



**BEYOND SUSTAINABILITY: TOWARDS AN IMPLEMENTATION  
OUTCOMES FRAMEWORK FOR ICT4D COMMUNITY PROJECTS**

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by

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# Declaration

I declare that this dissertation, which I submit herewith for the research qualification

## Master of Science degree in Computing

to the School of Computing, University of South Africa, is apart from the recognized assistance of my supervisors, my own work, and that all the sources that I have referenced or from which I have quoted have been indicated and acknowledged by means of complete citations. I further declare that I have not previously submitted this work, or part of it, for examination at the University of South Africa for another qualification or at any other institution of higher education.

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on this 18<sup>th</sup> day of August 2021

(Candidate)

## **Best Student Paper Award**

Part of this work was presented as a Student Paper in August 2018 at the IDIA conference, Hartbeespoort, South Africa. The title of the paper: Beyond Sustainability: Towards an Implementation Outcomes framework for ICT4D Projects presented and researcher received an award for “best presented paper” in our group.

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# Abstract

A significant challenge of ICT4D community initiatives is that they tend to fizzle out after a few years. To overcome this challenge, most research work has focused on sustainability. This research drew on the theory of implementation outcomes from public health to identify other community implementation outcomes that might contribute towards the sustainability of ICT4D community initiatives. The study was conducted in the qualitative-interpretive paradigm using three well-known South African ICT4D initiatives, namely: the Siyabuswa Educational Improvement and Development Trust (SEIDET), the Siyakhula Living Lab (SLL) and the Council for Scientific and Industrial Research (CSIR) Cyber Security Awareness Project.

The key findings revealed that (a) although efficient training was offered to community members at the commencement of the ICT4D initiatives, the vision for the initiative remained with the initiative champion; (b) people move and the technology changes, which necessitates a review of the relevance of the initiative and adapting current technology; (c) initial sponsors from different sectors who supported the initiatives when they commenced withdrew support with time; (d) the running of day-to-day operations of these initiatives requires formal policies and procedures for acceptable behaviour transparent to all the role players; (e) transferring the appropriate skills to the staff taking over the project, which imposes a fresh way of documenting the skill-transfer process.

The findings were then used to create an ICT4D implementation framework utilizing Actor Network Theory (ANT) because of the sociotechnical and non-linear nature of the findings.

The thesis recommends that ICT4D initiative leaders should continually broaden the community awareness of the positive impact of the initiatives; and to continually identify emerging digital technology and new sponsors who advocate for how such emerging technology could result in human development in the communities.

The research study makes a contribution to the theory and practice of ICT4D. For theory, the thesis draws on Implementation Outcomes literature, mainly garnered from the public health sector. For practice, the research recommends adopting the Implementation Outcomes framework as an appropriate instrument to enable longer standing ICT4D initiatives.

**Keywords:** ICT for Development (ICT4D); Evaluating Outcomes; Open Development; Implementation Outcomes; Capability Approach; Project Sustainability; Development Theory; Information Technology; Community Centre; Measuring Implementation.

## List of Acronyms and Abbreviations

CA	Capability Approach
CEO	Chief Executive Officer
CR	Critical Realism
CSIR	Council for Scientific and Industrial Research
DDoS	Distributed Denial of Service
HDI	Human Development Index
ICT	Information and Communication technology
ICT4D	Information and Communication Technology for development
IOs	Implementation outcomes
IS	Institutional sponsors
IT	Information Technology
ITU	International Telecommunication Union
MDGs	Millennium Development Goals
NGO	Non-Government Organization
OD	Open Development
OS	Organizational sponsors
OIP	Organizational Influence Process
PAJA	Promotion of Administrative Justice Act
PM	Project Manager

RGL	Research Group Leader
SDGs	Sustainable Development Goals
SEIDET	Siyabuswa Educational Improvement and Development Trust
SLL	Siyakhula Living Lab
UN	United Nations
WACS	West Africa Cable System

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# CHAPTER 1

## Introduction and Project Overview

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### 1.1 Background

The topic of development has attracted the interest of researchers from various fields such as economic studies, healthcare, social sciences and not surprisingly in the area of development studies (Gxulwana and Krauss, 2010). The key driver in this research area is the understanding of the traditional definition of development and that researchers continue to look for improved ways to achieve developmental goals. The growth in internet use, together with reprioritization of international development in many developing countries, has brought solutions of how ICT can be used to address global challenges. Even so, most of the development initiatives are focused on poverty reduction, improved economic conditions, better education, and improved quality of healthcare. In contrast, models for development assume that ICT4D interventions can achieve economic growth (Gxulwana and Krauss, 2010).

Information and communication for development (ICT4D) represents ICT and development; "ICT" for the technology-based systems and platforms, composed of electronic technologies used for communication and information processing; and "development" which comprises of infrastructure and social and economic elements such as education, poverty alleviation, general communication, sustainable livelihoods and governance (Smith and Turpin, 2017; Coetzee, 2019). In rural communities, ICT4D has contributed to the development of practices and policy recommendations and has enabled the use of ICT as a platform for transformative development (Marais, 2015). This study posits that implementation science can develop a well-structured implementation.

Implementation sciences ensure that new behaviours are sustained. For example in the ongoing Covid-19 pandemic, implementation science has been drawn upon to recommend social distancing, hand-washing and wearing of masks can be used as measures to deter infections in communities (Hirschhorn *et al.*, 2020; Wensing *et al.*, 2020). Following this example, interventions and strategies are implemented to improve the outcome and impact within an implementation framework. Such critical evidence produced through implementation research, can inform responses and the strategies are considered locally and globally to community initiatives (Hirschhorn *et al.*, 2020). Implementation science has become increasingly relevant in the developing phases of the pandemic and it is expected that its role will quickly grow in

the coming period (Wensing *et al.*, 2020). Public health efforts to stop the pandemic need to be accompanied by other evidence-based interventions to achieve longer-lasting outcomes. The use of appropriate implementation strategies ensure that lessons are learnt, and evidence-based practices are implemented faster than the pandemic to improve health amongst the population. This thesis draws on Implementation Science to improve ICT4D initiatives.

The increased acceptance of the role that ICT plays in human and social development has led to the emergence of many ICT4D initiatives. However, the evaluation of these ICT4D initiatives is often centred on their sustainability at the expense of other implementation outcomes such as penetration, fidelity, adoption, acceptability, appropriateness, cost, and flexibility of ICT for development.

Implementation outcomes (IO's) are defined as the impact resulting from purposeful actions for the implementation of new practices and services (Proctor *et al.*, 2011). IOs are widely reported in public health literature as part of an effort to understand the extent to which public health implementation is deemed to be effective. This study draws from the IOs literature as an alternative approach to assess ICT initiatives in order to ensure a more holistic implementation and evaluation criteria for other ICT4D initiatives. The study argues that ICT4D initiatives could lead to better and improved outcomes using the IOs framework.

Implementation science, from which the IOs framework emerge, emphasizes the importance of working with real-life situations by involving the actual users in the research. Most importantly, it encourages that the role players are intimately involved in the identification, design, and execution phases of the research. Although it is possible to use ICT for social development, a number of ICT4D initiatives have failed to achieve their goals and have negatively affected the communities where they have been implemented (Coetzee, 2019). Some of the key discussions in implementation research are concerned with the use of success indicators and outcome variables to evaluate the significance of the outcomes or to assess whether the implementation process was successful.

The underlying concept of the implementation of evidence-based practices is rapidly expanding in the public health sector. For instance, the lessons learned are being applied to influence outcomes such as helping caregivers and their patients to evaluate and make informed decisions about their health. In the same way, this research seeks to understand how ICT4D projects could benefit from the IOs framework.

## **1.2 Problem statement**

This research aims to understand how ICT4D initiatives can benefit from adopting the Implementation Outcomes framework. The problem of ICT4D initiatives is that the majority fail after a few years (Coetzee, 2019; Twinomurinzi *et al.*, 2009; Walton and Heeks, 2011). The research study identified the Implementation Outcomes (IOs) framework from Public Health as a potential framework that could guide ICT4D initiatives to assure long-lasting outcomes.

## **1.3 Research objective**

The main objective of this research is to develop a framework for measuring the Implementation Outcomes of ICT4D initiatives and ultimately improve the implementation of ICT4D initiatives.

## **1.4 Research questions**

The following primary research question (PRQ) was therefore investigated:

***PRQ: How can ICT4D initiatives benefit from the literature of Implementation Outcomes?***

The following research sub-questions (RSQ) were formulated to channel the study to the main research question:

***SRQ1: What are implementation outcomes?***

***SRQ2: How can implementation outcomes be adapted to ICT4D initiatives?***

The research assessed the IOs framework using the three significant ICT4D initiatives in South Africa, namely: Siyabuswa Educational Improvement and Development Trust (SEIDET), Siyakhula Living Lab (SLL) and the Council for Scientific and Industrial Research (CSIR) Cybersecurity Awareness Program.

### **1.4.1 Siyabuswa Educational Improvement and Development Trust (SEIDET)**

SEIDET is a non-profit organization founded in May 1990 by the community of Siyabuswa in the Mpumalanga Province of South Africa (Phahlamohlaka *et al.*, 2016a). ICT was initiated at SEIDET in 1994 after its Board Committee collaborated with the Department of Informatics

at the University of Pretoria. For many years, SEIDET concentrated on supplementary education for grades 10 to 12 where the focus was on science, mathematics and accounting and it grew into a vibrant determined project providing community members with ICT skills that helped them participate in the modern economy.

#### **1.4.2 Siyakhula Living Lab (SLL)**

Siyakhula (we grow together) Living Lab (SLL) was launched in 2006 and aimed at providing community members with technical skills that help stimulate the community's economic growth and alleviate poverty through the creation and adoption of innovative ICT-based solutions while in partnership with empowered users (Hlungulu and Thinyane, 2009). SLL is an ICT collaborative project of the University of Fort Hare, the Rhodes University, government, and the marginalized rural community of the Eastern Cape (Thinyane *et al.*, 2012). The SLL initiative started by offering communication services to the rural community of Dwesa by deploying ICT services to schools and offering access to a distributed network.

#### **1.4.3 CSIR Cybersecurity Awareness Program**

The CSIR Cybersecurity Awareness program was founded through a drive by the SEIDET board to encourage ICT awareness and in turn inspired a collaboration between the CSIR, the University of Pretoria and SEIDET (Phahlamohlaka *et al.*, 2016b). The first training on Cybersecurity was offered by the CSIR in 2011 from which sixteen members took part. That was followed by further training of fourteen members in 2013. The main objective of the training by CSIR is to enable community members to participate in the economic development of individuals, that being in line with the SEIDET objectives.

### **1.5 Overview of the methodological approach**

This research study involves an investigation of contemporary real-life cases, and it enables multiple sources of evidence to be used with a view of getting an understanding of the experiences of individuals. In this regard, the research was undertaken in the context of life experiences of the participants of the initiative who are involved in three ICT4D initiatives in South Africa; SEIDET, SLL and the CSIR Cyber Security Awareness Program. For this reason, the study has adopted the qualitative research approach.

The qualitative research study employed an interpretative case study to investigate the daily lives of various individuals and communities involved in ICT4D projects (Neuman, 2014).

Interpretative case studies help researchers understand the people and the cultural context in which they live (Klein *et al.*, 1999). The fieldwork that complimented the case study of this research involved the interaction between the researcher and the stakeholders involved in ICT4D initiatives. The research interviewed primary (i.e., Executive Management and Support Staff) and secondary (i.e., Private, Institutional, and Organisational Sponsors) ICT4D stakeholders and users. The relevant data for this study was collected through interviews. The data was analysed thematically and thereafter, recommendations for achieving Implementation Outcomes were made.

## **1.6 Research contribution**

The study primarily makes a contribution to ICT4D sustainability theory on how to develop a framework used in designing policies and the societal change in community implementation outcomes. And to the practice of ICT4D community initiatives by arguing for the inclusion of other factors influencing implementation outcomes.

The Implementation Outcomes theory proposes a framework for how ICT4D initiatives can progress beyond issues of sustainability by achieving long-lasting implementation. Furthermore, the findings of this research contribute towards the development of a theoretical framework for the implementation of ICT4D initiatives. The contribution to the practice of ICT4D community initiatives is a first step to guide research, and encourages the collaborative nature of society in view of the ICTs role in the implementation of ICT4D initiatives (Gxulwana and Krauss, 2010).

## **1.7 Outline of the Dissertation**

The rest of the dissertation is structured in the following manner:

**Chapter 2** discusses the three South African ICT4D initiatives where the research study was conducted in detail. The Siyabuswa Educational Improvement and Development Trust (SEIDET), the Siyakhula Living Lab (SLL) and the Council for Scientific and Industrial Research (CSIR) Cyber Security Awareness Project.

**Chapter 3** examines the relevant literature and concepts that influence ICT4D discourse, to ascertain how to best adapt the Implementation Outcomes framework to ICT4D initiatives. Prominent theories in development research (the Capability Approach and the Open Development theory) that influence the Implementation Outcomes of ICT4D are adopted and

used as a guide in developing the framework for this research study. The implementation outcomes will form the essential part of the chapter.

**Chapter 4** discusses methodologies used in the development of new and/or improved frameworks for the implementation of ICT4D initiatives. The chapter also explains suitable methodologies for the development of the suggested framework in ICT4D initiatives.

**Chapter 5** outlines how data is collected and analysed in this research. The chapter describes how the collected data was analysed using *Atlas.ti* version 8 with the emphasis on Implementation Outcomes (IOs).

**Chapter 6** makes recommendations of how ICT4D initiatives benefit from the literature of Implementation Outcomes and beyond sustainability. The chapter also reflects on the overall research journey from which the implications of the study are summarised.

# CHAPTER 2

## Description of three ICT4D Initiatives

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This chapter presents an overview of the three South African ICT4D initiatives where this research study was conducted. The chapter provides a detailed background on the Siyabuswa Educational Improvement and Development Trust (SEIDET), the Siyakhula Living Lab (SLL) and the Council for Scientific and Industrial Research (CSIR) Cyber Security Awareness Project. The chapter attempts to highlight how these initiatives were established, the leadership structures that govern the initiatives and the ongoing operation of the programs.

### **2.1 Siyabuswa Educational Improvement and Development Trust (SEIDET)**

Establishing SEIDET as a research site within the Kwa-Ndebele community was about development through education. Initially, SEIDET began with supplementing the shortfalls from the apartheid era in science and technical areas where indigenous Africans were prevented from studying subjects such as science, mathematics, and commerce. Through the supplementary studies, the students had access to other opportunities available in higher education institutes. Furthermore, students who have gone through SEIDET have become prominent representatives of Kwa-Ndebele community and of South Africa as a whole (Phahlamohlaka *et al.*, 2014).

#### **2.1.1 Stakeholder Engagement**

SEIDET consists of stakeholders from academic institutions, local and national government departments, the private sector, and community members. As part of the broader objectives of the SEIDET's board, community members are encouraged to participate as stakeholders in order to facilitate the economic development of the community (Phahlamohlaka *et al.*, 2016a).

SEIDET supports a variety of community projects, including educational and business initiatives. The initial research work at SEIDET was conducted by researchers from the Department of Informatics at the University of Pretoria. Since then, all ICT-related work and research studies conducted at SEIDET have been well documented, including details of a longitudinal study that serves as a basis for comparison (Twinomurinzi *et al.*, 2009; Phahlamohlaka *et al.*, 2016b). The success at SEIDET is also recorded in peer-reviewed



journals and a book was published to detail the people involved with SEIDET, its developmental impact and the lessons learned from the project.

### **2.1.2 Contribution to Development**

The SEIDET project has contributed immensely to the development of the community. For example, many community members have learned ICT skills from the initiative. This is evident in that many leading professionals from the local government, school learners and teachers within the community were able to use a computer keyboard for the very first time at SEIDET (Phahlamohlaka *et al.*, 2016a). Teachers have also learned how ICT can support their teaching tasks. In addition, the completion of two master's dissertations and five PhD theses based on the ICT-related work at SEIDET has greatly contributed to the socio-economic development of the community. SEIDET has also been able to attract public attention owing to its immediate outputs, and has been chosen as a single site to take part in the Promotion of Administrative Justice Act (PAJA) initiative due to its well-conceptualised approach to research (Phahlamohlaka *et al.*, 2010).

### **2.1.3 Governance and Leadership Structure of SEIDET**

The success at SEIDET is attributed to its leadership structure and governance. The leadership structure at SEIDET is outlined in Figure 2.1. The diagram indicates the Chairman is the leader and the founder of SEIDET centre. The Chief Executive Officer (CEO), who was appointed by the Chairman, heads the centre and reports to the Executive Board (i.e., board of directors). The Executive Board oversees the general management of the SEIDET centre.

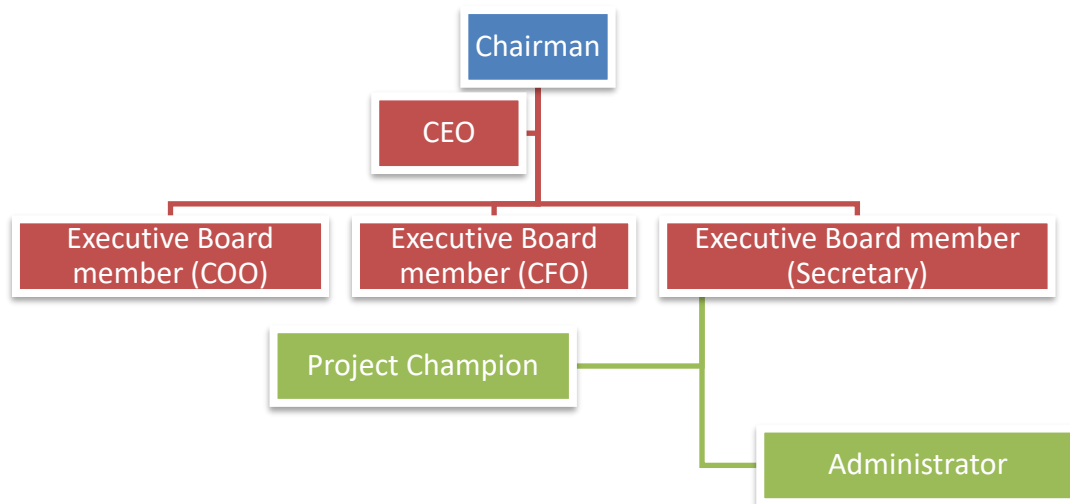


Figure 2.1: Organisational structure of SEIDET

The SEIDET centre consists of a project champion, who is someone from the community and whose task is to implement the projects. The main role of the project champion is to ensure that all involved in the project are able to achieve their goals and to ensure the ultimate success of the projects. An administrator has also been appointed to carry out all the administrative work at SEIDET.

#### 2.1.4 Development Initiatives

SEIDET has well-established infrastructure with a potential of becoming a smart community hub that addresses daily challenges through the use of ICT. According to Phahlamohlaka *et al.* (2016b) due to the number of ICT initiatives being undertaken at SEIDET community centre, a centralised structure is needed to effectively manage these initiatives while reducing the redundancy of the services being rendered at the centre. To further illustrate this point, the new vision of the SEIDET's board is to drive the initiatives towards a smart community centre. Hence, the current work at the community centre had to stop in order to re-strategize its vision for a smart community centre and only the matric re-examination programme is continuing at the community centre.

SEIDET initiatives are for community members who use computers or smart devices, yet in most cases lack the expertise to operate and understand the risks involved. Figure 2.2 shows the community centre where community members would use the computer facility. It was found that in 2008, many learners used the laboratory to take part in the research through computers (Twinomurinzi, 2010). However, no one used the facilities in 2019, except for the

administrator who helped learners to re-writing their matric. This, according to the CEO, was because the centre discontinued its services in order to refocus and align to SEIDET’s new and more relevant vision.



Figure 2.2 SEIDET community participants (Twinomurinzi, 2010)

## 2.2 Siyakhula Living Lab (SLL)

The Siyakhula Living Lab (SLL) was launched within the marginalised rural community of “Dwesa”, in the central Wild Coastal area of Mbashe Municipality, Eastern Cape. Although the lab is situated in an area that is rich in soil and high level of rainfall, it is on the one side surrounded by the Indian Ocean and on the other, by the grasslands of the former Transkei. The agricultural area is near the Dwesa-Cwebe Nature Reserve of the Wild Coast which promotes travel and tourism, and thus provides income generating opportunities for the rural community (Siebörger and Terzoli, 2010). The place is accessible by a gravel road and it is sometimes difficult to reach the area after heavy rainfalls due to the flooding.

Similar to many rural areas in South Africa, the community of Dwesa experiences socio-economic challenges such as poor service delivery, lack of infrastructure, poverty as well as the lack of adequate education and health facilities. The lack of service delivery means that people travel almost 40 km to the nearest city to buy necessities. In addition, there is also no electricity in the area, poor road conditions and weak telecommunication infrastructure (Siebörger and Terzoli, 2010).

The first time when ICT4D initiative was introduced, learners at the SLL used the lab to write research for their homework and assignments (see Figure 2.3). The most significant improvements at the SLL initiative were motivated by the views of the learners and their experiences (Mthoko and Khene, 2017). The underlying matter is that people move on and teachers behind do not have enough resources to keep the lab going while making sure the learners receive teaching, a reason given by the senior teacher in July 2019.

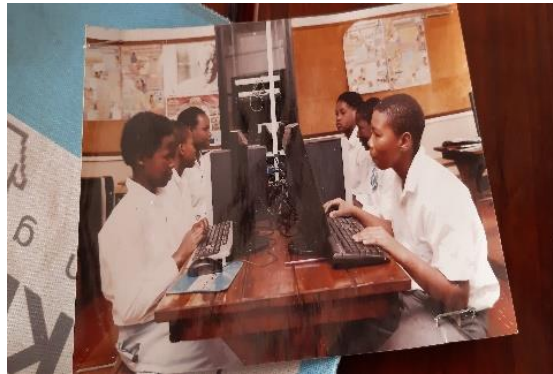


Figure 2.3 SLL research participants

### **2.2.1 How the SLL project was developed**

ICT programs are used to improve the lives of the community by enabling general innovation. In broader terms, the SLL initiative was particularly launched with the aim of improving the lives of the Dwesa rural community through the stimulation of the community's economic growth, poverty alleviation, and the creation and adoption of innovative ICT solutions in partnership with empowered users (Hlungulu and Thinyane, 2009). In fact, the initiative permitted a platform to introduce and testing of new and innovative ICT products and services that are used daily by the community (Thinyane *et al.*, 2012).

### **2.2.2 Service tools used at the SLL**

The use of ICT in building human capacity and transforming economies has been tested and validated in a real-life environment by introducing ICT related services and products (Hlungulu & Thinyane, 2009). SLL has facilitated community development by providing 17 schools and their related communities with internet connectivity. This resulted in the transfer of tangible skills and empowerment of people from rural areas. The Lab gained a reputable image because it started operating with its community members where the majority acquired ICT literacy skills

and it permitted its users to participate in research, thus building ICT knowledge for the participants. Several events have been hosted at SLL with participating delegates from all over the world and the SSL board have received recommendations to extend living labs to other African countries.

### 2.2.3 Leadership and governance structure of the SLL

The leadership and governance structure at SSL indicate that it is headed by the Chief Executive Officer (CEO), who reports to the board of directors (see Figure 2.4). The role of the Executive Board is to oversee the general management of the SLL. In addition to the Executive Board, a project leader is responsible for all project related tasks at the center. A user refers to a learner in the community who uses a computer service/smart device.

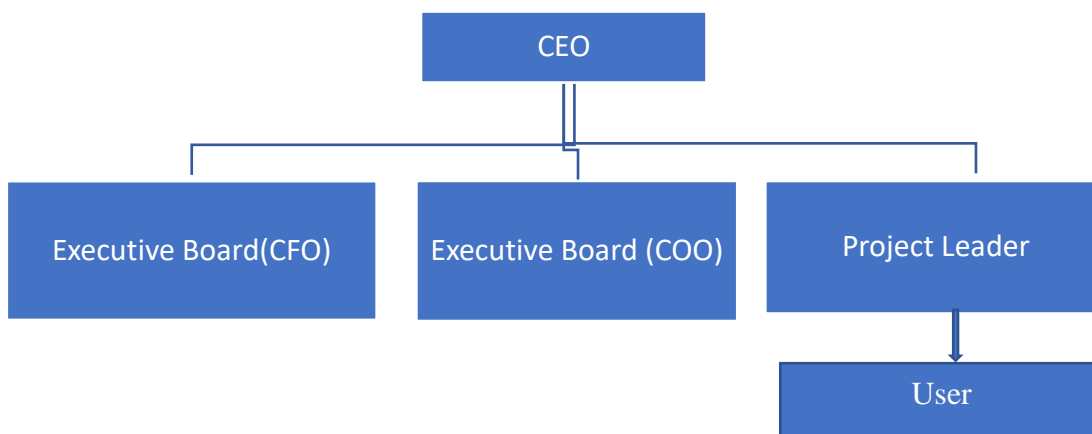


Figure 2.4: Organisational structure of SLL

### 2.3 CSIR Cybersecurity Awareness Program

Cybersecurity refers to important aspects in the policies, processes, best practices and technology of the National Security aimed at defend the national resources from unauthorized access, damage or attack (Grobler *et al.*, 2012). It also addresses the preventative methods used to shield information from being stolen. Cybersecurity awareness programs are established in order to inform internet users about the basics of cyber security and to protect them from being victims of cyber-attacks (Phahlamohlaka *et al.*, 2016b). The materials explained in the cybersecurity awareness programme covers topics such as password protection, surfing the

web, email security, social networking, internet banking, cyberbullying and identity theft. The materials further provide users with lists of known threats and best practices when operating technology devices.

### **2.3.1 Motivation for cybersecurity awareness initiative**

It remains important to encrypt and secure information for organisations and individuals of South Africa as security attacks have been previously experienced. The world is evolving and as the internet connects people together, it presents new opportunities for hackers and consequently their information is no longer secure. This is because more users are embracing the benefits of the internet, particularly the processing of online transactions anytime and anywhere. The awareness of cybersecurity is critical for the millions of users that connect and communicate through the internet, especially unsuspecting users that are often unaware of the security risks.

Hackers are motivated to breach security for financial gain and thus causing harm and spreading Distributed Denial of Service (DDoS). Cyber-attacks are haunting the world every day when unsuspecting internet users click on wrong links and incorrect websites. Cyber-attacks also target the internet user's personal data that includes names, password, email, and physical addresses threatening the security of end-users.

The discourse within ICT shows that there are a high number of organizations targeted by hackers. This then encourages internet users to be more careful and practice safety measures against attacks. Organisations must have measures in place that tests the computers and block hackers from accessing their data. Hence, providing training on best practices of cybersecurity has become a necessity to everyone and educating end-users on how to handle such threats when they occur. Social media, web and email are the most popular direct communication tool to deliver a message to all.

### **2.3.2 Regulation and secure design**

Africa, which consists of developed and underdeveloped countries, is the most vulnerable continent to cyber security threats due to the lack in IT knowledge, insufficient funds for raising awareness and the shortage of cyber security experts. Cyber-attacks are spread through wireless connections and mobile phones have access to the internet, increasing the possibility of malware infection, bullying over the social network and the risk of hosting malicious hackers.

The information saved in personal computers with a connection to the internet can be accessible to hackers and requires strategies to prevent vulnerability.

South Africa does not have a formal policy on cybersecurity; however, it recognizes the need for one to reduce vulnerability and prevent threats. It is a global concern that cybersecurity awareness is not mobilised enough, yet there are strategies and developments around the world to respond to cyber-attacks and crime (Dlamini *et al.*, 2011). Organizations have encountered threats and phishing emails, as a result they have implemented a safeguard security countermeasures initiative. It is aimed to educate the internet users in certain provinces of South Africa, the initiative is facilitated in the form of training in secondary schools and the workplaces (Dlamini *et al.*, 2011).

