.,* 2013) this issue was rectified through various meetings however another challenge was also noted which privacy is. The researchers discovered that the people prefer making calls from their mobiles phones other than from public phones. Hence they are working towards resolving such issues.

Other challenges include legal challenges with regards to how to make the telecommunications system 100% legal and get it to handle the capacity of more calls. There is also a barrier to access by gender and age. Rey-Moreno *et al.* (2013) state that there is limited participation of women and the youth in the project. There is need to find ways to ensure that women participate in the meetings and the youth develop an interest and are more involved in the project. Bidwell *et al.* (2013) also mentions the issue of time, although there were not many conflicts with regards to time in the project, she argues that ICT4D project implementers need to be aware of the timelines. For example, at a particular point in the project, meetings for the project had to be accelerated as some of the researchers had limited time they could spend in Mankosi and this caused tension. However overall the project follows the timescales set by the community cooperative and this helps in reducing conflicts.

6.2.4 The Aloe Project

The Aloe Voice Based e-market place project was launched with the aim to provide a platform where buyers and sellers of aloe can sell to each other through a voiced based platform (Isabirye *et al.*, 2015). The targeted community for this project is Albertina, a rural farming community in the Western Cape Province known to produce high quality aloe. The academic researchers involved in the project are from the University of Fort Hare. Other stakeholders include the IBM Speech Technologies group in Israel and the IBM Spoken Web Research group in India and members of the community in Albertina. The application was developed through a voice based system which enables users in underprivileged communities to access services found over the internet through voice driven applications (Isabirye *et al.*, 2015). In Albertina there was a huge challenge when it came to buying and selling of the harvested aloe. It was difficult to exchange information between the aloe farmers and harvesters when the aloe had been harvested. Hence the researchers decided to implement a spoken web e-commerce platform to resolve this challenge. The initial application was piloted to the users for eight weeks after training the initial users and then observing how they used the application during that period (Isabirye, *et al.*, 2015). After the eight weeks elapsed interviews with community members together with the observations made during their use of the application were used to help in altering the application to meet the users' needs (Isabirye, *et al.*, 2015).

In order to completely determine the needs of the Albertina community for the spoken web e-commerce platform. The researchers had to go through a rigorous process of action research. According to Isabirye (2016),interviews were held with the various stakeholders involved in

the aloe agricultural sector form the Eastern Cape and Western Cape provinces. The interviews helped determine the needs of these stakeholders and a conceptual model based on the findings was developed. After much consideration the Albertina community in the Western Cape as the target community of the project as the community had shown commitment throughout the initiation phase of the project (Isabirye, 2016). Furthermore they could highly benefit from the e-commerce platform as they were not using e-commerce before. In order to verify the needs of the community, unstructured interviews with the pilot group were undertaken and the researchers noticed that some of the details had been overlooked which were then incorporated into the prototype developed for cycle one. These components were later verified in the second cycle and the members of the community who were involved in the project were satisfied with the system as it could now perform the functionality they required. Through action research the academic researchers were able to test the prototype a number of times within the community.

However, there were some challenges that were faced in implementing the project. The challenges associated with the project were lack of infrastructure and limited financial resources. To resolve the infrastructure challenges, the researchers provided the community with mobile phones that they used for project which was the major infrastructural challenge (Isabirye, 2016). According to Isabirye (2016) with regards to sustainability, although the members of the pilot group who were interviewed had mentioned their desire to continue to use the service, only a few had continued to use it consistently for some months after the pilot phase had ended. Considering that the pilot group had comprised of only twelve participants, sustained usage by even half of them would have been too low to warrant the costs associated with maintaining the service. As a result, the Spoken Web aloe e-marketplace was suspended and the voice platform reallocated to another project (Isabirye, 2016). This was communicated with regret to the pilot group. Although the intention was to re-establish the project at a later stage using the lessons learnt from the intervention, the researchers had not been able to secure the funding to do so yet. In the following section the findings from primary data are discussed.

6.3 Analysis of findings

From the primary data attached in **Appendix 3**, the researcher identified five themes. These themes are for both data collected from project leaders and community members who had participated in the ICT4D projects discussed in the previous section. Due to the commonality among the participants, the data collected shows that their views on the project were not so

different and thus could be grouped into themes. To support the themes literature review and observations were also used. The themes are operational community engagement policies, understanding user needs, creating long term partnerships, synchronisation of timelines and monitoring and evaluation. The themes are discussed in detail in the following section.

6.3.1 Theme 1- Operational community engagement policies

In order for HEI researchers to engage in successful community engagement projects there is a need for operational community engagement policies to be in place. The South African Council on Higher Education (2010) argues that, HEIs only reflect community engagement in their vision and mission statements but it is not operationalised. Thinyane (2016) further argues that most HEIs in South Africa do not have well-articulated community engagement policies.

From the primary data collected, the respondents that are HEI researchers also expressed the same sentiment. One of the respondents, Respondent two mentioned that "*I am not aware of a community engagement policy at our Institution. We however do have a community engagement office but I feel my university touts being an engaged university, yet doesn't have a firm grasp on what that means."* The respondents generally agreed that there was still a need for clarity with regards to HEI community engagement policies. Respondent four further mentioned that *"I feel the policies exist, but are not yet fully mature or operational. In addition, they are not well communicated throughout the Institution. Basically, only those academics that have an interest in community engagement tend to be familiar with or understand the policies."* Respondent three also supported this notion and stated that, there is a generic policy for community engagement policy at their institution. The policy advices researchers to engage in community engagement but there is no prescription as to what exactly has to be done. Respondent three further mentioned that, it is upon the individual researchers and departments to figure out how they can work towards undertaking research activities that are in line with the community engagement policy.

However, the respondents who were interviewed also mentioned how their institutions were working towards supporting community engagement. Respondent three and four both mentioned that their institutions offered awards for the best community engagement projects. It was also stated that community engagement activities were used as evaluation criteria for promotional purposes. Respondent two further stated that when going for self-promotion or recruiting new academic candidates, community engagement was considered alongside

teaching and learning and research. However, they added that it did not bear much weight as there seems to be no clear understanding of what it means.

Other than the data gathered from the interviews, the researcher also attended a community engagement workshop at her institution. She also observed that there was a gap in terms of articulation of community engagement policies. She noticed that the understanding of community engagement in the institution varied across the academics from various departments. The academics who were actively involved in community engagement projects seemed to be more aware of the policies regarding community engagement at their institution. Whilst there were others who did not know who they should approach with regards to issues surrounding community engagement. Some of the academics involved in community projects, further argued that they were involved in community engagement. However, the projects they undertook were carried out in a voluntary manner. There was no research output or any credit bearing assessment linked to their activities. Hence the workshop provided them with insight on how they should undertake their projects. The objective of the workshop was to infirm academics that, community engagement in HEIs should be viewed as a scholarship of engagement. It should be integrated with specific outcomes of the curriculum, research and teaching and learning. Table 5 shows the suggested guidelines for measuring community engagement at the institution that were suggested by the facilitators of the workshop.

Table 5: Guidelines for assessing Community Engagement as a scholarship of engagement: Adapted from (Du Plessis & Van Dyk, 2016)

Assessment criteria	**Community engagement details and provide motivation** Short description of project (duration of project, what happens, who is the service provider, number of beneficiaries, demographics of beneficiaries) etc.
1. Level of student involvement and integration into curriculum	1.1 Community engagement integrated into curriculum (module name, assessment criteria linked to community engagement activities) **Or** 1.2 Opportunities that could be identified for Community engagement to be integrated into curriculum (what module with what assessment)
2. Level of integration with research and motivate	2. 1 Community engagement integrated into research (research informing or resulting in Community engagement) **Or** 2.2 Potential research informing or resulting in Community engagement
3. Level of participation and community ownership	3.1 Community Ownership of Community engagement project (who initiated the engagement, what difference does it make to the community/ In what way does the community give feedback on the project/ what must happen before the community

can govern the project on their own

Or

3.2 How can Community Ownership of Community engagement project

4. Level of across faculty cooperation

Based on the community engagement assessment criteria guidelines in table 5, the four cases being used in this study are discussed. With regards to assessment criteria one, all four respondents, the HEI researchers mentioned that they had students conducting research on the projects. The students were all assessed based on their activities in the projects and hence the activities were credit bearing. With regards to informing research, which is assessment criteria two, the respondents mentioned they had published articles on the projects. They had also attended various conferences both locally and internationally to share information about their projects. Assessment criteria 3 is discussed further in this chapter as it speaks more to collaboration and partnerships which are themes identified as important in this study. Hence based on the criteria the ICT4D projects in this study do satisfy some elements of the assessment criteria for community engagement.

6.3.2 Theme 2- Understanding user needs

For the successful implementation of ICT4D projects in the community, there is need for a rigorous needs assessment process. Mtsweni and Abdullah (2014) state that the needs assessment process needs to focus more on the people rather than the technology being implemented. In support of this notion, Carnegie (2015) mentions that community engagement projects should aim to satisfy the long terms needs of the community and not immediate needs only.

In order to attain this goal, HEI researchers have to understand the context and conduct proper needs assessment before undertaking their ICT4D projects. Krauss (2009) further states that for the success of ICT4D projects, there is need to ensure that the projects satisfy the needs of the communities involved, but still reflects on the communities' unique social fibre. To achieve this goal the approach used in determining user needs is important. Walton and Heeks (2011) argue that, researchers should not use the top down approach to determine

user needs. The respondents were all in support of this notion as they applied approches such as mixed approach and ethnography to determine needs.

Respondent four stated that the needs of the community were determined through desktop research, conversations and participatory action research. Another method mentioned by the respondents that were used to determine user needs are ethnography. Respondent two and three both stated that they used ethnography to determine user needs. Respondent two had this to say about how they determined user needs " *We were fortunate enough as we had already been there for so long and we knew the context". So we did not come into the community as outsiders, it was a different process that looked at what was already going on in the community and work towards meeting our goals and the community goals."*

Respondent three also mentioned how they incorporated ethnography and mixed approach instead of the bottom up to determine community needs. Respondent three mentioned that "*It was more of a mixed approach. We started with ethnography were people stayed in the community. But we also from our own knowledge considered other aspects which we could impose on the community, like the community knew they were not computer literate so they could not determine the teaching material."*

Respondent one mentioned that, the project was part of a holistic project. Hence for the researchers to attain more in depth understanding of the context they did in depth desktop research. They also had members of their team go in before the project was initiated to interact with the community and understand the context better.

From the communities members who were interviwed, they all could clearly point out benefits the ICT4D projects had on their communities. For instance Respondent 5 stated that the project made life easier for the people in the community involved as the teachers and students could now use tablets for learning. Furthermore the community members now had access to cheaper printing and photocopying services as they did not have to go into town anymore. She added that printing and photocopying were now being offered at a cheaper price at the schools. Respondent 6 mentioned that the project had brought togetherness in the community and it was a huge investment in the community.

However one of the respondents, Respondent two expressed concern with regards to the use of the system they had implemented. The respondent mentioned that the people were not using the system to make calls, they were only charging their phones. Among the reasons mentioned ,was the issue of them not knowing they could use the phones to make calls as

they thought the phones belonged to the tribal authorities. The respondent also mentioned that the people preffered making calls on their phones as compared to the public phones. The respondent mentioned that they were working on rectifying these issues.

In conclusion there are a variety of methods that can be used in understanding user needs. According to Isabirye *et al.*, (2015), the approach used to conceptualise, design and implement technology is very important. In the case of the Aloe project participatory action research was seen as a suitable method. This approach allowed the researchers to pilot the project to the community in a space of eight weeks. The pilot allowed the researchers to promptly rectify and address user concerns before officially rolling out the completed project (Isabirye *et al.*, (2015). After the project had been officially rolled out, the users expressed their satisfaction and were willing to continue using the service (Isabirye *et al.*, 2015). This reflected that the approach used to determine the user needs had been effective.

With regards to the Zenzeleni and Siyakhula Living Labs projects, ethnography was used as an approach to understand user needs. According to Dugmore (2012) the researchers from the Siyakhula Living Labs project, rented a place in the Dwesa community. They needed to live in the community and interact with the community members in order to successfully determine their needs. For the Zenzeleni project, they were fortunate because they already knew the context hence they did not come in as outsiders. They had been working with the community for six years before the project was initiated. From these two projects it is evident that the researchers understood that, knowledge from both the communities and researchers was vital in understanding user needs. Hence they needed to use a method to determine the needs of the community that allowed them to attain this knowledge. This can be attributed to the success of the projects as the Siyakhula Living Labs Zenzeleni project and have been running effectively since 2005 and 2011.

