



**CO-DESIGN OF YOUTH WELLBEING INDICATORS FOR ICT INTERVENTION IN AN
UNDERSERVED COMMUNITY IN SOUTH AFRICA**

by

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Signature

14 August 2019

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DEDICATION

I dedicate this thesis to God Almighty for immeasurable grace and blessings. I also dedicate it to my greatest cheerleader, support, and source of encouragement, my beloved husband Adebajji Olasupo Oluwole. You are one in a million! I thank God daily for you.

ABSTRACT

The challenges faced by members of underserved communities in South Africa have frequently been reported in literature. To ameliorate these challenges, different interventions have been introduced both locally and internationally to improve the wellbeing of the members of these communities. One such intervention is the introduction of information and communication technology ICT as a means to close the digital divide and meeting the socio-economic needs of the community. Youth living in these communities are expected to derive more benefit from ICT interventions as they have been reported to be more technology savvy and dependent on technology than the older adults are. However, the failures of ICT interventions deployed by donors have also been reported in literature. Authors have identified several reasons for the failure of ICT interventions, but a lack of consultation with the beneficiaries of this type of intervention is common to many findings. The exclusion of the youth as major beneficiaries of ICT interventions causes a lack of alignment between the interventions deployed for their use and the actual wellbeing needs of the youth in underserved communities. The failure of ICT interventions increases the digital divide and frustrates the good intentions of local and national government as well as international donors to improve the wellbeing of the youth in underserved communities.

By using the concept of wellbeing, the study aimed to explore how youth wellbeing indicators can be used to facilitate effective ICT interventions for youth empowerment and development in underserved communities in South Africa. Furthermore, the study aimed to design an ICT-based artefact to prioritise youth wellbeing indicators in underserved communities in South Africa.

The study was implemented through a qualitative research method using a service design strategy that allowed for a participatory research approach and co-design instrument for data collection from the youth living in Grabouw an underserved community in the Western Cape Province of South Africa. Data was collected from 40 youth aged between 15 and 30 at two workshops. Content analysis technique was used to analyse data.

Findings from the research show that given the opportunity, the youth are able to determine their social-economic needs. A comprehensive set of wellbeing indicators was developed. Thirteen wellbeing indicators symbolising the issues in the community were prioritised, which are: unemployment, self-image, reaching full potential, family support, access to water, sanitation and electricity, meaning and purpose of life, being healthy, religious practice, educational level, future expectations, freedom of expression, skills to get a job, and access to skills and

training. Overall, nine categories of wellbeing indicators were identified; of these, seven are similar to the Global Youth Wellbeing Index (GYWI) categories. Three new categories – aspiration, social support, and infrastructure and services – were realised. The three factors are an indication that the Grabouw youth may have special needs different from the global perspective as specified by the GYWI categories. Moreover, the priorities of the wellbeing indicators when compared to the GYWI rating for South Africa differ significantly, which may indicate that the needs of the youth living in underserved communities may vary largely from other youth in the country. Furthermore, an artefact that can be used to prioritise wellbeing indicators was designed.

It is important for stakeholders of ICT interventions to embrace participation of the beneficiaries as a means of aligning interventions to their needs. These stakeholders need to seek ways of developing artefacts that address the needs, not limited to health, so that the youth can take advantage of technology to improve their wellbeing on a continuous basis.

Keywords: ICT, index, indicators, informal settlement, intervention, wellbeing needs, nongovernmental organisation, underserved communities, rural areas, youth

LIST OF ACRONYMS

Acronyms	Meaning
BLI	Better Life Index
EPI	Environmental Performance Index
ESI	Ecosystem Service Indicators
EU	European Union
GPI	Genuine Progress Indicator
GYWI	Global Youth Wellbeing Index
HDI	Human Development Index
ICT	Information and Communication Technologies
ISED	Indicators for Sustainable Energy Development
ISEW	Index of Sustainable Economic Welfare
MFA	Material flow accounts
NAMEA	National Accounting Matrix including Environmental Accounts
NGO	Nongovernmental Organisation
OECD	Organisation for Economic Co-operation and Development
PLWHA	People Living with HIV/AIDS
SDI	Sustainable Development Indicators
UN	United Nations
UNAIDS	United Nations Aids
Wi-Fi	Wireless Fidelity

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CHAPTER ONE: INTRODUCTION

1.1 Introduction

Underserved communities exist in most countries of the world, notwithstanding the level of development of the particular country (Todd, Copeland, Husband, Kasim & Bamba, 2014; Hébert et al., 2015). The socio-economic situations of underserved communities differ from one another, with some characterised by extreme living conditions. These underserved communities, often neglected by the State, are typically characterised by dire economic conditions, social vices such as gangsterism, and drug abuse (Curtin, Schweitzer, Tuxbury & D'Aoust, 2016; Menkin et al., 2017). In addition to poor social services, the high crime and unemployment rates as well as a lack of access to good healthcare services and facilities characterise underserved communities. The presence of poor economic conditions, exposure to unhealthy living conditions, and poor social infrastructure in general compromise the health and wellbeing of both the individual and the community (Lambert & Kolbe-Alexander, 2013; Tanner & Du Toit, 2015). Among the major contributing factors identified as being root causes for these problems are inadequate health services, uneven distribution of health workers, the lack of health insurance, poverty, and geographical isolation (Scheibe, Richter & Vearey, 2016; Miah, Hasan, Hasan & Gammack, 2017).

Many members of underserved communities suffer a variety of health conditions emanating from poor economic conditions, which include high-stress levels, loss of lives, chronic illnesses and lower life expectancies (Tanner & Du Toit, 2015). McCabe, Carrino, Russell and Howse (2014) report on the prevalence of high stress levels among women in underserved communities. Similarly, Perry et al. (2014) as well as Sharkey et al. (2016) report that poor antenatal and postnatal care in these communities results in the loss of lives of mother or child or both. A wide range of preventable chronic diseases such as diabetes, cancer, HIV/AIDS, mental health issues and cardiovascular diseases are also commonly found in these communities, resulting in a high mortality rate (Wilson et al., 2015). Likewise, poor gerontology care for older citizens has affected the life expectancy of underserved community members, which is generally lower compared to people living in well-served communities (Hébert et al., 2015). Many articles report on the lives and living conditions of people in underserved communities with regard to their wellbeing (Mitchell, Macció & Fages, 2018; Schaeffner, Irvin & Smith, 2018).

There are several conflicting definitions and little consensus among authors on what wellbeing entails (Smith & Diekmann, 2017). However, wellbeing is a term that encapsulates the totality of how people live and the satisfaction they have with their lives. According to Huppert and Johnson (2010:2), wellbeing is “the combination of feeling good and functioning well”. The wellbeing of the youth in underserved communities is negatively impacted by the socio-economic standards in these communities. Due to dire economic conditions, young females are often left vulnerable and placed in difficult positions where they feel compelled to participate in gratuitous sexual activities. Participation in such illicit activities causes many to suffer from various health challenges related to unsafe sex (Scheibe et al., 2016). Furthermore, social vices such as gangsterism, robbery, violence, bullying, and alcohol and drug abuse are prevalent among the youth due to the high unemployment rates and low job opportunities in these communities, among others (Gomez, Abokhodair, Bayo & Park, 2013; Langa, Van der Merwe, Masuku & Jensen, 2017; Meth, 2017). Other than the physical health hazards, the youth in these underserved communities have displayed a range of psychological problems and issues emanating from abuse, teenage pregnancy, youth-adult relationships and parental negligence, which sometimes lead to suicide or suicidal attempts (Kimbui, Kuria, Yator & Kumar, 2018; Corburn & Sverdlik, 2019). For this research, the term “youth” is defined as young people in the age group 15 to 35 years as stated in the South African National Youth Policy (National Youth Development Agency, 2015) and the African Youth Charter (African Union, 2006).

1.2 Definition of youth in context

Goldin (2014) describes youth as a stage of life, a term used to discuss and assess mixed population groups with similar features of cognitive, physiological, social, and economic transition. Ritchie (2017) similarly proposes that youth is a stage in the natural progression of people’s lives. The word *youth* is often used interchangeably with an adolescent, a young person, a teenager, and sometimes a kid, with occasional differences (Goldin, 2014). However, the United Nations (UN) differentiates clearly between youth and adolescent. The UN MDG Report (un.org, 2012) describes adolescents as people between 10 and 19 years of age. Maconachie (2014:76) supports the UN MDG Report (un.org, 2012), and describes youth as “an age between childhood and maturity” or adulthood.

According to Embleton, Ayuku, Makori, Kamanda and Braitstein (2018), the United Nations’ entities and programme indicate different age ranges for the youth. The UN-

Habitat identifies youth as a group with ages ranging from 15 to 32 years. The United Nations Convention on Rights of the Child (UNCRC), which forms the basis of all United Nations Children's Education Fund (UNICEF) work, categorises youth as ages ranging from zero to 18 years. The United Nations Educational, Scientific and Cultural Organisation (UNESCO), which is the UN's Secretariat, as well as the International Labour Organisation (ILO) and UNICEF/World Health Organisation (WHO)/United Nations Population Fund (UNFPA) specify youth as people from 15 to 24 years of age. Furthermore, the UN established that the definition changes with demographic, economic, financial, and socio-cultural settings, with the age range of 15 to 24 serving for statistical purposes and for assessing the needs of young people (UNICEF, 2008). However, the African Union (AU) stipulates the youth age range between 15 and 34 years, whereas the African Youth Charter (AYC) recognises ages from 15 to 35. The South African government, in the 2015-2020 National Youth Policy, aligns with the AYC, which pegs the age range of youth at 15 to 35 years.

In most countries, adulthood commences at the age of 18, which is demonstrated by statutory voting rights at this age (Rueda, 2017; DeSilver, 2017). An observation of the age ranges of adolescents and the age range of the youth as specified by all entities show intersections among the age ranges of adolescents, the youth, and even adulthood. Furthermore, the word *youth* encapsulates part of the adolescent group (ages 15 to 19) and part of the adult group. For this study, the definition of the South African National Youth policy is used (15 to 35 years).

1.3 Wellbeing interventions in underserved communities

A new wave of sustainable development has led to a shift in focus from individual issues or challenges to that of a community viewed holistically (Vine & Judd, 2019). A shift is taking place from approaching individual challenges relating to health, education and culture to a more holistic approach that considers the wellbeing of individuals as a community (Mohamed, D'Silva, Samah, Shafril & Dahalan, 2018).

Thus, wellbeing is a broad way of viewing issues, which is defined as "a state of comfort, health and happiness" of an individual as well as a community (Helne & Hirvilammi, 2015:167). Wellbeing is mainly categorised in literature as subjective and objective (Mohamed et al., 2018). Subjective wellbeing reflects people's perception of what is important to them, rather than what others believe (Adler & Seligman, 2016). This category of wellbeing is based on an individual's report on life

satisfaction and happiness in a particular context (Schneider, 2016). On the other hand, the objective wellbeing reflects the opportunities and resources available and accessible to people in a given context (Gilbert, Colley & Roberts, 2016). The objective wellbeing approach is used to gain insight into the objective components necessary to promote a quality life (Western & Tomaszewski, 2016). Wellbeing needs to focus on the interconnection between issues and their consequential effect, taking into consideration how life issues are interrelated with one another. A typical example is illustrated by the relationship between happiness and health, where lack of happiness can result in poor health that may lead to unhappiness.