### **2.3.3 Structure of the Cyber-Security Awareness initiative**

Members of the South African public, particularly from rural communities, are not aware of and therefore not empowered to deal with real and potential cyber threats (Phahlamohlaka *et al.*, 2011). For this reason, the aim of the initial project of the Council for Scientific and Industrial Research (CSIR) Cybersecurity Awareness Program was to increase the level of awareness in cybersecurity in the rural communities of the Siyabuswa district of the Mpumalanga Province (Phahlamohlaka *et al.*, 2014). The program is a collaborative effort between the CSIR, and the University of South Africa aimed at educating novice internet and technology users on the basics of cyber security.

The program targets four main groups of computer users which are schools, entrepreneurs, staff from the local community and all users from the local community centre. While the training and materials is provided by the CSIR, community of the Siyabuswa district is trained and tasked with presenting the modules and the assessment (where necessary in the local language of Ndebele).

The SEIDET Board developed the CSIR initiative to provide Cybersecurity awareness training and CSIR broadband for all (BB4All) to the community members (Phahlamohlaka *et al.*, 2016b). In addition to training, the CSIR empowers local entrepreneurs with skills on online practices to advertise and sell their products online enabling them to take part in economic development.

In an effort to bring social and economic benefits, CSIR broadband for all enabled affordable broadband access through the sharing of connectivity using Mesh networking. It provided the village operators with training on the infrastructure maintenance, operation, and support to expand the BB4All offering within the community of Siyabuswa.

The organisational structure of the CSIR Cybersecurity awareness project consists of a research group leader (RGL) as the head of the project (as shown in Figure 2.5). The research group leader is responsible for distributing the project tasks amongst seven other researchers as well as overseeing their responsibilities. The main users of this initiative are the learners in the community who use a computer or smart device. Skilled village operators (VO) have been appointed and are responsible for the daily operation of the program. The recruitment of VO facilitated by SEIDET through schools and department of education (Phahlamohlaka *et al.*, 2014).

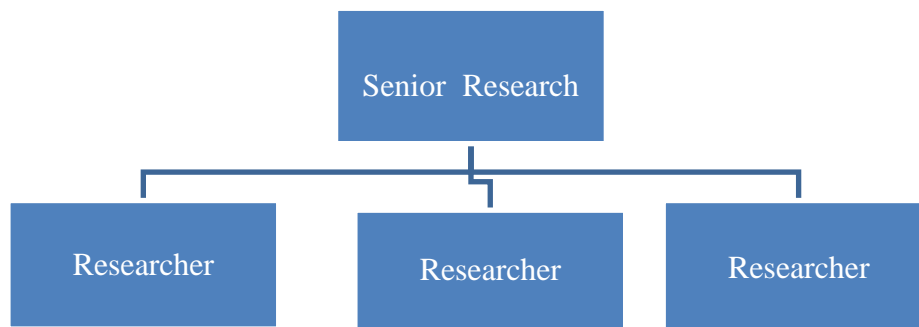


Figure 2.5: Organisational structure of cyber security awareness initiative.

## 2.4 Summary

Chapter 2 presented all the literature that is related to the introduction and summary of three ICT4D initiatives in South Africa. Most people in rural communities of South Africa, continue living in poverty and hoping to advance basic ICT skills from the initiatives. The context that is discussed in this chapter is vital, as it elaborates how the community is empowered through general innovation. In the next chapter, we discuss the literature review that was conducted during the research process.



# CHAPTER 3

## Literature Review

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Chapter 1 and 2 presented the purpose of the study to develop a framework for measuring the Implementation Outcomes for ICT4D initiatives and described three prominent South African ICT4D initiatives to be used in the study. In this chapter, literature pertaining to ICT4D, development theories and IOs is presented. The literature review is undertaken for purposes of determining the best way of adapting the IOs framework to ICT4D initiatives.

### 3.1 Introduction

Information and communication technology for development (ICT4D) refers to the adoption and use of ICT to achieve development outcomes (Egessa *et al.*, 2018). Design (2014) went further to define “development” as the means of contributing towards the improvement of the lives of people from disadvantaged communities. Nkula and Krauss (2014) posit that ICT4D should be recognised as a multiple system that needs to be analysed and accepted over time, and not necessarily only viewed as a problem that requires a solution. This, therefore, means that ICT4D initiatives should incorporate other socio-economic factors such as economic growth, health provision, education, food security and a clean environment. More so, ICT4D should provide new ICT solutions for developmental challenges by making significant contributions to human development (Walton and Heeks, 2011).

ICT can contribute positively to the development of the poor. For example, Gxulwana and Krauss, (2010) assert that ICT has made a significant contribution to development programs and this has led to increased investments in many development countries. Despite the significant potential of ICT4D, the extent to which ICT contributes towards the development is often not well understood by the very disadvantaged communities that are being targeted for development (Egessa *et al.*, 2018).

To use ICT4D as an effective tool for economic and social development, governments of developing countries should capacitate their communities, especially poor communities, with the level of proficiency in the requisite ICT skills. ICT skills can be defined as understanding

the use of ICT and digital technology, and the appropriate use of ICT in response to the needs of disadvantaged communities (Thapa and Saebø, 2014; Egessa et al, 2018).

### **3.2 Contribution of ICT4D in community development**

The International Telecommunication Union (ITU) has reported that most people around the world use the internet (Kleine *et al.*, 2009). The internet has changed interaction with organisations and with government institutions. The ubiquitous nature of the internet has meant more attention has now shifted to the use of the internet, especially ICT, as a tool for economic and social inclusion and community development.

ICT has, therefore, morphed into a sustainable development tool, with ICT4D and partnerships being at the centre of its exploitation (Ismail *et al.*, 2018). While the ubiquity of the internet is good for communities in developing countries that intend to use ICT4D for purposes of economic and social development, access and connectivity to ICT remain critical factors that need to be considered for community development when considering ICT4D projects. ICT4D projects stand to benefit communities since individuals within communities that have access to the internet could access information and study for degrees online, use social networking sites, phone friends online, do their banking and shop online (Kleine *et al.*, 2009). Therefore, ICT4D projects have a potential to build stronger communities, increase economic productivity and contribute to the rejuvenation of rural and regional economies. Ultimately, ICT4D is an important enabler of social cohesion and community capability.

The use of ICT should focus on improving community development by aligning technology projects to social needs (Vaughan, 2006). The initial step is to ensure that the project addresses the real need of that specific community. Thinyane *et al.* (2012) has commented on the seeming lack of understanding regarding the crucial need and right of individuals to access appropriate technology to fulfil their cultural and local needs. Having a complete system would assist in analysing development and strengthening contribution of ICT4D projects towards development (Mthoko and Khene, 2017). In addition, an understanding of how an ICT4D project initiative has impacted the community is important and can enhance learning and the overall contribution to community development.

### **3.2.1 Contribution of ICT4D to economic development**

Derlak and DuPre (2008) have stated that ICT4D is the application of ICT aimed at reducing poverty. ICT4D highlights the positive impact of internet use in the creation of new economic and social opportunities in economically disadvantaged and developing countries (Grunfeld *et al.*, 2011). Steyn *et al.* (2014) has noted that ICT was introduced purely from a strategic perspective with an aim to improve the economic condition of the country. In Bangladesh, ICT has been identified as one of the service sectors that plays a major role in economic development (Mamun *et al.*, 2018). The point is that creating the social and economic benefits, changes to existing framework involving government, industry and strong community engagement is essential. As far as engagement is concerned, knowledge sharing enhances a better understanding of practices that deal with "know-how" of staying attached to improved understanding (Pade-Khene and Lannon, 2017). A number of factors including implementing several policies towards development has contributed to the economic growth of ICT4D projects.

### **3.2.2 Contribution of ICT4D to development goals and network formulation**

In 2001, a United Nations' ICT task force focused on matters dealing with education and enabling the creation of environmental and internet governance (Kleine *et al.*, 2009). There is an economic interest from an international infrastructure viewpoint to support ICT4D within communities that are developing and growing. It is for these reasons that the United Nations (UN) maintains that the access to the internet is the basic human right and that the sharing of knowledge and information are key strategies that are essential to social and economic development (Siebörger and Terzoli, 2010). The United Nations (UN) has attempted to address fundamental injustices and inequalities that affect the world by setting up millennium development goals (MDGs). The MDGs expired in 2015 and were subsequently replaced by the Sustainable Development Goals (SDGs). SDGs are better connected to one another (Le Blanc, 2015) and are more integrated than the MDGs. All the 17 SDGs are aligned to the three pillars of sustainable development (i.e., economic prosperity, social inclusion, and environmental protection) and are geared towards addressing issues that impact directly on communities such as universal coverage of basic services in the areas of health, education, poverty alleviation and connectivity and access to the ICT infrastructure. Therefore, the SDGs require the adoption of ICT, or more specifically ICT4D projects, as a key catalyst for their

implementation. The UN itself has acknowledged that ICT plays a vital role in the implementation of the SDGs and, by extension, the development of communities. For example, the UN General Assembly for the 2030 Agenda asserts that the global interconnectedness and the growth of information and communications technology have been showing great potential to accelerate human progress, to develop knowledge societies and to bridge the digital divide.

Should MDGs have been taken much more seriously, it is believed the contribution of ICT to reduce poverty challenges at community level would have been considered a major issue in the international discussion (Steyn and Van Greunen, 2014). In addition, Steyn and Van Greunen (2014) note that attempts to address the inequalities of development facing our world at the time could have contributed to the reduction of poverty. Moreover, ICTs are moving from a specialist tool to an everyday use tool to support political, economic and education processes in developing countries (Heeks, 2020). The SDGs initiated by the UN should therefore be taken seriously as they have a direct impact on communities, especially in developing countries. Countries such as Europe, Japan and Canada have implemented programs, strategies, policies and legislature that facilitate the expansion of ICT capabilities to create a more advanced society (Steyn and Van Greunen, 2014). Developing countries could therefore do well to learn from such countries by incorporating aspects that are relevant to their needs in their respective developmental strategies.

### **3.3 Impact of ICT4D projects**

The diffusion of new technology, along with its implementation and challenges, has penetrated both the social and economic domains (Kleine *et al.*, 2009). A broader perspective has been adopted recently that incorporates context of communities and hosting new technologies towards the potential of ICT contributing to social economic improvement (Steyn and Van Greunen, 2014). In recent years, a broader perspective illustrating the socio-economic context of communities and focusing on the potential of ICT to contribute to development has been adopted (Steyn and Van Greunen, 2014). ICT has the ability to enhance communication as it acts as an effective tool in supporting rural development by facilitating the information flow process between rural and developed communities (Pade *et al.*, 2008). There is an evaluation paradigm shift whereby many ICT4D projects are concentrating on impact at the expense of earlier phases of project life cycle.

As the impact of ICT4D projects is felt across communities, the role that ICT can play and contribute to community development also increases. An increasing impact of ICT4D projects means that communities are more likely to be shaped by ICT4D and thus influence the uptake and application of even more ICT4D projects and ICT in general.

### **3.3.1 Impact evaluation and implementation**

The invention of ICT, and its implementation, can result in a community learning through the successful, or failed, implementation of the project (Kleine *et al.*, 2009). Three sphere models illustrate that a project should not focus excessively on its immediate concerns but broaden its concept to cater for the needs of disadvantaged communities in terms of capability of ICT for continuing impact (Pade *et al.*, 2008). It is essential that IS research uses impact assessments to evaluate the performance of ICT4D projects at their conclusion. The assumption is that the inclusion of ICT in developing societies would necessarily foster community development. However, ICT's ability to facilitate change depends on the society in which the invention is deployed, and the technology used. The impact of ICT implementation and ICT4D philosophy ought to first be tested in the specific community's cultural setting since the capability approach artefacts were designed within a western context (Robeyns, 2005). The impact of implementing ICT4D technologies in developing countries should thus be carefully considered (Steyn and Van Greunen, 2014).

### **3.3.2 Using ICT to ensure successful development**

Partnerships consisting of academia, government, municipality, private sector, and community members have immense impact that helps to address societal challenges. Such partnerships allow for the creation of services that ought to be exchanged, and validated, amongst stakeholders (Thinyane *et al.*, 2012).

The evaluation of rural ICT establishes the effectiveness and the impact of the contribution that the project can make towards development. Pade-Khene and Sewry (2011) posit that rural ICT evaluation is the application of relevant domains throughout the rural ICT project lifecycle and adapting to the social economic development designed to support the ICT involvement of rural development. The overall evaluation plan, which provides a high level overview of the entire

plan, is applied across the evaluation lifecycle; the evaluation lifecycle states the process that the rural ICT should undergo, and it is the central element; and the iterative design adapts over time as a result of development (Pade-Khene and Sewry, 2011).

Various aspects including how ICTs are implemented in the community should be addressed to ensure successful ICT4D implementation and thus limit the number of cancelled implementation efforts. ICT4D design and ideas should remain flexible, enabling the movement of the outputs to be available over time (Walton and Heeks, 2011). It is true that the positive impact and successful implementation of ICT4D in rural communities is significant and should be part of the sustainability of a project (Pade *et al.*, 2008).

### **3.3.3 The empowerment of disadvantaged communities**

Empowerment offers individuals, and their communities, the opportunity to improve relevant capabilities. ICT could enhance living standards in developing communities by providing information that could aid, and improve, the delivery of social services including skills development, employment, healthcare, government and educational services. Steyn *et al.* (2014) stated that the most important factor in the lives of many economically disadvantaged communities is not ICT, rather an appropriate focus on the roads, fresh water, and sanitation. It is claimed that the educational, health care, nutritional and economic needs of socio-economic disadvantaged communities must be addressed for them to live sustainable lives (Steyn *et al.*, 2014). The ICT industry has positioned itself to being unique and helping to develop a more socially and sustainable future for the people (Design, 2014).

## **3.4 Innovation challenges of ICT4D**

Peansupap *et al.* (2006) stated that challenges in the ICT4D context refer to instances of resistance to change, which occur during ICT adoption and implementation at both individual and group level. Another challenge of ICT4D implementation is the processes, different opinions and misunderstanding that tend to influence outcomes from being completely successful (Ismail *et al.*, 2018). Although most ICT projects are implemented successfully, a concern that African countries are having is the lack of the infrastructure to implement certain

ICTs that prohibit community members to use implemented services (Steyn and Van Greunen, 2014).

The most common challenges faced by rural communities include, amongst others, poverty and a lack of computer literacy skills (Thinyane *et al.*, 2012). Past results indicate that developing countries can suffer the devastating outcomes of embracing technology. Challenges relating to low levels of knowledge and low income levels of rural communities have placed many people at a disadvantage when compared with people in developed communities (Zhao, 2012). Despite a human being requiring the foundation of all social organisation, not much has been done to enable disadvantaged communities to gain such access (Kleine *et al.*, 2009).

Decision-making structure is considered as the best option to develop innovation strategies (Kleine *et al.*, 2009; Ismail *et al.*, 2018). IS researchers argue that the approach that is followed to drive ICT4D initiatives without considering required human and social context is the fundamental reason for failure of ICT4D projects (Twinomurinzi *et al.*, 2009). The impact of a project can be considered as a total failure if the initiative is never implemented or abandoned shortly after implementation (Twinomurinzi *et al.*, 2009). Some of ICT4D initiatives have failed because of people not understanding the social context and failing to include the relevant local institutions. Other ICT4D projects are often delivered using an approach that is not suitable for effective development (Walton and Heeks, 2011; Heeks, 2020). A project is deemed largely unsuccessful when some goals are achieved but some stakeholders, however, fail in attaining their major goals (Twinomurinzi *et al.*, 2009). Partial success or partial failure demonstrates that a project had some important outcomes and that some major goals were attained while others were not. A project is perceived as being wholly successful when all stakeholders realise their major goals and do not experience significant undesirable results.

Tongia *et al.* (2006) noted that, within the context of development, it is necessary to balance the cost, maintainability, and long-life cycle of the solution. The cost of ICT access is significantly low in India, while it is very expensive to be innovative in South Africa; this poses serious challenges in respect of funding of ICT4D projects. By the same token, although some notable progress has been made in mobile telephonic networks, enabling people to communicate effectively, the cost of access to information in certain parts of the world pose significant inequality (Kleine *et al.*, 2009; Shukri *et al.*, 2020).

There are some challenges in the ICT sector such as professionals pulling away into other sectors, insufficient skills, and lack of finances for entrepreneurs. To this end, Kleine *et al.*, (2009) has noted concerns relating to the use of limited development funds to assist with ICT4D projects in South Africa. Political power is considered important in rural communities; therefore, achieving community buy-in is a challenge if there is no political support for ICT4D project. Government can play a direct role in promoting ICT by assisting communities in a hands-on way and by partnering with public and private sectors to fund ICT projects (Vaughan, 2006). An initiative to revolutionize ICT was launched in Cape Town, which is known as the West Africa Cable System (WACS) (Steyn and Van Greunen, 2014). The purpose of WACS is to lower the cost of broadband access while contributing to the establishment of ICT4D artefacts such as e-health and education. A number of times, the knowledge of implementing ICT4D projects resides with the implementer, who often takes the expertise when the project funds run out (Pade-Khene and Lannon, 2017).

### **3.4.1 Policy issues in ICT4D Projects**

Enabling policy is important for ICT4D. Research indicates that government policies are the main contributing factor to different phenomenon whereby economic systems limit the participation of underprivileged individuals (Tongia *et al.*, 2006). Complementary policies assist in maximizing the benefits of ICT service and it is based on how well the implementation is (Mamun *et al.* 2018). It is often difficult to determine if a policy is a good policy until it has been successfully implemented to accomplish its goal. Many policies tend to make it difficult for the communities to run their projects (Ramírez, 2007). Indications are that conventional policies possess simple decision-making structures and objectives, which follow a top-down approach (Mamun *et al.* 2018).

In most developing countries, the national ICT4D policies promote the capacity building, community access and education issues of these countries, even though there are severe resource constraints in implementing the strategies (Vaughan, 2006). It is standard procedure for national priorities for poverty reduction to be initially created, and facilitated, in the development of strategy, regardless of whether or not the ICT4D policy and strategies are integrated or separated (Vaughan, 2006). ICT4D projects should be addressed through a holistic strategy, comprising an open policy, building human capacity and a transparent environment (Nkula *et al.*, 2014; Pade *et al.*, 2008). To this end, the entire policy development



approach needs to take into account the fact that the ICT4D capability of a community increases its sustainability. However, policy makers in developing countries that are responsible for content creation of these policies are often out of sync with the goals of ICT4D initiatives. The ICT4D policy relates to the development and knowledge transfer process which occurs during project implementation and most importantly between the implementers and community beneficiaries (Pade-Khene and Lannon, 2017).

### **3.5 ICT4D project evaluation case studies**

A complete project approach ought to consider all phases of project lifecycle (i.e., initiation, planning, execution, and closure). Individuals within rural communities should take positions of project champion, aimed at inspiring, creating awareness and encouraging community members to use ICT. In effect, these individuals will feel part of planning and decisions when implementing the community project (Pade *et al.*, 2008). Including the beneficiaries of the system during the design phase can better address community issues and will result in an implemented system that is better suited for the local requirements.

The inclusion of ICT consideration in the planning phase of ICT4D projects addresses the concerns of underperformance in the development context (Qureshi, 2017). This would typically involve an understanding of the relationship that exists between rural development and ICTs (Mthoko and Khene, 2017). The emergence of ICT in developing countries emphasises the development and implementation aspects of IT. Development requires an in-depth analysis of the human, the context of existence and interaction with the environment (Steyn and Van Greunen, 2014).

Project leaders need to identify the stakeholders already working in a community project at the beginning of the project to familiarise them with development goals and activities of the project (Pade *et al.*, 2008). Stakeholders need to feel involved and trusted in the engagement process whereby the failed aspects of the project produce valuable knowledge. This process is realised through a series of steps, which integrate ICT into new development efforts. For example, mention was made earlier that the capabilities ought to be transferred to the local beneficiaries to maintain the continuity of the implemented project (Nkula and Krauss, 2014). The involvement of as many community groups as possible as well as the use of participatory

approaches encourages members to take ownership of the project and tends to improve the success rate of the project (Vaughan 2006; Walton *et al.*, 2011). The ICT4D framework's social approach aims to nurture and improve sustainability at community level. This may, in turn, result in increased community and national participation thus leading to increased development outcomes. Many people overlook training, or do not conduct it in an appropriate manner; very often IT is introduced to developing countries without considering challenges such as social issues and cultural barriers (Steyn and Van Greunen, 2014). It is very important to understand the various development theories that frame the planning and implementation of ICT4D projects. For this reason, some of the major ICT4D development theories are considered in the next section.

### **3.6 ICT4D development theories**

The area of ICT4D research is very broad and it is focused on various subjects including, but not limited to, the diffusion of ICT artefacts, the impact of ICT in development, and the digital divide. Therefore, ICT4D research should not be exclusively focused on the technological and the visionary aspects of the ICT4D projects but also include the socio-cultural, political, and economic developmental factors (Walsham and Sahay, 1999).

Despite attempts at adopting the multi-perspective approach towards ICT4D implementation and research (Heeks and Arun, 2010), a more holistic approach is still required to understand the relationship between ICT and development better. It is noteworthy that many project failures will ultimately lead to limited or no impact on the development of the local communities being targeted by these ICT4D projects. More research on the "D" aspect of ICT4D needs to be conducted (Walsham, 2017) to avoid project failures and as a part of the broader vision to better understand the relationship between ICT and development.

Walsham (2017) notes that theory is an approach that is aimed at generalisability and that it allows moving from a framework of potential value to the understanding of other important contexts. Although many researchers have documented the potential of theorising the impact of ICT in development, research is still required to improve the theoretical understanding of ICT4D projects. Walsham (2017) argues that ICT-based projects aimed towards development

in a detailed context should not be studied in isolation, but rather in conjunction with a thorough investigation of the progression of historical development processes and governance.

Development theories, which are defined as “a collection of theories about how desirable change in society is best achieved” (Development theory, 2020) have their own history that is based on class, culture, historical context, and relations of power (P.01). Current development theories are generally classified into state-led (modernization and dependency), market-led (neoliberalism), and society-led (alternative) theories (Thapa and Saebø, 2014). The main theoretical tenet of an alternative development theory, the capability approach (CA), is human development. In the context of an ICT4D project, it can be argued that the human development theory is much more relevant since it is focused on rural and remote communities (Pieterse, 2001). Therefore, the application of CA in ICT4D research provides a suitable and appropriate avenue for facilitating an investigation of how ICT may be used to foster development (Thapa *et al.*, 2012).

A second prominent alternative development theory, the open development (OD) theory, has been extensively used in ICT4D implementation and research. The OD theory, which also supports core elements of human development such as knowledge and innovation, has become an area of special interest to the development community since it is fundamental to health, food security, education and other aspects of human development (Smith and Reilly, 2013).

In this study, two development theories, namely the CA and the OD theories, were selected to research the implementation of ICT4D based on their extensive used in the ICT4D field. It is envisioned that the CA and OD theory will address how and why specific outcomes relating to the ICT4D are achieved. Once the “core components” or “active ingredients” that influence the implementation outcomes (IOs) of ICT4D have been identified using these two development theories, a specific IOs theory will then be adopted. Ultimately, the aim of the new IOs theory is to develop new and/or improved framework for the implementation of ICT4D projects. The CA and OD theory are discussed individually and in more detail in the sections that follow.

### **3.6.1 Capability approach**

The capability theory is an economic theory formulated in the 1980s to help gauge the state of economics of a country (Robeyns, 2005). Amartya Sen defines CA as a framework that is

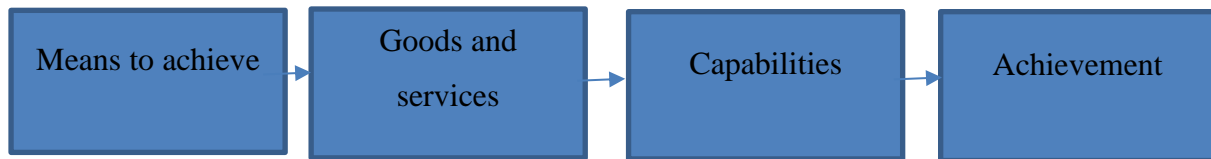
commonly used for the assessment and evaluation of the wellbeing of an individual, design of policies and social change of the community (Robeyns, 2005). The CA provides one of the theoretical foundations of the human development model and framework that evaluates and hypothesises the occurrences of desire-fulfilment. The theoretical foundation entails the evaluation of other approaches using the economics welfare and income-based theories. It is widely recognised that the CA brings together people's capability to function, which are held by the basic needs' theorists, to a single clear framework and extends beyond the analysis of deprivation and poverty by concerning itself with wellbeing (Robeyns, 2005). Moreover, an overwhelming amount of attention is paid to the difference between capabilities and outcomes in fields such as development, social and political policies, and welfare economics. The major thesis of the CA is the ability to achieve valuable functioning (Alkire, 2008). Functioning is defined as doing that which people value without a valid reason to value.

### ***Empowering poor communities***

Amartya Sen's approach is used as an evaluation tool to ascertain social cost or as a framework to design and evaluate policies of government and private organisations in developing countries (Robeyns, 2005). The approach fundamentally focuses on bringing together ideas regarding that which individuals can do and/or can become while simultaneously considering the removal of barriers to ensure freedom. The concept of empowerment draws strongly from Amartya Sen's CA in that it stresses the importance of empowering economically disadvantaged individuals in rural communities. This attained freedom, which is central to the development process, enhances an individual's ability to develop themselves and influence the world at large. Community empowerment is grounded in the important role played by community-based organisations. These organisations focus on the empowerment and development of economically disadvantaged communities. CA manages to collate the concerns held in basic theories into a philosophical framework that extends beyond the analysis of poverty and deprivation. Arguably, wellbeing and development should be conceptualised in accordance with individuals' capabilities and the opportunities afforded to them to partake in activities that render their lives meaningful. The CA assesses whether one person had an opportunity to accomplish that which another person has achieved (Robeyns, 2005).

Amartya Sen suggests that human development is the first step that needs to be considered in the process of expanding people's capabilities. Human development evaluates policies in accordance with individuals' differences and focuses on the effective undertaking of activities

that they chose to engage in. The quality of life should be measured in terms of the freedom that people consume. Sen elaborates that the CA can address all relevant concerns and that each approach has something to offer while highlighting the different aspects of entitlements. An important distinction is made between the means (goods and services) and the functioning and capabilities (where the characteristics of the goods enable the functioning). Figure 3.1 represents an individual capability and social context (Robeyns, 2005).



*Figure 3.1. Individual capability and social context (Robeyns, 2005).*

Some researchers doubt whether the CA can sufficiently address all theories of development for evaluation purposes (Robeyns, 2005). The quality and quantity of the available opportunities may determine the quality of the service. In addition, the evaluation will help to recognise human differences and embrace their participation since they are from different cultures with different values. Since no fixed list of capabilities exists, the CA is flexible in nature and allows researchers to develop and apply different methods, depending on their personal value judgements. It is imperative to consider what people can achieve while acknowledging that they differ in their capacity to translate possessions into valuable accomplishments (Clark, 2005). Also, indications are that subjective wellbeing should be used to judge the overall quality of life based on how people feel (Robeyns, 2005). It is important to check whether the means, or resources, are available to address all dimensions of the human state. It holds true that economic growth and the expansion of services and goods are essential for human development.