6.3.3 Theme 3- Creating long term partnerships

Literature previously discussed in this research argues that, ICT4D projects should be undertaken in a collaborative manner (Mtsweni & Abdullah, 2014). ICT4D projects require the participation of different stakeholders, including the community members, subject matter experts and project champions. Community engagement literature also reveals that the success of community based projects depends on effective collaboration (Lavery *et al.*, 2010). In this study, this entails that HEI researchers, community members and other stakeholders should work together effectively to achieve the goals of the ICT4D projects.

Therefore there is need for effective collaboration between the HEI researchers, community members and other stakeholders. This will help ensure that, there are mutually beneficial relationships that will benefit all parties involved when undertaking ICT4D projects. The respondents interviewed in this study emphasised on how they had built relations with the other stakeholders.

Respondent one stated that, they engaged with the community before the project started. To ensure the whole community was involved in the project, they would invite everyone to the project meetings and communicate with them in their local language. The community members were allowed to participate by asking questions about the project. This is an important aspect when creating partnerships as it makes the community feel involved and influences their willingness to participate in the project.

Respondent two stated that they had been involved with the community since 2004 and when the project was initiated in 2011, they already had an established relationship with the community. They built the relationship by having the project leaders live within the community. They would spend six to eight months at a time in order to get a much deeper insight about the community needs. Furthermore Rey-Moreno *et al.* (2013) states that, the lead researcher actually spent about 16 months in the community at some point. Hence it is evident that building partnerships requires a lot of time and commitment. Also through such commitment there are chances of building strong partnerships as the researchers and the community spend more time together.

Respondent three mentioned that because they did not have an established relationship with the community, they made efforts to build the relationship. However, the relationship was built from ensuring the people in the community understood the project and they could see the benefits. According to Gumbo *et al.,* (2012), the researchers would take turns to pay frequent visits in the community. They would live there, eat what the local people ate and do what they do. These researchers followed almost the same process as mentioned by the previous researcher. This leads to the conclusion that for the creation of long time partnership, there is need to send time knowing the other stakeholders.

From literature in this study it was also highlighted that for the success of the ICT4D projects in the community, involvement and participation of the community is important (Swanzen and Rowe, 2013). Respondent six, a community member who was interviewed, stated that the community members were involved in the planning and implementation of the projects. The

respondent further mentioned that, the researchers did not make decisions regarding the project without consulting them. Pade Khene *et al.* (2011) also states that, community based projects such as ICT4D projects could be seen as a threat to power by leadership in the community. In support of this notion Bidwell *et al.* (2013 state that they discussed the project with the tribal authority and the community members in order to gain approval. This helped ensure everyone was fully involved in the project. Hence it is of importance to involve them in all decision making processes. Without the approval of the community members, chances of success for the ICT4D projects are hindered.

According to Pade Khene *et al.* (2011), the project champion is also important in the successful implementation of ICT4D projects in the community. The champion should be able to motivate, inspire, and encourage people to see the benefits of the ICT4D project. Hence the project champion should preferably be a local community member. Respondent one, a HEI researcher said they had a project champion from the community who would facilitate communication between them and the community. Two other respondents, who are also HEI researchers, mentioned that there was a committee or cooperative in the community that was responsible for the project and was the point of contact for the HEI researchers. The ICT4RED project also had champions who would train the others teachers on how to use the technology (Herselman & Botha, 2014). This indicates how the HEI researchers worked in collaboration with the communities where they implemented the ICT4D projects. This whole process of involving the community and having project champions helps encourage ownership of the project by the communities. When the communities feel they own the projects the chances of its success are high.

However, one of the respondents, a HEI researcher mentioned that the long term partnerships in the projects needed district departments and even government to be involved. This would help ensure the sustainability of the project in the long run. Furthermore, another respondent mentioned that it was a challenge to maintain the relationships with the community as there are now fewer researchers willing to spend time in the community. From the community members, one of the respondents mentioned that there was need for the youth to get more involved in such projects as their participation was minimal. For the success of these projects there is need for full participation from all parties involved.

In conclusion based on the information from the respondents and literature, it important to take time to create partnerships when undertaking ICT4D projects. The success of ICT4D

projects by HEI researchers is highly dependent on these partnerships. It is evident that the researchers all took time to interact with the various stakeholders. However, some methods might be more effective than the others. For example, staying within the community for longer periods of time can help strengthen the partnership with the community. Compared to when the researchers pay short frequent visits. The community members might still view them as outsiders and it might take longer for them to have a trusting relationship with the researchers. Furthermore, in the community engagement workshop, it was mentioned that it might take at least three years to build a relationship before initiating a project in the communities. Hence HEI researchers need to use methods that allow them more time to interact with the communities to ensure they build strong partnerships. They need to ensure they have the sufficient time for the whole process.

6.3.4 Theme 4- Timelines

Time is of essence in any research project. In communities where collaboration among the communities' members is valued the planning of meetings and consideration of the community members' opinions with regards to decisions about the project takes time (Bidwell *et al.*, 2013). The challenge is that on the developer's side in this case the HEI there is also need to balance the constraints on the time they have for example project funding and expertise availability (Rey- Moreno *et al.*, 2013).

Respondent four also revealed that the relationships among stakeholders can cause challenges. The respondent mentioned that usually the timelines of the funders are not aligned with that of the research process. Brunello (2010) argues that usually the goals of the funders are prioritised. Hence in such cases the researchers will have to work with the funders timelimes and this might have adverse effecrts on the project.

Howver respondent, Respondent three mentioned that, with regards to timelines they were fortunate enough, because the other stakeholders allowed them to work according to their own timelines. Furthermore, Respondent two also mentioned that they had no issues with timelines as the project was run by the community cooperative, hence the cooperative worked with its own timelines. The respondent however did mention that since they had put more PHD students in the project who can spend more time in the field, there has been a great improvement in the project.

In intsances were conflicts concerning timelines arise, it is advisable to work towards how the various stakeholders can resolve the conflict. For example in one of the projects, the

Zenzeleni project, Bidwell *et al.*(2013) state that it often took considerable time to confirm research actvities with the community members. This conflicted with some of the deployment tasks for the project. However the overall goal was not to exact external timeframes on the community members. The timeframes were only adjsuted when it was really necessary (Bidwell *et al.*, 2013). This was an effective method as the project was successfully implemented. The co operative runs the project and they detect the pace at which activities regarding the project should be undertaken.

6.3.5 Theme 5-Monitoring and evaluation

Pade Khene *et al.* (2011) state that, impact assessment involves ongoing monitoring and evaluation of the project. Community engagement literature also reveals that community engagement projects such as ICT4D projects should achieve medium and long term goals of the community and not immediate needs only. This is achievable if the projects are properly evaluated and monitored. Impact assessment through ongoing monitoring and evaluation helps mitigate problems or enhance the project and increases the chances of success.

From the primary data collected, Respondent 1 pointed out that one of the lessons learnt on their project was the importance of doing constant monitoring and evaluation in order to identify problems areas and fix them. According to Herselman and Botha (2014), during the implementation of the ICT4RED project they conducted monitoring and evaluation. There were members of the research team who would meet weekly to discuss progress on the implementation of the project. The team members would also make available the data, reports and work in progress to other team members through channels such as emails and presentations (Herselman and Botha). Furthermore, respondent one mentioned that they would organise meetings with the district officials and community members were they discussed the project.

The other respondents, who are also HEI researchers, agreed that monitoring and evaluation was of importance in the success of the ICT4D projects. Respondent three mentioned that for the ICT4D project they implemented, monitoring and evaluation was conducted through meetings. The meetings were organised and the various stakeholders would meet and discuss about the project. In support of this notion, Dugmore (2012) states that the various stakeholders meet at organised workshops were they discuss the future direction of the project. Respondent one, two and three also mentioned that they do get a lot of feedback from the various students involved in the projects as part of their studies. Respondent two and three

mentioned that there are specific people who are actually responsible for the monitoring and evaluation aspect of the project. Respondent two mentioned that they have a post doc student who is responsible for the process. Whilst, respondent three stated that they have a research team responsible for monitoring and evaluation.

The respondents further mentioned that, for other interested stakeholders they share the information of the projects through various publications and conferences which they attend both locally and internationally. For example, one of the respondents actually mentioned that their project had made great impact to such an extent that the teaching material they used was now being used elsewhere within and outside South Africa. The following table, table 6 provides a summary of the cases based on themes identified in this study.

Table 6: Summary of cases

	ICT4RED Project	**Zenzeleni Project**	**Siyakhula Project**	**Aloe Project**
1. Operational community engagement policies	The institutions were very much involved in community engagement activities.	The researcher was not aware of a community engagement policy at the institution. However they do have a community engagement office.	The institution did have a community engagement policy. However, the policy was generic and it was the duty of individual researchers to come up with ways they can incorporate community engagement into their research activities. One	The community engagement policies exist but were not fully operational and communicated to the various stakeholders in the institution. Only the academics interested in community engagement were the ones that have knowledge about the policies.

			of the project leaders won an award (The Vice Chancellors Community Engagement Award) for the contributions made by the project.	
2.Understanding user needs	In depth desktop research was used. There were also different experts responsible for different parts of the project. The project was implemented in phases.	Ethnography was employed. The researchers already knew the context. Hence the process involved understanding the context from the inside and not coming in as outsiders.	Ethnography and mixed approach was used. The researchers stayed in the community. However, from their knowledge, they were also other aspects which they suggested on the community.	Desktop research was used together with conversations with community members and participatory design. The pilot project was initiated in iterations.
3. Creating long term partnerships	They engaged with the Cofimvaba community before the project started.	The project leaders lived within the Mankosi community. They would each spend long periods of	The members of the project team did not have an established relationship	The researchers approached the managing director of the aloe factory in Albertina. They were then

	Everyone was involved and the project was explained to them in their language. Members of the community were encouraged to participate and ask questions about the project.	time in order to gain deeper knowledge of what the community needs were.	with the Dwesa community. Hence in order to build this relationship, they rented a house in the community. They would frequently visit the Dwesa community and live the way the people in the community lived.	introduced to the farmers and harvesters. They maintained the relationship through field visits, emails and telephonic conversations.
4. Synchronisation of timelines	The project was implemented in three phases. With one school in the 1st phase, 11 schools in the 2nd phase and 14 schools in the final phase. This allowed the researchers sufficient time for the implementation and also to incorporate lessons learnt in	The project did have external deadlines they had to meet. In which case they managed to accommodate these deadlines. However the project was run by the community cooperative which operates according to its own time.	The researchers were allowed by the various stakeholders to detect the pace at which the project was implemented. They were fortunate enough to work according to their timelines.	Among the challenges mentioned for the implementation of the project is that, timelines of the funders and researchers are not often aligned. In such cases, usually the funders' timelines take precedence.

	each iteration**.**			
5. Monitoring and evaluation	The researchers had meetings with the community and district officials to discuss the project. Feedback was also attained from PHD students involved in the project.	There was a post doc student responsible for monitoring and evaluation. Also the other students who conducted research on the project did monitoring and evaluation.	There were organised workshops were the various stakeholders met and discussed about the project. There was also a research team that did monitoring and evaluation from the academic perspective.	The project is finished, hence there was no monitoring and evaluation**.**
Benefits to the community	The project has been running successfully since 2012. The teachers acquired skills they could use for their professional duties. The project also provided both the teachers and the students with access to better	The project has been running successfully since 2011. The community acquired technical skills as they are responsible for maintaining and constructing their solar and networking equipment. They also have access to cheaper	The project has been running successfully since 2005. About 17 schools in the Dwesa community have benefited from the project. Over 200 community members have been trained on how to use	The project was initiated as research and had to come to an end. However, the members of the Albertina community acquired knowledge on how they can use voice applications to manage their business activities. Before the project was introduced many of the

	teaching and learning material. With regards to the community as a whole, they now have access to cheaper photocopying and printing services.	telecommunications service. They can make calls for free within their network and are charged half the price for calls going outside the network. The solar charging stations also provided them with easier access to charge their phones. The project in general has brought community togetherness and the community works together to ensure it is sustainable.	computers. Besides obtaining basic computer literacy skills, the teachers and students are now utilising the technology as part of their teaching and learning strategy. There are also applications such as e-commerce platforms that have been developed which also benefit the community.	community members did not have mobile phones. Those who had phones only used them for services such as calling. However, the project introduced them to the use of e-service. The community members felt a sense of empowerment.
Benefits to the HEI researchers	The project had over 12 Masters and PhD students involved. They have acquired a lot of experiential learning.	The research activities in the project are part of the academic programme. They had Honours, Masters and PhD students involved. All of the activities	Besides the publications, the researchers have had the opportunity to disseminate information about the project at	The research project has contributed to the ICT4D knowledge base through various research outputs. The research has produced one journal article, three

Furthermore, the project has contributed to the knowledge in the ICT4D field through publications. To date the project has about 16 conference papers. Also due to its impact the training material used in the project is now being translated into other languages such as Spanish and used to train teachers elsewhere.

were credit bearing. The project also has made various publications.

conferences both locally and internationally**.** Furthermore, there have been students involved in the project who acquired knowledge through experiential learning and had their learning outcomes assessed based on their research activities. The research project has also won an award for best community engagement project at one of the institutions involved in the project.

masters' dissertations, and one PhD thesis. The project has also been presented at academic workshops**.**

Sustainability	The project was implemented successfully. It has been running for five years. In terms of financial sustainability, some of the schools now include the project in the school budget to sustain it.	The project has been running successfully for six years. It is owned by the community and the community cooperative runs the project. The project is not yet fully at a stage were no outside capital is required but they are getting there.	The project has been running successfully for 12 years. It now uses the living lab approach, which enables the community members to participate and contribute to research concerning ICT in their community. In terms of funding, the project still requires funding. However the community does make sufficient funds for the day to day running of the project.	The pilot project was implemented successfully. However, it was discontinued due to lack of funding.