Nevertheless, poor wellbeing of the youth in underserved communities has been reported in literature (Mash, Kroukamp, Gaziano & Levitt, 2015; Scheibe et al., 2016). The limited government presence to address these challenges has provided opportunities for humanitarian services to be involved, and to help improve the wellbeing of the members of these communities (Menkin et al., 2017). Through the instrument of volunteerism, non-governmental organisations, governmental organisations and other stakeholders of wellbeing in underserved communities provide different types of interventions with the aim of improving the quality of life of the inhabitants of these communities (Scheibe et al., 2016; Whitley, Gould, Wright & Hayden, 2018). Interventions can for example be workshops for entrepreneurship development, sex education, computer training and many more. Some companies introduced technology into these underserved communities by sponsoring computers and hardware. Government also contribute towards the use and uptake of technology by creating computer centres for the communities, for example. This technology 'injection' combined with the high rate of diffusion caused disruption, especially among the youth in the communities (Zilberstein, 2015; Correa, Ariel, Menzie & Brandon, 2017; Osman & Tanner, 2017; Krauss, 2018).

Several authors have explored different ways of achieving relevant and sustainable ICT interventions that can improve the lives of the youth in underserved communities significantly (Tanner & Du Toit, 2015; Smith & Turpin, 2017). However, it was observed that most ICT interventions struggle to improve the wellbeing of beneficiaries due to a lack of alignment between the purpose of ICT intervention and the needs of the users (Bon, Akkermans & Gordijn, 2016). It has been argued that there is limited research that holistically looks into the socio-economic wellbeing of the youth to determine their needs, to facilitate inclusion in decision-making processes leading to interventions

deployed to support the youth in the community. Therefore, the purpose of the study is to explore the prioritisation of the needs of the youth, using wellbeing indicators as a means of facilitating appropriately targeted ICT interventions for the youth in an underserved community.

1.4 Background to the research problem

The declining nature of the wellbeing of youth in communities has come under sharp scrutiny, given the many interventions that have been targeted at improving their wellbeing status, but without any meaningful impact. Despite the advent of participatory interventions as an effective way of achieving social-economic development in underserved communities, ten Brummelaar, Harder, Kalverboer, Post and Knorth (2018) argue that the youth are often excluded from participating in decisions pertaining to their wellbeing. It was noted that the youth are still largely excluded in socio-economic decisions in many South African communities, according to Hlagala and Dichaba (2018), despite organisations such as UNICEF advocating that views of children, the youth, and women be taken into account in decisions that concern them. García-Peñalvo and Kearney (2016) argue that the exclusion of the youth from decision-making processes in communities restricts the ability to understand their specific needs in order to address it in a meaningful manner.

The Global Youth Wellbeing Index (GYWI) Report indicates that youth constitutes about a quarter of the world population (Goldin, 2014). However, one major problem is the lack of contextual data on youth wellbeing indicators across sovereign countries that can facilitate the development of effective ICT interventions in their specific environments. Traditionally, wellbeing indicators were determined using the top-down approach, where project leaders identified indicators that would be used by the majority at the bottom of the pyramid (Kim, Kee & Lee, 2015; Bon et al., 2016). Using this approach, international bodies and national and provincial government do not include NGOs and the benefitting communities in the process of deciding the needs of a community (Singh & Flyverbom, 2016). For example, Gcora, Zaberand Chigona (2017) argue that most of the ICT systems implemented within South Africa by national government departments are done so without the participation of impoverished people in the community.

Over the last decade, different ICT interventions have been developed specifically for the youth in underserved communities to overcome the digital divide and access to ICT

services which they were previously deprived of (Pather & Gomez, 2010; Miah et al. 2017). The contemporary youth, growing up in an era of immersive technology use, are described as digital natives (Kim & Yang, 2016). The growing exposure of ICT to the youth has led to designing interventions in order to address the socio-economic needs of the youth in underserved communities. However, ICT interventions for the youth in underserved communities often lack the desired effect, because the development of such interventions is devoid of consultation with the intended youth in these communities (Winschiers-Theophilus et al., 2015). Palvia, Baqir and Nemat (2018) submit that although it has been argued that ICT interventions can have a significant impact on the socio-economic wellbeing of people, this impact is often not realised from the user's point of view.

One of the many challenges of ICT interventions targeted at wellbeing in underserved communities in Africa is the fact that they are often developed without properly establishing the wellbeing needs of the community (Bon et al., 2016). The processes of conceptualising and planning suitable interventions often lack community involvement such that deployed ICT interventions do not always align with the needs of the community (Bon et al., 2016; Chipidza & Leidner, 2017). It has been argued that in many situations, donors do not have a fair knowledge of the challenges of the beneficiaries. Ssozi-Mugarura, Blake and Rivett (2015) argue that the inability to address priority needs constitutes a reason for the failure of ICT interventions. Bon et al. (2016) concur with this, stating that many stakeholders, developers, and assessors of interventions are in fact unaware of the unique situations of underserved communities in Africa, yet they design interventions based on assumptions. More so, the wellbeing needs of underserved communities vary largely from one community to another, which is an important factor that should define an ICT intervention (Gupte & TeLintelo, 2015).

The importance of involving the youth in underserved communities to determine their wellbeing needs as a requirement for ICT interventions cannot be over-emphasised. The efficacy of ICT interventions to alleviate suffering of the poor and bring about socio-economic development in underserved communities has been an on-going debate for many years. Citing the example of Information and Communication Technology for Development (ICT4D) projects, Gcora, Zaber and Chigona (2017) assert that the assessment of ICT interventions must go beyond economic growth to including the assessment of the wellbeing of the beneficiaries of such interventions. Furthermore, where there is lack of identification and prioritisation of wellbeing needs the wellbeing of

the youth in these communities remain stagnated despite huge investments made towards their improvement. Lechman (2016) argues that the lack of prioritising wellbeing needs (factors that determine needs) and the lack of evaluating the impact of ICT interventions may account for low ICT penetration in underserved communities of many developing and underdeveloped countries.

Several examples of how inadequate needs assessments of underserved communities contributed to the failure of ICT interventions have been cited in literature. Bon et al. (2016) report an intervention in rural Rwanda where a telecentre was deployed to improve the wellbeing of the community members. However, about half of the adult population of the community were illiterate, could not communicate in the English language and were unable to use the intervention; consequently, the intervention failed. Ssozi-Mugarura et al. (2015) report an intervention in Bugaaki and Kicwamba, two underserved communities in Western Uganda; there, ICT was used to support a water management model. Also revealed, similar to the case in Rwanda, the ICT intervention was not able to help the community; hence, the challenges of members of these communities persist.

Despite investments in ICT interventions by a number of international aid organisations in South Africa, underserved community members are not able to utilise the interventions fully to their advantage, thus remaining in underprivileged situations. According to Curtin et al. (2016), many of the youth living in an underserved community do so under severe economic hardship. Osman and Tanner (2017) report that government and international aids have funded ICT interventions to several underserved communities in South Africa with examples of Khayelitsha, Philippi, and rural areas in Eastern Cape. However, Kovacic, Smit, Musango, Brent and Giampietro (2016) report that living conditions in these communities are deteriorating and members of the community experience a high poverty rate. In the case of a report by the International Data Group (IDG) on its website, an ICT project personally initiated by Bill Gates in March 1997 failed. Bill Gates during his visit to Soweto initiated the project as a step towards closing the digital gap in the township, a project that was replicated across South Africa. The author concluded that the initiative had since collapsed. The impact of these failing interventions for the communities is that the youth continue to face persistent economic hardship, as they are unable to take advantage of opportunities provided by ICT for employment purposes or empowerment as innovators and entrepreneurs, due to a mismatch of priorities and objectives of the interventions.

It has been argued that the lack of an evidence-based objective that targets wellbeing indicators prioritised by the youth can lead to the promotion of digital interventions with unintended negative consequences (Hejduková & Kureková, 2016; Kilburn et al., 2018; Makiwane, Gumede & Molobela, 2018). For the effective planning, implementation and monitoring of the success of interventions there is a need for process-based research to guide stakeholder interventions in any particular context (Lum, Evans & Shields, 2016). Authors have established the importance of wellbeing indicators to prioritise wellbeing needs and evaluate the impact of ICT interventions in communities (Miah et al., 2017). Comparably, Reid, Varona, Fisher and Smith (2016) argue that the measure of wellbeing in a specific context determines the measure of health, social, and economic goals achieved when evaluating any intervention. Hence, it is important that wellbeing indicators be developed to enable the evaluation of the long-term impact of ICT interventions on the development and quality of lives.

In summary, ICT interventions fail due to excluding beneficiaries from conceptualising, planning, and designing these interventions. Problems associated with ICT intervention failures include not considering the voice of the youth in the community, the lack of information on the priority needs of beneficiaries, and a limitation in the availability of youth wellbeing information. Consequently, ICT interventions for the youth in underserved communities are often derelict and fail because the youth are not properly engaged in decisions that affect their wellbeing. There is thus a need for establishing youth wellbeing indicators using a participatory approach that involves the youth determining their wellbeing needs in order to facilitate an effective ICT intervention.

1.5 Research problem

The lack of youth engagement in determining ICT interventions developed for their wellbeing in underserved communities is a challenge. Failure to identify and prioritise the needs of the youth often leads to the design of mismatched interventions. The result of not identifying and prioritising youth wellbeing indicators to facilitate the effective deployment and assessment of ICT interventions in underserved communities in South Africa leads to frequent failures of ICT interventions for the youth, ultimately resulting in wasted efforts and resources, white elephant projects, and the lack of significant impact on the wellbeing of the youth.

1.5.1 Problem statement

The lack of youth engagement in prioritising the wellbeing indicators in underserved communities often leads to the design of mismatched interventions, resulting in wasted efforts and resources with no visible impact on the wellbeing of the youth.

1.6 Research questions

To address the research problem, two research questions (RQs), subdivided in two research sub-questions (RSQs) were asked.

RQ1: How can youth wellbeing indicators for underserved communities be developed?

RSQ1: What are the factors affecting the wellbeing of the youth in underserved communities?

RSQ2: How can a comprehensive set of youth wellbeing indicators for underserved communities be developed?

RQ2: How can youth wellbeing indicators be used to determine ICT needs in underserved communities?

RSQ3: How can youth wellbeing indicators be prioritised to align with ICT interventions in underserved communities?

RSQ4: How can an ICT-based artefact be designed to prioritise youth wellbeing indicators in underserved communities?

1.7 Research objectives

The research objectives were formulated to align with the RSQs as follows:

- i) To determine the factors affecting the wellbeing of the youth in underserved communities in South Africa.
- ii) To propose a comprehensive set of youth wellbeing indicators from which the needs of the youth in underserved communities in South Africa can be prioritised.
- iii) To prioritise wellbeing indicators as a determinant of the needs of the youth for relevant ICT interventions in underserved communities in South Africa.
- iv) To design an ICT-based artefact that can be used to prioritise youth wellbeing indicators in underserved communities.

1.8 Research aim

This study aimed to explore how youth wellbeing indicators can be used to facilitate effective ICT interventions for youth empowerment and development in underserved communities in South Africa. A further aim was to develop an ICT-based artefact to prioritise youth wellbeing indicators in underserved communities in South Africa. Table 1.1 is a summary of the research questions, objectives, and approach. These are further elaborated on in Chapter Three.