ICT4D has the capability to transform community members into skilled individuals who can, in turn, do things for themselves and for the people around them by alleviating poverty (Robeyns, 2005). It is natural that users take pleasure in their successes and the achievement of their goals. Communities have the responsibility to translate capabilities into functioning since it, in accordance with Grunfelt *et al.* (2011), is a feature of individual wellbeing. It is important that people have the freedom to embrace opportunities so that they can live the life

that they envision for themselves and thus become the people they want to be so that they can freely contribute to their community. The increasing visibility of community contribution and compelling sources may result in the user's satisfaction and subjective wellbeing in the quality of life. Ramírez (2007) asserts that to make effective use of ICT tools, the community requires certain capabilities that will support them to gain access. The CA identifies social constraints that restrict wellbeing, and which ones should be included in efficient evaluations.

A major criticism of Amartya Sen's ideas is the individualistic approach, which is a western ideology. The research therefore considered additional ideas from the OD. The OD discussed in the next section allows for the community ideals to be incorporated.

### **3.6.2 Open development**

Open development refers to a set of possibilities that enable positive changes as facilitated by a network of international development activities (Smith *et al.*, 2013). This development consists of both practices and concepts grounded in human intentions, which consequently enhance transformation potential. *Openness* is the preferred marketing term used to denote that which encourages open participation, open content, open licencing as well as open governance (Buskens, 2014). Considering that the intention of open processes is, within political and economic practices, to shape our intellectual and open activities (Buskens, 2014), the theory and practice of OD has evolved into a specialised domain. Positive developments are possible through the engagement of new models (driven by beneficiaries) as well as participatory and collaborative innovation. Human agency is key to successful development efforts and, as such, development research that fails to acknowledge human interpretation will diminish the effectiveness of open and international development, as envisioned by Buskens (2014). A conceptual framework underpinned by a common understanding is required if OD is to remain open and for knowledge creation to benefit human beings. The concept of OD can also refer to the internet where open and free space is created, and communities connect and share freely. OD is thus transforming communities and opening opportunities by providing those individuals who can at least afford to pay.

Smith and Reilly (2013) argue that development plans should be structured in such a way that they absorb and facilitate changes and intellectual interrogation scrutiny while also being flexible and responsive enough. The critical aspect of globally networked IT is to support core

elements of human development such as knowledge and innovation (Heeks, 2020; Smith *et al.*, 2013). It is important to observe the mechanism governing conceptual patterns and not only the environment in which the OD operates. Observing the processes that contribute to the development as well as unrestricted access to the software contributes to innovation. As stated by Smith *et al.* (2013), the outcomes of conceptual gatherings are dependent on the energy generated when human beings interact in specific circumstances.

ICT creates possibilities for the facilitation of OD initiatives in both action and participatory research methodologies (Buskens, 2014). This process involves an open-sharing culture, participation, standards, and information that are freely accessible, and the encouragement of active participation and collaboration. ICT could be drastically improved if improvements on existing work could happen. Open models – generated by groups of people with good intentions – provide solutions that address the limitations of market and state systems. As mentioned by Buskens (2014), open models result in the redistribution of developmental gains and are inherently political since they are capable of challenging existing systems. They also influence the allocation of resources while facilitating knowledge production that adjusts the framework of contribution

In the next section, IOs theory metrics are considered and adapted for ICT4D projects.

### **3.7 Implementation outcomes (IOs)**

This research drew on the theory of implementation outcomes from public health. Appropriate implementation strategies can help to ensure that evidence-based responses are applied quicker (Hirschhorn *et al.*, 2020; Wensing *et al.*, 2020). An effective implementation plan must provide information that is relevant and ensure that intervention fits the target stakeholders (Cabassa and Baumann, 2020). Implementation scientists can help to study affects and how to effectively implement and sustain the inventions from lessons learnt. For example, South Korea responded successfully to the COVID-19 pandemic control, community education, early contact tracing, and testing. In the UK, similar inventions with a different key context were implemented, and the population was less responsive and some cases were not detected thus resulting in the spread of the disease (Hirschhorn *et al.*, 2020). The UK delayed implementing strategies (community education, early contact tracing and testing).

IOs refers to the outcomes of actions that are supposed to implement new services, practices and behaviours (Proctor *et al.*, 2011). Implementation describes the composition of the program when it is distributed in a set environment (Durlak and DuPre, 2008). In this this research study, it is argued that IOs could enhance the implementation of ICT4D initiatives.

Proctor *et al.* (2011) postulate that some studies measure the implementation success using the outcomes at the client level while some assess the outcome of implementation strategies using the improvement in the process. There are three important functions of IOs. Firstly, IOs serve as an indicator of the implementation success. Secondly, they are the centre indicators of the implementation processes. And lastly, they are the key transitional outcomes to service outcomes and the quality of the research. IOs work as a requirement to attain desired improvement in the service outcomes. There is, however, little theoretical understanding of the processes involved as well as differentiating whether the implementation failure occurred because it is ineffective or if deployment of good intervention was incorrect. Proctor *et al.* (2011) has stated that implementation research requires outcomes that are empirically well defined from the service effectiveness perspective.

Durlak and DuPre (2008) assert that capacity refers to the ability to plan, evaluate, select, implement and support the successful development. Understanding capacity helps to address the breach between research and practice that is necessary for successful implementation of a development project. The initial step towards improving the wellbeing of the population is to develop effective intervention. This requires dealing with continuous, effective, and complicated phases coupled with whether an organisation is keen to try new programs or not. In addition, checking how well the program is conducted and maintained over time is crucial for development (Durlak and DuPre, 2008). Implementation ought to be monitored at the early stages of innovation to detect and correct problems, thus ensuring better outcomes.

Grunfeld *et al.* (2011) has stated that empowerment is important if individuals are to be self-sufficient as empowerment removes obstacles barring the way to increased self-freedom. Implementation strategies should be approached in the same method by being specified both conceptually and operationally if they are to be scientifically tested, communicated in the literature and precisely employed in the form of training (Proctor *et al.*, 2013). Proctor *et al.* (2013) has defined implementation strategies as the techniques that are used to improve



implementation, adoption and sustainability of a certain program. The strategies are composed of key processes such as planning, educating, financing, managing the quality and attending to policy context. IOs adapted from the public health literature address the opportunities presented by various service systems, as well as the human challenges associated with staff training and day-to-day operational support in ICT4D initiatives. Some studies, however, measure implementation outcomes in terms of the improvement of the process (Proctor *et al.*, 2011).

IOs are assessed on the basis of acceptability, adoption, appropriateness, fidelity, sustainability, cost, and feasibility. These factors are discussed in more detail in the following sub-sections.

### **3.7.1 Acceptability**

Acceptability refers to the way in which implementation stakeholders distinguish whether or not a service, practice or treatment is satisfactory (Proctor *et al.*, 2011). If management has strong reasons as to why a system should be adopted it increases the chances of the system being accepted, mainly based on the training provided (da Silva *et al.*, 2013). System enhancement is necessary to increase information availability and quality. An acceptable system assists with the successful formulation of policies and knowledge.

The term *acceptable*, as viewed from an ICT4D perspective, means that all stakeholders understand the outcomes in the same way. This would mean that there is a fair degree of agreement amongst the stakeholders regarding what precisely is meant by the term *development* within their context. The stakeholders also agree on the role that ICT can play in achieving the development outcomes. Therefore, the following sub research questions (SRQs) were created and used as guides in the data collection (see Appendix D Interview Schedule):

**SRQ<sub>1</sub>** - Is the development vision and mission of the primary stakeholder/s (e.g., the sponsors, leaders) clear?

**SRQ<sub>2</sub>** - Do the different stakeholders share a common understanding as to the role of ICT in development?

### 3.7.2 Adoption

Proctor *et al.* (2011) posit that adoption refers to the initial decision to employ innovation. A suitable approach, which will increase project success, needs to consider the local background within which the system will be deployed. Proposing an ICT4D process that will embrace ICT in development and encourage local adaptation will result in a successful delivery as well as a sustainable framework. Careful project management and planning steps include constant communication with stakeholders which, in turn, helps to ensure that the benefits of the system's implementation are understood by all parties (da Silva *et al.*, 2013). The key lessons to be learnt towards the successful implementation of ICT4D approaches centres around initiatives such as planning, local capabilities, and technology development. These could all contribute and stimulate successful economic growth.

It is apparent from ICT4D literature that the adoption of ICT4D initiatives could result in people having access to the proper resources to help map a limitations and capabilities of an ICT4D project. The case might be that stakeholders partake in a project planning process that compels data gathering. This process will result in the successful overcoming of the disappointment of the ICT4D project, and it implies the use of flexible standard strategies and the building of human capital while developing professional skills and cultivating a system development and adoption approach. The relevance of proper project planning should be highlighted as this enables adoption in a context where information is openly available, and all stakeholders can partake and participate in development activities. To this end, the following SRQs will be explored:

**SRQ<sub>3</sub>** - To what extent have the community members tried out the ICT services?

**SRQ<sub>4</sub>** - What benefits could the ICT initiative render to the community using ICT?

### 3.7.3 Appropriateness

Proctor *et al.* (2011) has stated that *appropriateness* refers to the perceived compatibility of an innovation to address a certain problem. There is a difference between appropriateness and acceptability. A certain behavioural reflection could be appropriate, but not necessarily acceptable. It is not the responsibility of the sender to determine whether the material is appropriate or not. The recipients decide if they want to accept the material as appropriate.

While elaborating on the importance of innovation, appropriateness could be possible when the intended recipient accepts and gives approval that the technique has potential to make a positive change. It is worthwhile to note that while highlighting the relevance of providing appropriate services for an organisation both intellectual and normative components influence the design and use of the service. Appropriateness could be likened to theoretical thinking, which evaluates the capability of the system to achieve valuable goods that will enhance people's quality of life. An example of appropriate use is when an e-mail (as a communication tool) is used to deliver an intended message to a recipient(s). It is, however, not deemed appropriate to circulate e-mails of which the content might cause offence to the recipients.

Appropriateness could also refer to economic growth as this is considered an important indicator of human development. Appropriateness could mean recognising human capability to participate in transforming rendered ICT services. Human capability could also refer to a special way that enables community members to apply special skills. Implementation strategies should be approached in the same way and specified, both *conceptually* and *operationally*, if they are to be scientifically tested, communicated in literature, and precisely employed in the form of training. Implementation strategies have the detailed prerequisite whereby having knowledge is essential. Thus, the following SRQs will be investigated:

**SRQ<sub>5</sub>** - What are the actual needs / problems that are faced in the community?

**SRQ<sub>6</sub>** - How does ICT assist to address these needs?

### **3.7.4 Cost**

Proctor *et al.* (2011) has postulated that *cost* is the outcome that is based on the effort that has been invested in implementation phase, in that people volunteer their services for little or no payment. The cost of employing ICT to develop infrastructure that will in turn contribute to the knowledge gained by the community is high. However, evidence indicates that the cost of *not* implementing the said infrastructures would in all likelihood be much higher (Zhao, 2012).

As already alluded to, *cost* implies that the outcomes generated from the resources used will determine the amount of money available to translate the capabilities of a given implementation. Cost could also involve participating openly to reproduce solutions that will be used by the community at no rate but with good intentions. As predicated by Nicol *et al.*

(2003), it is difficult to identify integrated costing systems that provide information regarding the cost of specific activities in institutions. Evidence indicates that few costing systems have the capability to calculate the cost of network and overall central costs of departmental activities. Much effort is focused on quantifying an intervention and attaching a cost to it; however, few studies have reported on the cost of guideline implementation (Proctor *et al.*, 2011). Cultural barriers play a role in systematic costing where disagreement and instability amongst researchers could result in information that is too expensive for the staff (Nicol *et al.*, 2003).

Examples are not limited to tangible costs (including hardware/software renovation, internet subscription and infrastructure costs) or to intangible costs (such as time invested by unpaid stakeholders who are learning to use ICT and giving back to the community). The cost effectiveness of the system is not always a true reflection of the production process.

Therefore, the following sub-research question is going to be investigated:

**SRQ<sub>7</sub>** - What is the cost (Financial/non-financial) to maintain the ICT?

### **3.7.5 Feasibility**

*Feasibility* refers to the degree in which new innovation can be successfully completed within a specified setting (Proctor *et al.*, 2011). This implementation entails that new ideas are put in place in the community in accordance with specific policies that aim to improve social and economic development. These policies are composed of key processes such as: planning, educating, financing, managing quality and attending to policy context.

Drawing from the literature, feasibility measures the way people perceive quality of life while evaluating the process used to fulfil their wishes. Feasibility relates to the practicality of economic development looking at the possibility of how inventions could be achieved. Also, indications are that the concept may explain that a service is compatible to fulfil its purpose but not achievable due to training constraints. The following sub-research question is going to be explored:

**SRQ<sub>8</sub>** - To what extent are the users skilled to use the ICT?

### **3.7.6 Fidelity**

Proctor *et al.* (2011) has submitted that *fidelity* is the level at which an intervention is implemented in the original arrangement recommended by the developers. Fidelity entails commitment to follow procedures and policies when implementing an intervention; the outcome of the evaluation will determine if the program has delivered exactly as prescribed and written. The implementation should be exactly designed using the evidence of an intervention and the intended materials to meet the intended standard.

When viewed from ICT4D perspective, the term *fidelity* means that the innovation outcome is exactly as the agreed. The importance of fidelity emphasises the point that through the activity questions and lessons that are learnt positive opportunities can be extracted and facilitated in a correct sequence. Indications are also that fidelity should be measured separately for every implemented system to evaluate thresholds on which original components are delivered. Therefore, through fidelity, it is possible to produce the essential quality of an intervention and achieve the desired opportunities, which may ultimately determine the quality of the service. Therefore, the following research sub-research question will be investigated:

**SRQ<sub>9</sub>** - To what extent are the computers still serving the initial purpose?

### **3.7.7 Penetration**

Stiles *et al.* (2002) assert that *penetration* is the integration of a process that is used within a service and its systems. Penetration is used to characterise the following: (i) the accessibility of a service; (ii) the eligibility of those people who receive it; and (iii) measurement of product utilisation. People can use ICT systems in their own time, and at their own pace, to acquire skills that empower them to become the professionals they want to be. In doing so, the said people also contribute to their communities at the appropriate time.

When viewed from an ICT4D perspective, the term *penetration* means that the service impact is strong on the expected outcome of the service. The case might be that a certain system might be moderately operative and preferred by stakeholders because the existing service is poor; the training process would therefore ensure more penetration. The training process will result in a

positive development outcome considering the relevant service expansion and quality improvement of the service. Penetration of the service depends mainly on the distribution channel adopted and the availability of technology strategies practised. Therefore, the following research sub-questions will be investigated:

**SRQ<sub>10</sub>** - To what extent do users of computers/smart devices keep on coming back?

**SRQ<sub>11</sub>** - For the users who keep on coming back, why do they keep coming back?

### **3.7.8 Sustainability**

*Sustainability* refers to the process whereby a newly implemented behaviour is stably maintained within daily operations. As outlined by Proctor *et al.* (2011), healthy behaviours can be sustained in an environment by using organisational policies and best practices. The capability of the system depends mainly on the evaluation approach applied, which in turn enables the constant maintainability and health of the system. The process is evaluated according to the needs of the community as well as the policies designed prior to the implementation of the new behaviour. To ensuring that it can be easily upgraded and maintained, the system remains usable and serves its purpose for a longer period. A well-designed system, implemented in accordance with requirements as intended by the community and subjected to environmental policies will potentially endure for a longer period.

It is clear from the literature that *sustainability* refers to the effectiveness of the project and capability to continue functioning the way it has been without hindering individuals to benefit from the initiative. Having a resource that influences changes among the stakeholders and aligning the changes in innovation could assist in having an initiative that is maintainable continuously. The process includes establishing the effectiveness and the impact of the contribution that the project can make towards this development. Therefore, flexibility and emergency amendments are possible, and this results in sustained services. The involvement of system users is crucial to measure the *expected* and *actual* outcomes by checking the details provided on the performance indicators. Therefore, the following sub-research-question will be investigated and empirically tested using the Likert scale:

**SRQ<sub>12</sub>** - To what extent are there established routines to manage the daily operations of the ICT4D initiative?

Vaughan (2006) has noted that community based ICT4D projects could adopt a community informatics approach that would enhance the social capital, sustainability, and the overall contribution to development. ICT4D sustainability might be regarded as an ongoing process that involves dynamic and complex interactions between different actors. Phahlamohlaka *et al.*, (2010) has emphasised the importance of designing web-based tools that will enable communities to interact and collaborate effectively.

### **3.8 Chapter conclusion**

Chapter three has reviewed all the literature related to the development theories, with the main focus on each development theory being on the adoption of IOs theory for ICT4D initiatives. The adoption of a development theory is important to identify the core components or active ingredients that influence the IOs, which will result in developing a framework for implementing ICT4D initiatives. The next chapter provides information on methodologies that were used to assess an implementation framework for ICT4D initiatives.

# CHAPTER 4

## Research Methodology

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The previous chapter related the literature on implementation outcomes to ICT4D projects. This chapter presents the research approaches to achieve the objectives of the research stated in the introductory chapter of this thesis.

### 4.1 Research Methods

There are three main types of research methods in social research: qualitative, quantitative and design research. Qualitative research attempts to study the everyday life of different groups of people and/or a community with the aim of discovering and exploring the problem at hand of which very little is known (Neuman, 2014). Qualitative research methodology is designed to help researchers understand people, the social and cultural contexts in which they live, different knowledge, enquiry strategies, collection of data and analysis. Data is derived from direct observation of behaviours, interviews, written opinions, and public documents.

Quantitative research is an approach for testing objective theories by examining relationships among variables. The approach is used to measure variables on a sample of subjects, and it expresses the relationships using effect statistics. This approach is primarily used by positivist researchers such as Neuman (2014) with an aim to look for patterns and to draw conclusions. In this research, data was collected and presented in a table format to aid statistical analysis of the data such as identifying specific common items and patterns. The data analysis is based on well-developed techniques.

Design research is an approach that provides a detailed structured process model, along with combining the activities of design science research and action research (Mullarkey and Hevner, 2019). For the initial artefacts of design research process, defining concepts, system requirements, problem and solution models, design principles and design features. Above all, design process ought to generate knowledge that creates innovation, for example addressing an organizational need.

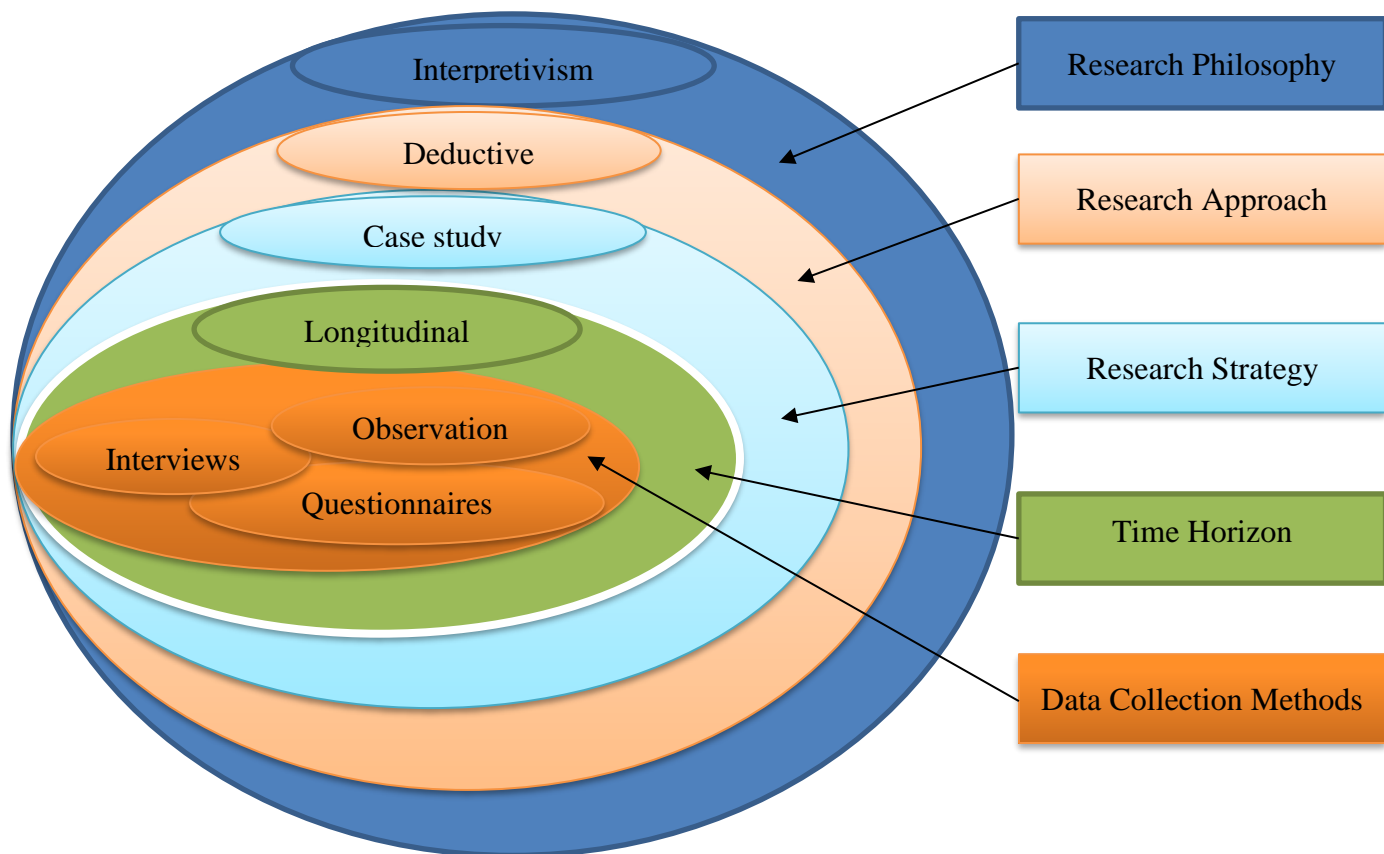
The qualitative approach is best suited for this research since it is more consistent with the primary research question of this research. The motivation for undertaking qualitative research



emanates from Myers’s (1997) argument that our ability to talk is the one thing that distinguishes human beings from the natural world.

## 4.2 Research Design

The Saunders research onion approach that was considered for this research study is illustrated in Figure 4.1. The onion provides the context within which data collection and data analysis procedures should be selected (Sahay, 2016). Onion rings can logically link all the factors that affect rural community projects, and the Saunders research onion emphasises the importance of the planning and designing the different stages of the research. The outcome of the research is developed in accordance with the outer layers of the onion, which forms the root, and the middle layers.



*Figure 4.1. Adapted Saunders Onion ring research method for this research*

### 4.2.1 Research Philosophy

The philosophies that inform this research and the research methodology include positivism, critical realism (CR) and interpretivism. These are discussed briefly in the next sub-sections.

#### **4.2.1.1 Positivism**

Positivism applies to the natural sciences as a model for inquiring about the natural world (Saunders *et al.*, 2011). This philosophy explains how and why phenomenon occur thus suggesting the application of parameters such as using measurement, correlation, statistical logic, and verification. This therefore implies that positivism is heavily quantitative. Methods associated with positivism include the use of surveys, questionnaires, random sampling, and hypothesis testing. However, the problem with the positivist approach is that it lacks the capacity for self-reflection and cultural production when applied to society and human agents (Saunders *et al.*, 2011). It is for reason that this research philosophy was not adopted for this research study.

#### **4.2.1.2 Critical Realism**

Critical realism refers to the meta-theory that is applied for social sciences. Critical humanist argues that often our senses mislead us since they are the images that represent what is real (Saunders *et al.*, 2011). Saunders et al. (2011) argues that critical realism relates to critical social theory that can be purely evaluative. The philosophy explains that there can be no split between values and facts in social theory. This therefore implies that social theory provides a critique explanatory that entails actions. The concern with critical realism approach is the way the theory of science is described, and the methods associated with the strength of its prescriptions (Saunders *et al.*, 2011).

#### **4.2.1.3 Interpretivism**

This research has adopted the interpretive case study approach. Interpretive studies assume that the access to reality is through social creations such as consciousness, language, and shared meanings (Meyers, 1997). Interpretive research attempts to understand the meaning that people assign to themselves, and its aim is to produce an understanding of the context and the process where information systems are influenced by the context. In addition, an interpretative approach refers to the in-depth case study (Walsham, 1995). In terms of explaining what a case study is, Noor (2008) refers to the concept as an event or the unit of analysis. A case study is an important enquiry that investigates the present case of real life with the gathering of evidence that enables a researcher to get a thorough understanding of a specific sequence of events. A case study is concerned mostly with how things happen, and it is therefore intended to focus on a particular issue and unit of analysis. The case study method is suitable to understand and examine the processes and training projects within organizations. It is relevant when there is a requirement to understand a situation in depth and to identify the events that are substantial

with significant information. In explaining its strength, Noor (2008) suggests that case studies enable the researcher to get a thorough understanding of a specific sequence of events and strings together pictures of different evidence. It allows for generalization since using multiple case study findings can result in replication. Reports and conclusions from different interpretive case studies that elaborate different issues are available in computer based IS literatures. Assuming that IS research classification is interpretive, the knowledge of reality is gained through social constructions like shared meanings, documents, tools and language (Klein *et al* ., 1999).

This research adopts an interpretive case study approach by demonstrating how ICT4D initiatives can be improved up using social creations to enable researcher to understand sequence of events.

## **4.2.2 Research Approach**

Three research logic paths (Abductive logic, inductive logic and deductive logic), which connect theory and data, are known (Levin-Rozalis, 2004).

### **4.2.2.1 Abductive Logic**

Abductive logic refers to a process of drawing conclusions often preferring hypothesis with strong facts to explain when there is no foundation in previous knowledge (Levin-Rozalis, 2004). This logic typically involves any situation where adequate evidence about facts and the acquired evidence that might justify any hypothesis is not yet available. This therefore implies that abduction is used as an enormous number of problem-solving techniques ranging from diagnosis to division understanding, to theory formation and evaluation. However, the main concern of abduction logic is that it takes a long time for the requisite data to be collected.

### **4.2.2.2 Inductive Logic**

Inductive logic refers to a perspective that confirms a theory by initially looking at concrete evidence and working towards more concepts and related theory. In inductive study logic, the practical experience and reflection on what is taking place and working towards improved ways is observed initially (Neuman, 2014; Levin-Rozalis, 2004). The logic then moves towards theoretical idea by initially addressing the general topic and clarifying non-specific ideas. This involves the formulation of new theoretical ideas that is faithful to confirmation. It looks for

theory that should be confirmed based on the evidence that can be generalized and thus provides an insight of development growth in the society (Neuman, 2014). Neuman (2014) posit that grounded theory refers to inductive social theory used in qualitative research to build by comparison of empirical observation towards abstract theory. In addition, most researchers use grounded theory as it involves designing new theoretical concepts from the bottom up, rather than testing theoretical ideas that already exists.

#### **4.2.2.3 Deductive Logic**

As far as deductive logic is concerned, the researcher starts with the theoretical concepts that elaborates the logical connections between previous theoretical assumptions and the hypotheses (Levin-Rozalis 2004; Neuman, 2014). Levin-Rozalis (2004) posit that hypothesis is explained by deductive establishment derived from a theory. The formulation of hypothesis assures the researcher that during the application of theory there will be no alteration. In addition, deductive logic examines the specialization to reveal the connections between the variables involved and elements that play a role.

The deductive logic was used in this study to develop richer theoretical framework that will be tested using data (Klein *et al.* , 1999).

### **4.2.3 Research Strategy**

Research strategy refers to the plan the researcher will undertake when answering their research questions (Saunders *et al.*, 2011). The experiment and survey are entirely linked to quantitative strategies, while archival and case study research could involve quantitative, qualitative, or mixed strategy. Other research strategies include ethnography, action research, grounded theory, and narrative inquiry. The first three are discussed briefly in the next sub-section.