Synopsis of cases

From the summary of the cases, the researcher learnt that there was a lack of articulation of community engagement policies. However, the HEI researchers involved in the 4 ICT4D projects seemed to have an understanding of how community engagement should be incorporated into their research activities. This is evident in that all 4 projects have produced relevant research outputs in

relation to the projects. They also all have publications and have students whose learning outcomes have been assessed based on the projects' research activities.

With regards to understanding user needs, evidence from the cases shows that there are different approaches that can be used to understand users' needs. For example, two of the projects Siyakhula and Zenzeleni used ethnography. Whilst the Aloe project and ICT4RED used desktop research and participatory design. The ones who applied ethnography were able to know the context better as they lived among the community. Such a method helped in gaining deep insight about the community and led to long term sustainability of the project. Although the ICT4RED and Aloe project did not apply ethnography, methods such as desktop research and participatory design were effective as well. In this case both ICT4RED and Zenzeleni implemented the projects in iterations. The implementation of the project in iterations helped in resolving the missing elements that would have been brought about by not spending time in the community. The approach they used allowed them to incorporate changes through lessons learnt in each iteration.

In terms of creating long term partnerships, the researcher discovered that this is a long process. Hence for sustainability of the projects there is need to allocate sufficient time to build the relations. The most preferable method based on the cases would be to spend time within the community. Although all the projects achieved their outcomes, methods such as having telephonic conversations and might not as be as effective as actually spending time in the community.

Lastly with regards to monitoring and evaluation, there is need for the constant monitoring and evaluation of the projects in order to ensure success. As is evident from the cases, there were people responsible for monitoring and evaluation of the projects. This helps in identifying problem areas to help ensure long term sustainability. For a project such as the Aloe Project which did not achieve long term sustainability due to issues such as funding, there is need to

come up with a way to source funds for continuation of the project. However, in the long run there should also be a plan were the community takes full ownership of the project. For example, in the Zenzeleni Project, the cooperative is not financially dependent. They acquire funds from charging a small fee for charging phones to the community members. The following section presents the proposed model and detailed recommendations based on the themes identified in this study.

6.4 Proposed model

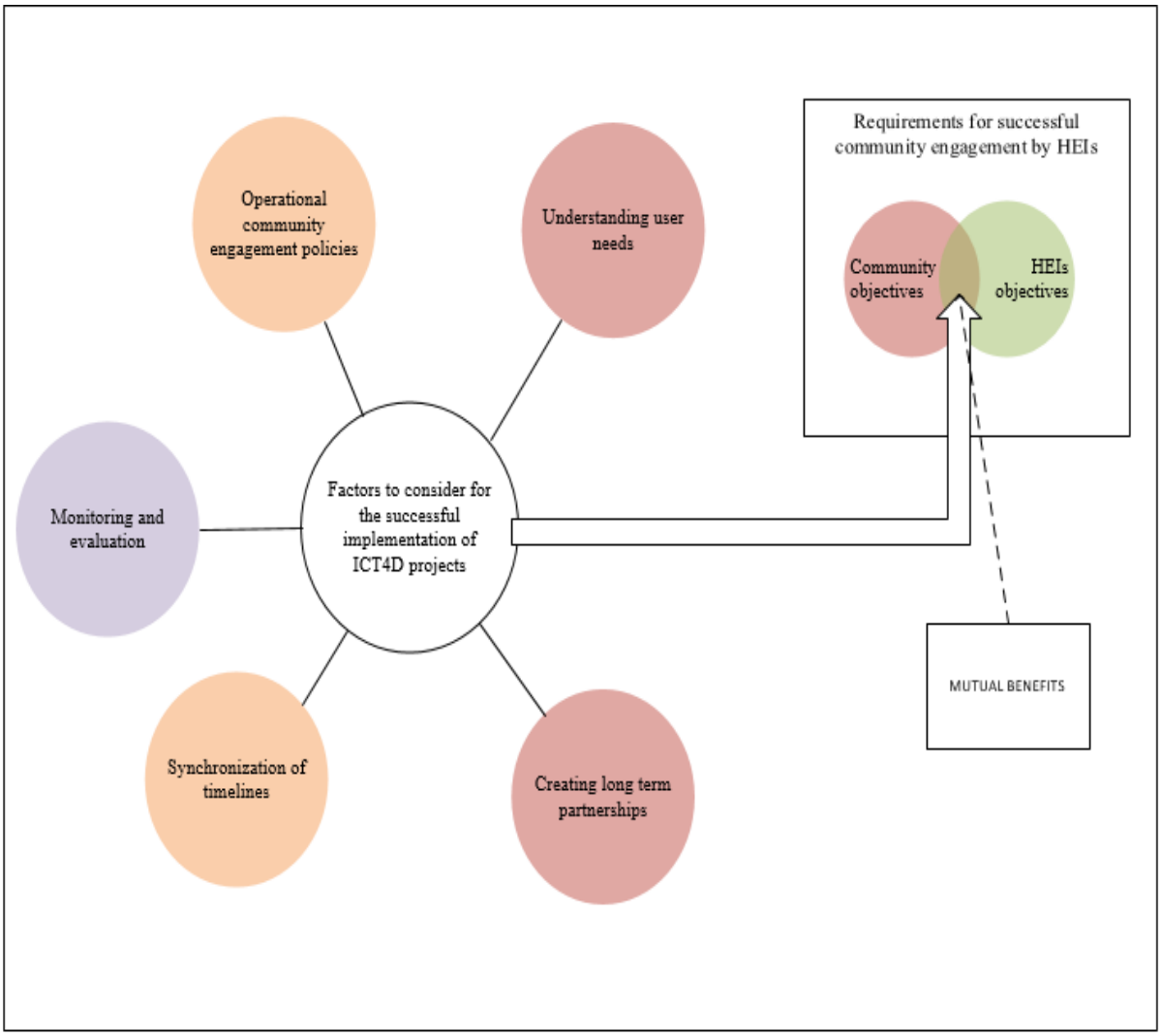


Figure 13: Proposed model for applying community engagement principles for the successful implementation of ICT4D projects.

Figure 13 is a diagrammatical illustration of a proposed model for applying community engagement principles for the successful implementation of ICT4D projects by HEI researchers in South Africa. From the model, the top right part is a diagrammatical illustration that for HEI researchers to successful undertake community engagement both the HEI objectives and community objectives when engaging in community engagement should be met. Thus there is a need to integrate community objectives and HEI objectives for mutual benefit in community engagement projects. In this study the researcher specifically investigated ICT4D projects. In ICT4D projects it is especially important to ensure that the projects satisfy their immediate and long term needs and that the outcomes of the projects have an impact on their quality of life. Whilst for the HEI researchers there should be knowledge gained through experiential learning. The learning outcomes should also be

integrated into the HEI curriculum and inform research. In order to achieve these outcomes, the researcher recommends the factors depicted in the model as the success factors for applying community engagement to undertake ICT4D projects. The recommended factors are explained in detail in the following section.

6.4.1 Operational Community engagement policies

From both literature review and primary data collected for this study, the issue of operational community engagement policies remains a challenge for HEIs in South Africa. The respondents confirmed that some of them were not even aware of the community engagement policies of their institutions. In instances where they were aware, they said it was upon individual HEI researchers involved in community engagement to attain more information on the policies. For successful community engagement by HEI researchers there is need for concrete operational community engagement policies that are well articulated to all the HEI researchers. One such way is to organise mandatory workshops for community engagement at HEIs in South Africa. In these workshops the community engagement department can inform the researchers on exactly what is required of them when undertaking community engagement projects. These workshops can also work as platforms used to inform the researchers about the benefits associated with community engagement. For example, at the community engagement workshop the researcher attended, some of the academics were not even aware of the awards offered for community engagement. However, through such workshops they attain all the knowledge they require. Also the various HEI researchers can learn from each other about how they can foster and successfully undertake community engagement projects.

Furthermore, through the community engagement policies, community engagement should be introduced as part of the curriculum. Degree programmes should introduce community engagement as a module. This will help ensure that students are taught about community engagement in line with their degrees. Students should study the theory and practical part of community engagement and the activities they undertake should be assessed. Maistry and Thakrar (2012) mentioned that most students involved in community engagement activities lack proper training. Hence the introduction of community engagement as a module will help provide the students with the adequate training required. For example, at the University of Fort Hare the community engagement department has a module that prepares students for community engagement. However, the module is still voluntary but open to all faculties and it teaches students to engage with the community through field work.

By articulating and implementing community engagement policies in HEIs, community engagement will no longer be treated as silo activity. It will be integrated with the other activities of teaching and learning in HEIs. This will enhance the undertaking of coordinated successful community engagement projects. The operational community engagement policies will be a foundation for HEI researchers in terms of what is expected of them when they engage in community engagement projects, which in this study are ICT4D projects. Operational community engagement policies can thus improve chances of success of ICT4D projects implemented by HEI researchers in the community.

6.4.2 Understanding User needs

Another important factor that was identified as important in applying community engagement principles for the successful implementation of ICT4D projects by HEI researchers is understanding user needs. Literature on both ICT4D and community engagement revealed that satisfaction of the needs of the community is of vital importance when undertaking a project. Walton and Heeks (2011); Mtsweni and Abdullah (2014) argue that the needs assessment process should focus on the people rather on technology. Thus it is of importance for HEI researchers when implementing ICT4D projects in the community to understand how needs should be assessed. The respondents described the different methods they used in understanding user needs and in support of literature, they all did not apply the top down approach. The respondents described using methods such as ethnography and participatory design to determine community needs. HEI researchers undertaking ICT4D projects need to follow such methods to understand community needs. Du Plessis and Van Dyk (2013) state that the only way to understand the needs of a community is by closely interacting with them.

Hence HEI researchers should use methods that provide them with close interaction with the community. Community engagement literature reveals that the ideal process to determine community needs when undertaking community engagement projects is when there is grassroots innovation. In this study it is whereby ICT4D projects are implemented based on the indegenious knowledge of the community within which they are implemented. This can only be accomplished if approaches such as ethnography and particpatory design are used to determine user needs. For example in one of the projects, Siyakhula Living Labs project they applied ethnography to determine user needs and they are now using the Living Lab approach in the project. This has made the project sustainable for over 10 years.

6.4.3 Creating long term partnerships

Creation of long term partnerships is also an important factor in the successful implementation of ICT4D projects by HEI researchers in the communities. For HEI researchers to understand the needs of the community there is need for creation of relationships in the process. One of the respondents actually mentioned that it was easy for them to determine the community needs as they had an already established relationship that was created through spending time in the community. Mtsweni and Abdullah (2014); Chauhan (2015) also reveals that successful community engagement projects depend on effective collaboration of all stakeholders. The respondents confirmed this as they all explained how they would work towards ensuring that all stakeholders were involved in the project. Failure to have good relations with any of the stakeholders may jeopardise the success of the project. Thus HEI researchers engaging in community based projects should ensure that they value all the stakeholders involved in the projects. They should ensure they have sufficient time to build relations with all the stakeholders, as good relations have a positive effect on the projects. The various stakeholders all have different competencies which can aid in the successful implementation and sustainability of the project.