Table 1.1: Research questions, objectives and methodology

Research Problem	The lack of youth engagement in prioritising the wellbeing indicators in underserved communities often leads to the design of mismatched interventions, resulting in wasted efforts and resources with no visible impact on the wellbeing of the youth.	
Research Aim	To explore how youth wellbeing indicators can be used to facilitate effective ICT interventions for youth empowerment and development in underserved communities in South Africa. A further aim was to develop an ICT-based artefact to prioritise youth wellbeing indicators in underserved communities in South Africa.	
Research Question	Objective	Method and Instrument
RQ1: How can youth wellbeing indicators for underserved communities be developed?		
RSQ1: What are the factors affecting the wellbeing of the youth in underserved communities?	To determine the factors affecting the wellbeing of the youth in underserved communities in South Africa	Participatory method using co-design and questionnaire
RSQ2: How can a comprehensive set of youth wellbeing indicators for underserved communities be developed?	To propose a comprehensive set of youth wellbeing indicators from which the needs of the youth in underserved communities in South Africa can be prioritised.	Participatory method using co-design
RQ2: How can youth wellbeing indicators be used to determine ICT needs in underserved communities?		
RSQ3: How can youth wellbeing indicators be prioritised to align with ICT interventions in underserved communities?	To prioritise wellbeing indicators as a determinant of the needs of the youth for relevant ICT interventions in underserved communities in South Africa.	Participatory method using co-design
RSQ4: How can an ICT-based artefact be designed to prioritise youth wellbeing indicators in underserved communities?	To design an ICT-based artefact that can be used to prioritise youth wellbeing indicators in underserved communities.	Participatory method using co-design and service design

1.9 Research methodology

The study followed a qualitative (subjectivist) approach based on the epistemological interpretivist paradigm. The units of observation were the youth living in the underserved community of the Western Cape. Data were collected through co-design sessions and questionnaires. The data were aggregated, categorised, and interpreted using content analysis.

1.9.1 Research philosophy

Saunders, Lewis and Thornhill (2019:130) define research philosophy as the “system of beliefs and assumptions about the development of knowledge”. One of the major reasons for adopting a research philosophy is to determine the appropriateness of the methodology followed (Holden & Lynch, 2004). There are two philosophical dimensions to research, namely ontological and epistemological dimensions (Saunders, Lewis & Thornhill, 2016).

1.9.1.1 Ontology

The ontological dimension is related to how an individual views reality, which can be objective or subjective (Saunders et al., 2016). According to Neuman (2013), there are two ontological positions – the realist and the normalist, also known as the objective and subjective positions respectively. The subjectivist theory asserts that reality is reliant on social actors (human beings) and presupposes contributions by individuals to social phenomena. Eriksson and Kovalainen (2015) argue that the subjectivist view holds that the only access to the external world is based on observation and interpretation. The authors add that the objectivist view holds that it is possible to have a world that is external and neutral to theory. The objectivist believes that reality is external to social actors and the existence of reality is independent of social interpretations (Neuman, 2013). The research was conducted from a subjective point of view because participatory research cannot be totally devoid of the influence or viewpoint of the researcher and subject; hence, both researcher and subject are participants in the research (Bergold & Thomas, 2012). As stated earlier, subjectivist ontology was followed for this research.

1.9.1.2 Epistemology

Epistemology focuses on how knowledge is sought and created. It answers the question, “What forms valid knowledge and the limitations to knowledge?” (Hallebone & Priest, 2009). The three approaches to epistemological philosophy are critical realism,

positivism and interpretivism (Eriksson & Kovalainen, 2015). The research adopted an interpretivist paradigm, which allowed the researcher to apply reality in a subjective way when exploring the topic of study and interpreting the findings. The interpretivist is concerned with the way individuals or groups of people share, understand, and interpret social events and settings (Eriksson & Kovalainen, 2015).

1.9.2 Research approach

The type of approach adopted by a researcher depends on the research question and the objective of the research. There are primarily two approaches to research, deductive and inductive. This research adopted an inductive approach because the researcher developed meaning from the data collected, such that the findings generated was inferred back to theory (Bryman, 2016).

1.9.2.1 Qualitative research

Campbell (2014) explains that qualitative research develops themes by collecting open-ended and emerging data. According to Campbell, qualitative research makes use of an interactive and humanistic method to collect data. Taylor, Bogdan and DeVault (2015) add that qualitative research produces textual or descriptive data that are often in the words (or writing) of the participants. Qualitative research is thus aimed at understanding beliefs and motives that influence people's actions (Hennink, Hutter & Bailey, 2011). The qualitative research method was used to collect data. Although some measure of numbers exists in the data where questionnaires were used, the focus of the data was on textual evidence, namely wellbeing indicators of the youth and the nature of prioritising the wellbeing indicators by the youth.

1.9.3 Research strategy

Pathirage, Amaratunga and Haigh (2008) define research strategy as one of the important decisions directing the course of the research. Service design was used as a guiding strategy for the study.

1.9.3.1 Service design

Service design is a user-centred strategy used to improve users' experience within a service delivery process. It involves working together with users of a service to determine how to improve their experience of the service. Service design is used in the process that co-creates value among users, organisations and other stakeholders (Patrício, Gustafsson & Fisk, 2018). Although service design was about co-creation of

intangible experiences, Sangiorgi and Prendiville (2014) argue that service design has evolved to include the design of tangible products that lead to improved intangible user experiences.

The overarching strategy used in this research is service design. A service design strategy was employed to engage the participants as co-creators of value that would lead to improved ICT interventions that are servicesintendedto improve the wellbeing of the participants. It was adopted based on the need to involve both users and stakeholders in the process of improving services.The participatory approach and co-design instruments are methods often used within service design (Carr, Drummond & Young, 2017; Lam, Zamenopoulos, Kelemen &Hoo Na, 2017). The research used a service design strategy with a participatory approach using co-design instruments to collect local youth wellbeing data from participants and prioritise youth wellbeing indicators. Furthermore, the same research strategy was used in the design and development of the proposed artefact.

1.9.4 Participatory research approach

The participatory research approach (PRA) is aimed at achieving a convergence of the perspectives of the participants and the researcher (Bergold& Thomas, 2012). Participatory research is used to provide a solution to complex problems by involving the people affected by the problem (Wiek, Talwar, O'Shea & Robinson, 2014). This method allows members of a community to be involved in the process of solving their problem. PRA was adopted due to the nature of the research questions, aim, and objectives. PRA allowed the researcher to gain a perspective of the youth in underserved communities within their environment. PRA also provided the opportunity to researchers and the youth to explore solutions to the research questionsjointly, which is the essence of the research, namely youth participation. Based on the participatory approach, questionnaires and data collection instruments for co-design were used in the study. Co-design and questionnaires are discussed next.

1.9.5 Data collection method

1.9.5.1 Sampling method

Purposive samplingis used in qualitative studies toobtain rich data on a topic of interest (Palinkas et al., 2015). Purposive samplingis more effective for collecting data for innovativeresearch or experimental research as opposed to random sampling (Palinkas et al., 2015). Thus, a purposive sampling method was used to select participants for the

research. Youth from the ages of 15 to 35 were purposively selected to match the age range specification for the youth as indicated in the South African National Youth Policy. Furthermore, the selected participants were the youth living in an underserved community and having a sound knowledge and experience of living in this community. Forty(24 and 16) individuals were selected and engaged during the two workshops respectively.

1.9.5.2 Data collection instruments

i) Co-design

Co-design is a data collection instrument where participants together with the researcher design solutions to their problems; it is a method strongly associated with the participatory research approach (Donetto, Pierri, Tsianakas & Robert, 2015). Co-design emphasises that participants know more about their problems and the desired solutions than the researcher knows, and is often employed in service design (Weston, Soanes, Chisholm & Wiseman, 2018). Therefore, the researcher works together with participants to design solutions to the problem. In this study, the researcher worked together with the youth in an underserved community to design and prioritise local youth wellbeing indicators.

ii) Questionnaire

A questionnaire contains the questions that the researcher intends to ask the survey participant, which can be done by answering verbally (interview) or in writing (Brace, 2018). Questions contained in a questionnaire can be structured or semi-structured (Brace, 2018). Structured questionnaires with open-ended questions were used in this study. The first questionnaire (Appendix 4) was used to solicit demographic data from participants and the second questionnaire (Appendix 5) to gain insight into the wellbeing conditions of participants.

1.9.6 Data analysis

The content analysis technique was used to analyse the data. One of the ways to apply content analysis is to engage in the frequency count of words (Stemler, 2001). Content analysis uses a procedure to draw inferences from texts concerning the sender of the message as well as the message itself (Weber, 1990). The authors argue that context analysis may be used for several purposes, including the coding of open-ended questions and unveiling the focus of an individual or group, among others. Content analysis can be used both inductively and deductively (Mayring, 2000). In qualitative

content analysis – which uses the inductive approach – categories are firstly identified from the theoretical background that the data are grouped into; the unit of analysis is identified next, and then the data are selected and appropriately categorised, where after the data are analysed quantitatively (Mayring, 2000).

For this research, a qualitative content analysis method was used because the researcher coded the data from open-ended questions to unveil the focus (priority) of the youth group. The wellbeing indicators selected by the participants were prioritised by coding the frequency of each wellbeing indicator.

1.9.7 Research ethics

Struwig and Stead (2013:72) recommend that researchers should follow the guidelines for conducting research because it is an ethical endeavour. Ethical clearance was obtained from the Faculty of Informatics and Design (FID) of the Cape Peninsula University of Technology. Ethical clearance was further sought from Theewaterskloof Municipality to allow researchers to collect data from the community. Consent was also sought from youth who participated in the research. The anonymity clause, which explains that the identity of participants will be protected, was read to participants. Participants were also asked to sign the consent forms, thereby indicating their willingness to participate in the research. They were informed of their right to leave the research at any point in the study and that they are not obliged to answer any question should they not be comfortable to do so. Section 3.11 provides a more detailed explanation of how ethical considerations were covered in the research.

1.10 Delineation

This research attempted to develop locally determined wellbeing indicators by the youth in an underserved community located in the Western Cape Province of South Africa. No other indicators were assessed.

The methodology, framework, and artefact presented as outputs in this research are limited for use in determining suitable ICT interventions for an underserved community. Although it may be possible to use it for other types of interventions, the researchers limited the scope to ICT interventions such that the argument presented in the background of the research and the research questions are properly aligned to the processes and findings.

The artefact referred to in this study was concluded at the design stage, which sufficiently answered the research question. A medium fidelity prototype was designed. However, the prototype was not presented to the participants in the co-design session, due to the limited time available for the research.

1.11 Research assumptions

The researcher assumed that the youth of the selected underserved community have the ability to identify their wellbeing needs and to prioritise them to reflect the true nature of their wellbeing needs. The researcher further assumed that there might be a difference in the indicators developed by the youth of the underserved community compared to those provided by stakeholders of wellbeing rankings and stakeholders of ICT interventions.