#### **4.2.3.1 Experimental Strategy**

As far as experimental strategy is concerned, the laboratory-based research is rooted in natural science and the experiment is often the requisition to conduct research. Experiment refers to the type of research that is based on the natural science and is applied mainly in social and psychological science research (Saunders *et al.*, 2011). This therefore implies that the purpose of experimental research is to study the probability of a change in the dependant variable that

is caused by the independent variable. Experimental research is not suitable for this research study since there is no relationship between variables that ought to be predicted.

#### **4.2.3.2 Survey Strategy**

Saunders *et al.* (2011) has stated that survey strategies refer to the preferred strategy in business and management research that is often used to answer questions such as ‘who’ and ‘what’. It is mostly related to deductive research approach, and it could therefore be used for descriptive and exploratory research. As far as the survey strategy is concerned, the collection of data from sizeable population is through a questionnaire which then allows for easy comparison (Saunders *et al.*, 2011). Research conducted through survey is not suitable for this research study since survey allows researcher to collect quantitative data which can be analysed quantitatively using inferential and descriptive statistics, Inferential and descriptive statistics talk about making predictions about a population and providing data descriptions of the population.

#### **4.2.3.3 Case Study**

Case studies are a preferred research strategy in answering questions such as “why” and “how” by interpretative exploration. Exploratory research case studies can be used as the foundation of formulating questions (Noor, 2008). As far as case study is concerned, the research is explored within the proposed amount of real life ideas. In addition, the limits between the context and situation being studied are mostly not obvious (Saunders *et al.*, 2011). This therefore implies that although the research is undertaken in context, understanding and exploring the context is limited by the amount of variables for which data can be collected. Interpretive research possesses the potential to produce profound understanding of the management of IS and, as such, IS development can assist IS researchers in gaining an understanding as to the thinking and acting in social and organisational contexts (Klein *et al.* , 1999). The exploratory case study research method will be used in this research study.

#### **4.2.4 Time Horizon**

Time horizon refers to the time the researcher takes to complete the research study. In terms of the time horizon, the researcher can elect to adopt either the cross sectional or longitudinal approach.

The cross-sectional study route is commonly used by researchers and it involves seeking to understand the situation at a particular time. Cross-sectional studies mostly employ survey strategies (Neuman, 2014).

The longitudinal route involves data collected over some time. Saunders et al. (2011) posited that the longitudinal approach allows the researcher to learn about development and change and provides for the testing and development of theories of human development.

This study used the cross-sectional approach.

## **4.2.5 Data Collection Methods**

### ***4.2.5.1 The Survey***

Surveys refer to the gathering of data from a group of people through their responses to questions (Neuman, 2014). In this form of study, various questions are asked to a large number of people in a short period of time. Instead of creating a situation or environment to see how people respond, replies are precisely recorded from a large number of people who have been asked the same questions. Survey data is presented in charts, graphs, or tables, and statistics are used to interpret it. In descriptive research, surveys are used frequently, and sometimes in exploratory research.

### ***4.2.5.2 Face-to-face Interviews***

Interviews were conducted on a face-to-face basis. Face-to-face interviews have the advantage of allowing the interviewer to use the exact wording written on the questionnaire during the interviewing process. The most important part of the interview is for an interviewer to ask questions and record answers (Neuman, 2014). A good interviewer always knows when to probe with “follow-up question” for clarity.

Interviews were the primary data collection method adopted for this research study. The developed questions were shared with co-workers and academic supervisor to critique the questions and thereby allow clarification, addition, and exclusion. The questions in this study were designed to be general and allowed the participants to make sense of the situation. Each research design has an approach and emphasis. It is important to offer a detailed explanation of methodological approach to warrant a chosen method

#### ***4.2.5.3 Purposive Sampling***

Purposive sampling, which is also known as judgment, selective or subjective sampling, was used to select the target population for the face-to-face interviews. Purposive sampling is a non-probability sampling technique whereby researchers rely entirely on their own judgment when selecting members of the population such as interviewees to participate in a study (Neuman, 2014). For this study, the target population was drawn from key informants who were actively involved with the projects and therefore possess the requisite intimate knowledge about the ICT4D projects under consideration (i.e., SEIDET, SLL, and CSIR Cyber Awareness Program). To this end, the following key informants representing various ranks for each of the ICT4D projects will be interviewed individually to obtain their perspective on the ICT4D projects:

- The CEOs.
- Executive Directors.
- Executive Board Members.
- Project Champions.
- Administrators.
- Management Team; and
- Users of facilities at the selected ICT4D projects.

The key informants mentioned above were selected after a rigorous identification process was conducted with the assistance of project leaders.

#### ***4.2.5.4 Interview question creation***

A set of open- and closed-ended questions were used to conduct the interviews. The self-administered, questionnaire that was designed by the researcher was organized as follows:

- **Section A:** Ethics
- **Section B:** Demographics
- **Section C:** Technical Questions

**Section A** of the questionnaires is designed to extract information regarding the ethical considerations in terms of participation, withdrawal, and rewards. **Section B** enables the collection of data related to demographics such as gender (observant), age, level of education, employment, and location. All questions in both **Sections A** and **B** are generic and are therefore designed for all participants irrespective of their level of seniority in their ICT4D. Lastly, **Section C** is designed for the collection of technical information and thus employ open-ended questions. The management, leadership and board were asked “interview questions”, while

users of facilities at selected ICT4D projects were asked “follow up questions”. Both types of questions are listed in **Appendix B**.

#### ***4.2.5.5 Reliability and validity of the questionnaire***

Validity refers to the procedure of checking the accuracy of the findings from the perspective of the researcher and participants. While, Reliability indicates that appropriate methods chosen by the researcher were applied consistently in a qualitative research study (Rose and Johnson, 2020). Reliability and validity in qualitative research is also seen as research integrity (Owoseni and Twinomurinzi, 2018). Emphasis is that qualitative research study that is more trustworthy involves aspects such as literature review and the depth engaged, epistemological understanding, the connection of appropriate theory and discourses, the data collection techniques and analytical method used, and the ways the research interlink with one another. The key point here is that theoretical concepts and generalizations in interpretive research should be carefully related to the field study details as they were collected by the researcher (Rose and Johnson, 2020; Klein *et al.*, 1999; Owoseni and Twinomurinzi, 2018). In addition, research integrity is linked to the trustworthiness, background, character of the researcher, as such, and the simplification of the research results.

Trustworthiness refers to the systematic accuracy of the research, the applicability of the research methods, the authenticity of the findings and the credibility of the researcher (Rose and Johnson, 2020). The concerns of trustworthiness of social science research borrowed from experimental design for the direction. Borrowing from quantitative approaches, the issue of generalizability, validity and reliability has to be addressed for the qualitative approaches to be considered reliable in social sciences (Rose and Johnson, 2020).

#### **4.2.6 Measures for validity, reliability, and trustworthiness**

To help researchers’ understandings of trustworthiness, qualitative research is concerned of methods and paradigms that shows interest in epistemologies and ontologies. The researcher might be willing to demonstrate the validity of a study using techniques such as an interview guide to determining its ability to act as a catalyst for social change (Rose and Johnson, 2020). The reliability can be achieved by consistent documentation of procedure. Increasing reliability demonstrate that themes and codes that are developed during analysis are consistent and clearly defined. Reliability, in instance research project involves multiple stakeholders, it is of



importance to have effective communication between members. Although a checklist of validity may be helpful, it is recommended for some techniques to be reported during the study. In addition, techniques may be necessary in some approaches than others, strategies were aligned with overall purpose and research questions (Rose and Johnson, 2020).


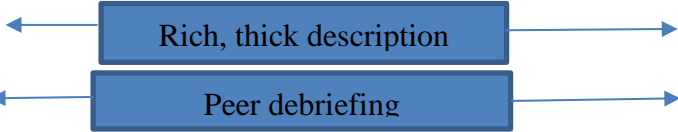
#### 4.2.6.1 Peer debriefing

Peer debriefing is about interacting with the person who assisted with research topic or process, questioning methodological practices and overall clarity, as well as contributing to a better understanding of the research's depth. For example, the process required extensive consultation with supervisors and community members (Rose and Johnson, 2020).

#### 4.2.6.2 Rich, thick description

This means that increased attention to detail of data provides a sense of reality and contextualized understanding to readers. The data may be extracted from participant perspectives (Rose and Johnson, 2020), see Table 4.1.

Table 4.1 Alignment of trustworthiness techniques (Rose and Johnson, 2020)

Trustworthiness techniques in qualitative approaches		Post positivism	Critical Theories	Constructivism	Participatory	
	Reliability	Consistent documentation of procedures				
		Defined codes/themes				
Validity						

The following procedures were followed in ensuring the trustworthiness and reliability of the study:

1. The evaluation of existing theory on the study.  
The evaluation of theory on this study should be closely related to the community project operations. The evaluation involves project champions, board of executives,

CEO, supporting staff, project leaders, members of the community and users. It complements the project by gathering feedback needed to improve ICT4D projects effectiveness in communities.

2. Research instrument design and qualitative research model.

Phases	Steps	Procedure adopted
Planning	Identify the research domain, Give close and open ended questions to participants	Goal's clarifications
Construction	Do content validation, develop new/improved knowledge	Item's definition
Validation	Analyse qualitative data for validation	Analysis of results

3. Ethics committee approval for data collection

All documents required for application has been properly done and approved by the university ethics committee.

4. The administration of interview mechanism.

Identify the end users and purposes of living labs, and record whether users perceive the usability and maintenance to be stable, increasing or decreasing. To capture related information and conduct interviews with selected board and users who interact with the living labs. The inclusion of data on the human use, if done properly, allows an opportunity by analysts make sense of an issue at hand and to develop knowledge of the human factors that affect the inconsistency.

5. Researcher's background and identification.

The readers ought to understand the researchers background as it has an influence on the outcome of the research. The main researcher in this study lives in Giyani, she has experience in incident management and trend analysis. She is perusing her career at the university of South Africa majoring in Information Systems.

6. Identification and analysis of data collected.

For this study the researcher has selected thematic analysis. Thematic analysis is the flexible process of identifying patterns within qualitative data (Ibrahim, 2012; Owoseni and Twinomurinzi, 2018). It is used for learning and teaching given the diversity of work. The approach is mostly adopted in social sciences to identify

interesting patterns in the data and use these patterns to interpret and make sense about an issue.

### 4.3 Data Preservation

Researchers recognize that the background of participants shape their interpretation. Research data will be safely stored in the university database for the intended period. All forms will be shredded once the required data has been recorded are kept securely at the university.

### 4.4 Units of Analysis

The unit of analysis included the following stakeholders for ICT4D initiatives; project managers; national, local, and municipal government departments; academic institutions; the private sector; users; and employees of the ICT4Ds. End users and project champions who are already involved in the projects were also interviewed. It is a requirement that all the stakeholders must understand the social development construct so that the people who are involved can freely express themselves. This allows for all ICT4D stakeholders to collect correct information for the initiative. The domain should enable stakeholders to ask questions and be involved throughout, as a result engaged and enthusiastic stakeholders that are driven to succeed will always be more productive. The different stakeholders for the respective ICT4D projects are listed in the Table 4.2.

Table 4.2: List of Stakeholders

	<b>SEIDET</b>	<b>SLL</b>	<b>CSIR Cybersecurity Awareness Program</b>
Executive Management	CEO, Project champion, Board of Directors, Executive/General Manager	CEO, Project champion	CEO, Management team, Project leader
Supporting Staff	Administrator	Project team members	Project team members
Other Stakeholders Institutional sponsors	UP, UNISA,	University of Fort-Hare,	University of Venda, UNISA

Government sponsors	Mpumalanga provincial government Telkom	Rhodes University, Eastern cape provincial government	Gauteng provincial government
Private sector sponsors		Saab Grintek, Telkom	
Users	School learners, Unemployed youth	School learners	Members of the community, Company employees

#### 4.5 Ethical Clearance

All research instruments such as interview guides and questionnaires were submitted to the University of South Africa's Ethical Standards Committee for approval prior to data collection. Appendix F has the approved ethics clearance certificate.

#### 4.6 Method of analysis

In the face-to-face interviews, which lasted around 20 minutes except for project champions, which lasted more than an hour. Participants were all asked about their experience of ICT4D projects, the development mission, and vision, whether they share a common understanding, the extent in which they tried out ICT services, the benefits that ICT could render to the community, the actual problems/needs faced by the community and the way ICT is addressing them, the cost of maintaining ICT devices and the extent in which users are skilled to use ICT, the extent in which computers are still serving their purpose, and if users keep coming back to use computer devices, why do they keep coming back, and the extent they have established routines to maintain daily operations of the ICT initiatives. Atlas.ti was used for the data analysis. Tables were used to present the findings and descriptions of the theses.

#### 4.7 Chapter Conclusion

This chapter presented the various methods that are used in this project. The qualitative method was selected for the research study. Interpretative philosophy and deductive approach were also adopted. The research selected exploratory case study strategy and longitudinal logic.

Lastly, the interview method was chosen to collect research data from three ICT4D projects. Therefore, the philosophical worldview proposed in this research is based on social construction.

# CHAPTER 5

## Analysis and Discussion of Findings

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In the previous chapter, the research methods used to assess an implementation framework for ICT4D projects were presented. This was to ensure that the correct data collection methods were followed for the collection and analysis of the data. In this chapter, the collected data was analysed and an implementation framework for ICT4D projects is introduced.

In the subsections that follow, the theory of IOs drawn from public health literature is used to identify other important factors to go beyond sustainability and improve the implementation of ICT4D initiatives. The data for this research study was collected from stakeholders summarised in Table 5, refer to interview questions, Appendix D.

Table 5. ICT4D Projects Stakeholders

		<b>Acceptability</b>	<b>Adoption</b>	<b>Appropriateness</b>	<b>Cost</b>	<b>Fidelity</b>	<b>Feasibility</b>	<b>Penetration</b>	<b>Sustainability</b>
<b>Primary stakeholders</b>	Executive Management	√	√	√	√	√	√	√	√
	Support staff	√	√	√	√	√	√	√	√
<b>Secondary stakeholders</b>	Private	√	√	√	√	√	√	√	√
	Institutional	√	√	√	√		√	√	√
	Organisational Sponsors	√	√	√	√	√	√	√	√

<b>Users</b>		N/A	√	√	√	√	√	√	√
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Primary ICT4D Stakeholders and Users of ICT4D projects (i.e., Executive Management and), as well as Secondary ICT4D Stakeholders and Users of ICT4D projects (i.e., Private, Institutional, and Organisational Sponsors). Whereas all above-mentioned IOs apply to Primary ICT4D Stakeholders, only one of the three factors (i.e., either Private, Institutional, or Organisational Sponsors) applies to the Secondary ICT4D Stakeholders. Except for the acceptability factor, all other factors are relevant to the Users of ICT4D projects.

Data was collected from 27 participants, of which 16 (59%) were men and 11 (39%) were women. The characteristics of the entire sample are specified in Table 5(a).

Table 5(a). Demographic characteristics and percentage point differences by interview

<b>Demographic categories</b>	<b>Participant count</b>	<b>Percentage</b>
<b>Gender</b>		
Female	11	39%
Male	16	59%
<b>Educational attainment</b>		
Learner	1	3.5%
Matric	1	3.5%
Certificate	2	7.5%
National diploma	1	3.5%
B-tech/Bachelor's Degree	4	15%
Honours	5	19%
Masters	10	37%
PHD	2	7.5%
Italian louder	1	3.5%
<b>Age</b>		
16-20	1	3.5%
20-30	4	15%
30-40	6	22%
40-50	5	19%
50-60	10	37%
60 -70	1	3.5%
<b>Employment (source of income)</b>		
Learner	1	3.5%

Academic	3	11%
Administrator	1	3.5%
Contractor	1	3.5%
Researcher/Senior Researcher	5	19.25%
Researcher and software developer	3	11%
Educator	6	22%
Engineer	1	3.5%
Manager (Financial, Risk, Chief Risk, dept of Schools, Data recovery, Impact area)	5	19.25%
Self employed	1	3.5%

## 5.1 Acceptability

Acceptability refers to the way implementation stakeholders distinguish whether a service, practice, or treatment is satisfactory or not (Proctor *et al.*, 2011). During face-to-face interviews, the primary ICT4D stakeholders (i.e., executive management and support staff) and institutional sponsors of ICT4D initiatives provided answers that sought to address the following sub-research questions (SRQs), which relate to the acceptability taxonomy:

**SRQ<sub>1</sub>** - Is the development- vision and mission of the primary stakeholder/s (e.g., sponsors and leaders) clear?

**SRQ<sub>2</sub>** - Do different stakeholders share a common understanding as to the role of ICT in development?

The perspectives of the primary and secondary ICT4D stakeholders in respect of acceptability are discussed in the sub-sections that follow.

### 5.1.1 Perspectives of Primary Stakeholders on Acceptability

#### 5.1.1.1 Perspectives of Executive Management on Acceptability

The codes, themes, and number of occurrences stemming from the answers provided by executive management during the interviews are summarised in Table 5.1.

Table 5.1. Acceptability by Executive Management

Themes	Codes	Occurrences
Access to services for community members	Accept: development through education	9
	Accept: internet connectivity	3



	Accept: the same opportunities for all	9
	Accept: allows information search	1
	Accept: ICT as an enabler of access to services to better lives	8
	<b>Total</b>	<b>30</b>
Ubuntu (togetherness and community participation)	Accept: executive management want locals to be involved	3
	Accept: level of happiness about achievement at the lab	1
	Accept: informing people about opportunities	1
	Accept: collaboration and partnership are emphasized	2
	Accept: allow researchers access to communities	2
	<b>Total</b>	<b>9</b>
Long term survival of a project	Accept: concern about the longevity of the project	1
	Accept: the finances need to support the project long term	1
	Accept: re-strategising the vision to make it more relevant to a changing environment	2
	Accept: worry about how the project will survive	1
	<b>Total</b>	<b>5</b>
Protect community members against unacceptable social influences	Accept: concern about cyberspace victims	1
	Accept: concern about project dysfunction	1
	Accept: self-protection from identity theft	2
	Accept: securely protection of users	2
	Accept: concern about taking care of devices	1
	Accept: defence tools	2
	Accept: awareness of cyber attacks	2
	<b>Total</b>	<b>11</b>
Transformational/emancipatory (change the status quo)	Accept: allow people to dream of a better future	1

Accept: designing tools that are aligned with the operation of an organisation	2
Accept: self-sufficient re computer	5
Accept: provide computer training	7
Accept: provide extra classes	6
Accept: create entrepreneurial opportunities	1
Accept: employment opportunities	2
Accept: concern about youth and economic development	1
Total	25

Table 5.1 suggests that the vision and mission of the initiatives is clear to the executive management of ICT4D. The themes of transformational scored the highest number of occurrences (twenty-five), therefore, the focus of the executive management is unsurprisingly on transformational outcomes through providing computer training, number of occurrences (seven) (see Figure 5.1). Computers are perceived as carrying transformative power and have this unique ability to impart important knowledge to communities.

Computer training emerged as the primary means of social and economic transformation for individuals in the community.

Since one of the ICT4D initiatives focused on cybersecurity awareness, it is expected that providing security awareness to those who are exposed to cyber-attack is considered as one of the important outcomes for executive management.

The findings presented in Table 5.1 indicate how executive management of ICT4D initiatives are unanimous in their desire to emancipate individuals in communities targeted for transformation using these initiatives.

ICT stands out as one of the means of achieving this emancipation. For example, one of the executive managers remarked:

*“SEIDET wants to make a difference in people’s lives through leveraging education and taking the outcomes of that and plugging it into the “D”, in other words, the development through education” (Male, age 59)*

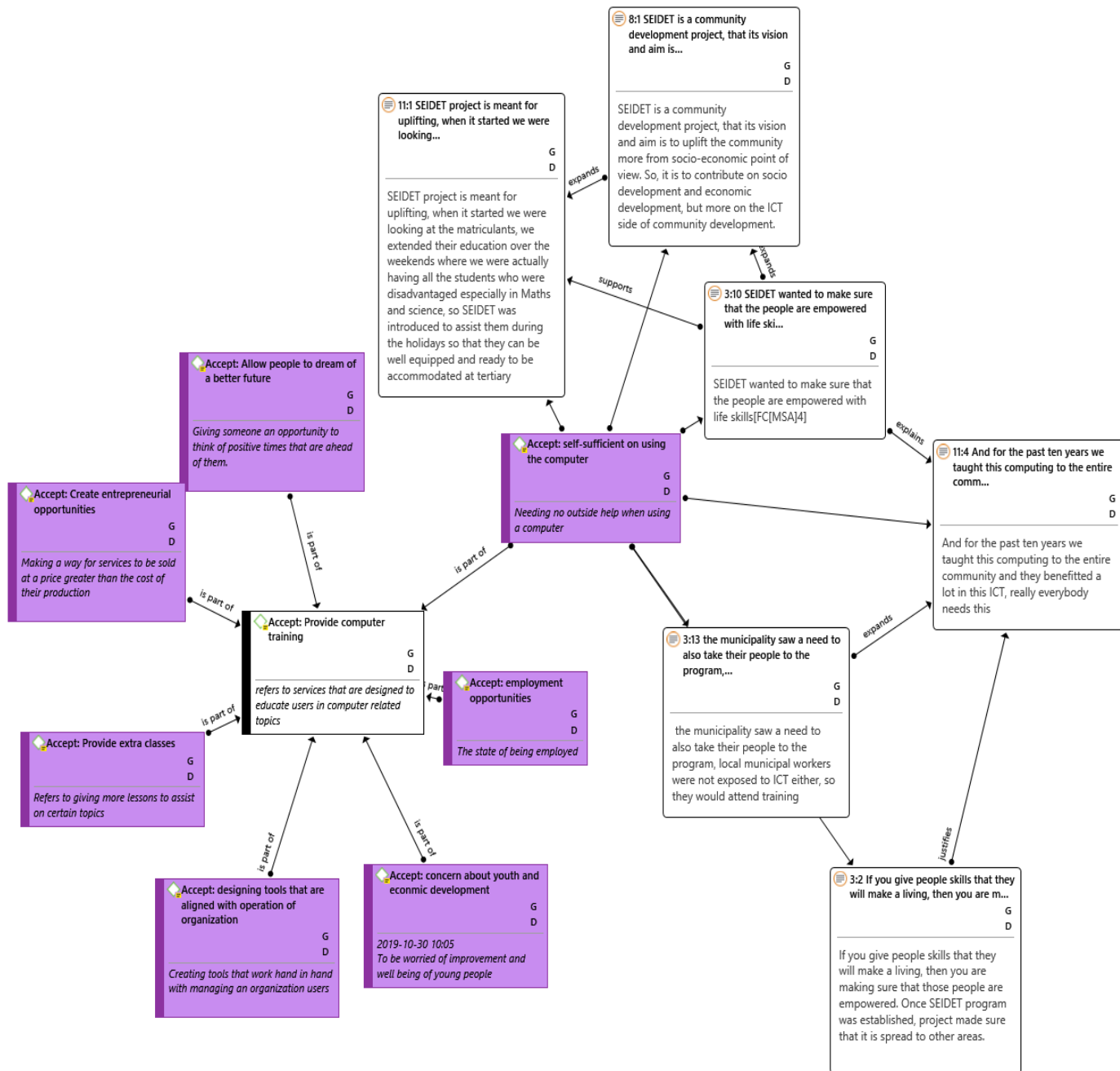


Figure 5.1 Illustration of transformation or emancipation from existing status

The themes emanating from the interviews with the executive managers are presented in Figure 5.1. For example, the theme relating to transformation seems to be emerging after interviewing the executive managers whereby they emphasised the fact that users must be transformed and become independent on the digital platform.

### 5.1.1.2 Perspectives of Supporting Staff on Acceptability

The perspectives of support staff are summarised in Table 5.2. The themes, codes, and number of occurrences are also displayed and explained in detail.

Table 5.2 Acceptability of Support staff

Themes	Code	Occurrences
A capable and informed society	Ssac: ICT is a driving factor of cyber awareness	1
	Accept: defence tools against online threats	4
	Accept: ICT as an enabler of access to services to better lives	3
	Accept: allow researchers access to communities	1
	Total	9
	Accept: concern about project dysfunction	1
	Total	2
Uplifting the community through education and training	Ssaccept: educate users about online risks	3
	Ssaccept: give basic literacy	3
	Ssaccept: helping the community with rewrite	1
	Accept: awareness of cyber attacks	4
	Accept: provide computer training	2
	Total	15

Based on Table 5.2, the support staff have a different understanding of the vision and mission of ICT4D initiatives when compared with executive management. The perspective of support staff on the purpose of the ICT4D initiatives relates mainly to the uplifting of individuals in the community through education and training. The themes of uplifting the community through education and training scored the highest number of occurrences (fifteen), therefore, the focus of the support staff is unsurprisingly on uplifting community through education and training outcomes through providing computer training and awareness of cyber-attacks, number of occurrences (four).

For example, one of the support staff members commented:

*“Is helping the community around Siyabuswa even nearest places because it is doing a lot of programs and then Matric rewrite”* (Female, age 49 ).

The findings displayed in Table 5.2 indicate the essential role that the ICT4D executive management needs to play by continually emphasizing *flexibility with means of development* to achieve development outcomes. For example, the means of development might have moved from traditional computers to mobile devices, and the type of development might also have shifted, yet the supporting staff continue to implement the means of development.

## 5.1.2 Perspectives of Private Sponsors on Acceptability

Private sponsors are relevant in the case of acceptability. The concepts of private sponsors involved in ICT4D initiatives are grouped into themes, codes, and number of occurrences, and the respective answers relating to private sponsors are summarised in Table 5.3.

Private sponsors are relevant in the case of acceptability. The concepts of private sponsors involved in ICT4D initiatives are grouped into themes, codes, and number of occurrences, and the respective answers relating to private sponsors are summarised in Table 5.3.

Table 5.3 Acceptability of Sponsors

Themes	Code	Occurrences
Skills development through education and awareness	Osaccept: educate members of the community	1
	Accept: provide extra classes	1
	Accept: awareness of cyber attacks	1
	Accept: provide computer training	1
	Osaccept: improve understanding of ICT	1
	<b>Total</b>	<b>5</b>
Social responsibility/ Transformation	Osaccept: giving back to people	1
	Accept: create entrepreneurial opportunities	1
	Accept: ICT as an enabler of access to services to improve lives	1
	<b>Total</b>	<b>3</b>
External participation	Accept: allow researchers access to communities	2
	<b>Total</b>	<b>2</b>

Table 5.3 suggests that private sponsors are willing to donate to and participate in ICT4D initiatives. In particular, the focus of private sponsors is obviously on social responsibility through enabling access to better the lives of the community members. The themes of social responsibility scored the medium number of occurrences (three). The objectives of private sponsors do not reflect the depth of emancipation in the same way it does for the executive management or support staff. On the other hand, the participation of users in sponsorship is very low.

Private sponsors are mainly thinking about:

*“Community project aiming at giving back to the people, assist learners by giving them tuition and assistance on weekends and school holidays” (Female, age 37).*

The perspectives of private sponsors point to the existence of a disconnect between the executive management, support staff and sponsors of ICT4D initiatives. While the support staff might still be required to be emancipated, it is evident that through the use of ICT, the people are volunteering their time to give back the service while improving the lives.

### **5.1.3 Summary and Key Takeaways on Acceptability**

“Acceptability” entails the way that the implementation stakeholders differ about whether the service is satisfactory. Executive management of ICT4Ds have compelling reasons why the service should be accepted, and they provide cybersecurity awareness training. Effective training can assist community members to participate in social and economic development. Clearly, a level of aspiration to emancipate individuals targeted for transformation exists.

## **5.2 Adoption**

This taxonomy refers to the initial decision to employ an innovation (Proctor *et al.*, 2011). During face-to-face interviews, different primary and secondary ICT4D stakeholders provided answers to address the following sub-research questions (SRQs), which are associated with the adoption taxonomy.