6.4.4 Timelines

Every project has various constraints such as resources and time. Time in research projects such as the ICT4D projects implemented by HEI researchers in the community is of essence (Bidwell *et al.,* 2013). Stakeholders such as the funders, the HEI researchers and the community all have their different timelines. For example the funders might want results by the end of a three year period and the HEI researchers might have students involved in the project for only two years. Whilst on the community side, it might take over two years to just build relations with them as discussed earlier under creating long term partnerships. In such a scenario, conflicts might arise that may hinder the success of the project. Hence it is vital for the stakeholders to find ways to handle the issue of timelines. Brunello (2010) states that the funders timelines are usually prioritised. This should not be the case, the projects are meant for the communities hence they should be prioritised. Hence when HEI researchers engage with the community they should balance the timelines of all stakeholders including the community as well as their timelines in order to ensure the success of the projects they implement. Furthermore the issue of timelines should be discussed before the project is even implemented. This enables all the stakeholders to make plans according to the provided. Also

it reduces conflicts with regards to whose timeline should be prioritsied. For example one of the respondents mentioned that the other stakeholders allowed them to work with their own timelines as researchers.

6.4.5 Monitoring and evaluation

Monitoring and evaluation has an important role in the successful implementation of ICT4D projects. For HEI researchers to successfully implement ICT4D projects in the community they need to conduct monitoring and evaluation during and after project implementation. Monitoring and evaluation during project implementation helps in that, the problems areas can be quickly identified and fixed whilst the project is still being implemented. This can help save costs and time that would be needed to fix problems if the project is evaluated when the complete project has already been rolled out. Also the stakeholders themselves play a major role in ensuring the monitoring and evaluation process runs smoothly. There is need to have regular meetings or workshops as stakeholders where the progress of the project is discussed. Also there is need to select a champion or a group of people responsible for the monitoring and evaluation process. For example, the Siyakhula Living Labs project has a co-operative that is in charge of the project. Whilst the Zenzeleni project has an ICT champion who is responsible for monitoring and evaluation. This helps with accountability if there is someone directly responsible for the monitoring and evaluation process.

6.5 Conclusion

This chapter provides a detailed analysis of the findings of this study. The chapter first introduced how the interview guide was developed. The interview guide was developed using literature review discussed in chapters two, three and four of this study. The primary data was then collected from six participants using semi structured interviews. The primary data collected was then analysed using cross case analysis. The data analysis was done using supporting evidence and observations done at the community engagement workshop. The information gathered was presented in the form of themes. The analysis first provides an overview of the four ICT4D projects that were used in this study. The ICT4D projects are the ICT4RED project, Siyakhula Living Labs project, Zenzeleni project and Aloe project. Following the overview, the data is presented in themes. From the themes the proposed model for applying community engagement principles for the successful implementation of ICT4D projects by HEI researchers is derived and presented. The factors that were identified to be of importance are operational community engagement policies, understanding user needs, creation of long term partnerships, synchronisation of timelines and monitoring and

evaluation. The following chapter concludes this study by providing a summary of the research process that was followed in this study.

Chapter 7- Conclusion

7.1 Introduction

This chapter aims to provide a concise summary of this research study. The findings and recommendations discussed in the previous chapter presented how the research analysis process was followed to produce the proposed model. The proposed model for this research aims to help HEI researchers in South Africa to apply community engagement principles for the successful implementation of ICT4D projects. The development process of the model involved using both secondary data and primary data. Secondary data was gathered from various sources such as journal publications and books. The primary data was gathered using semi structured interviews from participants who have been actively involved in the four case studies used in this research. The researcher aims to clearly provide how she arrived at the artefact for this study which is the proposed model.

In order to accomplish this the researcher discusses the theoretical model used in this research. The objective of this study is also discussed. Followed by the main research question and the sub questions with reference to how they were discussed in the literature chapters. The research methodology process and contribution made by this research is also discussed. The chapter then concludes by discussing directions for future research and the conclusion.

7.2 Theoretical Model

This research applied the Hackathon Model. According to Mtsweni and Abdullah (2014), the Hackathon Model is an iterative model which shows elements that can be used to develop rapid and collaborative ICT solutions. The model has four main elements which need to be considered when undertaking ICT4D projects in the community. These elements namely needs assessment, collaboration, impact asssessment and sustainabilty can influence the successful implementation of ICT4D projects. The researcher discovered that both ICT4D and community engagement have the same goal. Using the constructs of the Hackathon model the relationship between ICT4D success factors and principles for successful community engagement is discussed.

The first factor to be discussed is collaboration. According to Mtsweni and Abdullah (2014) ICT4D projects should be collaborative in nature in order to be successful. Community

engagement literature on the other hand also reveals that for successful implementation of community based projects between HEI researchers and the community, there is need for the HEI researchers and the community to work together and build long term relationships (Lavery *et al.,* 2010). The essence of collaboration and creating long term partnerships is that the different stakeholders have various competencies which can aid in successful implementation of the ICT4D projects.

Mtsweni and Abdullah (2014) also argue that sustainability is a vital success factor for implementation of ICT4D projects. There is need for HEI researchers to plan for the sustainability of the CIT4D projects they implement. Pade Khene *et al.* (2011) states that most ICT4D projects implemented in underprivileged communities are prone to fail. This is because there are usually no plans on how to sustain them in the long run. Community engagement literature in support if this notion argues that community engagement projects should satisfy both immediate and long terms needs of the community (Lavery *et al.,* 2010).

Furthermore, in the Hackathon model Mtsweni and Abdullah (2014) also state that the successful implementation of ICT4D projects is driven by conducting a proper needs asssement process. There is need to focus more on the needs of the people rather than on technology to ensure success of the project. One such way is by encouraging community ownership of the project. In support of this notion community engagement literature reveals that a community based project has high chances of success if the project provides for opportunities of ownership and control to the community (Lavery *et al.*, 2010). This helps in improving the level of commitment the community members will have to the project and there are higher chances of this project being successful.

The last factor that the Hackathon model considers to be of importance in implementing ICT4D projects in the community is impact assessment. Mtsweni and Abdullah (2014) state that impact assessment involves determing the impact the project will have on the community through out the project. This entails that there is need for all the various stakeholders to work together and ensure they properly evaluate and monitor the project. Community engagement literature also reveals that for a community engagement project to be deemed successful it shoul have measurable impact on the community's quality of life (Carnegie, 2015). This only achievable if there is proper impact assessment plans in place for the project.

7.3 Objective of the study

The objective of this study was to determine how HEI researchers in South Africa can successfully implement mutually beneficial ICT4D projects in the communities. The outcome of this study was a model that will help HEIs in achieving this goal. The proposed model is expected to help HEI researchers to undertake ICT4D projects that meet the goals of community engagement for HEIs in South Africa. Whilst also at the same time satisfying the goals of the ICT4D projects in the communities in which they are implemented.

The model was derived by investigating the following main research question

How can HEI researchers apply community engagement principles for successful implementation of ICT4D projects?

The main research question was examined using three sub-questions and were discussed in the relevant literature chapters. A brief description of each of the sub questions is provided in the following section.

i. **What factors should HEI researchers consider when implementing ICT4D projects to ensure success?**

This chapter discussed the factors that HEI researchers need to consider when they undertake ICT4D projects in the community. The chapter initially discussed the impact of ICT on development and how it can help in the achievement of the global development goals. It also discussed how ICT is an enabler for development in underprivileged communities and thus has the potential to improve their quality of life. However also identified was that successful implementation of ICT4D projects in these communities has been a major challenge. Most of the ICT4D projects that have been implemented have partially succeeded or totally failed to meet their goals. For these projects to be successful there are various success factors that need to be considered. Some of the factors that were identified include needs assessment, sustainability, collaboration and impact assessment. Therefore, in order to successfully implement successful ICT4D projects which have the desired developmental impact in underprivileged communities, HEIs should consider these factors.

ii. **What challenges are currently faced in terms of implementing ICT4D projects in communities by HEI researchers?**

This chapter discusses the challenges that HEI researchers face when implementing ICT4D projects in the community. These challenges were identified as being either inhibitors or barriers. The challenges that were discussed include, lack of finance, poor training, poor community engagement policies and lack of proper co-ordination among the various stakeholders. Therefore, there was need for HEI researchers to have ways to mitigate or address these challenges in order to implement successful ICT4D projects in the community.

iii. **How can community engagement principles influence the successful implementation of ICT4D projects by HEI researchers?**

This chapter discussed how community engagement principles influence the successful implementation of ICT4D projects by HEIs in communities. A background on community engagement and the different models that HEIs apply for community engagement was discussed. It was discovered that since the inception of community engagement as an integral part HEIs have been struggling to gain a common understanding of what it entails. The community engagement principles were identified and discussed with how they relate to the success factors of ICT4D projects which are the focus of this study. The outcome of this discussion was that ICT4D projects implemented in communities are also community engagement projects; hence they are driven by the same goals and principles. These are goals such as needs assessment, collaboration and impact assessment.

The relevant literature that was discussed in this study helped in addressing the main research question for this study. This was also coupled by employing the appropriate research methodology which is discussed in the following section.

7.4. Research Methodology

Chapter five of this research study provided a detailed account of the research process that was followed. Firstly, the research paradigm that was selected was discussed and justified. The researcher used interpretivism and the study was qualitative in nature. This is because the researcher needed an in depth understanding of the phenomenon under study. Because the phenomenon under study was answering a "how" question specifically "*How can HEI researchers apply community engagement principles for successful implementation of ICT4D projects?"* the case study method was employed. Four case studies of ICT4D projects that have already been implemented in various communities by HEI researchers in South Africa were used. Primary data was collected from six participants involved in these projects using semi structured interviews. The participants included HEI researchers and community

members. The interviews were guided by an interview guide that was developed from literature review. After data collection the data was then transcribed and analysed collectively using the cross case analysis method. From the analysis of this data, themes were identified which then led to the development of the artefact of this study. The artefact of this study is a proposed model of how HEI researchers in South Africa can successfully implement ICT4D projects in the community. The following section provides the contribution that this research made

7.5. Contribution

This study contributed to the body of knowledge in the successful implementation of ICT4D projects. The study proposed a model that explains how specifically HEI researchers in South Africa can undertake ICT4D projects in communities. The contribution was in the form of a proposed model for applying community engagement principles for the successful implementation of ICT4D projects by HEI researchers. The proposed model was presented in Chapter six. The model proposes that for ICT4D projects undertaken by HEI researchers in South Africa to be deemed successful they should be mutually beneficial for the HEI and the community. Successful implementation of ICT4D projects in the communities provides benefits such as better access to information and social services such as health care and educational facilities (Chilimo & Ngulube, 2009). This can improve the quality of life of the community members.

With regards to the HEI researcher's successful implementation of ICT4D projects helps them acquire knowledge which informs research and curriculum (Carnegie, 2015). The knowledge acquired through experiential learning can thus be used for future implementation of other ICT4D projects by HEIs. Therefore, for the successful implementation of these projects the proposed model suggests five factors that need to be considered. These are operational community engagement policies, understanding user needs, creation of long term partnerships, timelines and monitoring and evaluation

7.6. Future research

The proposed model was developed using four case studies of ICT4D projects undertaken in various communities by HEI researchers in the Eastern and Western Cape Province of South Africa only. Future researches could investigate how HEI researchers can apply community principles for the successful implementation of ICT4D projects in other Provinces in South Africa. The model can also be tested to see if it can be generalized to other ICT4D projects

undertaken by HEI researchers. Furthermore, with regards to the sample instead of interviewing HEI project leaders and community members only, the sample could include students involved in the ICT4D projects as well. This because their perspectives would differ from the other participants hence providing much deeper insight into the projects.

7.7 Conclusion

This research focused on determining how HEI researchers in South Africa can apply community engagement principles for the successful implementation of ICT4D projects. To reach the objective of this study which was presented in the form of proposed model, extensive literature review regarding ICT4D and community engagement was reviewed. The literature included identifying how principles of community engagement influence the successful implementation of ICT4D projects. Also discussed were the challenges and factors that HEI researchers need to consider when implementing ICT4D projects in the community. Supported by primary data gathered from participants from the four case studies used in this research and observations, the proposed model was developed. The proposed model suggests that HEI researchers can successfully implement ICT4D projects by applying community engagement principles if the ICT4D projects are mutually beneficial. Factors they should consider to ensure there is mutual benefit are operational community engagement policies, understanding user needs, creating long term relationships, timelines and monitoring and evaluation.