1.12 Significance/contribution of the research

This research is particularly important because of the limited literature available that connects wellbeing to ICT and to ICT interventions. This is significant because the needs of underserved communities differ and vary largely from the needs of well-served communities. Interventions to improve the wellbeing of underserved communities are often introduced with the assumption that it targets one or a few of the needs of the community. Subsequent to frequent failures, the wellbeing indicators developed in this research will be useful to stakeholders of community interventions to understand the current state of the community in terms of the prevalent issues and needs. It will help to understand the wellbeing priorities of the community, hence highlighting the issues that should be targeted for maximum impact on the wellbeing of the youth in the underserved community.

Since wellbeing indicators are tools for assessing economic and social development, it can also be used to assess the impact of ICT interventions on the socio-economic development of the underserved community. Assessing the impact of specific ICT interventions on the youth requires a pre- and post-assessment before and after an ICT intervention is introduced. When wellbeing indicators are re-prioritised after a considerable time of having exposed the youth to specific ICT interventions, the impact is determined by how each indicator targeted by the intervention has moved on the priority list. The movement reflects the extent to which the need for the specific indicator has been met or not. Hence, it provides a means to evaluate the impact of ICT on

development in the underserved community identified by the authors as challenging, as stated in the background of the research.

The importance of this research is that when interventions are objectively targeted and adequately measured, it will affect the community positively by reducing the wasting of resources in terms of time and money expended on the deployment of non-impactful ICT interventions. Overall, it will improve the quality of the lives of the youth living in this community by reducing inequality. Also, a general improvement in the wellbeing of people living in the underserved community will bring the nation closer to its National Development Plan, targeted at reducing inequality by the year 2030 (South African National Planning Commission, 2013).

1.13 Summary

This chapter provided a broad overview of the problem statement and research questions. The main aim and objectives of the study as well as the significance and contribution of the research were presented. The problem statement elucidated throughout literature is that the lack of youth engagement in prioritising the wellbeing indicators in underserved communities often leads to the design of mismatched interventions, resulting in wasted efforts and resources with no visible impact on the wellbeing of the youth. The problem statement has led to the formulation of two research questions: 1) How can youth wellbeing indicators for underserved communities be developed? 2) How can youth wellbeing indicators be used to determine ICT needs in underserved communities? Therefore, the study aimed to explore how youth wellbeing indicators can be used to facilitate effective ICT interventions for youth empowerment and development in underserved communities in South Africa. A further aim was to develop an ICT-based artefact to prioritise youth wellbeing indicators in underserved communities in South Africa.

The overarching significance of the study is the provision of sustainable ICT interventions to improve the wellbeing of the youth living in underserved communities. Service design was selected as strategy to guide the participation of the youth in designing their wellbeing indicators and priorities as a way of improving the satisfaction and impact of ICT interventions on their wellbeing. The researcher's philosophical assumption was briefly discussed, and a description was provided on how the data were collected and analysed. Furthermore, as a requirement for conducting research, ethical considerations with regard to access to participants, their privacy and consent

were discussed in brief. Findings from the research reveal the process of identifying youth wellbeing indicators. Seventy youth wellbeing indicators were identified. This set of wellbeing indicators provided a pool from which the youth have prioritised their wellbeing indicators. To automate the process described, the technical background for an artefact was designed and presented.

1.14 Organisation of the thesis

This thesis consists of seven chapters and includes references and appendices. The chapters are organised to link the progression of the thesis from the title through to the conclusion. The content of each of the chapters is elucidated in Figure 1.1 below.

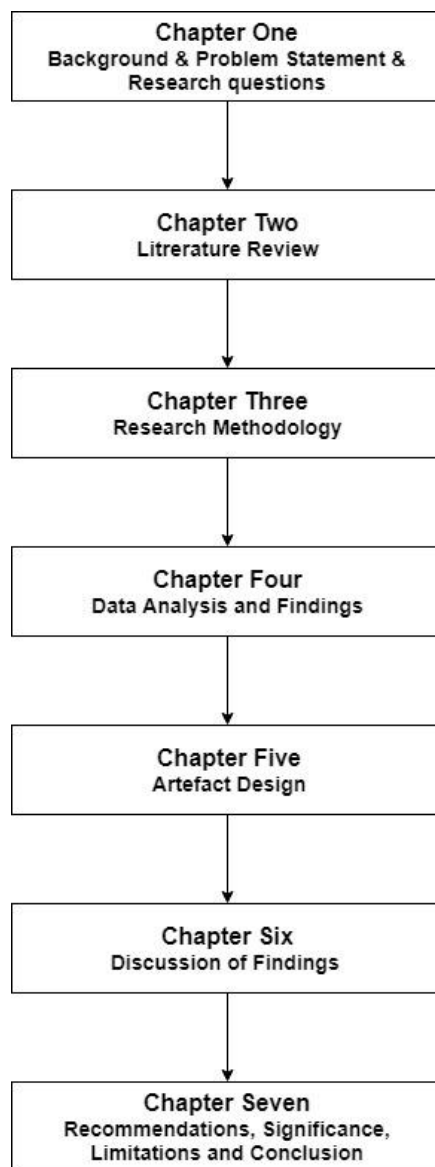


Figure 1.1: Clarification of chapters

Chapter One: The first chapter introduces the research and establishes the problem statement, aims, objectives, and research questions. The methodology adopted in the research is presented, and the limitations (delineations) and significance of the research are explained. The chapter concludes with the layout of the thesis.

Chapter Two: Provides an in-depth review of the literature on the issues of wellbeing in underserved communities, its role players, and the interventions of stakeholders to improve the wellbeing of the youth living in these communities. The review highlights the use of ICT interventions and the plight of digital volunteers in enhancing the quality of life of youth members in underserved communities. An understanding of wellbeing, wellbeing indicators, and some of the common wellbeing indices used for assessing wellbeing are also discussed. The various ICT interventions for underserved communities and the authors' submission of the challenges of evaluating interventions, especially technological interventions, are elaborated on. Finally, ICT interventions, why ICT interventions fail, and the importance of contextual indicators are highlighted.

Chapter Three: Explains the philosophical positions of the researcher and the motivation for the suitability of these positions for the research. The research strategies and means employed during the data collection and analysis are also included. Ethical considerations are discussed.

Chapter Four: Provides a description of the community setting and the activities preceding the data collection. The data collection procedure, analysis, and findings for RSQ1, RSQ2 and RSQ3 are discussed.

Chapter Five: Provides the technical background to the development of the artefact. It provides the answer to RSQ4 through a background on the design of the artefact and technological aspects of the design in terms of functionality. The prototype for the artefact to be used for assessing youth wellbeing in the underserved community is elaborated on.

Chapter Six: Provides a discussion of the findings of the research based on the research questions. The chapter presents the collation of data, the themes, the patterns, and the findings uncovered by the research. Some of the findings were compared to theories and findings by other authors.

Chapter Seven: Summarises the discussion of findings and closing the thesis through presenting the recommendations and conclusion of the study.

The next chapter presents the literature review with a special focus on keywords featuring in the context of the background and problem statement.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

Osman and Tanner (2017) and Gaskin, Vazin, McCleary and Thorpe (2018), among others, posit that national and international concerns regarding improving the quality of life of the youth living in underserved communities have intensified. This chapter synthesises, summarises, and draws rich insights from extant research on the topic of the study. Keywords and concepts related to the study were used in sourcing relevant material from academic databases. Keywords used include wellbeing, indicators, youth, non-governmental organisations, non-profit organisations, ICT, interventions, and underserved communities. Peer-reviewed articles, conference papers, reports, theses, and other relevant materials were sourced from CPUT's subscribed database libraries such as ScienceDirect, Social Science journals, The World Bank Open Knowledge Repository (OKR), Scopus, NewsBank, and Google Scholar to conduct a comprehensive literature study. The literature review covers concepts on the background, research problem, research questions, and aim of the study. The chapter provides a broad analysis and interpretation of related topics under the following headings:

- i) Wellbeing
- ii) Underserved communities
- iii) Interventions in underserved communities
- iv) Wellbeing indicators
- v) Frameworks for ICT interventions in underserved communities

2.2 Wellbeing

According to Bradburn (1969:9), psychological wellbeing is a variable of "primary importance", which is linked to Aristotle's idea of *eudaimonia*, commonly translated as wellbeing. Bradburn (1969) believes that the wellbeing of humans overarches all their actions and places intense focus on the distinction between negative and positive effect. According to this model, if an individual enjoys a high level of psychological wellbeing to such an extent that it is in excess of the negative (variable), then the negative effect of the variable will dominate the positive effect of that variable (Bradburn, 1969). To simplify, this means that the high or low psychological wellbeing of the person affects the manner in which they are able to deal with the situation (Bradburn, 1969). Scholars such as Ryff (1989) criticise Bradburn's work for placing too much emphasis on the positive/negative level of the psychological wellbeing of the individual. Bradburn's (1969)

definition of wellbeing focuses on the psychological reactions of ordinary people in their daily lives to different factors. This view is grounded on the idea of how ordinary people cope with the daily challenges of life and difficulties that they may face. Moreover, Michaelson, Mahony and Schifferes (2012:8) define wellbeing as “how people feel and how they function, both on a personal and a social level, and how they evaluate their lives as a whole”. Human wellbeing is the foundation to a sound society and necessary for a society’s development and prosperity (Alatartseva&Barysheva, 2015). Kubiszewski, Zakariyya and Costanza (2018) summarise the definitions by stating that the understanding of wellbeing is built on people’s ability to access basic needs, which influences how they feel and live.

Although several authors have over the years referred to wellbeing as health or a component of health (Wyn, Cahill, Holdsworth, Rowling & Carson, 2000; Patton et al., 2016), Carter (2019) states that wellbeing consists of five main domains, which are: safety, social connectedness, meaningful access to relevant resources, mastery, and stability. Dalziel (2018) posits that the achievement of wellbeing is concerned with the extent to which an individual perceives to having achieved personal preferences.

One of the problems with this definition is that quality of life (QoL) is used interchangeably with wellbeing (Kim, Woo & Uysal, 2015). The World Health Organisation (WHO) defines QoL as “an individual’s perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns”. The concept appears to be broad and refers to how the individual’s somatic health, personal beliefs, psychological state, social relationships with others, and their relationship to relevant features of their environment influence their wellbeing (WHO, 1997). The achievement of life goals as a defining feature of wellbeing stems from the works of Emerson (1985), whereas other authors opine that wellbeing originates from individuals’ perception and view of their current situation and their ambitions and aspirations (Felce & Perry, 1997; Silva, Duca & Nahas, 2017). The wellbeing of society refers to the benefit of all people within that society. This includes the achievement of adequate economic development (objective dimension of wellbeing) and the quality of life (subjective dimension of wellbeing) (Easterlin, 2015; Dalziel, 2018). Therefore, when evaluating the wellbeing of a particular community or society, it is necessary to measure and use both subjective and objective indicators.

Alatartseva and Barysheva (2015) explain that human needs are categorised into two major types, namely internal (subjective) wellbeing, which is concerned with personal features and characteristics, and external (objective) wellbeing, which focuses on the perception and evaluation of society.