**SRQ<sub>3</sub>**- To what extent have the community members tried out the ICT services?

**SRQ<sub>4</sub>** - What benefits could the ICT initiative render to the community using ICT?

The perspectives of the primary and secondary ICT4D stakeholders in respect of adoption are discussed in the next section.

### **5.2.1 Perspective of Primary Stakeholders on Adoption**

#### ***5.2.1.1 Perspective of Executive Management on Adoption***

The perspectives of executive management on adoption are summarised in the form of themes, codes, and number of occurrences in Table 5.4.

Table 5.4 Perspective of Executive Management on Adoption

Themes	Code	Occurrences
Learning and teaching (Benefit)	Adopt: facilitate efficient learning	4
	Adopt: mostly computer training	2
	Adopt: an affordable platform to a digital world	2
	Total	8
Community connection (Benefit)	Adopt: easy and efficient communication to the community	1
	Adopt: convenient on communication and timesaving	2
	Adopt: facilitate efficient online access	2
	Adopt: community is accessing banking services	1
	Total	6
Reaching out to the youth (Benefit)	Adopt: convenient centre to learn matric online	4
	Adopt: touched computer for the first time	3
	Adopt: facilitate entrepreneurship skilling	1
	Total	8
Social and development (Benefit)	Adopt: an opportunity for social-economic development	4
	Adopt: community is accessing the Facebook platform	1
	Adopt: the use of social media platforms	2
	Adopt: facilitate effective use of e-services	4
	Total	11
Bringing ICT to the communities	Approp: provide access to information	3
	Adopt: high-rate usage of devices and computers	1
	Adopt: majority acquired basic skills	4
	Adopt: easily accessing the internet	4
	Adopt: develop skills that assisted in future job	1
	Adopt: gives a foundation for the development of professionals	3
	Total	16
Undergo continuous awareness and safety sessions.	Adopt: people are still falling into cyber traps	1
	Adopt: community is unknowingly spreading harmful viruses	1
	Adopt: keeping an eye on the equipment	1
	Adopt: serving the equipment with care	1
	Total	4

Table 5.4 indicates that the executive management focuses on the different types of benefits that come with using digital technologies. One of the benefits includes supporting members of

the community through learning and teaching. Another social benefit is reaching out to the youth by making a community centre a place to study matric online and social and development outcomes through making opportunities available to all.

The themes of bringing ICT to the communities scored the highest (sixteen) through easy access to the internet with a number of occurrences (four). Ease of access to the internet facilitates the sharing and of information amongst people. This would mean that cyber-security awareness ought to be done regularly and safety tips to be communicated because people are falling into cyber traps daily.

The findings summarised in Table 5.4 indicate how executive management of ICT4D initiatives are working together to bring cyber-security awareness programs closer to the community. Introducing ICT to the communities involves regular exposure to development and digital skills offering. For example, one of the executive managers remarked that:

*“I mean you think about the services that are there now, that you can access, apps which brings banking closer, ICT enabling learning, that was the service” (Male, Age 59)*

### 5.2.1.2 Perspectives of Supporting Staff on Adoption

This section relates to the perspective of support staff on adoption of ICT4D initiatives, the themes, codes, and number of occurrences are summarised in Table 5.5. The responses of support staff are summarised thereof:

Table 5.5 Perspective of Support Staff on Adoption

Themes	Code	Occurrences
Provide community members with convenient access to information and services	Ssadop: making people aware of security risks	2
	Usadopt: ICT can be used as a tool to find jobs	1
	Ssadopt_ provide access to e-services	3
	Ssadopt: learners receive training to use computers	1
	Total	7
Development of new ways to interact with students (users)	Ssadopt: medium use of technology in rural	3
	Ssadopt: high rate use of social media platform	1
	Adopt: high rate usage of devices and computers	3
	Total	7
	Ssadopt: computer services in the community saves time and money	2



Reduce administrative burdens (Social and development benefit)	Ssadopt: completing forms online is convenient and saves time	1
	Ssadopt: computer services in the community saves time and money	1
	Total	4
Opportunity to participate in the information society (Social and development benefit)	Usadopt: community members know basic computer skills	3
	Adopt: community members use ICT to support their business	2
	Ssadopt: development of professional skills	1
	Adopt: the access to use the lab after hours	1
	Ssadopt: ICT brings the world closer to people	3
	Total	10

Table 5.5 shows that support staff have compared the social benefits rendered by ICT initiatives with those highlighted by executives. Supporting staff's perspective of social benefits was mainly focused on the opportunity to participate in the information society outcomes, therefore, the themes scored the highest number of occurrences (ten) by way of bringing the world closer to people through ICT the number of occurrences (three) (see Figure 5.2). ICT bringing the world closer to people would mean that the community has been given the means to participate in the information society.

The supporting staff is allowing members of the community to participate in the information society, and the effective use of ICT tools leads to a reduction of an administrative burden that overwhelms the society. Participation in the information society is possible because the support staff have tested ICT services to develop new ways to interact with students (users).

One support staff noted:

*"Some community areas take +- 20 minutes to get to town, at least if people know that they can order things online and get them delivered in their houses because ICT brings liberation and standard of living to the communities"* (Female, Age 37)

The findings displayed in Table 5.5 shows the importance of ICT4D support staff to continually encourage members to use online tools. This means "*convenient access to information and services*" for the realization of development outcomes. For example, convenient access to information would mean the basic skills required for using computers have been provided.

## 5.2.2 Perspectives of Organisational Sponsors on Adoption

The secondary ICT4D stakeholder that is relevant for the adoption factor is organisational sponsors. Therefore, in this section, the perspectives of the organisational sponsors of the ICT4D initiatives are discussed. Table 5.6 displays the views of the organisational sponsors in code grouped in themes; the number of their occurrences is also displayed.

Table 5.6 Perspectives of Organisational Sponsors on Adoption

Themes	Code	Occurrences
Improve living standards in rural communities	Osadopt: community members are happy about computer basic skills	1
	Adopt: enables participation in entrepreneurship	1
	Adopt: convenient on communication and timesaving	1
	Usadopt: people are spending less as they use data for communication	1
	Usadopt: bringing liberation from using an internet cafe	1
	Usadopt: to do the research online	1
	<b>Total</b>	<b>6</b>
Encourages good cooperation for community members (Social and economic benefit)	Osadopt: older generation use phones only for traditional calling	1
	Osadopt: students are extremely using technology	2
	Osadopt: youngsters use WhatsApp to share information	1
	Osadopt: worry about accessing the lab	1
	Ssadopt: medium use of technology in rural	1
	<b>Total</b>	<b>6</b>

It is evident from Table 5.6 that, compared to executive management, organisational sponsors have a slight understanding of the social benefits arising from the ICT services rendered to the community. The organisational sponsors are mainly focusing on the social benefit outcome to "Encourage good cooperation for community members". It is evident that students are using the fourth industrial revolution technology for different reasons, therefore, it is apparent that ICT is an enabler for delivering relevant and valuable education.

For the ICT initiatives to have a longer-lasting implementation outcome, it is essential to encourage good cooperation with organisational sponsors. Good cooperation serves as a

baseline to provide a good foundation in building and improving living standards. A specific organisational sponsor said:

*“Most of the targeted group are students, they are living technology life. Almost everything is done through technology, our space evolves in that ICT is the “thee thing” in everybody’s life” (Male, Age 49)*

The findings listed in Table 5.6 indicate a disconnection between the executive management and support staff as regards the ICT4D outcomes. A large amount of community members is living the technology life, although it still needs to be emancipated. These findings show that the usage of smart devices/computers is mostly for socializing while executive management and support staff continually work on *“giving training that will improve the standard of living”*.

### 5.2.3 Perspectives of Users on Adoption

The codes, themes, and number of occurrences of the responses of the user, which were captured during the interview, are summarised in Table 5.7.

Table 5.7 Perspectives of Users on Adoption

Themes	Code	Occurrences
Makes technical solutions easier to use for everyone (learning and teaching benefit)	Usadopt: the need to find jobs	2
	Usadopt: ICT can be used as a tool to find jobs	1
	Usadopt: attend computer classes	1
	Ospenet: to do the research online	1
	Usadop: bringing liberation from using internet café	2
	<b>Total</b>	<b>7</b>
Great opportunities for bringing people together	Usadopt: allows self-reliance in using computer	1
	Usadopt: computer training helped me find employment	1
	Adopt: enables participation in entrepreneurship	1
	Usadopt: knowledge to operate computer functionalities	3
	Adopt: the access to use the lab after hours	1
	Adopt: high rate usage of devices and computers	2
	<b>Total</b>	<b>9</b>

Based on Table 5.7, users have demonstrated a massive learning benefit acquired by testing ICT4D initiatives. Although executive management and support staff revealed a more grounded benefit when using ICT services, then the focus of users are on great opportunities for bringing people together outcomes (number of occurrences nine). Bringing people together is possible whereby knowledge to operate computer functionalities is the first task to be executed in creating the solutions that are easier to use for everyone.

For example, one user was quoted as saying:

*“Even teachers from Ngwane and the surrounding areas, they were not able to use computers, there were not able to use email. So, by use of this computer lab they are able now to use emails, internet and others” (Female, Age 43)*

The findings listed in Table 5.7 shows the importance of ICT4D users to continually learn from the solutions provided through ICT initiatives, *“easy to use for everyone”*. For example, having the requisite ICT skills translates into most users applying for jobs using online platforms; this indicates a move from the traditional ways of applying for jobs such as dropping a hard copy of a curriculum vitae in a designated area.

The themes that emanated from interviewing the support staff are summarised in Figure 5.2. For example, staff are mostly concerned with social development whereby opportunities that are provided to the community members to use ICT4D initiatives emerge.

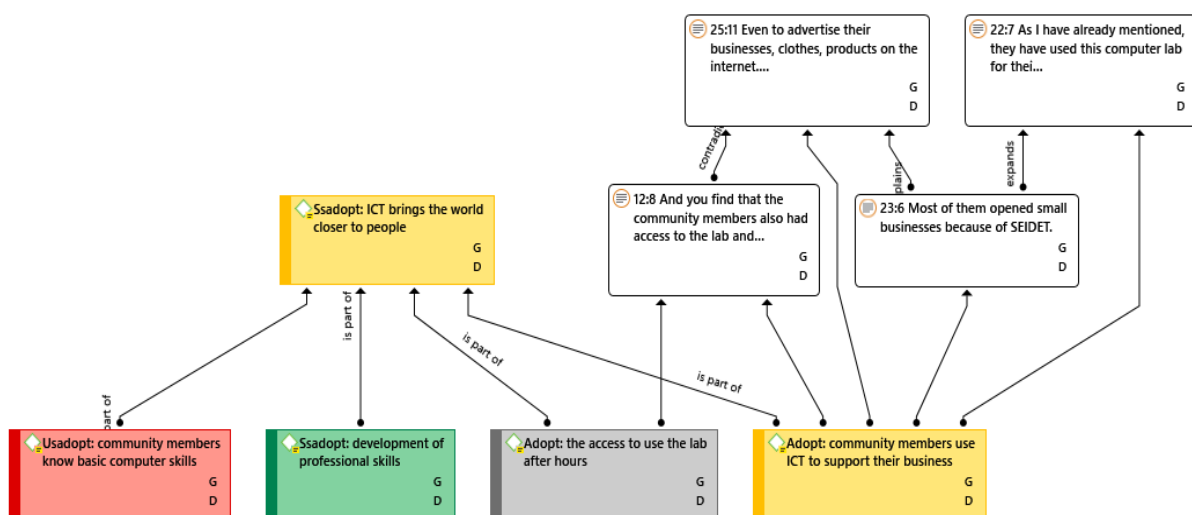


Figure 5.2 Illustration of the opportunity to participate in the information society

## 5.2.4 Summary and Key Takeaways on Adoption

“Adoption” refers to the initial decision to use innovation. This was seen as a suitable approach, since bringing ICT to communities increased their social benefits by being a part of the information society. Careful project management entails good cooperation with organisational sponsors. The planning steps were essential in making the training attainable for everyone, thereby improving the standard of living in rural communities.

## 5.3 Appropriateness

This taxonomy refers to the perceived compatibility of an innovation to address a certain problem (Proctor *et al.*, 2011). In this respect, answers from face-to-face interview were collected from several primary (e.g., executive management and support staff) and secondary (institutional sponsors in the case of the appropriateness taxonomy) ICT4D stakeholders as well as users of ICT4D initiatives. The answers to the interview questions were meant to address the following SRQs, which are associated with appropriateness taxonomy.

**SRQ<sub>5</sub>** - What are the actual needs/problems that are faced in the community?

**SRQ<sub>6</sub>** - How does ICT assist to address these needs?

The perspectives of the secondary and user ICT4D stakeholders regarding appropriateness are discussed in the following sub-sections.

### 5.3.1 Perspectives of Primary Stakeholders on Appropriateness

#### 5.3.1.1 Perspectives of Executive Management on Appropriateness

The perceptions of executive management on appropriateness are presented in Table 5.8, the requisite codes, themes, and the number of occurrences is also presented.

Table 5.8 Perspectives of Executive Management on Appropriateness

Themes	Code	Occurrences
Community needs	Approp: concern of maintaining high expectation raised to community	1
	Approp: the need for ICT in rural	1
	Usadop: the need to find jobs	2
	Approp: basic needs for the community	1

	Approp: high rate of illiteracy	3
	Total	5
Centre needs	Approp: lack of government support	1
	Approp: the need for funding	1
	Cost: concern about lack of funding	1
	Cost: maintenance of devices	1
	Osadopt: worry about accessing the lab	1
	Approp: provide updated antivirus	1
	Total	5
Global development in society	Approp: older generation are not ICT literate	1
	Approp: the need for establishing ICT incubation hubs	1
	Approp: the need for ICT oriented leaders	1
	Approp: provide a communication tool	2
	Approp: concern of high poverty rate	4
	Approp: the need for small business opportunities	2
	Approp: concern of network connectivity	6
	Osadopt: concern of devices uses	1
	Accept: concern about youth and economic development	1
	Total	19
Opportunities to prepare community about online defence	Approp: the need for cybersecurity awareness training	1
	Approp: the issue of identity theft	1
	Approp: concern of cyberbullying incidents	1
	Approp: lack of cyber knowledge	1
	Approp: concern of preventative measures	1
	Accept: concern about antivirus software update	2
	Total	7
Engage the community in education offering	Approp: build a confident nation	3
	Cost: investing in staff to provide technical service	1
	Adopt: develop skills that assisted in future job	2
	Accept: collaboration and partnership	2
	Approp: distribution of technology	1
	Accept: allows information search	1
	Approp: access to study material	1
	Approp: provide access to information	3
	Approp: providing access to the lab	1
	Approp: a passion to offer the program	1
	Approp: providing awareness to the people	2
	Approp: lack of technical knowledge	1
	Approp: lack of technical support	2
	Total	21

It is evident from Table 5.8 that executive management of ICT4D initiatives have a slightly less understanding of the needs and challenges faced in the community. The themes of engaging the community in education offering scored the highest number of occurrences

(twenty-one), therefore, the focus, of the executive management is unsurprisingly on education offering outcomes through providing access to information, number of occurrences (three) (see Figure 5.3). Poverty is a serious challenge in rural communities and imparting the community with knowledge constitute a means of bringing innovation.

For the initiatives to have a longer-lasting implementation, all members must be involved in education offering. A command of new technology and its development can assist community members to acquire the knowledge needed to avoid online attacks. The sponsors will be the source of support to meet the community when they are in financial need.

For example, the executive management remarked that:

*“Transport, most people would walk to class, others won’t attend because of not having money. Sometimes they will complain when you charge computer class for 1000, although the value is still low compared to the urban area”* (Female, Age 36)

*"People are not working, so they do need access to the technology, access, one would argue that access is there under them of the smartphones, but no."* (Male, Age 55)

The findings illustrated in Table 4.8 indicate how executive management of ICT4D initiatives are working together to alleviate poverty in the community, therefore, it is important to *engage all community members* in ICT education as a means of reaching out and making a difference in people’s lives. This would mean that community members are taught basic computer skills.

### **5.3.1.2 Perspectives of Supporting Staff on Appropriateness**

The perspectives of supporting staff on appropriateness are presented in Table 5.9. The requisite codes, themes and the number of occurrences is also summarised.

Table 5.9 Perspectives of Supporting Staff on Appropriateness

<b>Themes</b>	<b>Code</b>	<b>Occurrences</b>
Education offering to the community	Approp: facilitate efficient learning	1
	Ssapprop: an opportunity for online teaching platform	2
	Adopt: develop skills that assisted in future job	1
	Accept: informing the people of basic requirements	1
	Approp: facilitate effective use of e-services	1

	Approp: provide access to information	2
	Usadopt: the need to find employment	1
	<b>Total</b>	<b>9</b>
Addressing with knowledge and capabilities	Ssapprop: people are not aware of risks associated with computers	2
	Osapprop: the worry of resources constraints	1
	Sscost: concern of antivirus software update	1
	Approp: lack of technical knowledge	1
	Usapprop: lack of computer training	1
	Ssapprop: skilled people always move on	1
	Adopt: concern of infrastructure security	4
	Approp: the issue of identity theft	2
	<b>Total</b>	<b>13</b>

Table 5.9 shows that supporting staff are much more aware of the ICT needs and challenges in the community compared to the executive management. The themes of addressing problems with knowledge and capabilities scored the highest number of occurrences (thirteen), therefore, the focus of Support staff is on addressing problems faced in the community through acquired knowledge and capabilities outcome. It is apparent that the community infrastructure (Computer laboratories) needs proper security measures to avoid the devices being stolen, concern of infrastructure security scored a high number of occurrences (four).

The supporting staff are thereof believing that when you offer education to the community, you are addressing the root of challenges with strong, knowledgeable, and capable professions. One of the support staff talked about:

*Some users mentioned “there is a network problem in community space (you find that the base stations are far from each other). (Male, Age 37)*

The findings displayed in Table 5.9 highlights the role played by support staff in the continuous *monitoring of security controls/infrastructure* for the achievement of development outcome. For example, to make security updates on computers/smart devices and utilize up-to-date information on threats, it is found that computers/smart devices continue to be a risk hence the support staff remain to implement proper security to the devices.



### 5.3.2 Perspectives of Institutional Sponsors on Appropriateness

In this section, the results of the responses by institutional sponsors are presented. The code, emerging themes and the number of occurrences is also included (see Table 5.10).

Table 5.10 Perspective of Institutional Sponsors on Appropriateness

Themes	Code	Occurrences
People ought to have the right skills	Approp: concern of network connectivity	4
	Osapprop: the worry of resources constraints	2
	Approp: concern of high poverty rate	1
	Osapprop: high rate of unemployment	1
	Osapprop: solutions are not meeting the needs of the community	1
	Osapprop: people are lazy to go and look for jobs/make an income	1
	Total	15
Bringing efficient development to the people	Approp: easy and efficient communication to the community	1
	Osapprop: the need for using devices productively	1
	Approp: the need for cybersecurity awareness training	1
	Osapprop: allows easy use of computers	1
	Osapprop: quicker information processing	1
	Total	6

Table 5.10 shows the problems and needs slightly identified by institutional sponsors in ICT4D initiatives. Their perspective demonstrates that people ought to have the right skills, and that will be possible when they have better network connectivity, in that way people will be able to participate in a digital era and alleviate the high rate of poverty.

By providing better network connectivity, institutional sponsors should be able to source knowledge and bring to the people an efficient development.

For example, responses from institutional sponsors:

*“The computers are not usable because the internet is very slow, there is no funding to buy data, only principal’s computer is operational the rest of the school is not using their computers”* (Female, Age 42)

*"The school don't have the projectors to project the information from the computers, the internet is not in good order now, so people are unable to research because it is not in good condition" (Female, Age 43)*

The above-mentioned statements point to a disengagement between executive management and support staff on the one hand and institutional sponsors on the other. Institutional sponsors have tried out better connectivity and the Internet in other areas and are getting frustrated when using the Internet at the community centre. There is a competition between community centres and internet café's offering the internet service, that needs to be looked at in the long run.

### 5.3.3 Perspectives of Users on Appropriateness

The perspectives of users on appropriateness are illustrated in Table 5.11, and the answers have been arranged in codes, themes, and the number of occurrences.

Table 5.11 Appropriateness Users

Themes	Codes	Occurrences
Increase in the proportion of users who efficiently became professionals	Adopt: develop skills that assisted in future job hunting	1
	Osapprop: quicker information processing	1
	Ssapprop: expansion of employment opportunities	1
	Usapprop: convenient and timesaving for banking	1
	Total	4
People acquired the basic skills	Usapprop: lack of computer training	2
	Osapprop: the worry of the capability to participate	2
	Usapprop: worry about retaining skills	3
	Usapprop: concern of spending more time in social media	1
	Approp: the need for ICT in rural	1
	Usapprop: issue with electricity that keeps tripping when windy	1
	Usapprop: worried about the disadvantages of age gap in computer teaching	1
	Cost: concern about initiative continuity	3
	Usapprop: more worried about freedom in a social platform	1
	Approp: the need for small business opportunities	1

	Osadopt: worry about accessing the lab	1
	Usapprop: worry about lack of job opportunities	1
	Approp: concern of maintaining expectation raised to the community	1
	Total	19

When compared with executive management, it is quite clear from Table 5.11 that Users have a better understanding of the needs and problems faced by community members, and community members recognize the solution that ICT provides. Users believe that they have received the basic skills and will have to come up with ways of continuing with the ICT4D initiative.

By transferring the requisite basic skills to the users, the ICT4D initiative will end up having a skilled and effective personnel that is capable of serving, and by extension, contributing towards the improvement of the lives of members of the community. For example, some of the users said:

*“...continuity, most people after passing their computer courses there was nothing after that.”* (Male, Age 29)

*“But the government didn’t come, they did not do anything to boost the lab so that it can keep going.”* (Female, Age 41)

Whereas such views seem to reveal an existence of teamwork and collaboration between support staff and users within the communities, findings also appear to highlight a distinct separation between Executive Management and the users. Users continue to look for *Income generating ways through the use of smartphones and computers*. The ICT allows the use of smart devices and computers to participate in programs such as trading sessions, programs could be introduced to the users since it has been identified as a possible income generator option.

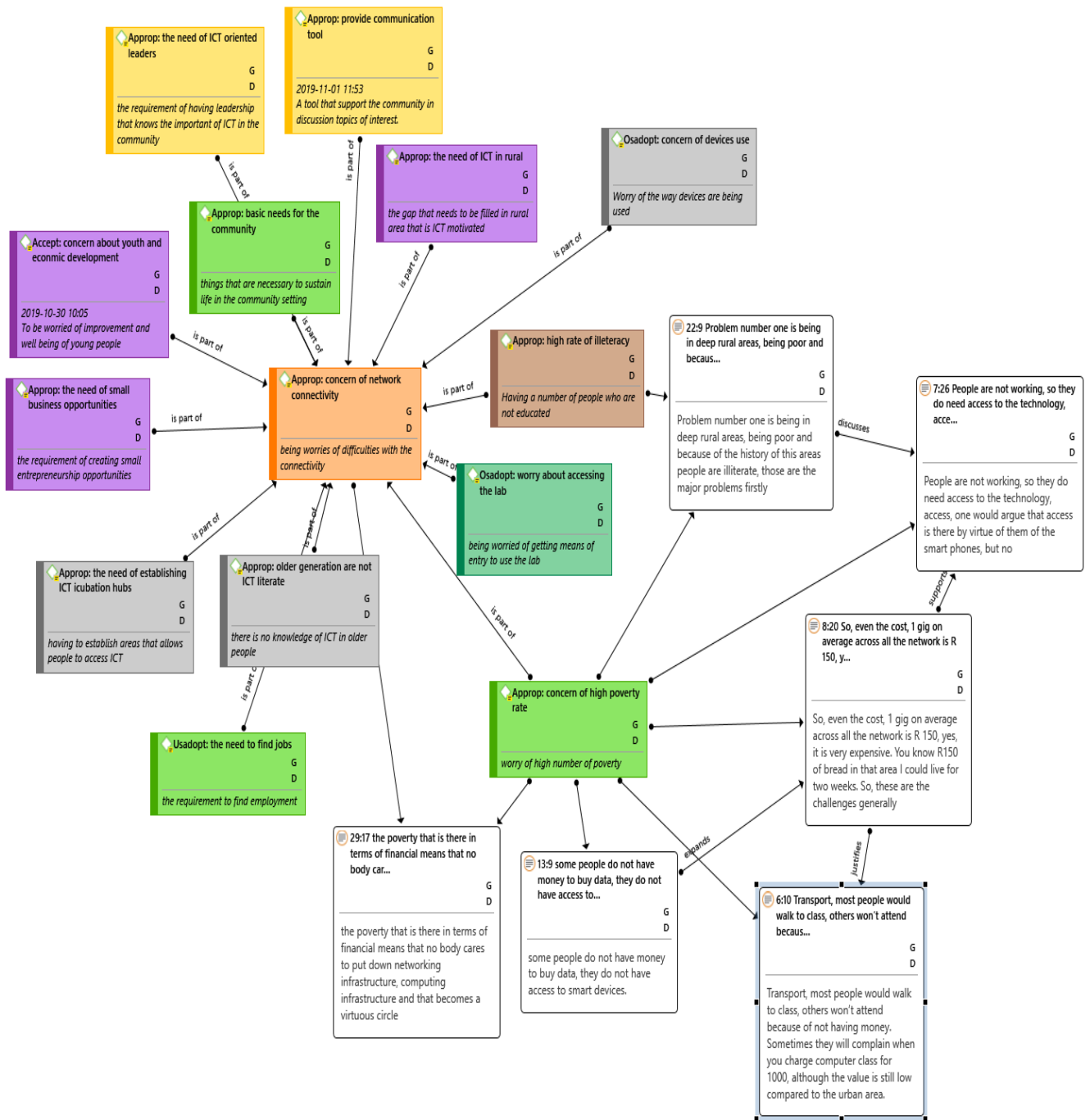


Figure 5.3 Diagram to Engage the community in education offering

Figure 5.3 highlights the themes emanating from the perspectives of executive management, which acknowledges that community needs can be dealt with through educating the same community. The importance of providing education and training stems from all ICT4D stakeholders in rural communities, which mostly emanates from high rates of poverty that is prevalent in these communities.

### 5.3.4 Summary and Key Takeaways on Appropriateness

“Appropriateness” points out the compatibility of an innovation in addressing the poverty challenge in rural communities. The users decided whether they wanted to accept the education offering as appropriate. Appropriateness means recognising that users believe that they have received the basic skills to participate in transforming rendered ICT services, thus bringing an efficient development to the community.

### 5.4 Cost

This taxonomy refers to the cost result based on the effort that has been invested in implementation, in that people volunteer their services for little or no payment (Proctor *et al.*, 2011). It was envisaged that information obtained from the various stakeholders (i.e., primary, secondary as well as users) during the face-to-face interviews would address the following SRQ, which relates to the cost taxonomy.

**SRQ7-** What is the cost (Financial/non-financial) to maintain the ICT?

The perspectives of the primary and secondary ICT4D stakeholders in respect of cost are discussed in the sections that follow.

#### 5.4.1 Perspective of Primary Stakeholders on Cost

##### 5.4.1.1 Perspectives of Executive Management on Cost

The perspectives of executive management on cost relative to ICT4D initiatives, the codes, themes, and number of occurrences are presented in Table 5.12.