References

Ali, M., & Bailur, S. (2007). the Challenge of " Sustainability " in Ict4D – Is Bricolage the Answer ? *Proceedings of the 9th International Conference on Social Implications of Computers in Developing Coutries*, *29*(May), 54–60. Retrieved from www.ifipwg94.org.br/fullpapers/R0010-2.pdf

Avgerou, C. (2010). Discourses on ICT and Development. *Annenberg School for Communication & Journalis, 6*(3), 1-18.

Barratt, M., Choi, T. Y., & Li, M. (2011). Qualitative Case Studies in Operations Management: Trends, Research Outcomes, and Future Research Implications. 329-342.

Baxter, P., & Jack, S. (2008). Qualitative Case Study Methodology: Study Design and Implementation for Novice Researchers. *The Qualitative Report, 13*(4), 544-559.

Bender, C. J. (2008b). Curriculum enquiry about community engagement at a research university. *SAJHE, 22*(6), 1154-1171.

Bender, G. (2008a). Exploring conceptual models for community engagement at higher education institutions in South Africa. *Perspectives in Education, 26*(1), 81-95.

Bernardo, M. A., Butcher, J., & Howard, P. (2011). An international comparison of community engagement in higher education. *International Journal of Educational Development*, 1-6. doi:10.1016/j.ijedudev.2011.04.008

Bidwell, N. J., Reitmaier, T., Rey-Moreno, C., Roro, Z., Siya, M. J., & Dlutu, B. (May 2013). Timely Relations in Rural Africa. *Proceedings of the 12th International Conference on Social Implications of Computers in Developing Countries* (pp. 93-106). Ocho Rios,: IFIP.

Botha, A., & Herselman, M. (2015). A Teacher Tablet Toolkit to meet the challenges posed by 21st century rural teaching and learning environments. *South African Journal of Education, 35*(4), 1-19.

Bringle, R., & Hatcher, J. (2009). Innovative practices in service-learning and curricular engagement. *New Directions for Higher Education*(147), 37-46.

Brunello, P. (2010). ICT for education projects: a look from behind the scenes. *16*(3), 232-239.

Bryman, A. (2004). Qualitative Research on Leadership: A critical but appreciative review. The leadership quarterly, 729-769.

Carnegie. (2015). *Carnegie Community Engagement Classification*. Retrieved from nerche.org: http://nerche.org/index.php?option=com_content&view=article&id=341&Itemid=92#CE%20def

Chauhan, P. (2015). Community Engagement Of Higher Education In India-An Application of Caroll's Model of Social Responsibilty. *Global Journal of Multidisciplinary Studies , 4*(3), 65-72.

Chilimo, W., & Ngulube, P. (2009). Using selected models to explore the connection between information and communication technologies and poverty reduction in developing countries. *Mousaion , 27*(1), 97-115.

Collis, J., & Hussey, R. (2009). *Quantitative Methods for Business Management* (3rd ed.). New York: Palgrave Macmillan.

Creswell, J. (2003). *Research Design: Qualitative, quantitative, and mixed methods approaches* (2nd ed.). London: Sage Publications.

Creswell, J. (2014). *Research Design: Qualitative, quantitative, and mixed method approaches*. London: Sage Publications.

Dodson, L., Sterling, S. R., & Benett, J. K. (2012). Considering Failure: Eight Years of ITID Research. *Information Technologies & International Development, 9*(2), 19-34.

Du Plessis, C., & Van Dyk, A. (2013). Intergrating the community voice into service learning: Engaging with communities. In J. McMillan, C. Du Plessis, A. Van Dyk, H. Dippenaar, W. Carvalho-Malekane, R. Osman, & N. Petersen (Eds.), *Service Learning in South Africa* (1st ed., pp. 59-84). Cape Town: Oxford University Press Southern Africa.

Dugmore, H. (2012). Siyakhula Living Lab: An important step forward for South Africa and Africa. Grahamstown, Eastern Cape Province, South Africa.

Dzidonu, C. (2010, April). An analysis of the role of ICTs to achieving MDGs. Accra, Ghana. Retrieved August 20, 2016

Easterby-Smith, M., Thorpe, R., & Lowe, A. (2002). *Management Research: An introduction* (2nd ed.). London: SAGE publications.

Eisenhardt, K. M., & Graebner, M. E. (2007). Theory Building From Cases: Opportunities and Challenges. *Academy of Management Journal, 50*(1), 25-32.

Fengu, N., & Krauss, K. (2012). *Introducing and implementing ICT4D training in a developing community in South Africa.* Retrieved from carnegie3: http://www.carnegie3.org.za/papers/82_Fengu_Introducing%20and%20implementing%20ICT4D%20training%20in%20a%20developing%20community%20in%20SA.pdf

Flick, U. (2009). *An Introduction to Qualitative Research.* London: SAGE Publications

Ford, M., Botha, A., & Herselman, M. (6-9 May, 2014). ICT4RED 12 - Component Implementation Framework: A Conceptual Framework for Integrating Mobile Technology into Resource constrained Rural Schools. *Proceedings of the IST-Africa Conference.* Mauritius: IST-Africa .

Geldof, M., Grimshaw, D. J., Kleine, D., & Unwin, T. (2011). *What are the key lessons of ICT4D partnerships for poverty reduction?* Retrieved May 8, 2016, from DFID: http://r4d.dfid.gov.uk/PDF/Outputs/SystematicReviews/DFID_ICT_SR_Final_Report_r5.pdf

Gichoya, D. (2005). <Factors Affecting the Successful Implementation of ICT Project in Government.pdf>. *The Electronic Journal of E Government*, *3*(4), 175–184. http://doi.org/10.1108/13552519910282601

Gomez, R., & Pather, S. (2012). ICT Evaluation: Are We Asking The Right Questions. *The Electronic Journal on Information Systems in Developing Countries, 50*(5), 1-14.

Gonzalez-Perez, M. A. (2010). The civically engaged university model in Colombia. *International Journal of Technology Management & Sustainable Development, 9*(3), 161-173.

Goodrick, D. (2014). *Comparative Case Studies.* Retrieved July 15, 2015, from Devinfolive: http://devinfolive.info/impact_evaluation/ie/img/downloads/Comparative_Case_Studies_ENG.pdf

Gorjestani, N. (2000). Indigenous Knowledge for Development. *UNCTAD Conference on Traditional Knowledge* (pp. 1-8). Geneva: The World Bank.

Gumbo, S., Thinyane, H., Thinyane , M., Terzoli, A., & Hansen, S. (2012). Living Lab Methodology as an Approach to Innovation in ICT4D: The Siyakhula Living Lab Experience. In P. C. Cunningham (Ed.), *IST-Africa 2012 Conference Proceedings* (pp. 1-9). International Information Management Corporation.

Hancock, B., Windridge, K., & Ockleford, E. (2009). *An Introduction to Qualitative Research*. Nottingham: NIHR RDS EM/YH.

Hart, A., & Northmore, S. (2011). Auditing and Evaluating University-Community Engagement: Lessons from a UK Case Study. *Higher Education Quarterly, 65*(1), 34-58.

Heeks, R. (2002). Information Systems and Developing Countries: Failure, Success, and Local Improvisations. *The Information Society, 18*(2).

Heeks, R. (2008). The ICT4D 2.0 Manifesto: Where Next for ICTs and International Development? *IEEE Computer, 41*(6), 26-33.

Heeks, R. (2009). Theorizing ICT4D Research. *Information Technologies and International Development, 3*(3), 1-4.

Heeks, R. (2010). Do Information and Communication Technologies (ICTs) contribute to development. *Journal of International Development, 22*, 625-640.

Herselman, M., & Botha, A. (2014). *Designing and implementing an Information Communication Technology for Rural Education Development (ICT4RED) initiative in a resource constraint environment: Nciba school district, Eastern Cape, South Africa*. Pretoria: CSIR Meraka.

Hofstee, E. (2006). *Constructing a Good Dissertation: A Practical Guide to Finishing a Master's, MBA or PhD on Schedule.* Johannesburg: EPE.

International Telecommunications Union (ITU). (2015, November 30). *ITU releases annual global ICT data and ICT Development Index counrty rankings.* Retrieved February 29, 2016, from ITU: http://www.itu.int/net/pressoffice/press_releases/2015/57.aspx#.VtR5a1R97IV

Isabirye, N., Flowerday, S. V., & Von Solms, R. (2013). A developing country market model for voice-based information services. *Annual Conference on WWW Applications.* Cape Town: ZA-WWW.

Isabirye, N., Flowerday, S. V., Nanavati, A., & Von Solms, R. (2015). Building Technology Trust in A Rural Agricultural E-Marketplace: A User Requirements Perspective . *The Electronic Journal of Information Systems in Developing Countries (EJISDC), 70*(4), 1-20.

ITU. (2015). *Measuring the Information Society Report 2015*. Geneva.

Jacob, W. J., Sutin, S. E., Weidman, J. C., & Yeager, J. L. (2015). *Community Engagement in Higher Education Policy Reforms and Practice*. Rotterdam: Sense Publishers.

Kabanda, G. (2012). *The impact of ICTs on MDGs : Context for diffusion and adoption of ICT innovations in East and Southern Africa*. Retrieved March 4, 2016, from Unisa: http://www.unisa.ac.za/contents/conferences/odl2012/docs/submissions/ODL-039-2012_Final_KabandaG_2.pdf

Kinash, S. (2012). *Paradigm, Methodology and Methods*. Australia: Bond University.

Krauss, K. (2009). The collision between international ICT policy and a deep rural afrocentric community in South Africa: Assumptions, interpretation, implementation and reality. *Proceedings of Second Annual SIG GlobDev Workshop* (pp. 1-37). Phoenix: SIG GlobDev.

Kulatunga, K., Amaratunga, D., & Haigh, R. (2007). Salford, United Kingdom. Retrieved from http://usir.salford.ac.uk/9847/1/156_Kulatunga_KJ_et_al_RESEARCHING_%E2%80%9CCONSTRUCTION_CLIENT_AND_INNOVATION%E2%80%9D_METHODOLOGICAL_PERSPECTIVE_IPRC_2007.pdf

Kumar, R. (2004). eChoupals: A Study on the Financial Sustainability of Village Internet Centers in Rural Madhya Pradesh. *Information Technologies and International Development*, *2*(1), 45–73. http://doi.org/10.1162/1544752043971161

Lavery, J. V., Tinadana, P. O., Scott, T. W., Harrington, L. C., Ramsey, J. M., Ytuarte-Nuñez, C., & James, A. A. (2010). Towards a framework for community engagement in global health research. *Trends in Parasitology, 26*(6), 279-283.

Lazarus, J., Erasmus, M., Hendricks, D., Nduna, J., & Slamat, J. (2008). *Embeding CE in South African Higher Education.* Retrieved May 22, 2015, from Education, Citizenship and Social Justice.: http://eus.sagepub.com/cgi/content/abstract/3/1/57

Lin, C. I., Kuo, F. Y., & Myers, M. D. (2015). Extending ICT4D studies: The value of critical research. *MIS Quarterly, 39*(3), 697-712.

Maistry, M., & Thakrar, J. (2012). Educating students for effective community engagement: Student perspectives on curriculum imperatives for universities in South Africa. *South African Review of Sociology, 43*(2), 58-75.

Marais, M. (2011). *ICT for development: people, policy and practice* (pp. 100-120). Pretoria: IDIA.

Mtega, W. P., & Malekani, A. W. (2009). Analyzing the usage patterns and challenges of telecenters among rural communities: experience from four selected telecenters in Tanzania. *International Journal of Education and Development using Information and Communication Technology, 5*(2), 68-87.

Mtsweni, J., & Abdullah, H. (2014). Rapid and Collaborative Development of Socially Relevant Computing Solutions for Developing Communities. (pp. 337-348). Port Elizabeth: International Development Informatics Association.

Musiyandaka, D., Ranga , G., & Kiwa , J. F. (2013). An Analysis of Factors Influencing Success of ICT4D Projects: A Case Study of the Schools Computerisation Programme in Mashonaland West Province, Zimbabwe. *Journal of Community Informatics, 9*(4).

Oates, B. J. (2006). *Researching Information Systems and Computing.* London: Sage Publications.

Pade-Khene, C., Mallinson, B., & Sewry, D. (2011). Sustainable rural ICT project management practice for developing countries: Investigating the Dwesa and RUMEP projects. *Information Technology for Development, 17*(3), 187-212.

Patton, M. Q. (1990). *Qualitative Evaluation and Research Methods.* Newbury Park: Sage Publications, Inc.