2.2.1 Subjective wellbeing

In terms of what constitutes subjective wellbeing, Diener, Suh and Oishi (1997) assert that subjective wellbeing consists of three interconnected mechanisms: life satisfaction, pleasant affect, and unpleasant affect. Life satisfaction relates to the mental sense of satisfaction, whereas affect refers to pleasant and unpleasant emotions and moods (Diener et al., 1997). Ryff (1989) identifies that wellbeing comprises positive relationships with others, self-acceptance, autonomy, purpose in life, environmental mastery, and realisation of potential. More recently, wellbeing has been coined with the ability to fulfil life goals (The Government Office for Science, 2008), happiness (Den Haan, Ellison, Ilzetzki, McMahon & Reis, 2017) and life satisfaction (National Research Council, 2014). Shin and Johnson (1978:478) define wellbeing as “a global assessment of a person’s quality of life according to his own chosen criteria”, which is still largely used as the standard of wellbeing in recent literature.

Moreover, a stable subjective wellbeing is achieved when individuals consistently have the psychological, social, and physical resources they need to meet a particular psychological, social, and/or physical challenge (Green, Felstead, Gallie&Inanc, 2016). Subjective wellbeing is not stagnant but a dynamic process that changes all the time and can therefore not be measured easily and accurately (Blanchflower & Oswald, 2004; Twenge, Sherman & Lyubomirsky, 2016). Because of the dynamic nature of subjective wellbeing, which is based on the situation, a higher level of wellbeing means a higher ability to deal with difficult circumstances (Twenge, et al., 2016). Subjective wellbeing has been used to test the impact of interventions and a number of theoretical predictions (Tomyn, Weinberg & Cummins, 2015; Weiss, Westerhof&Bohlmeijer, 2016).

2.2.2 Objective wellbeing

Objective wellbeing has been equated to economic development (objective living conditions) and subjective wellbeing is equated here to the individual’s perceptions of quality of life. It represents tangible factors that determine the quality of life of the individual, which can be acted upon to vary the standard of living. These tangible factors include access to healthcare services, social services, information services,

education, housing, food resources, employment, nourishment, sanitation, and general infrastructure. Objective wellbeing indicators provide insight into the amenities available to a community and aid in initiatives for development. Therefore, a change in the objective wellbeing of a given community can be a determinant for development. Objective wellbeing relies on postulations about basic human needs and rights (Susanne & Donna, 2017). Gilbert et al. (2016) submit that objective wellbeing constitutes the standard of living of people and the determinants for the quality of the lives they live. The authors add that this definition makes objective wellbeing relevant to policies. Objective wellbeing measures are concerned with assessing and analysing the scientifically observable conditions affecting the lives of people – individual or community. Hence, objective wellbeing is a crucial factor in the planning and evaluation stages of interventions (Biedenweg, Stiles & Wellman, 2016; Susanne & Donna, 2017). It is therefore important for policy makers to consider the effect of policies on the wellbeing of the people concerned before such policies are enacted (Den Haan et al., 2017). The objective and subjective dimensions of the wellbeing of a community have to be considered to understand their actual wellbeing (Hicks, 2011; Kubiszewski et al., 2018) (Table 2.1).

Table 2.1: Dimensions of wellbeing(Hicks, 2011)

Wellbeing	
Objective Dimension	Subjective Dimension
Objective wellbeing (Economic development -living conditions)	Subjective wellbeing Individual perceptions of residents about their quality of life

2.3 Underserved communities

In broad terms, Theodori (2005) defines a community as a local population expressing a shared sense of identity through interrelated actions. On the other hand, Smith, Levkoff and Ory(2016) emphasise that a community population must share geographical boundaries that include towns and cities. However, the word “community” can refer to a professional group or class of people (Cohen-Scali, Rossier& Nota, 2018). An example of this is the interpretation of a community as a profession in the article titled, “*Are women an underserved community in the information technology profession*”. In this sentence, women are referred to as a community (Trauth&Quesenberry, 2006). Another definition of community found in literature is a

group of people who exhibit similar behaviour or activity. An example is given by Folk, Mashek, Tangney, Stuewig and Moore (2016:341) who refer to a group of criminals as “a community of criminals”.

2.3.1 A global perspective of underserved communities

Underserved communities refer to a group of people living in a disadvantaged area, lacking basic amenities and opportunities such as good healthcare facilities, roads and sanitation (Myers, Kline, Doherty, Carney & Wechsberg, 2014). Such communities are also referred to as “disadvantaged”, often riddled with high unemployment rates, high crime rates and poor infrastructure (Myers et al., 2014). Underserved communities are often referred to as a group of unprivileged people living in areas identified by the government as poor; informal settlements also share similar characteristics with underserved communities (Trauth & Quenenberry, 2006; Mash et al., 2015). These communities are largely found in townships, informal suburbs, rural environments and many of the farming communities in the country.

The existence of underserved communities is not limited to underdeveloped or developing countries of the world. Underserved communities exist even in developed countries such as the United States of America and the United Kingdom (Joseph & Golden, 2017; Fizer, Bruine de Bruin & Stillo, 2018). From a global perspective, underserved communities are almost synonymous with rural areas and most of the articles on underserved communities can be linked to rural areas (Grobler, Marais & Mabunda, 2015; Preston et al., 2018; Reid, Peacocke, Kornik & Wolvaardt, 2018). Authors from different parts of the world have carried out various research studies on the socio-economic lives of members in underserved communities, experimenting on various ways to improve the quality of life in these communities. The high percentage (46%) of the world population living in rural underserved communities may explain why these communities have gained attention in recent times (Dixon, 2015). Corburn and Sverdlik (2019) add that approximately 900 million people worldwide live in slums and improper houses that can be referred to as underserved communities. In literature, several underserved communities are addressed by different names, such as underprivileged communities (Mohammad, Al-Mekhlafi, Moktar & Anuar, 2017), poor-resourced communities (Preston et al., 2018), and marginalised communities (Byrne, 2018).

In most countries, with the United States of America (USA) and South Africa as examples, certain races and ethnic groups are identified as mostly living in underserved communities (Joseph & Golden, 2017). In the USA, the highest racial/ethnic minority group is the Black Americans, followed by the Hispanics (Hou & Cao, 2018). Several authors have identified that the minority groups in the USA suffer inequality compared to their white counterparts (Thiede, Sanders & Lichter, 2018). Due to the socio-economic gap between the minority racial/ethnic groups and the majority of whites, most of the underserved communities are occupied by the minority groups (Ashing-Giwa et al., 2004; Fastring et al., 2018). The underserved American communities are characterised by a lack of access to health (Joseph & Golden, 2017), economic inequalities (Bor, Cohen & Galea, 2017), drug use (Cooper et al., 2016) and crime (Short Jr, 2018). Otherwise, the minority groups are classified as underserved populations, indicating that they are underserved irrespective of where they live, as they may not be bound by a geographical boundary (Reiss, Levitan & McNally, 1982; Strauss et al., 2018). However, underserved populations may create underserved communities, as there tends to be wellbeing clusters (Dudgeon, Bray, D'costa & Walker, 2017).

Furthermore, several issues are found to affect the wellbeing of people living in underserved communities across the world. In Australia and the USA, for instance, health challenges, including an increasing number of people suffering from diabetes, are reported (Joseph & Golden, 2017). Australia is one of the countries in the world that has explored the concept of wellbeing analysis and measurement as a means to improve the lives of their citizens, especially the youth. The Australian Research Alliance for Children and Youth (ARACY) is an initiative by the Australian government to improve the wellbeing of children and youth (Smith, 2016). Australia not only explores the wellbeing concept of the youth on a national scale, they also explore the wellbeing of the Aboriginal youth who are believed to be from underserved communities (Priest, Paradies, Gunthorpe, Cairney & Sayers, 2011; Tomin, Cummins Norrish, 2015). Authors submitted that some of the most reported obstacles to the wellbeing of the underserved youth in Australia are racism, discrimination, and the impact of the Australian stolen generation (Bodkin-Andrews & Carlson, 2016; Dobia & Roffey, 2017; Marmor & Harley, 2018).

2.3.2 The nature of underserved communities in South Africa

The growing number of informal settlements and underserved rural communities influenced the submission by Lorini, van Zyl and Chigona (2014), quoting the World Bank (2014), that South Africa ranks highest in terms of inequality worldwide. Individuals settle in poor and undesirable living environments due to inadequate housing provision (Corburn & Sverdlik, 2019). Dudgeon et al. (2017) agree with the notion that people build social divides and create clusters based on their level of wellbeing. The authors posit that one of the reasons for the existence of several underserved communities in South Africa can be linked to human clustering.

Jones (2016) asserts that the emergence of underserved communities in South Africa is associated with the manner in which power was wielded during the apartheid period. Similarly, according to Graven (2014), inequality and poverty in South Africa were fuelled by years of pro-apartheid, followed by poor developmental structures. The pervasiveness of underserved communities in South Africa is due to the domineering practice and policies of the commanding elite class during the apartheid era that forced people of colour, i.e. "Africans" and "coloureds", to live as sub-citizens (Ross, 2017). The segregation policies of the apartheid era were designed to propagate inequality between social classes and deny the labelled lower class citizens access to basic amenities (Hino, Leibbrandt, Machema, Shifa & Soudien, 2018). Furthermore, Kon and Lackan (2008) as well as Fusheini and Eyles (2016) argue that the combination of inequality between social classes combined with discrimination based on gender, culture, race, and sexual orientation contributes immensely to challenges facing underserved communities in South Africa. Today, many underserved communities are by-products of South Africa's apartheid past, where the rural-urban divide further separates society into classes and races.

In South Africa, apart from rural areas, many underserved communities are informal settlements, most of which are found in urban areas. According to the US Department of Economics and Social Information and Policy Analysis (1997:45), "informal settlements are areas where groups of housing units have been constructed on land that the occupants have no legal claim to, or occupy illegally", or "unplanned settlements and areas where housing is not in compliance with current planning and building regulations (unauthorised housing)". Both definitions are true for informal settlements in South Africa; housing is not according to the spatial plan (Todes, 2012) and in most cases, most of the lands were hijacked (Rogerson, 1999; Singh, 2018).

After apartheid, Informal settlements became communities of poor black and coloured South Africans (Oldewage-Theron, Dicks & Napier, 2006; Schoeman, 2018). Houses in informal settlements are built with poor quality cheap materials. Houses are sometimes built of wood or corrugated iron sheets. The land size and population of informal settlements keep increasing due to the unaffordability of house rent, land and property (Marutlulle, 2017). Awotona (2018) argues that the persistent increase in informal houses is caused by the gap between supply of formal affordable houses and demand.

One of the characteristics of informal settlements is overpopulation. Many informal settlements, unlike rural underserved communities, are characterised by a high population. In 2011, Khayelitsha for example was reported to have a population of about 400,000 and Gugulethu about 100,000 inhabitants (Statistics South Africa, 2011). There are over 437 informal settlements in the Western Cape Province alone, with about 146,000 households (Statistics South Africa, 2011). Basic amenities such as water and good sanitation still constitute a challenge to members of these communities (Brown-Luthango, Reyes & Gubevu, 2017). The safety and security of women and children are also compromised (Meth, 2017).

The pervasive nature of informal settlements is a major challenge in South Africa and Africa as a whole. However, a growing number of these underserved communities now exist within close urban settings (Piatt, Seidel, Chen, Powell & Zgibor, 2012; Roy, Hurley, Plumb, Castellan & McManus, 2015). Nevertheless, these underserved communities, despite their proximity to urban environments, still lack basic social and living amenities in contrast to their existing neighbourhoods (Mash et al., 2015).