Table 5.12 Perspectives of Executive Management on Cost

Themes	Codes	Occurrences
Ongoing cost related to constant configuring and maintenance	Cost: concern about the initiative and financial support	1
	Cost: concern about lack of funds	3
	Sscost: It cost a couple of millions to erect infrastructure	2
	Cost: the cost of having fast computers	1
	Cost: certain about operational costs in projects	5
	Cost: investing in staff to provide technical service	2
	Cost: involved in production and maintenance	1

	Cost: maintenance of the devices	5
	Cost: maintenance of the software	2
	<b>Total</b>	<b>22</b>
Streamline the operational processes	Cost: concern about project continuity as people move on	1
	Cost: control and taking care of lab access	1
	Cost: time invested by unpaid stakeholders	3
	Cost: concern of infrastructure security	1
	Cost: the issue of theft	2
	Cost: slow computers cause the delay in progress	1
	<b>Total</b>	<b>9</b>

The information provided in Table 5.12 suggests that the executive management is mostly responsible for the costs involved in the maintenance and daily operations of ICT4D initiatives. The focus of executive management is expectedly on the ongoing cost that is related to constant configuring and maintenance outcomes. The themes of ongoing cost related to constant configuring and maintenance scored the highest number of occurrences (twenty-two), therefore, users are more certain about operational costs in those projects, number of occurrences (five). Operational costs include daily maintenance of broken devices such as central processing units (CPUs) and mouse.

The findings tabulated in Table 5.12 shows that executive management of ICT4D initiatives are focused on streamlining the operational processes that target communities to align ongoing costs that are related to constant configuring and maintenance. For example, one of the executive managers posited:

*“The only exceptions were when we had to replace broken devices, those were the expenses we paid for” ( Male, Age 57).*

#### **5.4.1.2 Perspectives of Support staff on Cost**

The perceptions of support staff on financial and non-financial cost, including the codes, themes, and several occurrences, are presented in Table 5.13.

Table 5.13 Perspectives of Support staff on Cost

Themes	Codes	Occurrences
Investing in future generations	Cost: certain about operational costs in projects	2
	Uscost: payment of a minimal fee that keeps the lab going	1
	Cost: concerned of infrastructure security and maintenance costs	2
	Ssco: It cost us a couple of millions to erect infrastructure	1
	Total	6
Installation and maintenance support	Sscost: It requires technical skills to set up/support the lab	2
	Sscost: training of the learners	1
	Cost: maintenance of devices	3
	Cost: maintenance of software	3
	Total	9

Table 5.13 suggests that support staff is mostly responsible for the non-financial costs associated with ICT4D initiatives. Particular attention is paid by support staff on installation and maintenance support which scored the highest number of occurrences (nine) for the devices and software, number of occurrences (three). By maintaining software and devices, the Staff is investing in future generations.

One supporting staff member remarked:

*“It cost data to update and maintain, the broken screen requires to be replaced, network data, repairing and physical damage” (Male, Age 55).*

The results presented in Table 5.13 shows how important it is for supporting staff to always consider *“the increasing value of individual technologies”* to achieve development outcomes. For example, the increasing value means maintaining the devices and ensuring that the Support staff makes the relevant resources and the requisite training available.

#### 5.4.2 Perspectives of Private Sponsors on Cost

The views of institutional sponsors on cost are presented in Table 5.14, and the ideas are organised in codes, themes, and the number in which they are being quoted.

Table 5.14 Perspective of Institutional Sponsors on Cost

Themes	Codes	Occurrences
The passion of serving the community	Osco: more worried about data usage and cost	1
	Cost: concern about lack of funds to maintain devices	1
	Cost: concerned of infrastructure security and maintenance costs	1
	<b>Total</b>	<b>3</b>
Finance support and process database repository	Cost: investing in staff to provide technical service	1
	Cost: maintenance of software	1
	Cost: maintenance of the devices	1
	Cost: the need for financial support from donors	1
	Cost: certain about operational costs in projects	1
<b>Total</b>	<b>5</b>	

When compared with executive management, the institutional sponsors are least worried about the cost incurred in ICT4D initiatives (see Table 5.14). Institutional sponsors are mainly concerned about financial support and the process database repository which scored the highest number of occurrences (five), whereby they see the need to finance and support the initiatives. Institutional sponsors usually donate finance support, unsurprisingly institutional sponsors have the passion of serving/giving back to the community.

One of the institutional sponsors remarked:

*“As an NPO you always beg, ask for the donations, that’s how we always get the source of income.”* (Male, Age 55)

The points tabulated in Table 5.14 to a contradiction between executive management, support staff, institutional sponsors, and users. Although the community might still need to be liberated, the sponsors are not continuously committed to funding the initiatives since institutional sponsors are not making/gaining money.

### 5.4.3 Perspectives of Users on Cost

This section illustrates the perception of users on cost of ICT4D initiatives. The codes that came out of user’s responses, themes and the occurrences are presented in Table 5.15.

Table 5.15 Perspective of Users on Cost

Themes	Codes	Occurrences
The need for infrastructure operation support	Approp: lack of technical support	1
	Cost: delays in the lab due to weak electricity	1



	Total	2
Easy interactive to the digital world	Uscost: not certain of operation costs	2
	Uscost: i don't pay to use the lab	2
	Uscost: payment of a minimal fee that keeps the lab going	1
	Total	5

Table 5.15 suggests that users are less concerned with the costs in ICT4D initiatives, when compared with executive management and support staff. Particularly, the themes of easy interaction to the digital world scored the highest number of occurrences (five), therefore, the focus of user's is unsurprisingly on that they don't pay to use the lab number of occurrences (two). Mainly, the need for infrastructure operational support would result in the community that could experience the easy interactive platform to the digital world.

The findings listed in Table 5.15 indicate that users of ICT4D initiatives are not interested in the costs involved in the daily operation of the project, but rather on easy and accessible interface. The computer service was offered for free to the community members in some ICT4D initiatives, while some ICT4D initiatives allowed a minimal fee just to keep the community centre laboratories clean. For example, one of the users made the following remark about cost:

*"I do not pay anything to use the computer"* (Female, Age 11).

Figure 5.4 reflects support staff codes and the groups of themes on cost. It is evident from Figure 5.4 that the support staff are more into cost of developing future generations through installing and maintaining the infrastructure in ICT4D initiatives.

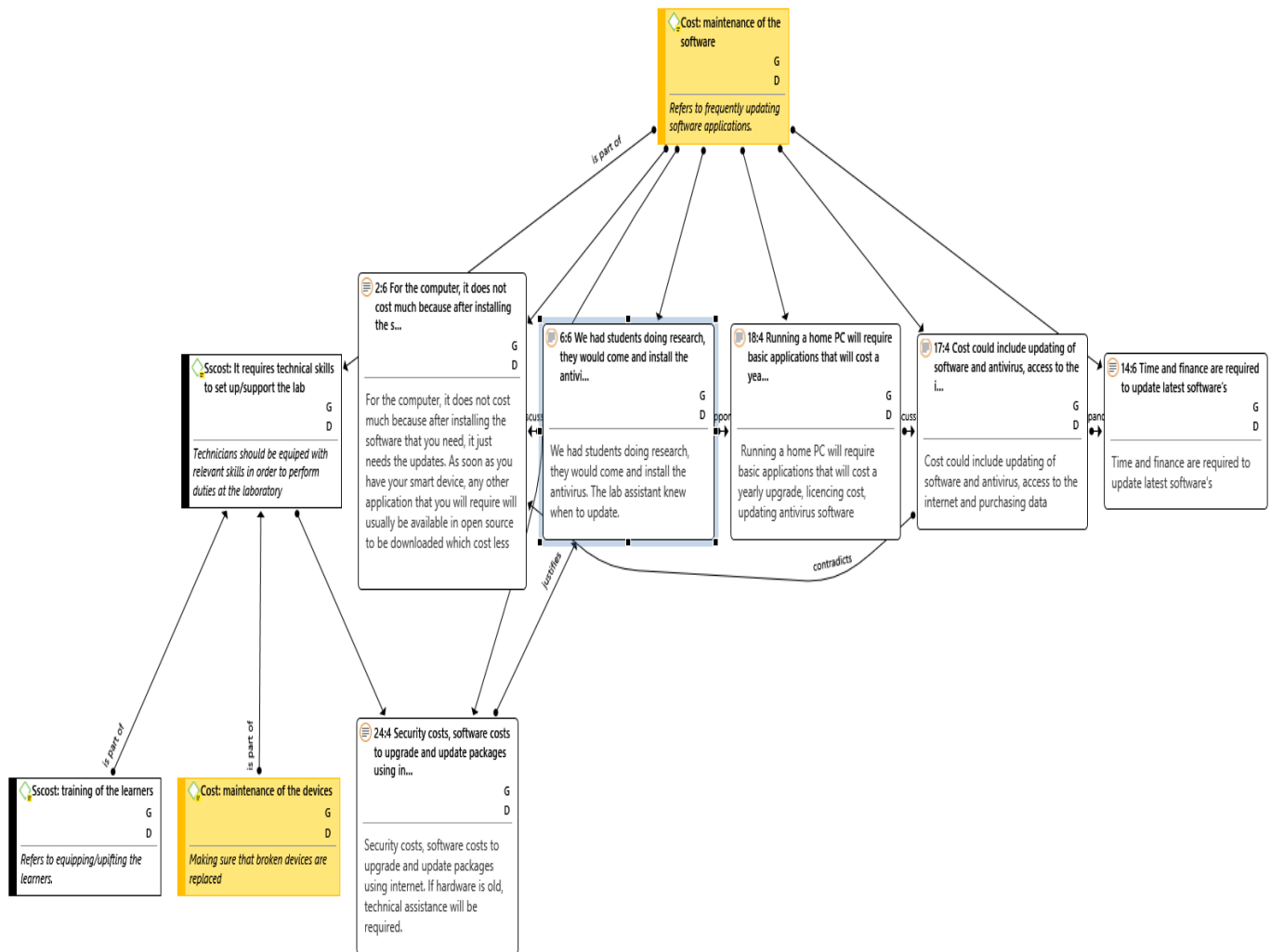


Figure 5.4 Illustration of Installation and maintenance support

### 5.4.4 Summary and Key Takeaways on Cost

“Cost” is a result that is based on the invested effort in daily maintenance. It also refers to the costs involved by participating openly in streamlining the operational processes – to ensure that communities align the ongoing costs with good intentions. Thus, in determining the necessity of donations for financial support, it emerged that institutional sponsors have a passion for serving/giving back into supporting the initiative. Evidence indicates that users of ICT4D initiatives are not interested in the costs involved in the daily operation of the project.

## 5.5 Feasibility

This taxonomy refers to the degree to which innovation can be successfully completed within a specified setting (Proctor *et al.*, 2011). Responses to face-to-face interview questions by the various stakeholders were meant to address the following SRQ, which is related to the feasibility taxonomy.

**SRQ7-** To what extent are the users skilled to use ICT?

The perspectives of the various ICT4D stakeholders relating to feasibility are discussed in the following section.

### 5.5.1 Perspective of Primary Stakeholders on Feasibility

#### 5.5.1.1 Perspectives of Executive Management on Feasibility

The perspectives of executive management on feasibility are outlined in Table 5.16. The responses are organised in codes, themes, and occurrences.

Table 5.16 The Perspectives of Executive Management on Feasibility

Themes	Code	Occurrences
Provision of knowledge	Feasi: concern of older generation not using ICT	2
	Approp: concern of maintaining expectation raised to the community	1
	Feasi: concern about community involvement in entrepreneurship	1
	Feasi: ensure technical support is in place	2
	Total	6
Managing operations training and support context	Feasi: better use of devices after computer training	5
	Feasi: advance use of smart devices/computers	5
	Feasi: basic use of smart devices/computers	6
	Feasi: the majority haven't touched a computer	2
	Feasi: middle generation are careful using ICT	2
	Feasi: no knowledge of use before training	4
	Feasi: young generation is advanced using ICT	4
	Total	28

Based on Table 5.16, executive management is of the view that users are able to use computers. executive management is mostly interested in managing operations training and supporting context, and it scored the highest number of occurrences (twenty-eight), therefore, the required computer training is offered to the community (five).

The findings presented in Table 5.16 suggests that for ICT4D initiatives have a longer-lasting implementation, executive managers must oversee the management of the operations training and support the context of the initiatives. In doing so, the knowledge is provided to community members of different age groups. For example, a planning strategy might direct the initiative in the right direction mainly by providing guidance on how to follow best practices. For example, one of the executive managers remarked:

*“The facilitators had to teach them on how to use a mouse, and as time goes by members were able to work independently without help from the facilitators” (Male, 51).*

### **5.5.1.2 Perspectives of Supporting Staff on Feasibility**

In this section, the views of support staff on feasibility are presented and displayed in codes, themes, and the number of occurrences (see Table 5.17).

Table 5.17 Perspectives of Support staff on Feasibility

<b>Themes</b>	<b>Code</b>	<b>Occurrences</b>
Sharing information/tutoring the community members	Feasi: advance use of smart devices/computers	1
	Feasi: young generation is advanced using ICT	2
	Ssfeasi: those with lab access can use well	1
	Ssfeasi: good knowledge of smart device uses in urban	1
	Ssfeasi: very knowledgeable with smart devices in rural	2
	Feasi: basic use of smart devices/computers	5
	Feasi: no knowledge of use before training	1
	<b>Total</b>	<b>13</b>

Table 5.17 suggests that the supporting staff have a common understanding of the "how to use computers" in ICT4D initiatives. The themes of sharing the knowledge with members of the community scored the highest number of occurrences, therefore, the focus of supporting staff is on sharing the knowledge with members of the community. Basic use of smart devices or computers, number of occurrences (five) is considered a basic skill whereby members of the community can use the Internet and email, word processing, graphics, multimedia, and spreadsheets.

For example, one of the supporting staff posited:

*“Users in rural communities are very knowledgeable with smart devices, however, they are having a basic understanding of computers” (Female, Age 43).*

The findings tabulated in Table 5.17 show the interconnection of views between the executive management and supporting staff. Although the members of the community want to be taught, it emerges that with the provision of training users can use smart devices/computers extensively without any supervision.

### 5.5.2 Perspectives of Organisational Sponsors on Feasibility

The perspectives of organisational sponsors on feasibility outcomes is presented in Table 5.18. The codes, themes and the occurrences are included.

Table 5.18 Perspectives of Organisational Sponsors on Feasibility

Themes	Code	Occurrences
Different levels in computer knowledge and development	Feasi: better use of devices after computer training	1
	Feasi: basic use of smart devices/computers	2
	Feasi: young generation is advanced using ICT	1
	Feasi: no knowledge of use before training	2
	<b>Total</b>	<b>6</b>

Based on Table 5.18, it is evident that organisational sponsors have observed how knowledgeable the users are when it comes to using the computers/smart devices. The themes of different levels in computer knowledge and development are standing out with the number of occurrences (six), therefore, the organisational sponsors are focusing on reaching different levels in knowledge development outcome. Reaching different in development levels may include looking at sponsoring users to educate those with no knowledge of use computers, number of occurrences (two).

For example, an organisational sponsor advanced the following:

*“Most of the schools do not know how to use the computers, or to connect to the network. Only those who already had computers can operate” (Male, 56)*

The finding illustrated in Table 5.18 indicates that ICT4D initiatives are deemed important to organisational sponsors as they are prepared to volunteer their services in the form of money and/or skills to empower the community. For example, organisational sponsors would input their ideas intending to improve social and economic development in ICT4D initiatives.

### 5.5.3 Perspectives of Users on Feasibility

The perspectives of users on feasibility outcomes are outlined in Table 5.19. The responses are displayed in the form of codes, themes, and the number of occurrences.

Table 5.19 Perspectives of Users on Feasibility

Themes	Code	Occurrences
Most accessible to interact with the outside world	Usfeasi: it has helped in shaping our career	3
	Ssfeasi: very good use of smart devices	2
	Usfeasi: i know basic computer skills	2
	Usfeasi: well enough to be there for peers who need help	1
	Usfeasi: I have a better understanding of computer technical	2
	Adopt: community members use ICT to support their business	1
	Total	12

Table 5.19 suggests that users are very knowledgeable about how to use computer devices compared to executive management and support staff. In particular, users referred to the way ICT4D initiatives are mostly accessible for interaction with the outside world, number of occurrences (twelve). The focus of executive management is on how computer devices have helped in shaping user's careers, number of occurrences (three). Shaping user's careers reference to the way the service is accessible for use in economic development.

For example, one user remarked:

*"They know a lot, even those who are working in supermarkets, they can use their tills from the experience of computers"* (Female, 42)

Table 5.19 suggests a link between the executive management, supporting staff, organisational sponsors, and users. With a lot of middle-aged community members involved in ICT4D initiatives, there is a positive response whereby many users are advancing their careers through the use of computers, the finding is presented in Table 5.19 number of occurrences (three).

The themes that emanate from interviewing the users are summarised in Figure 5.5. For example, the theme “most accessible to interact with the outside world” emerge after talking to most stakeholders and primary stakeholders’ emphasis was that users’ access is the basic requirement of effective collaboration.

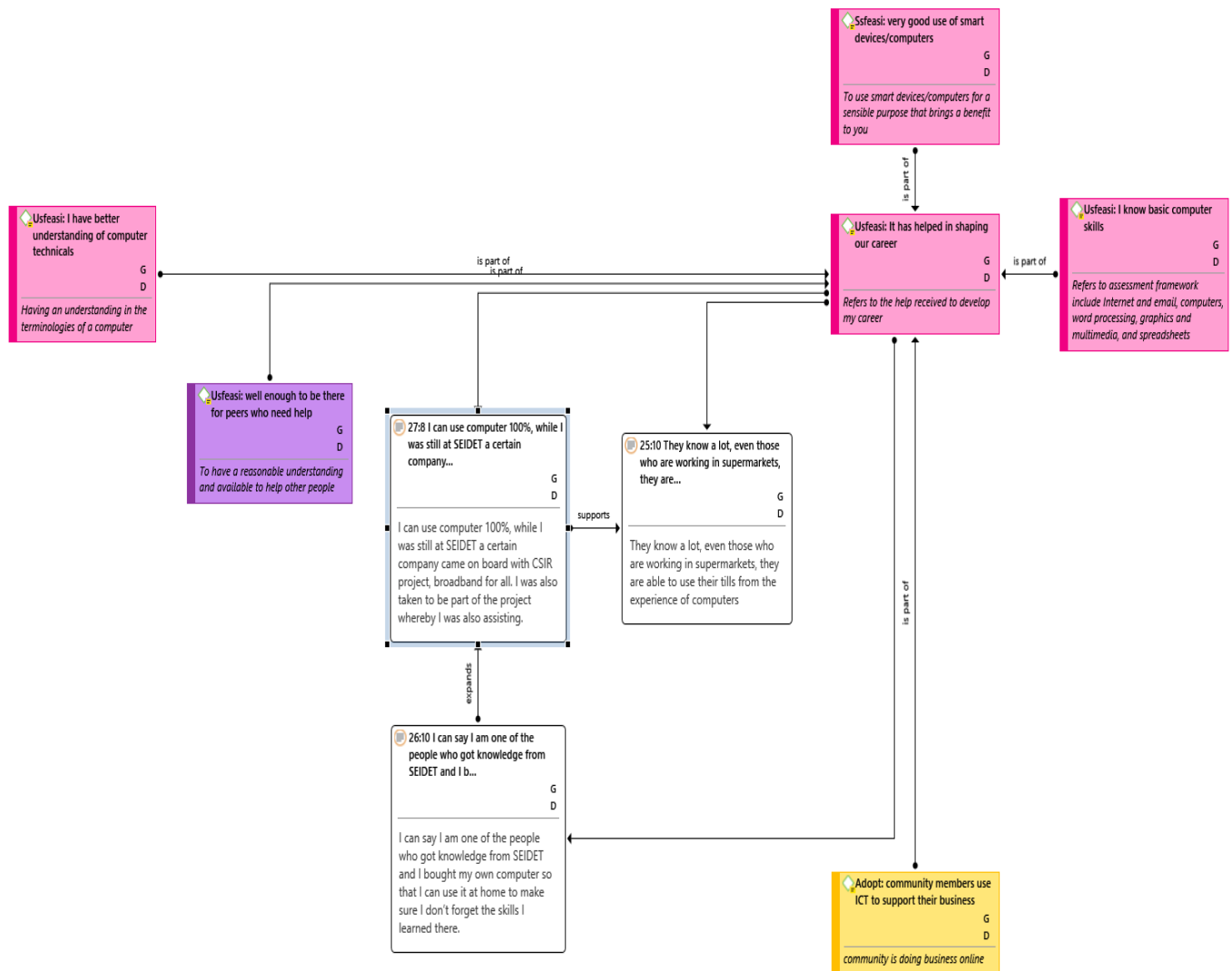


Figure 5.5. Most accessible to interact with the outside world

### 5.5.4 Summary and Key Takeaways on Feasibility

“Feasibility” describes the point at which computer and cybersecurity awareness training can be completed successfully within a specified environment. New ideas are put in place in a community, in line with existing policies and procedures. This was achieved by overseeing the management of operations and supporting the context of the initiatives. The aim is to improve economic development, including the possibility of a planning strategy that channels the

initiative in the right direction – mainly by guiding “best practices” adherence. Indications are that with the provision of training, users can utilise smart devices/computers extensively without any supervision.

## 5.6 Fidelity

This taxonomy refers to the level at which an intervention is implemented in the original arrangement recommended by the creators (Proctor *et al.*, 2011). Answers derived from the face-to-face interviews with the various ICT4D stakeholders (i.e., executive management, support staff, institutional sponsors, and users) were geared towards addressing the following SRQ, which relate to the fidelity taxonomy:

**SRQ9** - To what extent are the computers still serving the initial purpose?

The perspectives of these ICT4D stakeholders in respect of fidelity are discussed in the subsections that follow.

### 5.6.1 Perspectives of Primary Stakeholders on Fidelity

#### 5.6.1.1 Perspectives of Executive Management on Fidelity

The perspectives of executive management on fidelity organised in codes, themes and occurrences are illustrated in Table 5.20. The emerging themes are also included in the table.

Table 5.20 Perspectives of Executive Management on Fidelity

Themes	Code	Occurrences
Poverty reduction	Fidel: more certain that computers/smart devices help people to achieve their goals	7
	Fidel: certain about services that serve the community extremely	5
	Fidel: people enhance computer specifications to get better results	2
	Fidel: computers/smart devices are bettering the community life and more	4
	Total	18
Ground rules for acceptable behaviour	Fidel: certain about people misusing the services	2
	Total	2

It is evident from Table 5.20 that the executive management of ICT4D initiatives is more certain of computers or smart devices serving the initial purpose. Particularly, the executive management’s focus is unsurprisingly on poverty reduction, scored the highest number of



occurrences (eighteen) where people are more certain that computers help people to achieve their goals (see Figure 5.6). Community members have used computers to get basic skills and remarkably improved their lives, therefore, it is critical to have computer laboratories operate in rural areas, computers/smart devices are bettering the community life and more (four).

For the ICT4D initiatives to have a longer-lasting implementation, the running of day-to-day operations of these initiatives requires ground rules for acceptable behaviour that are transparent to all the role players.

Mostly, executive management are thinking of: *“Yes, there is an even greater need than before. Initially, people were just doing computer because it was an additional requirement when you apply for the job that you must have an added advantage which is a computer literacy”* (Male, Age 57).

The findings displayed in Table 5.20 indicates the importance of executive management to continually *specify appropriate requirements* to provide solutions outcomes where needed. For example, the proposed solutions ought to be tested and accepted to decide if it meets all the requirements before recommendations are finalized.

### 5.6.1.2 Perspectives of Supporting Staff on Fidelity

The perspectives of supporting staff on fidelity are summarised in Table 5.21. These responses are arranged in codes, themes and occurrences and emerging themes are discussed.

Table 5.21 Perspectives of Support staff on Fidelity

Themes	Code	Occurrences
Gaps existing in society to be gradually diminished	Fidel: certain about services that serve the community extremely	3
	Fidel: more certain that computers help people to achieve their goals	6
	Fidel: people enhance computer specifications to get better results	1
	Total	10
Becoming an enabler for job creation	Osfid: do not agree or disagree if the project still serve the initial purpose	1
	Fidel: people move, and continued use is not sustained	1
	Total	2

Table 5.21 suggests that support staff acknowledges the benefits that accrue through the use of computers or smart devices found in ICT4D initiatives. The themes of “gaps existing in society

to be gradually diminished” scored the highest number of occurrences (ten), therefore, support staff is more certain that computers help people to achieve their goals, number of occurrences (six). Once the gaps existing in society are gradually diminished, the ICT4D initiative becomes an enabler for job creation in the community setting.

As an example, a member of support staff remarked that: *“They still serve the initial purpose, the initial purpose for smartphones was to connect and communicate but recently they have enhanced the functionalities.”* (Female, Age 49).

The above remark points to a continuation between executive management and support staff in the communities. For example, connecting users of the community demands for regular awareness on cybersecurity to mitigate risks. Support staff can accomplish this through the provision of basic training and regular adoption of best practices.

## 5.6.2 Perspectives of Institutional Sponsors on Fidelity

The perspectives of institutional sponsors on fidelity are shown in Table 5.22. The answers to the interview questions relating to institutional sponsors are presented in codes and themes.

Table 5.22 Perspectives of Institutional Sponsors on Fidelity

Themes	Code	Occurrences
Provide the community with convenient access to information and services	Fidel: people enhance computer specifications to get better results	1
	Fidel: more certain that computers help people to achieve their goals	2
	Total	3
Take effective measures to build up information resources that encourage learning	Osfid: do not agree or disagree if the still project still serve a purpose	1
	Fidel: concern about the use of computers/smart devices as intended	1

	Total	2
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Based on Table 5.22, several organisational sponsors have doubts that computers are still used for the intended purpose, and this contradicts the views of most executives and users. The rest of the institutional sponsors are of the view that computers or devices provide the community with convenient access to information and services outcome by helping people to achieve their goals, number of occurrences (two). Helping people to achieve their goals is considered a primary means of giving the community the right access to resources.

The findings illustrated in Table 5.22 indicate the critical views of institutional sponsors on ICT4D initiatives; it is crucial to take effective measures to build up information resources that encourage learning. In doing that, the ICT4D initiative is capable of providing the community with convenient access to information and services. For example, one institutional sponsor remarked:

*“Yes, because now we are, our education is becoming paper-free. So, those computers are tools that are used nowadays. Yes, they are serving their initial purpose.” (Female, Age 30).*

### 5.6.3 Perspectives of Users on Fidelity

The perspectives of users on fidelity, which are organised in codes, themes, and occurrences, are presented in Table 5.23. The views of users are also presented based on their responses.

Table 5.23 Perspectives of Users on Fidelity

Themes	Code	Occurrences
Letting people learn things they didn't think they could learn before	Fidel: project is currently not operating and was used fully then	2
	Fidel: concern about using computers/smart devices as intended	1
	Total	3
Provide training of mixed blend (self-paced; tutor based; peers)	Fidel: more certain that computers help people to achieve their goals	4

	Fidel: people enhance computer specifications to get better results	1
	Fidel: certain about services that serve the community extremely	1
	Fidel: certain about people misusing the services	1
	Total	7

According to information presented in Table 5.23, users are more certain that computers or smart devices are still serving the initial purpose compared with institutional sponsors. The user is focussed on receiving training of mixed blend outcomes through self-paced studies; tutor based and learning with peers, the theme has scored the highest number of occurrences (seven). Community members have discovered that allowing people to learn things they did not think they could learn before develops the professionals that uplift the standard of living.

For example, one user remarked that: *“I can use my mother’s cell phone to google homework, my mother taught me that. I take my mother’s phone and count mathematics, google names and do other things whenever I have homework to write”* (Female, Age 11).

Drawing from Table 5.23, ICT4D Users appreciate that emancipation comes with the ICT4D initiatives in terms of participation in information and technology. For example, participation in ICT4D initiatives might have changed from just acquiring certification or knowledge to initiating and committed on owned businesses whereby the skills acquired at the initiatives are applied daily.