Petersen, N., & Osman, R. (2013). An introduction to Service Learning in South Africa. In J. McMillan, C. Du Plessis, A. Van Dyk, H. Dippenaar, W. Carvalho-Malekane, R.

Osman, & N. Petersen (Eds.), *Service Learning in South Africa* (1st ed., pp. 1-33). Capetown: Oxford University Press Southern Africa.

Raiti, G. C. (2007). The Lost Sheep of ICT4D Research. *Information Technologies and International Development, 3*(4), 1-7.

Ranga, M. M., Thinyane, M., & Terzoli, A. (6 September 2010). Exploring cost-effective reinforcements for rural telecommunication networks: Dwesa case study. *Southern African Telecommunication Networks and Applications Conference* (pp. 1-6). Cape Town: Spier Estate.

Rey-Moreno, C., Tucker, W. D., Bidwell, N. J., Roro, Z., Siya, M., & Simó-Reigadas, J. (2013). Experiences, Challenges and Lessons from Rolling Out a Rural WiFi Mesh Network. *The ACM Symposium on Computing for Development (DEV 2013)* (pp. 92-106). Bangalore: ACM Press.

Rislana, K., Good , A., Adams, C., & Scott, P. (2016). The Role of ICT Education and Trainings in Poverty Reduction and Economic Empowerment: A Case Study of Jigawa State Government ICT4D Intervention. *ECEG2016-Proceedings of 16th European Conference on e-Government* (p. 177). Slovenia: Academic Conferences and publishing limited.

Rowley, J. (2002). Using Case Studies in Research. *Management Research News, 25*(1), 16-27.

Saunders, M., & Tosey, P. (2012, May 21). *The Layers of Research Design*. Retrieved from academia.edu: http://www.academia.edu/4107831/The_Layers_of_Research_Design

Saunders, M., Lews, P., & Thornhill, A. (2007). *Research Methods for Business Students*. England: Prentice Hall.

Shakir, M. (2002). *The selection of case studies: Strategies and their applications to IS implementation cases studies*. Retrieved July 8, 2015, from ICBS: http://www.icsb2012.org.nz/massey/fms/Colleges/College%20of%20Sciences/IIMS/RLIMS/Volume03/The_Selection_of_Case_Studies-Strategies_and_their_Applications_to_IS_Implementation_Cases_Studies.pdf

South African Council on Higher Education (CHE). (2010). *Community Engagement in South African Higher Education*. Pretoria: Jacana Media (Pty) Ltd.

Swanzen, R., & Rowe, C. D. (2013). Community engagement as a form of social entrepreneurship in higher education curriculum. *Journal of Community Positive Practices, 13*(4), 55-70.

Tapia, M. N., Gonzalez, A., & Eliceui, P. (2005). *K-12 Service Learning in Argentina*. St Louis: Center for Social Development Global Service Institute.

Tarus, J. K., Gichoya, D., & Muumbo, A. (2015). Challenges of Implementing E-Learning in Kenya: A Case of Kenyan Public Universities. *International Review of Research in Open and Distributed Learning, 16*(1), 120-141.

Thinyane, M. (7-9 March 2016). Walking the Teaching, Research and Community-Engagement Tight Rope: Dynamics, Reflections and Lessons Learned. *10th International Technology, Education and Development Conference (INTED)* (pp. 172-178). Valencia: INTED.

Thomas, D. R. (2006). A General Inductive Approach for Analyzing Qualitative Evaluation Data. *American Journal of Evaluation, 27*(2), 237-246.

Thomson, A. M., Smith-Tolken, A. R., Naidoo, A. V., & Bringle, R. G. (2011). Service Learning and Community Engagement: A Comparison of Three National Contexts. *Voluntas, 22*, 214–237.

Thorne , S. (2000). *Data analysis in qualitative research*. Retrieved June 10, 2015, from Evidence-Based Nursing: http://ebn.bmj.com/content/3/3/68.full

Toyama, K. (2011). Technology as amplifier in international development. *iConference'11* (pp. 75-82). New York: ACM.

United Nations (UN). (2015). *The Millennium Development Goals Report*. New York. Retrieved March 4, 2016, from http://www.un.org/millenniumgoals/2015_MDG_Report/pdf/MDG%202015%20rev%20(July%201).pdf

United Nations Development Programme (UNDP). (2001). *Making New Technologies Work for Human Development*. New York: Oxford University Press. Retrieved March 24, 2016, from http://hdr.undp.org/sites/default/files/reports/262/hdr_2001_en.pdf

United Nations Development Programme (UNDP). (2016). *Sustainable Development Goals (SDGs)*. Retrieved February 29, 2016, from United Nations Development Programme (UNDP): http://www.undp.org/content/undp/en/home/sdgoverview/post-2015-development-agenda.html

Unwin, P. T. (2009). *ICT4D: Information and Communication Technology for DevelopmenT*. Cambridge: Cambridge University Press.

Walton, M., & Heeks, R. (2011). *Can a Process Approach Improve ICT4D Project Success?* Retrieved from Seed: http://www.seed.manchester.ac.uk/medialibrary/IDPM/working_papers/di/di_wp47.pdf

Weber, J. S., & Toyama, K. (2010). Remembering the past for meaningful AI-D. University of Michigan.

Botha, A., & Herselman, M. (2015). A Teacher Tablet Toolkit to meet the challenges posed by 21st century rural teaching and learning environments. *South African Journal of Education, 35*(4), 1-19.

Ford, M., Botha, A., & Herselman, M. (6-9 May, 2014). ICT4RED 12 - Component Implementation Framework: A Conceptual Framework for Integrating Mobile Technology into Resource constrained Rural Schools. *Proceedings of the IST-Africa Conference*. Mauritius: IST-Africa .

Heeks, R. (2002). Information Systems and Developing Countries: Failure, Success, and Local Improvisations. *The Information Society, 18*(2).

Heeks, R. (2008). The ICT4D 2.0 Manifesto: Where Next for ICTs and International Development? *IEEE Computer, 41*(6), 26-33.

Heeks, R. (2010). Do Information and Communication Technologies (ICTs) contribute to development. *Journal of International Development, 22*, 625-640.

Herselman, M., & Botha, A. (2014). *Designing and implementing an Information Communication Technology for Rural Education Development (ICT4RED) initiative in a resource constraint environment: Nciba school district, Eastern Cape, South Africa*. Pretoria: CSIR Meraka.

Willliams, B., Marais, M. A., & Rampa, M. (16-20 September 2013). Evaluation Design of the Cofimvaba e-Textbook Initiative. *South African Monitoring and Evaluation Conference (SAMEA)*. Johannesburg: SAMEA.

Yin, R. (2014). *Case Study Research: Design and Methodology*. London: SAGE Publications.

Yin, R. K. (2009). *Case Study Research Design and Methods* (4th ed.). California: SAGE Publications Inc.

Appendix 1: Ethical Clearance

University of Fort Hare
Together in Excellence

ETHICAL CLEARANCE CERTIFICATE

Certificate Reference Number:	ISA031SMKO01
Project title:	**A Community Engagement model for implementing Information and Communication Technology for Development Initiatives by Higher Education Institutions in South Africa.**
Nature of Project:	Masters
Principal Researcher:	Jacquilin Mkombachoto
Supervisor:	Ms N Isabirye
Co-supervisor:	Prof M Thinyane

On behalf of the University of Fort Hare's Research Ethics Committee (UREC) I hereby give ethical approval in respect of the undertakings contained in the above-mentioned project and research instrument(s). Should any other instruments be used, these require separate authorization. The Researcher may therefore commence with the research as from the date of this certificate, using the reference number indicated above.

Please note that the UREC must be informed immediately of

- Any material change in the conditions or undertakings mentioned in the document
- Any material breaches of ethical undertakings or events that impact upon the ethical conduct of the research

The Principal Researcher must report to the UREC in the prescribed format, where applicable, annually, and at the end of the project, in respect of ethical compliance.

Special conditions: Research that includes children as per the official regulations of the act must take the following into account:

Note: The UREC is aware of the provisions of s71 of the National Health Act 61 of 2003 and that matters pertaining to obtaining the Minister's consent are under discussion and remain unresolved. Nonetheless, as was decided at a meeting between the National Health Research Ethics Committee and stakeholders on 6 June 2013, university ethics committees may continue to grant ethical clearance for research involving children without the Minister's consent, provided that the prescripts of the previous rules have been met. This certificate is granted in terms of this agreement.

The UREC retains the right to

- Withdraw or amend this Ethical Clearance Certificate if
  - Any unethical principal or practices are revealed or suspected
  - Relevant information has been withheld or misrepresented
  - Regulatory changes of whatsoever nature so require
  - The conditions contained in the Certificate have not been adhered to
- Request access to any information or data at any time during the course or after completion of the project.
- In addition to the need to comply with the highest level of ethical conduct principle investigators must report back annually as an evaluation and monitoring mechanism on the progress being made by the research. Such a report must be sent to the Dean of Research's office

The Ethics Committee wished you well in your research.

Yours sincerely

Professor Gideon de Wet
Dean of Research

15 May 2016

Appendix 2: Interview Guide

Questionnaire for HEI Project Leaders

1. May you please provide an overview of the goals and objectives of the ICT4D project you are undertaking?
2. How were the needs of the community determined?
3. Literature reviews that most Higher Education Institutions do not have operational community engagement policies? What are your views on the community engagement policy of your institution?
4. Does your institution offer incentives or awards to help foster community engagement projects?
5. How are the strategic activities of the HEI (teaching and learning and research) integrated into your project?
6. Who are the stakeholders in the project?
7. How did you initially connect and build relationships with the community? How do you maintain this relationship?
8. Is there anyone among the community members involved in the planning, implementation, monitoring and evaluation of the project?
9. What plans were in place for skills transfer to the community members? How was the process conducted?
10. What capacities and competencies of the various stakeholders does the project aim to enhance?
11. What is the current and future stage of the project? Who is in charge? How is it funded?
12. What challenges have you faced towards accomplishing the objectives of the project?
13. Did you have or do you have enough time to implement the project?
14. What are the critical success factors of the project?
15. How is the project monitored and evaluated? Who is responsible for the process?
16. How is the knowledge gained through the project shared among the community and other people?
17. How is the knowledge gained through the project shared among the community and other people?

Questionnaire for Community Members

1. May you please provide an overview of the project in your community?
2. How has the project benefited the community?
3. How was the relationship between the community and the other stakeholders initiated and how is it maintained?
4. In the development and implementation of the project was the community given sufficient opportunity to contribute to the project?
5. How were the people in the community trained for the project?
6. Was there sufficient time and training to acquire skills and knowledge to utilise the project?
7. What skills have the members of the community benefited from the project?
8. How is the project maintained in terms of funding?
9. How is the project monitored and evaluated?
10. What challenges have you faced with regards to the project?
11. How is information about the project communicated among the community members?
12. Is there anything else you would like to add with regards to the project?

Appendix 3: Summary of responses

Project Leaders Summary of responses

Question	Respondent 1	Respondent 2	Respondent 3	Respondent 4
1. May you please provide an overview of the goals and objectives of the ICT4D project you are undertaking?	The objective was to see how the whole education system in Cofimvaba can be influenced through the use of mobile technology. The aim was to come up with a framework that can be used to integrate knowledge in tablets to support teaching and learning	The objective was to figure out how ICTs can benefit rural communities and in so doing learn how the community can sustain the project without us or with us in a different capacity. Our Long range goal is to figure out how the model can be replicated to other communities.	The general overview of the project is focused on introducing ICT and its benefits to the community. The idea is to have communities to benefit from ICT deployments. So we have deployed our equipment in a number of schools around the Dwesa area, about 17 schools. One of the things that we have done, is to incorporate community engagement through teaching computer literacy courses. We have trained close to 200 community members. We also started the same project here. It's an extension of Siyakhula but it's within the Nkonkobe Municipality.	The goals were to understand how e-commerce can be used to support agricultural trade (specifically aloe) in disadvantaged communities. The project also sought to test the suitability of voice as a medium of exchange in communities that do not have access to computers or internet enabled devices, and face language and literacy barriers when using information services. The study also sought to examine the issues of trust relating to the adoption of new technologies by rural communities. The study was intended to be a research project, and the goal (as communicated with the pilot group from the onset) was to understand e-commerce, trust and technology adoption in the context of rural agriculture.