Apart from informal settlements, similar to other countries of the world, rural communities in South Africa are mostly marginalised and underserved (Msuya et al., 2017). They often lack basic infrastructure, human capital and economic opportunities common to other underserved communities. Another type of underserved communities identified in literature is the communities enclosed within farms that consist of farm workers and their family members (Osman & Tanner, 2017). These communities are said to consist of marginalised young people who live in places that are excluded from prevailing government benefits (Walker & Mkwanzani, 2015).

2.4 Wellbeing in South Africa

The Organisation for Economic Co-operation and Development's (OECD) Report, "*How's life? South Africa*", explains that the places where people live influence their wellbeing largely because of the influence it has on their personal safety, their levels of exposure to air pollution, employment opportunities, and access to basic amenities. Hence, the journal recommends the need for regional perspectives of wellbeing (Peiró-Palomino, 2018).

Hamann, Biggs and Reyers (2016) describe wellbeing as consisting of five elements, namely health, security, basic supplies for a good life, good social relations, and free action and choice. According to Hamann et al. (2016), each South African falls within one of these five elements, which can also be categorised into low, medium, and high-income earners, and each of the three categories is differentiated by (i) unemployment levels, (ii) household income, and (iii) property ownership. Furthermore, the authors submit that South Africa is characterised by the clustering of people according to their levels of wellbeing and that each municipality falls within one of the three categories.

Also, factors such as colonisation, apartheid, social exclusion, inequality, low education, disruption of culture as well as family and community life, especially youth and children, can have a negative impact on the wellbeing of people (Kriegler, 2015). The impact of such factors on the wellbeing of people may be passed on from one generation to another because successive government systems have failed to bring about significant changes in these communities. Members of communities who are poor and underserved are not provided with the same resources available to wealthier families. As a result, poverty and unemployment continue from one generation to the next.

2.4.1 Challenges to the wellbeing of the youth in underserved communities in South Africa

Whitley, Wright and Gould (2016) identify that most children and youth from underserved families lack life-coping skills. These skills include self-regulation, disease prevention, avoidance of substance use, and emotional control. The authors suggest that investment in teaching the youth about life skills is an alternative solution to end the problem of poverty that affects the youth from underserved communities in South Africa (Whitley et al., 2016). The wellbeing of people flourishes when they have the capability to achieve what is important to them. Where there are hindrances in achieving these

values, the wellbeing of people can be compromised. However, this study focused on the wellbeing of people living in underserved communities. The inhibitors to the wellbeing of these communities are revealed in subsequent sections.

The lack of infrastructure and economic opportunities adversely affects the quality of life and wellbeing of members of underserved communities (Harris, Kleiber, Goldin, Darkwah & Morinville, 2017). Underserved South African communities are faced with the lack of access to adequate ICT resources, education, employment, healthcare, and economic opportunities. Authors have reported that members of underserved communities in South Africa often stage protests demanding that the government provides them with better infrastructure and improved socio-economic conditions (Nleya, 2011; Wasserman, Chuma & Bosch, 2018).

Underserved communities are faced with many socio-economic-political and technology challenges that affect their livelihoods and wellbeing, with a population that lacks basic help from society. Moreover, the youth stage is a period when adolescents begin to explore their uniqueness and independence, seeking emancipation from family emotionally and economically while trying to establish self-identity (Basson, 2008). The youth are during this period faced with the need and desire to make certain lifetime decisions that often shape their entire lifetime, albeit the challenges they face in society (Augsberger & Swenson, 2015). The youth require an enabling environment to make meaningful and progressive decisions at a crucial stage of their lives, particularly those in underserved communities who have been limited in one way or the other by society (Gonsalves et al., 2015). Challenges affecting underserved communities, particularly in South Africa, are further identified and discussed below with the focus on youth experience.

2.4.1.1 Poverty and unemployment

Experimenting with adulthood can have both a positive and negative effect on the youth; it can help to master the adult's roles and responsibilities, but it sometimes brings about delinquent behaviours in the youth due to peer pressure or bad influence in the society. The resultant situation leads to early sexual activities, unprotected sex, teenage pregnancy, unhealthy dieting, nonattendance of school, bullying, gangster violence, and stealing and shoplifting, among others (Carney et al., 2019). The youth are also prone to mental challenges such as stress, anxiety, depression, and anorexia if they face non-ideal situations and have unsavoury experiences of societal ills. Cross

and Lauzon (2015) argue that challenges faced by the youth are often compounded by the exposure to extreme poverty and the pressure exerted on them by the vices common in the environment where they live. Marteleto, Cavanagh, Prickett and Clark (2016) state that poverty is mostly found among “African” and “Coloured” youth who reside in rural underserved areas. Their study further found that Limpopo and the Eastern Cape share the highest prevalence of poor young people, followed by the Free State and then KwaZulu-Natal. More urbanised provinces such as Gauteng and the Western Cape show lower proportions of poorer young people. However, due to the high density of underserved communities, most of the young poor urban dwellers are more likely to live in underserved communities.

Youth in underserved areas often lack exposure to job opportunities and have poorer health status than those living in well-served areas. Such factors, according to Cross and Lauzon (2015), negatively affect the economic capacity and social wellbeing of the youth in underserved communities. Challenges facing adults and older people in underserved communities also have a ripple effect on the lives of the youth. Parents who are unemployed, not economically empowered, and socially bankrupt may not be able to prepare the youth for the daunting responsibilities ahead of them (Yoo, Chung & Lee, 2015).

2.4.1.2 Social support

Dysfunctional family systems, single-parent households, parental alcoholic dependence, and substance abuse are vices found among parents in underserved communities, which have a negative impact on the youth (Smokowski, Bacallao, Cotter & Evans, 2015). Levetan and Wild (2016) state that children raised by both parents are found to be able to adjust better to life situations than those raised by single parents.

2.4.1.3 Healthcare services

Scheibe et al. (2016) explain that most people living in rural underserved communities in South Africa lack access to health resources, including education, illness screening, counselling, treatment, and reproductive health services. The authors indicate that these communities suffer from both minor and chronic conditions and there are no healthcare centres at close proximities where they can seek medical help. Due to the lack of basic preventive and diagnosis facilities, the burden of non-communicable diseases is prevalent in underserved communities (Hunter-Adams, Battersby & Oni,

2019). Moreover, Mash et al. (2015) indicate that historically disadvantaged communities have a higher risk of type II diabetes than other populations.

Historically, the youth represented the healthiest sector of the population. However, recent challenges, which include HIV/AIDS, substance abuse, mental illness, poor health, crime, and violence, are removing this advantage. HIV/AIDS is the most critical of these health challenges faced by the youth as they are most vulnerable to infection. Rural-underserved communities have higher rates of HIV infections among adolescents (Le Roux, Davis, Gaunt, Young, Koussa, Harris, & Rotheram-Borus, 2019). Conserve, Middelkoop, King and Bekker (2016) confirm that the prevalence of HIV/AIDS among the youth living in underserved communities in South Africa is high. In addition, the authors reveal that the youth in South Africa face social inequalities and sexual violence. The authors indicate that communication among the youth concerning HIV disease is low and can be a reason for the high rate of disease transmission in the country. Furthermore, the prevalence of HIV/AIDS in underserved communities is linked to poor socio-economic factors among the youth (Shisana, Zungu & Evans, 2016).

Ritchwood, Penn, Peasant, Albritton and Corbie-Smith (2017) indicate that the youth are at the risk of contracting the HIV disease due to inadequate awareness of preventive measures that can be taken to ensure that the spread of the virus is controlled. These challenges influence the wellbeing of the youth in underserved communities and on the community as a whole; therefore, many ICT interventions have been designed by different organisations to address the challenges.

The need to involve the youth in the process of addressing their challenges is advocated in literature (Bernard, 2016; Collinson et al., 2016; Milton-Edwards, 2018). The engagement of the youth in discussions about their wellbeing shows empathy and serves as an inspiration for them to acquire better skills that lead to productivity; it also benefits the society at large (Maconachie, 2014; Ho, Clarke & Dougherty, 2015). Larkins et al. (2015) add that the youth are more likely to address priorities regarding health in their community compared to adults; hence, they are able to provide solutions to challenges faced by their communities. Summarily, Zheng, Hataka, Sahay and Andersson (2018) argue that ICT facilitates development when stakeholders seek information about the development process, power structure, and mechanism that enable the intervention.

2.5 Interventions for underserved communities

Several efforts have been made to address problems faced by members of underserved communities and many stakeholders made an effort to alleviate the suffering of people in these communities. This section describes stakeholders, their functions, and their efforts to better the wellbeing of members of underserved communities.

2.5.1 NGO and NPO activities in underserved communities

Non-governmental organisations (NGOs), also known as non-profit making organisations (NPOs), are formally constituted, non-profit seeking, non-political and, among other factors, must be voluntary (Salamon & Anheier, 1992). NGOs are neither government nor commercial-driven and are meant to fill the gap between government and societal needs (Liu, Kirby & Berger, 2017). Some of the characteristics of NGOs include advocacy activities, non-profit operations, reliance on volunteers' membership and participation, and they are always founded to address a specific goal (Liu et al., 2017). NPOs are instrumental to the production and distribution of required goods and services in contemporary economies and have the role of carrying out humanitarian services in developing countries (Aldashev, Marini & Verdier, 2015). They serve as a vehicle for redistributing the wealth and quality of life indicators, especially in reaching underserved people and communities.

South Africa's statistics showed an 86% rise in the number of registered NPOs from above 65,000 in 2009/2010 to more than 136,000 in 2013/2014 (Statistics South Africa, 2015b). When grouped by the objectives and funding component, the highest are registered for social services, housing development and religious purposes at 36%, 26%, and 17% respectively (Statistics South Africa, 2015b).

The NGOs were found to be very useful during the democratisation period of South Africa. It served as a school where democratic values were taught, and they worked to avoid societal conflicts and represented the interest of the poor (Heinrich, 2001). The HIV/AIDS epidemic has also benefitted from NGO interventions in South Africa. According to Schneider, Hlophe and van Rensburg (2008), the prevalence of HIV/AIDS in South Africa and the intervention of the national plan brought about a large number of NGOs. In 2012, there were about five (5) doctors and 36 nurses per 10,000 people in South Africa and even a lower ratio in underserved communities (Statistics South Africa, 2015b).

The European Union (EU) provided about 250 million rand from 2002 to 2007 to support collaborative efforts between NGOs and the government towards the curtailment of the spread of the HIV/AIDS epidemic in South Africa (Schneider et al., 2008). The National Department of Health in the 2005/2006 financial year allocated 68 million rand to funding NGOs that were engaged in HIV/AIDS and TB care in the provinces (Ndlovu, 2005).

2.5.1.1 NGOs and volunteering activities in underserved communities

A volunteer is a person who donates time, experience, skills or services for a cause without receiving a direct financial reward for the work done (Laczo&Hanisch, 1999: 456; Wilson, 2000). Volunteering is a selfless activity intended to help people that are in need of such an activity (Geiser, Okun & Grano, 2014). Paxton, Reith and Glanville (2014) submit that volunteering is important in building and maintaining a civil society. It is vital because it helps to support the wellbeing of local communities and improves the wellbeing of people, including the volunteers themselves (Hughes, Paxton, Quinsaats & Reith, 2017). The World Health Organisation (WHO, 2008) asserts that volunteering is a major part of community participation in primary healthcare that is useful for the achievement of providing health for all humanity.