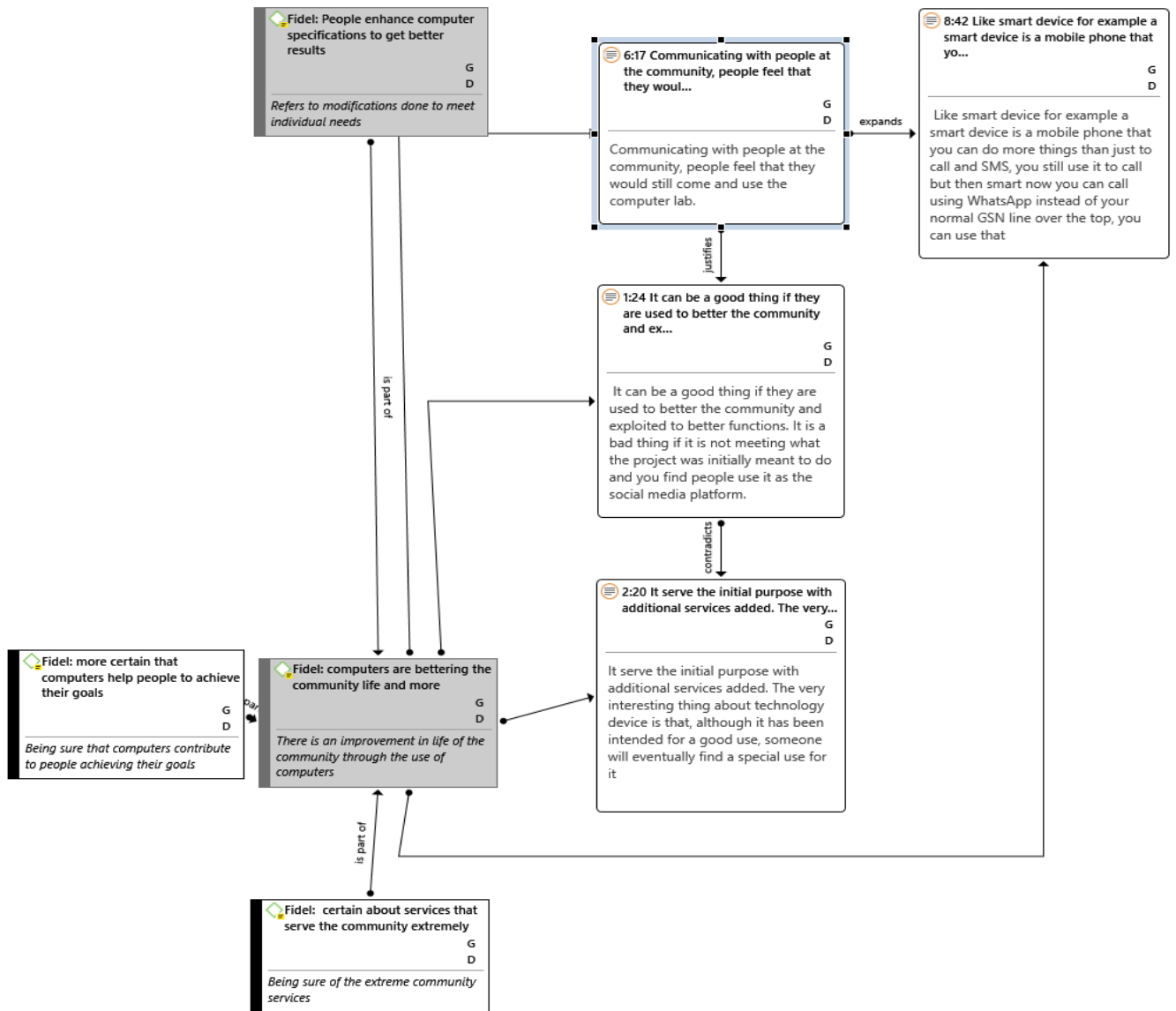


Figure 5.6 Poverty reduction

Based on the responses of executive engagement, the emerging theme of reducing the rate of poverty in the rural community is presented in Figure 5.6. Mostly, the computer is used as a baseline to provide services.

### 5.6.4 Summary and Key Takeaways on Fidelity

“Fidelity” is the level at which the running of the day-to-day operations of these initiatives require ground rules for acceptable behaviour that is transparent to all role players. The implementation should be designed to specify the appropriate requirements in providing outcomes solutions. A combination of the activity questions and the lessons learnt showed that an ICT4D initiative can provide the community with convenient access to information and

services. It is possible to produce a high-quality intervention and achieve the desired opportunities through self-paced studies.

## 5.7 Penetration

Penetration refers to the integration of a process that is used within a service and its systems (Stiles *et al.*, 2002). Various stakeholders (executive management, support staff, organisational sponsors, and users) provided answers to questions posed during face-to-face interviews. These answers were meant to address the following SRQs, which relate to the taxonomy of Penetration.

**SRQ<sub>10</sub>** - To what extent do users of computers/smart devices keep on coming back?

**SRQ<sub>11</sub>** - For the users who keep on coming back, why do they keep coming back?

The perspectives of the primary and secondary ICT4D stakeholders in respect of penetration are discussed in the next section.

### 5.7.1 Perspective of Primary Stakeholders on Penetration

#### 5.7.1.1 Perspectives of Executive Management on Penetration

The codes, themes, and number of occurrences of the responses of the executive management on penetration, which were captured during the interview, are summarised in Table 5.24.

Table 5.24 Perspectives of Executive Management on Penetration

Themes	Code	Occurrences
Users expectations need to be managed	Penet: people are discouraged to use the centre	2
	Penet: there is a reasonable amount of lab usage	4
	Penet: people keep on coming back to use the lab	4
	Penet: manage the use of lab in groups to give access to all	1
	<b>Total</b>	<b>11</b>
Enable community members to access to tertiary	Penet: for tutoring difficult subjects	1
	Penet: to help peers who need assistance	1
	Penet: good quality education to community members	2
	Penet: to apply for university admission	2

Penet: to send through job applications	3
Penet: for social media usage	2
Penet: to complete assignments and print	3
Penet: to attend a computer course	3
Penet: to browse the internet	5
Total	22

The perspectives of executive management on users that keep on coming back to use computers/smart devices is shown in Table 5.24. The themes of “enable community members to access to tertiary” scored the highest number of occurrences (twenty-two), executive management is focused on enabling community members to access tertiary outcomes through attending a computer training course (see Figure 5.7). Attending a computer training course translates to members acquiring basic computer skills that they use computer efficiently.

When community members are allowed the access to tertiary, in doing that, you are participating in development work and striving to make sure the expectations of the users are met. For example, users may become the professionals when qualified. This was particularly evident in the following comment by one of the executive managers:

*“I would spend a full day, even a night. We started when I was doing my first year, we studied java through a SEIDET computer” (Male, Age 49).*

Executive management has noticed the high number of users browsing the Internet, the statement mentioned points to the glamour of initiatives to the community whereby the glamour is apparent to all regardless of the distance. The findings illustrated in Table 5.24 indicates that it is important of ICT4D executives to continually *strive to make an initiative accessible* to all users toward achieving the development outcomes. For example, there must be a balance to skilled support staff in terms of having funds to purchase data that is used at the community centre to be readily available.

### **5.7.1.2 Perspectives of Supporting Staff on Penetration**

As shown in Table 5.25, the perspectives of ICT4D support staff on penetration are displayed in code, themes, and the number of occurrences.

Table 5.25 Perspectives of Support staff on Penetration

Themes	Code	Occurrences
Bringing anticipated solutions in one bucket	Penet: people frequently come back to use the centre	4
	Penet: people would come back time and again	4
	Penet: people used the computer at the centre once	1
	Total	9
A platform that offers strong service impact	Penet: to complete assignments and print	2
	Penet: to send through job applications	2
	Penet: to apply for university admission	1
	Penet: good quality education	1
	Sspen: to communicate with friends	1
	Penet: to browse the internet	3
	Penet: to attend a computer course	1
Total	11	

Based on Table 5.25, support staff are of the view that people keep on coming back to use the computers at the community centre for various purposes. The perspective of support staff is conflicting with that of the executive management and users, the main focus of the support staff is on a platform that offers strong service impact, the number of occurrences (eleven), people would come back time and again to access and use the service at their own pace.

The findings presented in Table 5.25 shows that bringing anticipated solutions in one bucket is of importance to supporting staff of ICT4D initiatives. For example, training that empower support staff to be able to render platform offering strong service in development is in place. Therefore, eligible users that should receive the service enrol to use the computers at the community centre. For example, one of the supporting staff members remarked:

*“People who are willing to learn will keep on coming back to use computers, especially youth searching for jobs” (Female, Age 36)*

### 5.7.2 Perspectives of Organisational Sponsors on Penetration

The perspectives of organisational sponsors on penetration outcome are summarised in Table 5.26. The findings of organisational sponsors are discussed and the data in the form of themes, codes and the number of occurrences is presented.



Table 5.26 Perspectives of Organisational Sponsors on Penetration

Themes	Code	Occurrences
Bringing liberty to the community with ICT	Penet: people would come back time and again	2
	Penet: people used the computer at the centre once	2
	Ospen: community lab was the only place to access computers	1
	Total	5
More interactive programs to attract users to participate	Penet: usage frequency at the centre depends on users' requirements	1
	Penet: usage is dependent on whether what they want is available	1
	Total	2

The perception of organisational sponsors on users who keep on coming back to use computers/smart devices is shown in Table 5.26. The focus of the organisational sponsors is clearly directed more towards interactive programs to attract users to participate in the outcome. Community members seem to have lost interest mainly because their understanding of ICT4D initiatives is they are acquiring a certificate, like the college and not that they are acquiring basic development skills. Some of the people who initially used the centre to access employment opportunities became discouraged after failing to secure employment.

The findings illustrated in Table 5.26 points to a disconnect between the executives, supporting staff and users in the communities. It is crucial to *include more interactive programs* for the community to participate regularly (e.g., hosting idea-sharing sessions and finding solutions). One of the organisational sponsors commented:

*“people who are looking for jobs might not be using the lab more often should the applications in the lab be limited e.g. once someone typed the CV they might have it for long and don’t need to use the computers for the same purpose”* (Male, Age 51)

### 5.7.3 Perspectives of Users on Penetration

A summary of the perspective of users on penetration that is presented in Table 5.27 shows the extent to which users keep on coming back to use the computers/devices. The results are presented in codes, themes, and the number of occurrences.

Table 5.27 Perspectives of Users on Penetration

Themes	Code	Occurrences
Available resources for the community members	Uspen: to do my CV	1
	Uspen: to submit my tax returns	1
	Penet: to browse the internet	2
	Penet: to complete assignments and print	1
	Penet: to help peers who need assistance	2
	<b>Total</b>	<b>7</b>
Consistence use and complete multiple tasks	Penet: people bought their computers and use at home	2
	Penet: people used the computer at the centre once	1
	Ospen: community lab was the only place to access computers	1
	Penet: i use smart device/computer daily	2
	Penet: people frequently come back to use the centre	1
	<b>Total</b>	<b>7</b>

It is evident from Table 5.27 that most of the users would keep on coming back to use computers at the centre for different personal reasons compared to the executives and supporting staff. There is a balanced focus on proficiency and accomplishing multiple tasks easily with available resources for the community members outcome, number of occurrences (seven), therefore users are using computers daily to connect to the Internet and do research for their school assignments and assisting peers who need help.

The findings presented in Table 5.27 indicates *utility*, that is, how the initiatives are meeting the needs of users in ICT4D. One user believes that there is no need to have internet cafes since people are now skilled and can use modems to connect at the comfort of their homes. the following comment reflects the thinking of users:

*“I use computer/smart device every day, sometimes just to watch movies but the day won’t go by without using the computer”* (Male, Age 34).

The views of executive management on the extent to which users interact and use the computer to send through applications is presented in Figure 5.7. For example, the views of executive management emphasize that a breakthrough is possible by enabling Users to access tertiary through attending a computer course.

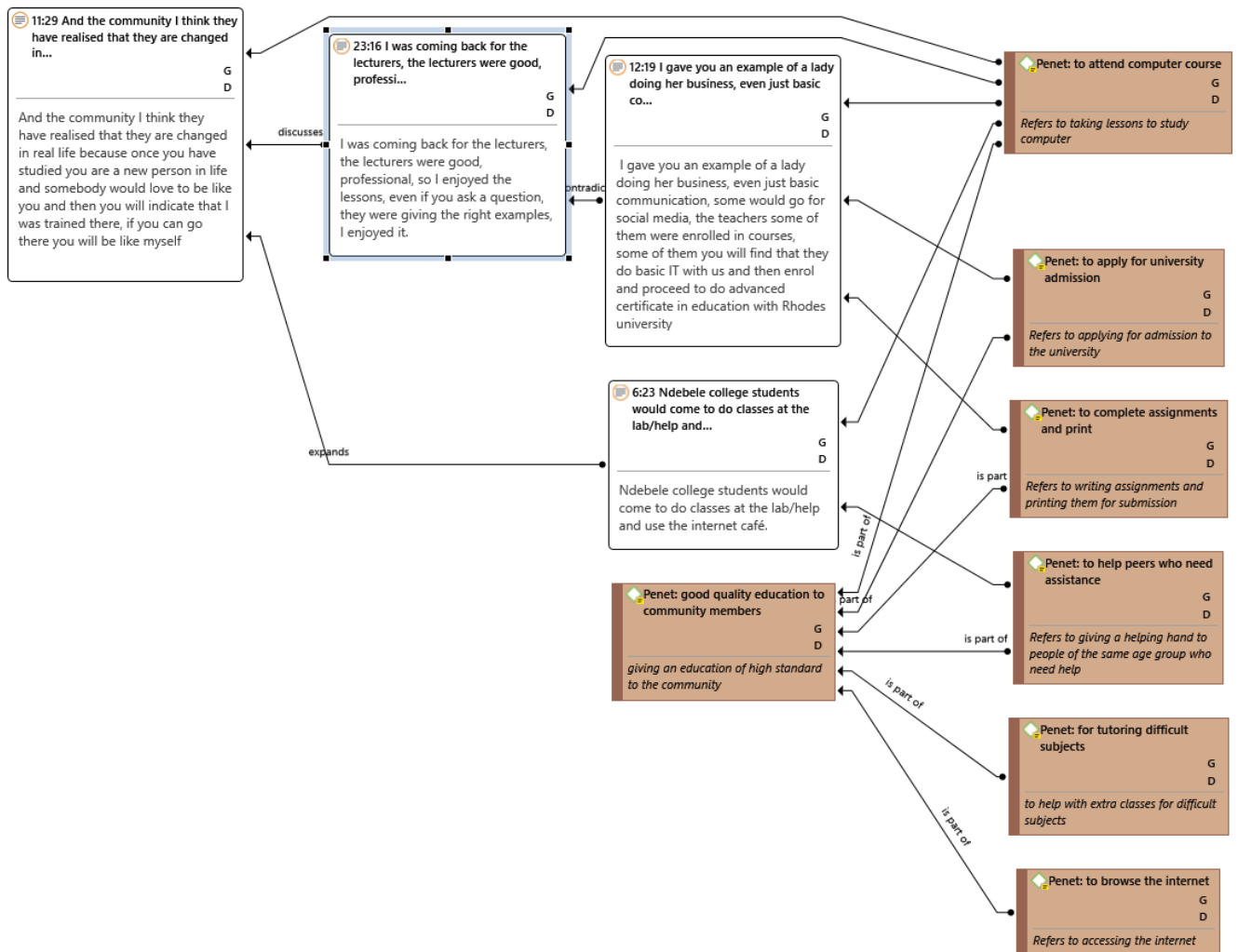


Figure 5.7. Diagram of Enabling community members access to tertiary

### 5.7.4 Summary and Key Takeaways on Penetration

“Penetration” relates to the interaction amongst users that persuades them to continually use computers. It also entails the accessibility of the service by enabling community members to access tertiary institutions. The eligibility of users means that they gain basic computer skills and that they can use a computer efficiently. Community members attended training in their own time and at their own pace, to gain skills that empowered them to become professional. Some people who used the centre to access employment opportunities became discouraged after failing to secure employment.

## 5.8 Sustainability

This taxonomy refers to the process whereby a newly implemented behaviour is stably maintained within daily operations (Proctor *et al.*, 2011). Responses to face-to-face questions of the different stakeholders (i.e., executive management, support staff, institutional sponsors and users), were captured to address the following SRQ, which is related to the taxonomy of sustainability:

**SRQ<sub>12</sub>**- To what extent are there established routines to manage the daily operations of the ICT4D initiative?

The perspectives of the primary and secondary ICT4D stakeholders and users with regards to sustainability is discussed in the following sub-section.

### 5.8.1 Perspective of Primary Stakeholders on Sustainability

#### 5.8.1.1 Perspectives of Executive Management on Sustainability

The perspectives of executive management on sustainability are presented in the form of codes, themes, and number of occurrences in Table 5.28.

Table 5.28 Perspectives of Executive Management on Sustainability

Themes	Code	Occurrences
Practices and opportunities for improvement in sustainable operations	Susta: informal guidelines to use the laboratory	3
	Susta: we have training/user manuals	6
	Susta: reference booklets for best practices	2
	Susta: ground rules to use the laboratory	1
	Susta: we have operation timetable	3
	Total	15
Information sharing portal for the community	Susta: I'm not aware of any procedures	2
	Susta: formal procedure created for future use	2
	Total	4

It is obvious from Table 5.28 that executive management does not have a formal procedure designed for community initiatives. The themes of “practices and opportunities for

improvement in sustainable operations” scored the highest (fifteen) through training/user manuals with number of occurrences (six). Therefore, the executive management is focussed on practices and opportunities for improvement of sustainable operations outcomes by providing training/user manuals.

For the initiative to have a longer-lasting implementation, good practices, and opportunities for improvement in sustainable operations must be driven by formal procedures. Once users have understood the available opportunities to improve the daily operation process of community centres, the information should be shared on the central portal for the community reference.

The results presented in Table 5.28 illustrate a contradiction in the outcomes of ICT4D. The research, therefore, recommends that best practices need to form part of the legislation. This would mean that ICT4D initiative is grounded in the operation standards, through integrating work instructions into policies and procedures.

#### **5.8.1.2 Perspectives of Supporting Staff on Sustainability**

The perspectives of supporting staff on the sustainability of ICT4D initiatives are grouped in codes, themes and the number of occurrences and are summarised in Table 5.29.

Table 5.29 Perspectives of Supporting Staff on Sustainability

<b>Themes</b>	<b>Codes</b>	<b>Occurrences</b>
Organizing the times and skilling the community	Susta: we have training/user manuals	3
	Susta: we have operation timetable	1
	Susta: I’m not aware of any procedures	3
	Susta: reference booklets for best practices	2
	Susta: informal guidelines to use the laboratory	1
	<b>Total</b>	<b>10</b>

According to Table 5.29, the supporting staff is also aware that there are no formal procedures to run the ICT4D initiatives. Supporting staff is mostly concerned with organizing the times and providing imperative skills to the community by developing the training/ user manuals from the beginning. The rate of skill transfer is very low since the running of operations at the centre is not documented; similar sentiments were expressed by the executive management.

For the ICT4D initiatives to have a longer-lasting implementation, a formalised procedure is recommended to guide users that are available for scheduling times and receive training. One of the supporting staff said:

*"Yes, there is a detailed program tailored for any type of user. it is structured to cater for any person. e.g., cleaners can get info on how they can protect themselves, high school kids can have clarification on cyberbullying"* (Female, Age 37)

The findings illustrated in Table 5.29 points to disparities between executive managers, supporting staff and users. Supporting staff continually emphasizes the importance of *centralized communication by means of scheduling consistency* to achieve the development outcomes. For example, centralized communication offers more opportunities for the whole team whereby all users are aware of the movements of their entire team where scheduling important tasks can be made possible without constantly checking availability.

## 5.8.2 Perspectives of Institutional Sponsors on Sustainability

The perspectives of institutional sponsors on sustainability outcomes, which are presented in the form of codes, themes, and occurrences of similar responses on daily operational routines, are summarised in Table 5.30.

Table 5.30 Perspectives of Institutional Sponsors on Sustainability

Themes	Code	Occurrences
Promotion of regular awareness on the communities the initiative engages	Susta: I'm not aware of any procedures	3
	Susta: formal procedure created for future use	1
	Susta: informal guidelines to use the laboratory	1
	Total	5

Based on Table 5.30, the perception of institutional sponsors is that ICT4D initiatives are not transparent enough in providing work instructions. Unsurprisingly, institutional sponsors are focusing more on the promotion of regular awareness on community the initiative engages, number of occurrences (five). Institutional sponsors help users to be aware of the best practices that will assist them to be not vulnerable, as well as helping users to be effective when using the computers/smart devices.

The findings indicate that institutional sponsors of ICT4D initiatives are eager to promote the sharing of information to better service delivered in all ICT4D. For example, one institutional sponsor has remarked:

*“Not necessarily, yes, we were assisted because all of us know a computer. So, tutors usually assisted those who lack understanding of the computer” (Male, Age 37).*

### 5.8.3 Perspectives of Users on Sustainability

The perspectives of users on sustainability outcomes of ICT4D initiatives are summarised in Table 5.31. The views of users on daily operational routines are discussed and shown in codes, themes, and number of occurrences.

Table 5.31 Perspectives of Users on Sustainability

Themes	Code	Occurrences
More involved user in the process of innovation	Susta: I’m not aware of any procedures	1
	Susta: reference booklets for best practices	1
	Susta: we have operation timetable	1
	Susta: informal guidelines to use the laboratory	1
	Susta: we have training/user manuals	2
	Total	6

Based on the Table 5.31, despite daily operational manuals being in place, it is not clear what the agreed procedures. The focus of users is to be more involved in the process of innovation, whereby training is given/scheduled to cater to all users. Training/user manuals ensure that skills and all necessary information to perform tasks are in place and shared accordingly.

Since one of the ICT4D initiatives focused on cybersecurity, it is expected that regular training must be provided to current or new users. The training of users will ensure maximum efficiency is acquired in ICT4D initiatives.

The findings in Table 5.31 shows the importance and necessity of involving users in ICT4D initiatives process design, the theme “more involved user in the process of innovation” speaks of committed and innovative processes that leads to smooth operation and positive outcomes. The following comment reflects the views of many users:

*“It was a manual, informal thing that was used, it was having a lot of information that will assist even a new user” (Female, Age 25).*

Having a schedule on how ICT4D initiatives should operate emerges as theme “more involved user in the process of innovation”. Good planning strategy, as shown in Figure 5.8 specify that skilled users could increase the level of computer usage, because users are knowledgeable (see Figure 5.8). The results in Figure 5.8 goes beyond the usage, and cover the portion where initiative produces employable professionals and improving the standard of living in rural communities.



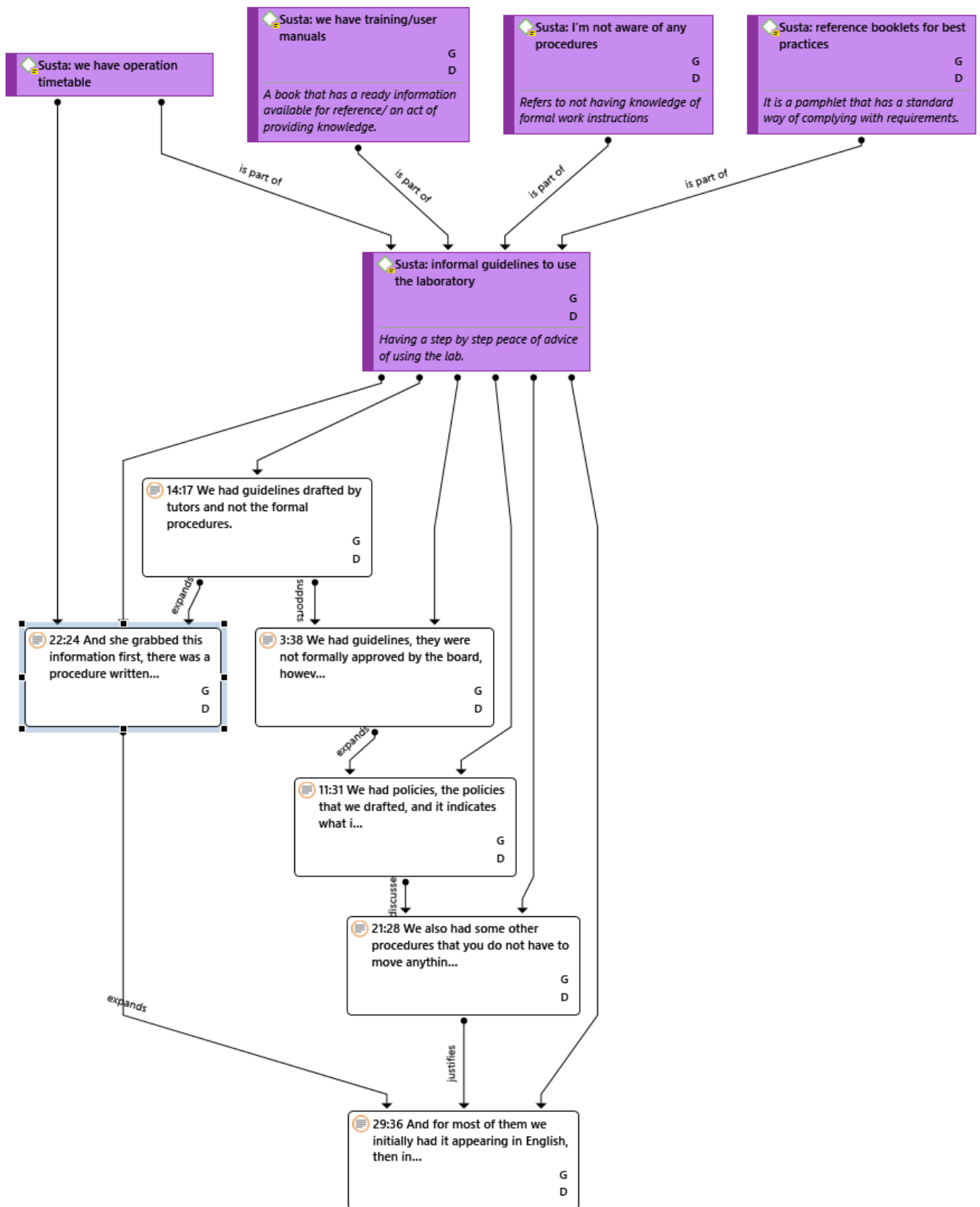


Figure 5.8 Organizing the times and skilling the community

#### **5.8.4 Summary and Key Takeaways on Sustainability**

“Sustainability” pointed out behaviour in maintaining the service of daily operations. The initiative focused on practices and opportunities for improvement by providing training/user manuals and driving formal procedures. Information must be shared on the central portal for the community to reference. We ground ICT4D initiatives in operation standards, by integrating work instructions into policies and procedures. Good planning strategy could increase the level of computer usage, produce employable professionals, and improve standards.

#### **5.9 Emergence of a substantive framework for Beyond Sustainability through IOs**

The findings and results suggest that non-linear and dynamic methods are required to ensure that ICT4D initiatives last longer, amid continuous and rapid digital technology changes and uncertainty. The study therefore drew on Actor Network Theory to collate the key findings into a framework that goes beyond the linear approach in IOs.

Actor-Network Theory (ANT) is a sociotechnical theory to understanding humans and their interactions with inanimate objects (Cresswell, Worth and Sheikh, 2010). Humans, things, ideas, and concepts are all considered "actors" in these networks. An actor acts in collaboration with other actors and in social settings. If technology (actant) is introduced, the entire network's functionality is affected (Cresswell, Worth and Sheikh, 2010). ANT assumes that any actor, regardless of status, are either removed from or added to the network.