2. How were the needs of the community determined?	The Deputy Director at the Department of Science and technology approached us to do a holistic project on his constituency (Cofimvaba). The holistic project was TECH4RED and ICT4RED is part of the project.	We were fortunate enough because we had already been there for so long and we knew the context. Instead of us coming as outsiders and saying you need this, it was a different approach that looked at the processes that were going on inside the community so that we could work our goals in with what the goals of the community where.	It is more of a mixed approach. We started with ethnography were people stayed in the community. But we also from our own knowledge considered other aspects which we could impose on the community, like the community knew they were not computer literate so they could not determine the teaching material.	The needs of the community were determined through desktop research, conversations with stakeholders and participatory design.
3. Literature reviews that most Higher Education Institutions do not have operational community engagement policies? What are your views on the community engagement policy of your institution?	The Universities I work with are all engaged in community services. They are doing well with that. Since I was the chairperson of the Living Labs in South Africa, I know what exactly Universities are doing when it comes to community engagement.	I'm not aware of a community engagement policy at UWC. My understanding is that community engagement means different things to different people. For example, for many, community engagement means going to high schools and advertising UWC's programmes in an effort to attract students. For others, like myself, it's about engaging communities within a research programme/endeavour. We do have a community engagement office, and they appear to side with the former interpretation. There is a community engagement portal on the UWC website, but one has to register and jump	The university basically has a strong policy for community engagement. The policy that is documented is so much detailed although it is a generic policy. It does not describe exactly what you have to do in the community, but what it actually prescribes is that as academics you have to take time to use your knowledge to help the communities surrounding our universities. So as I am saying it generic, it is then upon departments and individuals, mainly it is upon individuals who work as researchers considering your research area, you now have to look at how you can help the community. Actually the	I feel the policies exist, but are not yet fully mature or operational. In addition, they are not well communicated throughout the Institution. Basically, only those academics that have an interest in community engagement tend to be familiar with or understand the policies.

		through hurdles in order to get into it. I feel my university touts being an engaged university, yet doesn't have a firm grasp on what that means.	University has been so much vocal in that part stating that we have to participate so there is a generic policy which advices people to engage in community engagement but there is no prescription as to what exactly you have to do	
4. Does your institution offer awards or incentives to help foster community engagement projects?	From my own experience most of the institutions I work with seek funding elsewhere for these projects. They are very expensive so they need a lot of funding. It will be very difficult for the institutions to fully fund the projects.	I am not aware of funding available for community engagement. One more thing: when we go for self-promotion, or look at incoming candidates for academic positions, the bullet community engagement is always there alongside research, teaching and admin. However, it doesn't really bear much weight, again because there doesn't seem to be a clear understanding of what it means.	It is used for promotional purposes. To see what you have been doing in the community you have to produce evidence to show what exactly you are doing and the impact of your intervention on the community. In terms of incentives, unfortunately at the moment the University does not fund community engagement activities, although within the community engagement framework there is that provision that it has to fund such projects, but I think mainly the problem is that the University is financially constrained. So basically funding comes from individuals who raise funds through research funding or from various centres. So I can say its external funding.	Yes, academics are assessed on their community engagement profile when applying for promotion. There is also a monetary award from the vice chancellor for excellence in community engagement.

5. How are the strategic activities of the HEI (teaching and learning and research) integrated into your project?	I have about 12 Masters and PHD students from universities in the Eastern Cape involved in the project. Through this research we have managed to publish research papers informing the ICT4D research field. We have also informed researchers from Universities in the Eastern Cape about the project. Because of its success some of them are doing more research with focus on other areas, for instance there were ethnographers who want to stay there and write their perspectives of the project	BANG activities and research projects, such as Zenzeleni and Sign Support, are part of the academic programme: Honours, MSc, PhD because all of these are based on research. They are credit bearing. Of course the research outputs go on the CV, too. Furthermore, it should be noted that all of our ICT4D-oriented graduates get jobs, too, and interestingly, not in the ICT4D space. It's all corporate SA. So, it would appear that the research and teaching and learning skills involved with ICT4D projects are indeed transferable.	The project has a huge impact. In teaching basically, when our researchers take time to go and teach computer literacy, it really promotes the teaching and learning aspect of the project. Besides them teaching that our researchers are also learning a lot from the community in terms of culture and other aspects of life. It also has a lot of impact in research because it has served as a platform our researchers our students can use to carry out their research. So in that case it is actually sharpening our research by helping us be on the ground, working with the communities and accomplishing various objectives.	The study contributed to journal and conference publications, as well as a doctoral thesis. Some findings from the research have contributed to the content of some subjects that I teach. I think this is a long term outcome of the project. I have since joined a provincial ICT in agriculture research group. The topic is of emerging relevance and interest nationally. We have organised a workshop involving researchers (including researchers from CSIR), students and community stakeholders. The workshop and research group examines ways in which ICT can support agriculture, and aims at generating content that can contribute to further research and application in the field. One of the focus areas is the use of voice platforms to support rural agriculture. Two of my masters' students have conducted their research studies in the subject area. I believe the more we advance the research, the more likely it is that it will inform the

				curriculum.
6. Who are the stakeholders in the project?	Besides the teachers and learners and the project team, the provincial chair of the department of education, the principals at the schools and the tribal leaders and parents.	First and foremost we have the community, then the academics and the various funders we get to help fund the project.	There academic researchers from UFH and Rhodes and community members. There is another important stakeholder in this case who the funder is. So we have various companies that support the project. The main sponsor is Telkom but we have other companies that are greatly supporting like SAP Green Techit's also an IT technological company. We also have Corian SA. We had other small ones previously.	The project was conducted collaboratively with researchers at the university, the IBM development teams in India and Israel, the aloe processing factory, the aloe harvesters and the farm owners where the aloe was harvested from.
7. How did you initially connect and build relationships with the community? How do you maintain this relationship?	There was a specific group on our team who were very good with change management and also stakeholder management. They engaged with the community before the project started. Everyone was invited and in their own home language the whole process was explained. Questions could be asked and throughout the whole	The project leaders lived there for like 6 to 8 months at a time. They each spent between one or two years in the community and that gave much deeper insight into what the community needs were and how to take the technology and help it fit in better with what the community needs were. Also Luckily for us, the latest PhD graduate on the project has	We had to build the relationship with the Dwesa community from scratch; we did not have any previous relationship as you can see our university is actually located more than 300km away from the Dwesa community. So the key aspect that led to the project being developed there is the location of the community. It is located in nature reserve. So the idea was	We approached the aloe community by contacting the aloe factory; the managing director then connected us with the farmers and the harvesters and asked them to assist us with the project. We then maintained contact through field visits, telephonic conversations and emails.

	project the district officials and principals involved received change management training.	elected to do a post-doc and remains involved in the project. He goes to the field regularly, spending up to a month at a time. We are all in constant contact with the community research assistants. However, the main reason why we can maintain the relationship is because we continue to attract funding on the project, as well as the project itself is generating income locally (and the revenue stays local, too).	that if you deploy the project there it increases awareness to the community as the community is in a tourism area. So the issue was linked to tourism, so we had to go there on the ground and start from scratch. So to maintain the relationship came from ensuring that the people understood why we were there and for them to see the benefits from the project. So the Dwesa community has seen the benefits of the project itself and taken it upon themselves to support the project. I can say they are really positive about the project.	
8. Is there anyone among the community members involved in the planning, implementation, monitoring and evaluation of the project?	There was one community leader who was involved in the project from the beginning till the end. He was the go between person for the community and the stakeholder management group. He would report on progress at tribal meetings and also report back to us	Actually the community cooperative is very much involved in the project. They are the ones who decide on how the project should proceed and we also have a contact person who works closely with us. He is our local research assistant and is a permanent resident in the Mankosi community.	The community has a committee with a chairman, secretary and other committee members who are responsible for the project.	
9. What plans were in	As reviewed in the book.	In fact, we did training on	The researchers would take	Training was provided to all

place for skills transfer and how was the process conducted?	The teachers were trained using the earn as you learn approach and the train the trainer approach. They would earn badges for completing modules in the training. Once they had enough badges they would receive a tablet. Some of them would become trainers and issue badges to the others. With regards to the students they could not enter the community the first time alone, so we introduced them and explained their roles and linked them to specific teachers so that when they wanted to go without us they would engage with this person.	solar charging and network management in a way that the training was hands-on and included the community members building the solar stations themselves, as well as installing (and even upgrading) the network components. The main community research assistant is in charge, and does most of the continued maintenance	turns and go and conduct computer literacy training in Dwesa. The community members after they complete the course would get certificate of competence. We are using ICDL. But we are working on getting the centre accredited so that we issue them with certificates that are accredited with bodies such as SAQA.	members on the use of the voice platform. Younger members of the pilot group were requested to assist the elderly when necessary. A user manual was provided. The rest of what the group learned was achieved without our direct involvement, and was an unintended consequence. One said the project opened up a whole new world for them, they saw mobile phones differently, and were amazed at how it could make their work much easier.
10. What competencies of the various stakeholders does the project aim to enhance?	The teachers acquired digital literacy skills and innovation skills. There was a huge collective consciousness among them.	The competencies are technical, financial, legal and social. Technical in the sense of constructing and maintain the hardware of the project, including solar and networking equipment. Financial in terms of the community cooperative decided on how much things cost, e.g. charging a cell phone battery or per minute charge for a voice call outside the network; and they collect the	There has been a lot of impact from the educational perspective because from the 1st time when we deployed our infrastructure, the community members include teachers and students themselves, not many had ever touched a computer before. The teachers had not had the chance to utilise ICT for students learning. So since we started this project ICT has become part of their teaching strategy. Students are	For the community members, the project developed their awareness of the use of voice applications to support their business activities. Before the project, many of the participants did not use their phones for much more than calling one another. Some did not even have mobile phones. And the elderly members used their children and grandchildren to operate their phones for them. They were

		money, and manage it, themselves. Also, by going through the licence exemption process with ICASA, they have also become aware of the legal ramifications of running an ISP. Lastly, we are hoping that the experience of running an ISP opens their eyes to the social challenges of doing so, e.g. getting women involved, having the youth know more than the elders, etc.	accessing a number of materials through the computers. They have also set up some groups around the schools where they can communicate through the ICT medium. We work in collaboration with Rhodes, so our students Masters and PHD do conduct from time to time some research in that particular area. There are some who have developed some particular applications that have been deployed for example the e-commerce platform, which is very beneficial to the community.	not aware that their phone's interface could be switched from English to Afrikaans. This was useful since most of them could speak English fluently. After using the application over an eight-week period, they also acquired some basic e-skills. They were able to use an e-service (the voice application) efficiently; they were needing less support, and had a sense of progress and accomplishment. The phone and the application were no longer seen as intimidating, and the community had a sense of empowerment. The managing director of the aloe factory expressed interest in extending the application to support production planning. This is an initiative we wish to initiate when we have the resources to implement it and a suitable plan to sustain it.
11. What is the current and future stage of the project? Who is in charge? How is it funded?	The project is still running. However, nobody is funding the project, but there is still some interest money. We are also fortunate because of the success of the project	The community cooperative runs the project. They have from the very beginning of the current phase, in this case, since 2012. There is one point of contact that works most	In terms of funding, the biggest contributor to this are the institutions. Mainly the biggest contributor is Fort Hare although we do get collaboration from Rhodes. So	The project had a start and end date and was not intended to last indefinitely. This was communicated to the participants from the start, and they knew it was primarily a

there is a new project which uses modules developed for ICT4RED which we are involved in with the department of rural development and land reform.

closely with us, we call him the ‘local research assistant' or 'community research assistant'. He does most of the coordination for the project, as well as spearheads the technical support. It will be up to the cooperative to decide if and when we add Internet services to the project, and how to organise and pay for the backhaul. As I said, we have a post-doc on the project now, and he can assist with these issues. With regards to funding We have been able to attract several small grants, most recently the Internet Society donated some money which included an upgrade of the mesh potatoes in the field (these are the networking nodes). I would hope that after adding internet services, and figuring out a way to get lower end smart phones into the community, the network would be able to become financially sustainable based on charging phone batteries, voice calls and data; and not require outside injection of capital. We haven't quite reached that state, but I think we are moving in the right

at the moment the community has not reached a level where they are able to fund the project themselves. However, there has been a number of initiatives from various schools were they charge minimal fees for access to computers and internet. They then use that money to buy things like printing paper and for the day to day running of things. So we are no longer running the day to day things. We hope that in the long run this project is going to grow as the adoption increases we believe that they will be able to generate more money to an extent that we will allow them basically to stand on their own. Actually a project has a start and an end, meaning that at one point our massive intervention will have to come to an end although we keep supporting other issues. The idea is to offload the whole load to the community. Even if it’s the institutions that started the project it’s their project at the end of the day. Otherwise we would not have done them any service if we continue like that. A lot of things can change on the

research study. The project reached its end however we do have plans to initiate further interventions in future (as mentioned in the previous question). The project was funded by IBM and could not be extended beyond the scope of the project plan. Further funding will be required for future interventions.