The shortage of a health workforce is prevalent in most countries of the world, especially in developing countries and specifically in underserved areas (Nullis-Kapp, 2005; Darzi & Evans, 2016). This has led to a reliance on community health volunteers to support healthcare services especially in underserved communities (Vareilles, Pommier, Marcha & Kane, 2017).

NGOs and NPOs recruit volunteers to accomplish their goals in society, especially those in the rural and underserved communities (Smith, 2012; Naidoo et al. 2018). Due to financial constraints and the quest to get beyond affordable resources, NGOs often rely on volunteers since they earn little or nothing for their time and skills invested in working in NGOs (Woolvin & Rutherford, 2013; Sinervo, 2017).

Some volunteers are specialists in the various fields they offer their assistance; they use their skills to help the underserved communities achieve a higher standard of wellbeing in their areas of expertise (Griggs et al., 2014). However, some volunteers require training and may not have previous knowledge on the field or topic in which they offer their assistance (Schneider et al., 2008; Kanjo et al., 2016). Campbell and Cornish

(2012) argue that some volunteers who are not experts in the field they provide assistance for, are often allowed to work without any form of training.

In 2014, volunteers in South Africa donated about 610.4 million volunteer hours, which amounts to more than 293,000 full-time jobs (Statistics South Africa, 2015a). The Nation saved a total of 9.8 billion rand that would have been spent had the volunteers been paid employees (Statistics South Africa, 2015a).

Volunteers were used extensively by NGOs in the fight against the HIV/AIDS epidemic; they helped carry out different functions at various times, especially in underserved areas of South Africa (Dageid, Akintola & Sæberg, 2016; McVittie, McKinlay & Ranjbar, 2018). Steyn et al. (2005) describe the involvement of volunteers through NGOs as an indispensable extension of the Anti-Retroviral Treatment (ART) solution to people infected with HIV.

An example of an NGO volunteer intervention was the Entabeni Project in South Africa, which empowered poor local women to work as home-based caregivers for AIDS patients in underserved communities (Campbell & Cornish, 2012). Most of the informal caregivers working with the primary caregivers for the wellbeing of people living with HIV/AIDS (PLWHAs) mainly within the underserved communities are volunteers (Akintola, Hlengwa & Dageid, 2013; Dageid, Akintola & Sæberg, 2016). They are helpful in the provision of basic nursing care, education and in monitoring adherence to medication by patients suffering from HIV and Tuberculosis (Schneider et al., 2008).

One of the areas where volunteers in South Africa have made an impact is working as lay counsellors. Lay counsellors are used in areas with scarce human resources to help with psychological and human behavioural changes as an aspect of healthcare delivery to underserved communities (Petersen, Fairall, Egbe & Bhana, 2014). They are recruited from the communities in which they work, with a certain level of education as a requirement to enable them to carry out counselling functions effectively (Peltzer, Tabane, Matseke & Simbayi, 2010). Although lay counsellors are not experts, they are often trained in the topic or field they intend to provide counselling on (Nadkarni et al., 2017) Training provides a basic understanding of the subject, behaviour, ethical and legal issues, supervision, and mentorship.

A study by Petersen et al. (2014), revealed that many lay counsellors are recruited during pre-test, post-test and other types of psychological therapies for PLWHA. Most

of these lay counsellors involved in health counselling and testing are funded through the President's Emergency Plan for AIDS Relief (PEPFAR) by the USA.

South Africa also relies on lay counsellors for psychological interventions in terms of self-management and behavioural changes in people suffering from chronic conditions (Petersen et al., 2014). They are used to attend to patients suffering from moderate to severe depression in primary healthcare facilities in underserved communities (Patel et al., 2017).

Nevertheless, Jackson et al. (2015) indicate that it is easier to find volunteers for the short-term, and that it is a huge challenge to retain volunteers on a long-term basis, especially for long-term projects. Nesbit and Brudney (2010) posit that because volunteering is an unpaid endeavour, volunteers are often in short supply and highly mobile, leading to instability and the inability to sustain any long-term social community work built around volunteering.

However, inadequate supervision, lack of standardised training, poor definition of roles and poor remuneration are some of the challenges facing lay counsellors in South Africa (Peltzer & Davids, 2011; Petersen et al., 2014).

2.5.1.2 International ICT interventions for underserved communities

The eruption of technology and the Internet has enabled the development of technological interventions. ICT has been used to target an overall improvement in access to information, health and educational services in these communities (Chib, 2015). ICT interventions have been used to accomplish national (Itodo & Oluwasesan, 2018) and international goals (Walsham, 2017) and policies towards equity and the improvement of the quality of life in underserved communities. Several humanitarian organisations such as the United Kingdom's Department for International Development (DFID), United State Agency for International Development (USAID), multilateral agencies such as World Food Program (WFP) and the United Nations Children's Fund (UNICEF) (Howden, 2009) are also involved in improving the quality of life in underserved communities. Most of these humanitarian organisations have participated in different projects within different provinces in South Africa, targeting rural and urban (informal settlements) underserved communities (De Satgé & Watson, 2018). The USAID website (usaid.gov, 2019) estimates the cost of assistance provided by the United Nations to South Africa as 459.7 million US dollars in the 2016 financial year.

The website indicates that USAID has provided support in terms of the care, treatment, and prevention of HIV/AIDS, promoting basic education, combating gender-based violence, and strengthening small-medium enterprises. Furthermore, UNICEF has been supporting South Africa since the end of apartheid by creating a safer and healthier living environment for children (unicef.org, 2019). Campbell and Baernholdt (2016) provide an example of how USAID sponsored the training of community health workers in rural South Africa by collaborating with an NGO.

Moreover, it is argued that ICT interventions can facilitate better access to basic services and address the socio-economic inequality in these communities (Hooley, Hutchinson & Neary, 2016; Miah et al., 2017). International, national, and local aid organisations as well as academics and NGOs have included ICT interventions to assist with the development of underserved communities globally (Lorini et al., 2014). On an international scale, a spectrum of ICT4D projects is being deployed to assist the underserved communities in Africa as a means of bridging the digital divide and providing opportunities for economic empowerment by using ICT (Bon et al., 2016). Although a few ICT projects are funded by national government, international organisations such as the World Bank and the United Nations often provide ICT projects as interventions for development in underdeveloped and developing countries of the world (Ashraf, Swatman&Hanisch, 2008; Bon et al., 2016). Osman and Tanner (2017) argue that ICT4D initiatives are useful tools for empowerment and escape from socio-economic inequality in developing countries.

Moreover, authors have reported a number of ICT4D intervention projects deployed to improve the wellbeing of underserved communities in South Africa, citing the examples of *Alice* and *Dwesa*, both in the Eastern Cape Province, as well as *Khanya*, a project that equipped schools in the Western Cape (Chigona&Mooketsi, 2011; Mamba &Isabirye, 2015).

2.5.1.3 Interventions by the South African government

The South African government has provided several interventions to address some of the identified challenges in underserved communities. With the commencement of democracy in South Africa in 1994, the strategy employed was to identify specific areas of need in the country and subsequently to provide interventions for these (Brieger, Sommerfeld & Amazigo, 2015). The African National Congress (ANC) party has led government to recognise the lack of education as well as gender and economic

inequality as factors contributory to gross poverty, especially in underserved communities. Other problems inherited from apartheid were a high rate of casual labour, unemployment, lack of access to basic services, and inadequate infrastructure (Triegaardt, 2006; Stull, Bell & Ncwadi, 2016).

Several pro-poor policies were implemented as a way of addressing the vices of inequality, including the Reconstruction and Development Programme (RDP), which is a socio-economic policy framework implemented in 1994 by President Nelson Mandela of the ANC political party. A similar programme is the National Nutrition and Social Development Programme (NNSDP) (Ardington & Lund, 1996). The RDP Policy White Paper (South Africa, 1994) is a socio-economic policy framework aimed at eradicating apartheid and building a democratic, non-sexist, and non-racial South Africa. The policy was initiated to address the challenges faced by underserved rural communities, which include exclusion in education, welfare, health, transport, and employment. Although it is a national policy general to all South Africans, it targets the poorest and marginalised communities. The government made provision for basic needs such as water, food, sanitation, healthcare, and housing. The number of people living in informal settlements motivated the need for the RDP housing project that provided free houses to poor South Africans.

Another important intervention by the government was the provision of social grants to reduce poverty among groups that are vulnerable to low income (Samson, MacQuene & Van Niekerk, 2006). The beneficiaries of the social grants were children, people living with disabilities, and elderly people. According to the OECD, one of the interventions that helped reducing inequality and poverty was the introduction of social grants for children, pensioners, and people living with disabilities. Social grants have helped to increase access to basic needs such as housing, electricity, and education. These needs are often lacking in underserved communities and some community-based interventions have brought about improved wellbeing for South Africans in these areas.

Other areas where the government has made meaningful contributions include the provision of infrastructure, for example the mini-grid project that aided in providing electricity to rural South Africa (Azimoh et al., 2016). According to the authors, the mini-grid project aimed at improving socio-economic development in the affected areas. Housing interventions were also provided to people living in informal settlements

(Huchzermeyer, 2003; Brown-Luthango et al., 2017). A state-led initiative on storm water management was also recorded in literature (Adegun, 2015). Moreover, several efforts have been made by the government through various national, provincial, and local governments to meet economic and other social challenges of the youth living in underserved communities. One of government's interventions is youth empowerment through the National Youth Development Agency (NYDA) (2015). NYDA provides grants to youth entrepreneurs (Herrington, Kew, Kew & Monitor, 2010).

Tanner and du Toit (2015) add that the South African government has tasked higher education institutions of learning with assisting underserved communities in bridging the social-economic gap. Assisting underserved communities to reduce socio-economic inequality is the third mandate of higher institutions, apart from teaching and research and their socio-responsiveness in the country (Tanner & Du Toit, 2015).

Moreover, authors have reported that the effect of these interventions is not without negative consequences to members of underserved communities. Interventions such as housing and economic empowerment have been said to exclude the males in favour of females (Gibbs, Jewkes, Sikweyiya & Willan, 2015). This condition further excludes previously underserved men and affects their roles as heads and providers of the family. Meth and Buthelezi (2017) reveal that communities of formalised housing provided to members of informal settlements are riddled with crime and high levels of insecurity. The authors explain that despite having formal homes, unemployment among the people is responsible for the rise in insecurity and the lack of safety.

Furthermore, the government has demonstrated its desire to break the digital divide by providing free Wi-Fi hotspots in underserved communities in South Africa (Chigona, Mudavanhu, Siebritz & Amerika, 2016; Budree, Chacko & Fourie, 2017). By improving access to the Internet, the youth in underserved communities can improve their levels of education (Brown, Saint & Russell, 2017) and civic participation (Hashmi, Khanna & Sharma, 2018), have access to information on employment, and are able to socialise. However, Tungela and Iyamu (2018) argue that free Wi-Fi may not translate into access to the Internet in these communities. The low security of information transmitted over public Wi-Fi is of concern to users (Maimon, Becker, Patil & Katz, 2017).