ANT supports various realities and different performers, resulting in a more detailed representation of the dynamic interactions between many actors without overlooking their interdependence. This can be useful in understanding how social impacts are formed as a result of interactions among different individuals in a network (Alexander, 2014). When it comes to the fast-paced and ever-changing world of digital technology, this is critical, especially when reality is actively presented by multiple individuals in a specific time and place.

Figure 5.9 attempts to represent the complexity of the research findings into a framework guided by ANT.

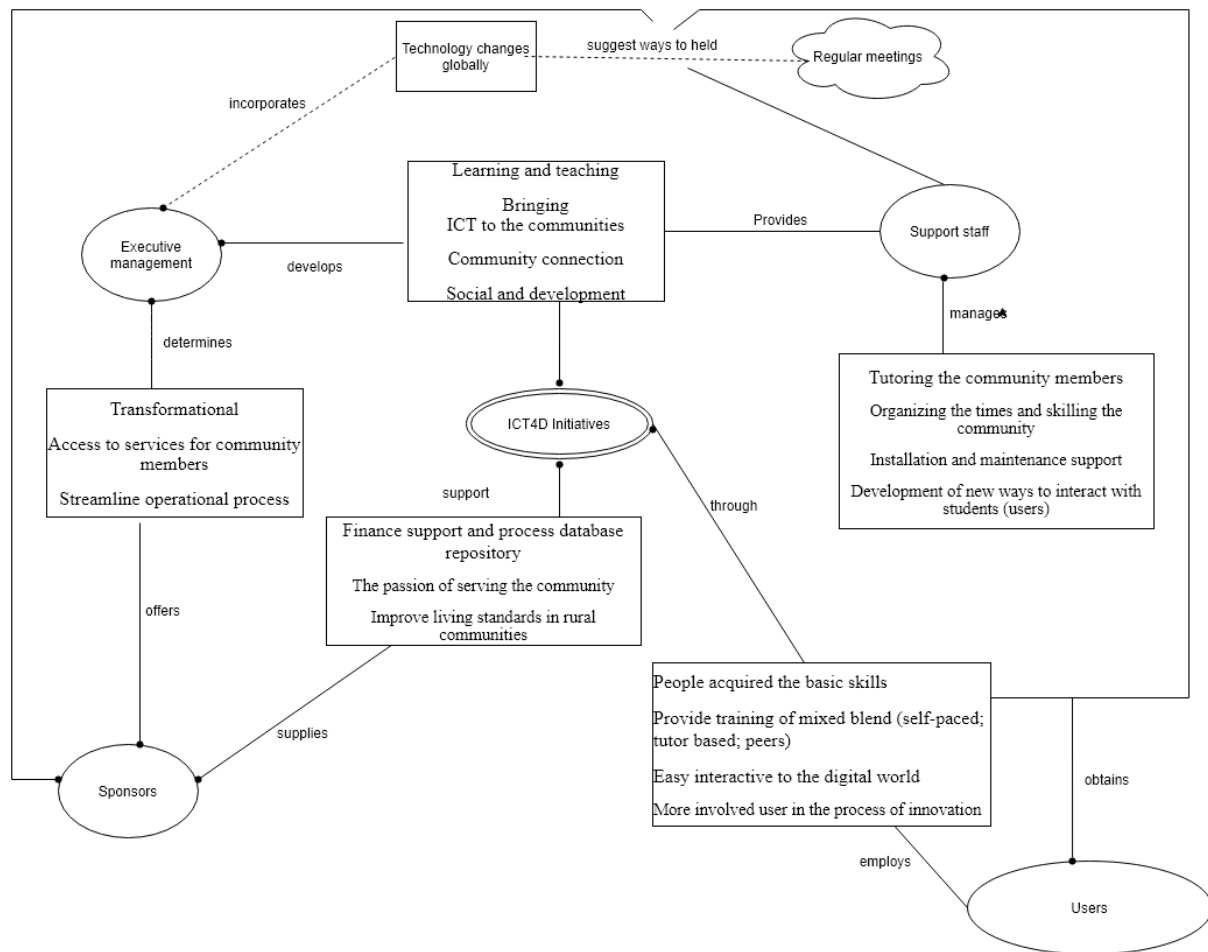


Figure 5.9 ICT4D initiatives framework

Figure 5.9 allows for a number of remarks (Alexander, 2014): Translation is the process for representing a network with a single entity, which can be an individual or another network (Callon et al., 1986). The process of translation is summarized as moments, namely: Problematization, Intersement, Enrolment, and Mobilization. Moments of translation are discussed in more details:

Problematization refers to the act of an actor (a group or an individual) defining the nature of a problem in a specific scenario and establishing dependency as a result (Callon et al., 1986). Rather than taking a situation's common knowledge (myth) for granted, problematization turns it into a problem, allowing fresh perspectives, consciousness, thought, hope, and action to arise. Intersement is fixing the situation by "locking" other actors into the roles that were proposed for them in the actor's program. Enrolment is the description and interrelationship

of the roles that were previously assigned to different actors (Callon et al., 1986). Mobilization refers to ensuring that presumably speaking for key collective entities are suitably representative of all network members acting as a single agent.

The **ICT4D initiative** is the central and uniting entity that acts as the obligatory passage point. It shows whether the actors' interests are aligned, need to be aligned, or are outside the network. The benefits of ICT4D initiatives in terms of vision bearers include bringing ICT to the communities developing learning and teaching, connecting the community, and social and development.

### **Problematisation**

There were three primary identified challenges: the great deal of poverty in the communities; the initiatives were no longer connected because of funding issues; and the computers used in ICT4D initiatives were too slow.

Yet there remains a common theme across stakeholder, learning and teaching members of the community as a means to contribute to reduce poverty.

There is a need to continually understand the community challenges.

To help people out of poverty, more economic resources are needed to assist people increase their income and better provide for themselves and their families. It is important to involve members of the community in every development step.

To speed up computer devices, it is recommended that antivirus software be updated on a regular basis and that work be saved on the cloud. Updates can be configured to appear as a pop-up at the bottom of the screen and be executed by any user. It is important to upgrade computer devices to the latest version for quicker performance, even though these have cost implications.

The cost implication means that several mechanisms to continually raise finances are considered as a related *problem* that similarly needs to be considered.

### **Interessement**

It is necessary to bring all stakeholders together and conduct regular imbizos to discuss emergent changes, both technological and in the community and propose new or innovative

methods. For example, new technology such as stock exchange trading can be taught as a means for community members to engage in economic development.

The recommendation to all stakeholders is to have an open policy for raising suggestions that will benefit the community. Some examples that are relevant today within the context of the COVID pandemic include holding online meetings where all stakeholders can join and participate freely from anywhere. These similarly have cost implications.

### **Enrolment**

Managing the initiatives involves engaging with community members, installation, and maintenance support of the digital technologies, organizing schedules and skilling the community.

It is necessary to standardize the operational processes so that new members can use the digital technologies much easier. As users benefit from the ICT4D initiative, they will very likely encourage others to join and take advantage of the same benefits.

### **Mobilization**

Sponsors and “those who started the initiative” are often most careful about keeping the initiatives on track to achieve their goals.

It is critical therefore to create a binding regulation that requires community members to contribute to ICT4D initiatives in economic and non-economic ways. For example, by volunteering to clean up or monitor. Such voluntary acts are a means to giving back using non-economic and tend to improve the individual sense of well-being.

## **5.10 The research journey**

The researcher had to get consent to interview CSIR, DWESA, and SEIDET stakeholders, and an arrangement was therefore made to travel to the respective areas where these stakeholders are located. One of the project leaders of SEIDET offered to meet the researcher halfway, and this resulted in the project leader driving a total distance of 80 km to meet with the researcher and answer the questionnaire. Despite no specific incentives being offered by the researcher,

an administrator from the same institution used her time on a Saturday to drive around with the researcher to meet and interview the relevant stakeholders. Although it was not possible to meet board members on the same date, alternative arrangements were made for the researcher to meet board members. This occurred around Pretoria, Sandton, Bryanston, and SEIDET. While preparing for SLL data collection, a project leader offered the use of his car since Dwesa can be reached through a gravel road and the researcher had challenges to get an SUV car that will accommodate the trip. The gravel road was 47 kilometres away (see Figure 5.10), so the tire pressure was reduced to avoid damaging the vehicle's tires.



Fig 5.10 Gravel road to DWESA

Lastly, the project leader at the CSIR was very organized and accommodated the researcher in her office for the day.

### **5.11 Challenges and Data Collection**

Several challenges were encountered, because of the strike at one of the locations, Dr. J.S Moroka Municipality. The initial arrangements were therefore cancelled, and the SEIDET administrator provided the stakeholders' contact detail, for the researcher to arrange a suitable time with other stakeholders. Internal politics became an issue (previous SEIDET board member was not willing to participate) and one board member would not schedule time for the interview with the researcher because it had not been organized by SEIDET board members. He indicated that he was not willing to participate until the board had contacted him and explained what the researcher intended to achieve. Therefore, building relationships became a mandatory aspect of the community initiatives because its improved teamwork.

The project champion initially expressed the fear that a researcher might want to expose the challenges that are experienced in the initiative. There was no electricity at DWESA during the

researcher's visit and the educator indicated that sometimes the school would go for two weeks without power. The next day, the researcher returned to Mpume for the interviews; only to find that the educators had to attend an urgent meeting. The principal provided the contact details of the educators for the interviews to be conducted telephonically. The installation of backup solar panels in schools will help during an electricity outage.

The CSIR was a completely different experience: the project leader made the arrangements with all stakeholders who were scheduled to be interviewed. She coordinated the meeting times while the researcher was conducting the interviews. The interviews were recorded on audio and later transcribed into text. Wherever strong emphasis was made, it was included in the transcription and words that made it difficult to understand the general meaning of the data quotations were removed.

#### **5.11.1. Schools are no longer connected**

Most schools in SLL were not connected because of funding issues. The government is no longer supporting initiatives fully and generally only gets involved closer to the election period. The researcher found that the computers were never fully functional because they were old.

#### **5.11.2. Sponsors no longer involved**

Concerning cybersecurity awareness, sponsorships became a challenge since people consider sponsoring in areas where they will benefit. Fig 5.2 shows that the sponsors who had been involved at the beginning of ICT4D initiatives, namely, Saab Grintek, Telkom, COFISA, etc., were not available for the interviews since most had lost interest in the project due to various reasons.

#### **5.11.3. The movement of people**

Most of the individuals who were with the project when it began are now with new companies; however, several members who founded SEIDET are still involved in its progress to date. A formal policy for skill transfer should be put in place, signed, and approved by board members.

#### **5.11.4. Project stagnation**

The initial purpose of the project remained the same a decade later, hence some of the users were losing interest in using the laboratories. A suggestion was to use the lab as an idea-sharing platform space and to allow the youth to be taught trading skills since many schools are now taking advantage of trading courses to equip learners.

#### **5.11.5. Changes in Technology**

The computers used in ICT4D initiatives are too slow, mainly because they are using an old version of an operating system. The machines are Pentium 4 with very little memory and antivirus software is not consistently updated. There was no technical support on-site to maintain the system. New “ransomware” is targeting the world daily, therefore, regular training about cybersecurity awareness is vital. SEIDET is re-strategising the vision of the initiative and is including more relevant programs to accommodate revolving technology.

#### **5.11.6. Power challenges**

The thesis identifies the possibility of extending the research by addressing the glaring problem of ICT4D initiatives that fizzle out after a few years. During this research, one of the board members took time off from work and went beyond his duty to assist the researcher – this proved their passion for the initiatives. The absence of formal policies to operate in all ICT4D initiatives was noted and is being addressed. The researcher discovered that the challenges faced by the Support staff remained a part of the initiatives e.g., not being able to connect to a Wi-Fi router and sometimes the lab will not be used due to the lack of available, skilled trainers.

#### **5.11.7. Lack of proper handover skills**

Although efficiency training was offered to community members at the commencement of the ICT4D initiatives, the vision for the initiative remained with the initiative champion. Moreover, works in the literature that indicated the embracing of ICT4D implementation and the formulation of the knowledge management system had not yet been realised.



## **5.12 Chapter Conclusion**

Chapter five has presented the findings to the three ICT4D initiatives, and important findings indicated a significant framework based on Actor Network Theory that goes beyond the linear approach in IOs. The development of a framework is essential in order to identify methods for extending the life of ICT4D initiatives. The next chapter provides the overall summary and implications to this research study.

# Chapter 6: Conclusions

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## 6.1 Summary of Thesis

The research investigated the tendency of ICT4D community initiatives to fizzle out. A review of the literature relating to ICT4D, development theory, and implementation outcomes was undertaken to enable a deeper understand of the research. The qualitative-interpretive methodology guided the study and analysis. A framework was then developed using the findings into an ICT4D implementation framework using Actor Network Theory (ANT). This chapter provides an overall reflection of the research, the inferences, and the implications of the study. The chapter also offers some practical contributions.

The main aim of the study was to investigate the ability of the implementation outcomes framework to contribute to the theory and practice of ICT4D community initiatives. The implementation outcomes framework is a popular framework in public health studies for assessing the sustainability of public health initiatives, and for assessing the ability of such initiatives to achieve long-lasting outcomes. A significant challenge to ICT4D initiatives is that they tend to “fizzle” out after a few years (Phahlamohlaka *et al.*, 2010); and most research has, therefore, focused on overcoming this challenge by addressing issues relating to the sustainability of ICT4D (Pade-Khene and Lannon, 2017). This study sought to contribute to the narrative of the sustainability of ICT4D initiatives by evaluating how these initiatives can achieve longer-lasting outcomes. Specifically, the study sought to answer the primary research question: “how can ICT4D initiatives benefit from the literature on implementation outcomes”? This question was supported by two secondary research questions, namely, “what are the implementation outcomes” and “how can implementation outcomes be adapted to ICT4D initiatives”?

The study was conducted in a qualitative-interpretive paradigm using three well-known ICT4D initiatives in South Africa, namely, Siyabuswa Educational Improvement and Development Trust (SEIDET), Siyakhula Living Lab (SLL), and the Council for Scientific and Industrial Research (CSIR) Cyber Security Awareness Project.

In the sub-sections that follow, the two secondary research questions are addressed before make inference according to the primary research question.

### **6.1.1 Implementation Outcomes and ICT4D**

Implementation outcomes refer to the outcomes of actions that are purposed to implement new services, practices, and behaviours (Proctor *et al.*, 2011). Implementation outcomes are key requirements to attain desired improvements in service outcomes. IOs deals with the possibilities posed by different service systems, especially challenges that relate to staff training, and day-to-day operational support.

There are three important functions of implementation outcomes:

- To serve as an indicator of implementation success.
- They are nearer to the indicators of the implementation processes; and
- They are the key transitional outcomes to service outcomes and the quality of research.

The contribution of IOs to ICT4D community initiatives are illustrated using the eight key factors in the next section.

#### ***6.1.2.1 Acceptability and Community Development***

The IO's framework revealed the disconnect between executive management, support staff, and individuals in the community in the outcomes of ICT4D initiatives. Executive management are genuinely concerned about providing means to members of the community through ICTs. Support staff are mainly concerned with enabling the ICT for the community. The community on the other hand are frustrated when the "means" and the "freedoms to achieve" through ICT do not necessarily result in the "achievement". The frustration is carried over to potential new community users. It is therefore critical to continually align the vision of the executives and staff to support the "achievement" needs of the community. For example, if the primary community need is for earning an income, then the ICT should be continually adapted to assist the community members to earn that income.

It is recommended, for example, that: regular *get-together sessions* (locally called imbizos and lekgotlas) where the outcomes and the changing "achievement" needs of the community can be discussed (as it had been at the beginning of such initiatives) and better *means of development* should be identified and pursued.

### ***6.1.2.2 Adoption of Broader Social Engagement among all Stakeholders***

The IOs framework revealed that there is nonetheless a similarity in understanding the outcomes of the different stakeholders about what social and economic development mean to the community.

It was clear that the IOs adopt a linear approach to the rollout and implementation of community outcomes. However, the mechanisms in communities are often not linear but non-linear. The resultant framework which was guided by ANT but informed by the findings from IOs has a better chance at achieving greater adoption within communities as it takes into account the non-linear nature of communities.

### ***6.1.2.3 Imitate concepts and adapt ICT for Appropriateness***

The “disconnect” between executive management, support staff and secondary stakeholders in rural communities reflected in the appropriateness of the ICT within the community initiative. For example, executive management did not fully appreciate the connectivity issues that users were having at the community centre because their focus was mainly on financing and keeping the initiative going. The benefit of using the community centre, which was initially the ICT, were no longer evident to users and management due to the slowness of the computers.

It is therefore critical to continually adapt the ICT products according to the community needs. The study therefore recommends that ongoing understand of community needs and ongoing innovations in ICT are an intricate part of ICT4D initiatives.

### ***6.1.2.4 Cost and Adaptation of Offerings among Stakeholders***

There was a difference in “the concept of cost” between executive management and users. Community members were interested in participating in the digital world in the same way they experienced on their digital devices – fast and simple. So, while the executives felt the costs to achieve a similarity in experience were high, community members expected more.

#### ***6.1.2.5 Feasibility and Interrelation among all Stakeholders***

The IOs identified a need for a self-paced online training package for community members. Support staff and executive management, for example, were not completely organizing material on SharePoint since they were focused on day-to-day operations. Because there was no formal handover, the continuing use became an issue when support staff moved on with their careers, making it difficult for members who were interested in taking over to continue with daily operations.

It is suggested, for example, that support staff encourage documentation and save details on the cloud, with the goal of making the outcome “most available to engage with the outside world”.

#### ***6.1.2.6 Compulsory Engagement with Fidelity (commitment to follow procedures)***

The executive management and users indicate a slight disconnect, indicating that the initiative is no longer serving its original purpose of innovation as agreed. At the time of their inception, ICT4D initiatives provided significant skills to members of the community; however, the needs have developed in response to technological demand. For example, when the needs of community members change, the operation procedure can be revised and workshops (such as stock market trading classes) can be introduced for the youth.

#### ***6.1.2.7 Penetration and Continuous Engagement among all Stakeholders***

It's comforting to know that your investment in a thorough approach will pay off. The penetration of ICT in communities calls for the improved innovation and users' reliability. It's important to remember that ICT improves people's quality of life, and the mechanisms that lead to this can be organized and made accessible to others.

Considering that obtaining permission to collect data from some of the community members who were initially involved in the initiatives was challenging, the delegation of responsibilities is an area that has to be improved.

#### **6.1.2.8 The Consistent Level of Improvement on Sustainability among Stakeholders**

For example, community members can set up reminders and to-do list on calendar. The community members feel involved when included at all project levels to improve the processes, it tends to be fruitful using the properly approved channel. It is therefore crucial for the communities to embrace change; project leaders recognise the necessity of re-strategising the vision of the initiatives to adapt to these needs.

It emerged that most researchers use ICT4D initiatives as a test crew for their research studies with the view of acquiring data – thereafter abandoning the initiative. IS researchers have a responsibility to critically discuss a better world view of ICT4D initiatives as social researchers. It is recommended that the initiatives must find a way of tying the researchers to give back through some form of legal mechanism. For example, a researcher can sign an agreement to donate a specified amount once data gathering is completed after gaining permission to collect data from initiative leaders.

#### **6.1.3 How ICT4D Initiatives can Benefit from the Literature of Implementation Outcomes and Go Beyond Sustainability**

The research journey, experiences of the researcher, as well as the research's contribution to knowledge on implementation outcomes, are discussed in the sub-sections that follow.

### **6.2 Contribution to Knowledge**

#### **6.2.1 Theoretical Contribution**

The research resulted in the development of a theoretical framework. The way theory contributes to knowledge is considered a foundation of investigation into what makes the theoretical conclusion (Walsham, 2017). The study proposed a framework on how ICT4D initiatives can benefit from the literature of implementation outcomes and go beyond sustainability. The framework partially contributes as a guideline to how ICT4D can progress beyond issues of sustainability by achieving long-lasting implementation outcomes. The theory of ICT4D assists in guiding and evaluating research; therefore, it is crucial to take into account the context of the theory within which the development must occur (Twinomurinzi *et al.*, 2009; Walsham, 2013). The validity of the theory was demonstrated through the theoretical lenses of the capability approach, open development, and implementation outcomes.

The contribution of the theory to ICT4D provides the foundation of the outcome that contributes to the comprehensive approach in ICT4D background (Mthoko and Khene, 2017). The theory of development should form part of the basic understanding that research has for a research problem. It provides an exact explanation of what the theory is about and investigates the outcome and the impact assessment contributing to the knowledge. Theoretical knowledge provides a framework that defines the relationship between contribution and influence. The ICT implementation and change is mainly an organisational influence process (OIP) (Ngwenyama and Nielsen, 2014). Although structural properties have consequences for performance, it is indicated that OIPs can improve effectiveness when implementing organisational innovation and policies. The practical contribution affords practical knowledge that focuses on interpreting the dynamics between institutions in the economy and informal traders. Furthermore, theoretical knowledge has been developed on the empirical observation of OIP by going back and forth through the literature as indicated in Table 6.2.

Table 6.2: Different Contributions to Knowledge (Ngwenyama and Nielsen, 2014)

<b>Types of contribution</b>	<b>Description of claims</b>	<b>Potential contents of knowledge claims</b>
Theoretical contribution	Advancement of theoretical knowledge	This research expects to propose a new implementation framework for ICT4D projects
Practical contribution	Advancement of research practice knowledge	This research will investigate and propose ways to implement different implementation outcomes

On a theoretical approach level, the foremost contribution has been in the development of an approach on how to have longer-lasting ICT4D initiatives.

### **6.2.2 Practical Contribution**

The functioning of society and social behaviour represent the desired social future by enhancing living (Sahay, 2016). The research work, by looking beyond the sustainability of ICT4D initiatives and arguing the adoption of other factors on implementation outcomes, has practical evidence for the longer-lasting implementation that could serve the community extensively through policy implementation and, of course, consistent sponsorship.

At a practical approach level, this research has shown that implementation outcome factors can be adopted in ICT4D initiatives in anticipation of moving beyond sustainability. Challenges such as poverty and unskilled community members can then be explored and addressed using a socially suitable method.

### **6.3 Limitations of the Study and Future Research**

The ICT4D initiatives that were studied were already facing operational challenges. Time also limited the research since it could have been very insightful to test the suggested framework on all three ICT4D initiatives.

### **6.4 Concluding Remarks**

People for whom ICT4D initiatives are created, move on, and take new opportunities after they have gained experience. Change is a necessity. Both society and technology are undergoing substantial changes; therefore, to go beyond linearity in the implementation framework and continually innovate with new mechanisms that allow for such shifts is important.

Because of a dependence on donations, there is often limited infrastructural growth and becomes the responsibility of the board members of these ICT4D initiatives. The shifting of responsibility for the support and maintenance of the devices used in the initiatives is commonplace.

Even though ICT may have improved the quality of life for the people, there is a communication barrier in some ICT4D initiatives due to rural areas being far from urban locations. Thus, making it difficult to exploring the services.

The study shows that skilled people are always moving to urban areas in search of new job opportunities. In implementation outcomes, penetration of a service is one of the important service outcomes, which characterise the accessibility of a service.

There is a decrease in using computers in ICT4D initiatives because of systems performing slow and no new interesting activities. The proposition is that policies must be designed before the project implementation—to cater for maintenance and training requirements.

It should be emphasised that initiatives have loyal project founders.



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## *Interview schedule*

<b>Number</b>	<b>SRQ</b>	<b>Executive management</b>	<b>Supporting staff</b>	<b>Sponsors</b>	<b>Users</b>
1.	Participation	Can you confirm that your participation in this study is voluntary?			
2.	Withdrawal	Are you aware that you are free to withdraw at any time and without giving a reason?			
3.	Rewards	Do you know the study is for the completion of a degree and no benefits will therefore be derived from your participation in the study?	Do you know the study is for the completion of a degree and no benefits will therefore be derived from your participation in the study?	Do you know the study is for the completion of a degree and no benefits will therefore be derived from your participation in the study?	Do you know the study is for the completion of a degree and no benefits will therefore be derived from your participation in the study?
4.	Sex	What is your gender (observe)?	What is your gender (observe)?	What is your gender (observe)?	What is your gender (observe)?

5.	Age	What is your year of birth?	What is your year of birth?	What is your year of birth?	What is your year of birth?
6.	Education	What is the highest level of education?	What is the highest level of education?	What is the highest level of education?	What is the highest level of education?
7.	Employment	What do you do to support yourself?	What do you do to support yourself?	What do you do to support yourself?	What do you do to support yourself?
8.	Location	Where do you live?	Where do you live?	Where do you live?	Where do you live?
9.	Is the development vision and mission of the primary stakeholder/s (e.g., the sponsors, leaders) clear?	According to your understanding, what is the purpose of the project?	According to your understanding, what is the purpose of the project?	According to your understanding, what is the purpose of the project?	N/A
10.	Do the different stakeholders	What role do you think ICT is	What role do you think ICT is	What role do you think ICT is	N/A



	share a common understanding as to the role of ICT in development?	playing in fulfilling the purpose of the project?	playing in fulfilling the purpose of the project?	playing in fulfilling the purpose of the project?	
11.	To what extent have the community members tried out the ICT services?	To what extent have the community used the computer/smart devices?	To what extent have the community used the computer/smart devices?	To what extent have the community used the computer/smart devices?	To what extent have you used the computer/smart devices?
12.	What benefits could the ICT initiative render to the community using ICT?	What do you think are the benefits of ICT to the users?	What do you think are the benefits of ICT to the users?	What do you think are the benefits of ICT to the users?	What do you think are the benefits of ICT to you?
13.	What are the actual needs / problems that	What do you think are the actual needs / problems	What do you think are the actual needs / problems	What do you think are the actual needs / problems	What do you think are the actual needs/ problems

	are faced by the community?	that are faced by the community?	that are faced by the community?	that are faced by the community?	that you are facing?
14.	How does ICT assist in addressing these needs?	How do you think computers assist in addressing the needs you just mentioned?	How do you think computers assist in addressing the needs you just mentioned?	How do you think computers assist in addressing the needs you just mentioned?	How do you think computers assist to address the needs you mentioned above?
15.	What is the cost (financial/non-financial) to maintain the ICT?	What does it cost (financial/non-financial) to maintain the computers/smart devices?	What does it cost (financial/non-financial) to maintain the computers/smart devices?	What does it cost (financial/non-financial) to maintain the computers/smart devices?	What does it cost (financial/non-financial) you to use the computers/smart devices?
16.	To what extent are the users skilled to use the ICT?	How well do the users know how to use the computers/mobile?	How well do the users know how to use the computers/mobile?	How well do the users know how to use the computers/mobile?	How well do you use the computers/mobile?

17.	To what extent are the computers still serving the initial purpose?	Do you think the computers/smart devices are still serving the initial purpose?	Do you think the computers/smart devices are still serving the initial purpose?	Do you think the computers/smart devices are still serving the initial purpose?	Do you think the computers/smart devices are still serving the initial purpose?
18.	To what extent do users of computers/smart devices keep on coming back?	Do you think people keep coming back to use the computers/smart devices?	Do you think people keep coming back to use the computers/smart devices?	Do you think people keep coming back to use the computers/smart devices?	How often do you use the computer/smart device?
19.	For the users who keep on coming back, why do they keep coming back?	For the users who keep on coming back, why do you think they keep on coming back?	For the users who keep on coming back, why do you think they keep on coming back?	For the users who keep on coming back, why do you think they keep on coming back?	Why do you keep on coming back?
20.	To what extent are there established	Do you have written procedure on how to run the	Do you have written procedure on how to run the	Do you have written procedure on how to run the	Are you aware of procedures about using the

	routines to manage the daily operations of the ICT4D initiative?	computers at the centre?	computers at the centre?	computers at the centre?	computer/smart devices?
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