		direction.	ground issues like funding and the project can collapse. So we are readying the community to accept all the running of the project.	
12. What challenges have you faced towards accomplishing the objectives of the project?	The biggest challenge we faced and we are still facing is that the national department of education was not interested in being involved. Without their extra support for maintenance and sustainability the impact of the project will be affected. Also some donors are using the opportunity to donate tablets to schools but they are not training the teachers to use them as we did. It is highly likely that at the end of the day they just accept the tablets lock them away or use them for personal use. Also when teachers leave they take their knowledge and experience away which is not necessarily replaced.	The projects are very expensive, we had to get a lot of funding as we spent a lot of money on the project each year. There is money needed for student support and for travelling since it is far away which we have been criticised for going from Cape Town to the Eastern Cape. Also we have seen more advances in the project since we started putting more PHD students other than Masters as they can spend more time in the field. Also the fact that the people do not use the system to make calls and there are various reasons for that. Social reasons as the people thought the phones could only be used by the tribal authority and they could only go and charge their phones. Privacy as well the phones are public phones and people prefer to make calls from their own phones, so we are looking at how we can do	The biggest challenge is funding, funding is very scarce such that we have to scale down some other issues. For example because of the distance that separates us from that community we are not able to be with them all the time. We have to go after some and we feel that this kind of scenario is not all that helpful. We need to be with the community throughout. Also of late researchers are become fewer and fewer that are interested on working on the research. You know it's a rural area and when we were doing our research people had to go and stay there for a week or two weeks, so not many researchers choose to do research in that area.	Timelines of the funders do not often align with timelines of the community and those of the researcher process. The funders' timelines take precedence.

		that. There are also some legal challenges even though the system is legal it is still breaking a few laws, we need to make it 100% legal and get it to handle the capacity of doing more calls. We are also trying to include more women in the project as both managers and users.		
13. Did you have enough time to implement the project?	Yes. Actually we had different experts working on different aspects of the project like we had experts in project management, stakeholder management, change management etc. So the whole project was well planned even before it started. And when we rolled out the project it was not strenuous in terms of time. We also rolled out the project in phases which helped us work well with the schools we had in each phase.	We view this as an ongoing concern. As we get external funding, there are deadlines and deliverables associated with that funding. And we have several on the go. However, the base operation of the network is in the hands of the community cooperative, and they operate on their own time scale.	There might have been one or two things that were neglected. But basically what I can say is that we are basically fortunate in that we have not encountered such problems. All the stakeholders have allowed us to detect the pace and everything. The funders also allowed us to detect the pace of objectives, timelines and everything. So there has not been any misunderstanding of any sort.	Yes
14. What are the critical success factors of the project?	The first success factor was that technology had to be earned. The training was fun and it involved gamification. We also celebrated milestones and the whole community could	It's hard to say at this point. Obviously, use of the network in terms of number of phones charged and number of voice calls made help us determine the impact. However, I believe the true success factors will be	The critical success factors are basically hinged on the communities' desire to participate that is the starting point. Secondly the funders because without them the project would not come to	

	see the improved skills of teachers and it also boiled down back to the learners. The teachers also gained exposure to 21st century skills of teaching like problem solving and creativity. Asset management was also handled very well, the process went off smoothly.	the amount of money spent on communications. We'd like to show that the project lowers the cost of communications so that money can be used for other items, like food.	fruition. Also the attitude of the community. Then we ourselves the preparedness and attitude of the researchers. So the success has been hinged on the funding and some companies even donating the equipment and also the community with a positive attitude.	
15. How is the project monitored and evaluated? Who is responsible for the process?	From the beginning we wanted to see the project as an example of long term sustainability. So there are still meetings between the team, district officials, principals and everybody else where they voice their opinions about the project. We have a help desk also for repairing tablets and we developed a total cost of ownership model which the schools can use to help them plan financially for acquiring or repairing new equipment. We also get feedback through our PHD students who have not completed their studies yet.	We have a post-doc on the project, and this is his responsibility. We plan to do periodic (e.g. every couple of years) data collection to see if people's behaviour and use of the network has really changed, alongside actual quantitative collection of what people actually do on the network.	What I can say is that we organise a number of workshops were we meet with the community members. We discuss issues and progress and what needs to be addressed basically. Also at some point twice a year we also meet the other stakeholders and we brief them on the progress of how the project has been going and then we discuss together giving each other ideas of how this can be done. Besides that, we have a research team that also does the evaluation from the academic point of view from time to time and we have our research meetings where we discuss about the project. Form the community side we	The project is over no monitoring and evaluation

actually have a committee that has a chairman and all other members. So the committee is the one that disseminates all the information, we contact the chairperson ourselves and then we discuss if we are going to have a meeting. They also even without us have their own meetings from time to time and they give us some feedback. And then if they think that there is a need for us to get together they inform us.

16. How is knowledge gained through the project shared among the community and other people?	The meetings carried out involved everybody in the community. The community members also had separate meetings alone. Information would be shared between the project team and the community through one of the community leaders who was involved from the beginning to the end. In the academic environment we had meetings with various universities informing them about the project. They also wanted to go and do additional research due to the success of the project. Besides that we had 16 conference papers and the training material was developed through open source licence so it was translated to Afrikaans and Spanish and its being used elsewhere	The cooperative conducts regular open community meetings regarding the project. The current status and issues of concern are discussed openly and regularly. In the academic community it is through various publications and conferences were we get to interact and share information about the project.	From the academic perspective we share it through some organising workshops where we do presentations and we even also disseminate in various conferences national and international. We also have a number of publications which have the information about the project. With the community it is through the workshops or meetings that we have, were members that have never participated are taken through what exactly the project is about.	One journal article, three masters' dissertations, one PhD thesis, one academic workshop, several presentations to DRDAR

17. What are the lessons learnt from implementing this project?	We learnt a lot on community engagement, stakeholder management and deployment of assets. We learnt about looking at the area holistically and also about infrastructure. You have to look at all facets involved in technology integration not just technology integration itself. Lastly it is very important to do constant monitoring and evaluation in order to understand where the red flags are and address them	Well, we try to publish these things. Our most recent pub contains a lot of what we have learned through the most recent M&E data collection. Rey-Moreno, C., Blignaut, R., May, J., & Tucker, W. D. (2016). An in-depth study of the ICT ecosystemin a South African rural community: unveiling expenditure and communication patterns. *Information Technology for Development*, 1–20. http://doi.org/10.1080/02681102.2016.1155145	We learnt about the importance of the community. You cannot do a project successfully without a positive attitude and a number of issues cannot be carried out if you do not involve and include the community. So we have learnt that the community itself has to be part of the whole project, actually closely on the fore front of the project. The other thing is to always give updates to funders especially from the financial sustainability point of view, they need to see credible results and they want to see how their intervention in terms of funding benefits the society. Also we have to be very innovative and work hard, it is not easy to sustain a project especially when the institution is at still at a point where it cannot fund community engagement. So you have to be very active getting in touch with various industries to try and form partnerships.

Community members' summary of responses

	Respondent 5	Respondent 6
1. May you please provide an overview of the project in your community?	The project started at our school in 2013. We were in the project and all the teachers we given tablets and we were trained on how to use the tablets. Not only to use them but to use them in teaching using different strategies when you are teaching or presenting your lesson so that you can be able to teach using the tablets.	The project in our community is meant for the community to benefit from using ICT. In our case it aims to reduce the costs associated with the charges associated when you are using the mobile networks. The pricing of the networks is too high for the disadvantaged communities and the project helps us reduce the costs.
2. How has the project benefited the community?	The people used to go to town for printing and photocopying, but now they come to the school and we charge them 60c and in town its one rand. For them to go to town it also costs money its 10 rand. Also the teachers and learners use the tablets for learning.	The primary benefit of the project is that the project is being used to invest in the community. It giving back to the community. The second benefit is that the project has brought some sort of community togetherness. Because the project is structured in a way that there are 12 villages and each village has chosen a delegate to represent them in the project. We sit together on a monthly basis to discuss about the plan of the project like now we are in the process of upgrading the project.
3. How was the relationship between the community and the other stakeholders initiated and how is it maintained?	The researchers came and told us about the project. We were one of the first schools to have the project before it went to other schools. For the meetings about the project everyone was invited and told about the project even the parents. So the whole community knows about the project. Now the researchers do come sometimes and send in researchers and we also have a WhatsApp group for the facilitators which we use to communicate and we can communicate with them.	So when the project was formally initiated. The project team approached the tribal authority. Here in Mankosi we have the tribal authority and headmen and sub headmen. They were all consulted about the project and then gave consent for the project after consulting with the people.

4. In the development and implementation of the project was the community given sufficient opportunity to contribute to the project?	Yes we were involved because everyone was invited to the meetings of the project to see what was going on and to ask questions about the project.	Yes, they were involved because the tribal authority would call for a meeting and people were invited to come and hear about the project and ask what the project is about and what they wanted to know.
5. How were the people in the community trained for the project?	We had about 10 modules were you had to do them. eight of them were compulsory, so if you did not do the eight compulsory ones you would not get a tablet. Tablets were earned not given. You had to get the eight badges and then you would qualify for a tablet. Then we had recognition were we were given certificates to say the tablets are ours and the school would receive about 150 tablets for the learners.	So in the beginning when the project was started, the community members were the devices are hosted were all trained on how to set them up. Everyone set up the devices at their homes themselves. Now that we are upgrading we also have a team working together because we need to upgrade our devices to such a capacity that they can provide internet access to the schools in the community and enable people to use Wi-Fi among other things.
6. Was there sufficient time and training to acquire skills and knowledge to utilise the project?	Yes, we had sufficient time for the training. I am actually one of the facilitators who trains the teachers who were not trained before.	Yes, because the people implemented the devices themselves and finished. Also now with the help of other people I can actually maintain and the equipment.
7. What skills have the members of the community benefited from the project?	The teachers can now use the tablets for teaching. There are also the students who can now get material for learning using the tablets and also have access to other teachers from the different schools.	The community members are now working together maintaining the project and making sure the equipment is working well. They know the project is helping them charge their phones and make cheaper calls.
8. How is the project maintained in terms of funding?	We do get money from the printing and photocopying but that is not enough. We use the money from the school budget for the maintenance of the tablets and right now we have not taken any tablets for repair they are working. Next year we are going to include the project in the school budget; the school does set aside money for that from the school	In terms of funding we have money which is collected at the end of the month through the co-operative that is attained from charging a fee for charging phones. The money is used for different things such as to finance members of the co-operative who want to go into town for meeting concerning the project. Also for upgrading the funding we managed to attain funding

	fees.	from an external NGO funder and we are still waiting on the South African one. Our project was listed under the non- profit cooperative section so they need us to write a proposal for that. Hopefully we will get the funding.
9. How is the project monitored and evaluated?	As the facilitator at my school I am the one who looks after the project. Count the tablets and there are students who are there to take the tablets and go with them to the teachers. The researchers do come sometimes to see how the project is going.	Usually their students in the research who come here often and they will be doing some sort of evaluation. They can focus on different areas the technical aspects of the project, the gender aspects and many more things. I can say that is how the project is mostly evaluated and this information is then brought back to us.
10. What challenges have you faced with regards to the project?	We recently had a break in and 37 tablets were stolen. We had to hire a security to protect the tablets and keep them safe.	The problem is that we are a disadvantaged community and before there have been external people who have come in with money to spent or funding they got. They did not make the community feel like they owned the projects. I can say this project is like an icon for the community because the community feel like the project is their own, and they see that the project is meant to benefit them and not the funders.
11. How is information about the project communicated among the community members?	From us we have a WhatsApp group for the facilitators where we discuss the project and the students also have access to the other teachers.	We compile progress reports and send it to them and they communicate back with us. We also have our own meetings and the information the student researchers get, they communicate it back to us to help to see where the project is going right and where it is wrong. They never do anything without informing us.
12. Is there anything else you would like to add with regards to the project?	The community needs to know that the project is now their own because that was not formally communicated. I wish also the district department of education would come and evaluate and monitor this project because it is not only at our school but at many schools.	Being so hands on the project, I guess you do notice some things which need attention. For example, I think there is need to find a way to get the youth more involved in the project. Like now when we are upgrading we need more hands, let us say at a school if they run out of data bundles they will need someone there to assist them with that, so if the youth are involved that would be very helpful.