In summary, although many interventions were sponsored by the government, interventions were often targeted at poor people, the youth, or people living in

underserved communities. There are limited articles on interventions designed specifically for the youth living in underserved communities in South Africa. Moreso, there are limited ICT interventions by the South African government.

2.6 Types of interventions in underserved communities

2.6.1 Health-related interventions

People living in underserved communities are more concerned with survival and generally only visit the hospital as a last resort even though they may be critically ill. This attitude contributes to the high mortality rate among people from these communities, often caused by preventable or non-terminal illnesses. As a means of intervention, NGOs, independent volunteer groups, government, and international aids offer several types of health-related screening tests to the youth in underserved communities. Preventive measure such eye tests, HIV screening and diabetes screening are important steps in reducing the burden of disease. In literature, authors report that members of underserved communities are provided with the aforementioned tests (Mash et al., 2015; Rheeder, Morris-Paxton, Ewing & Woods, 2017). HIV/AIDS screening is an important step in reducing the rates of infection and enacts treatment. Countries showing a high prevalence of HIV/AIDS encourage their citizens to undergo voluntary screening in order to ascertain if they have contracted the virus. It is in particular the youth in underserved communities who need interventions to ensure screening tests because of their level of ignorance about the disease, belief in myths, and their state of poverty. The South African government provides screening tests for rural communities in the comfort of their homes (Conserve et al., 2016). Screening tests for non-communicable diseases such as diabetes and cancer have been introduced to all citizens, but specific effort is made to ensure that members of underserved communities undergo screening for early detection and treatment if found to be ill (Rheeder et al., 2017; Ogle, Koen & Niehaus, 2018).

Several efforts have been made to increase the number of health professionals working in primary health care in underserved communities, especially the rural communities (Grobler, Marais & Mabunda, 2015). The government introduced intervention, compulsion, and incentive measures, which implies that some health professionals are mandated to work in these communities. Different types of incentives are provided to increase the chances of retaining these professionals. The use of technology to connect rural hospitals to healthcare professionals at remote locations is also encouraged (Maeder, Ho & Marcelo, 2016). An example of a technology-based health intervention is

tele dermatology (Maeder et al., 2016; Walters, Mars & Scott, 2016). More technology-based interventions are discussed in section 2.6.2.

In South Africa, many information-based interventions have targeted underserved communities, some directed towards mental health, frail care for older people, early cancer detection, providing information, and combating the spread of HIV/AIDS, tuberculosis and sexually transmitted diseases (Bradley, Risi & Denny, 2004; Wechsberg, Luseno, Kline, Browne & Zule, 2010; Malan, Mash & Everett-Murphy, 2016). One such intervention in an underserved area is the Entabeni project that targeted PLWHA. The project recruited and trained individuals for home nursing and counselling skills in order to provide home-based care (HBC) and support to PLWHA in the area (Campbell and Cornish, 2012). Several other types of information-based services include counselling for the management of Type II diabetes by trained health workers (Mash et al., 2015).

2.6.2 ICT-based interventions

One of the growing trends in commerce is the movement from product-based services to ICT-based services (Williams, Chatterjee & Rossi, 2008). Growth in the number of infrastructures such as cloud and web-based technologies has opened source data facilitates for the growth of ICT (Miettinen, Ryttilahti, Vuontisjärvi, Kuure & Rontti, 2014). One of the advantages of ICT-based interventions is its convenience in terms of accessibility to people, thereby replacing some of the traditional services (Hofemann, Raatikainen, Myllärniemi & Norja, 2014).

Over the years, ICT has been used to access, inform and treat health behaviours and aid the delivery of services in underserved communities (Sharmin, Faith, Prieto Martín & Ramalingam, 2017). The smartphone is a popular ICT tool for digital service interventions to many underserved communities. By the year 2016, an estimated 16.5 million smartphone users were registered in South Africa, with an estimated probability of 23 million users by the year 2020. The statistics provided by Poushter (2016) show that by 2014, 46% of the South African youth (18 to 34 years of age) compared to 30% of adults (35 years and above) reported owning smart phones.

Smartphones are useful for connecting people with healthcare professionals, keeping records, monitoring and reporting health status. As the use of smartphones increases, technological interventions are shifting towards the use of these devices as platforms

for improving and maintaining the wellbeing of the members of underserved communities, especially technologysavvy youth. Although issues such as the affordability of a smartphone and poor internet facilities were reported as barriers to internet access, the smartphone still remains the most used ICT in underserved communities (Stanton, Molineux, Mackenzie & Kelly-Hope, 2016). Recently, smartphones have become more affordable, which further increases its usage especially among the poorer population where cost is of high significance (Linguissi, Ouattara, Ntambwe, Mbalawa & Nkenfou, 2018).

Subsequently, different types of ICT-based interventions in the form of mobile applications such as electronic health records and telecentres have been developed for use by members of underserved communities (Du Bois & Chigona, 2018). Mobile applications have been proven as useful tools to spread awareness and information about disease prevention and control (Linguissi et al., 2018).

Another example of an ICT-based intervention is a mobile application developed to provide timely reminders to PLWHA for their daily ART medication. Antiretroviral therapy (ART) has been proven to reduce the morbidity and mortality rate of PLWHA. However, a lack of adherence to ART medication may result in drug resistance and the subsequent death of patients (Pop-eleches et al., 2011; Duggal et al., 2018). Mobile applications have been proven to advance the lives of PLWHA by reminding them to adhere to their ART treatment (Pop-eleches et al., 2011; Källander et al., 2013; Arya et al., 2018). Other mobile applications include delivering digital service interventions for the prevention of mother-to-child transmission by providing unlimited access to healthcare workers to monitor mothers and their breastfed babies (Linguissi et al., 2018).

However, Hofemann et al. (2014) submit that despite several opportunities made possible through ICT-based interventions, organisations still struggle to provide services that are needed by users. The misalignment between intervention and need may lie in the technological centeredness of the approach used in developing software. This means that technically superior solutions may not be valuable and user-friendly to the intended users. Therefore, some authors propose the use of service design to improve the alignment between users' needs and the proposed ICT interventions (Williams, Chatterjee & Rossi, 2008; Hofemann et al., 2014; Miettinen et al., 2014).

Des Jardins et al. (2017) agree that the introduction of technology to improve health in underserved communities can be challenging due to a lack of technical support, expertise, and inadequate infrastructure for connectivity and financial resources. However, Des Jardins et al. (2017) affirm that technology can be useful in addressing the problems of health disparities and inadequate healthcare services in underserved communities. Although community-based interventions have the potential for satisfying the need for primary healthcare in underserved communities, the ability to expand access to health services has not been tested over time (Brieger et al., 2015). One of the problems identified in providing healthcare to underserved communities is the recruitment and retention of sufficient health professionals to attend to the needs of community members (Jiménez et al., 2016).

However, despite the high potential offered by ICT, Chib, May and Barrantes (2015) observe limited evidence between ICT interventions and poverty eradication. Tanner and du Toit (2015) argue that despite different international and locally based interventions aimed at eliminating the socio-economic inequality of members in underserved communities, it may not be as effective as inequality deepens. The authors add that the ICT4D initiatives can be a solution. However, failures were reported of several ICT interventions that involved ICT4D initiatives and other donor organisations (Mamba & Isabirye, 2015; Chipidza & Leidner, 2017).

2.6.2.1 Causes of ICT intervention failures in underserved communities

Various reasons for failing to effectively utilise and derive benefit from ICT interventions designed to aid people living in underserved and rural areas have been highlighted in literature. Many underserved areas in South Africa exist below subsistence levels and remain impoverished (Mamba & Isabirye, 2015). Furthermore, basic infrastructure types such as electrical reticulation and communications, which are necessary pillars for economic growth, have remained underdeveloped in many deep rural communities in South Africa (Salemink, Strijker & Bosworth, 2017). This is especially true for the ICT sector. Access to information plays a vital role in the emergence of global information and empowers underserved communities through skills enhancement, poverty reduction, and overall improvement of their quality of life. However, underserved areas face many challenges in accessing basic technology (Salemink et al., 2017). Some of the challenges identified by literature are provided in this section.

2.6.2.2 Power challenges

The single greatest challenge faced by underserved communities is the lack of consistent, reliable, and affordable electricity, which hinders the computing infrastructure for rural health and wellbeing informatics (Mamba & Isabirye, 2015). The majority of underserved areas are located in remote and rural parts of the country and have no access to main power; where available, such power is in most cases largely unreliable. In addition to being undependable, the instability of these power mains often poses a threat to unprotected electronic equipment (Salemink et al., 2017). Some underserved areas have come to rely on diesel generators as the most common power source, but the increasing costs of fuel and constant maintenance issues means that the generators only run for a few hours a day and are prone to unexpected failure (Mamba & Isabirye, 2015). Solar power as an alternative is simply too costly when deployed to back other computing hardware. The logical immediate alternative lies in low-power consumption hardware that is cost-effective to run on solar (or other renewable source) or using partial-grid power (Correa & Pavez, 2016).

2.6.2.3 Environmental challenges

The physical environment is the second largest challenge faced by underserved and rural areas (Correa & Pavez, 2016). Factors such as dust, heat, and humidity in the physical environment of rural areas pose many challenges for standard computer hardware (Mamba & Isabirye, 2015). Dust and heat compromise sensitive electronics by shorting circuits and impeding airflow and heat dissipation whereas humidity causes corrosion, condensation and even mould, causing electrical problems (Hudson, 2013).

2.6.2.4 Connectivity and cost challenges

Connectivity, bandwidth, and costs are some of the many obstacles to the most promising ICT interventions and applications such as telemedicine and other real-time diagnostic training initiatives in underserved areas (Lun et al., 2013). The lack of internet access impedes basic efforts to collect and analyse information for ICT deployment (Salemink et al., 2017). For example, the lack of reliable connectivity causes difficulties such as virus control and system updates for core IT functions, leading to an increase in cost and a reduction in use value. However, the existence of ICT tools may overcome these challenges for a growing number of underserved communities in sub-Saharan Africa and other parts of the world (Hudson, 2013). The rapid growth of cellular networks globally translates into connectivity and affordable data services for these communities (Velaga, Beecroft, Nelson, Corsar & Edwards, 2012). Salemink et al. (2017) argue that although most networks in South Africa do not

yet provide high-speed connectivity in rural areas, they are able to support a number of low-bandwidth applications such as email. Velaga et al. (2012) state that further expansion and upgrade of these networks will provide crucial connectivity to a large number of rural communities and will be better able to support data-intensive applications.

2.6.2.5 Human resources challenges

The human obstacle to sustain ICT interventions in underserved areas is a very important issue (Islam & Hoq, 2017). Most members of underserved communities are inexperienced computer users and acceptance of ICT interventions by underserved communities may be identified as challenges to the efficacy of such interventions.

2.6.2.6 Inexperienced computer users in underserved communities

According to Salemink et al. (2017), digital exclusion is a major issue in addressing social, economic, and cultural equity in countries such as South Africa. The foremost digital exclusion issue in South Africa is the current lack of e-skills in underserved rural communities (Nkosana, Skinner & Goodier, 2016). Most of the members of these communities do not possess ICT-related knowledge, skills, and competencies and as a result, they are not able to harness the benefits of ICT interventions deployed in their areas (Dzansi & Amedzo, 2014). E-skills are necessary tools to achieve equitable prosperity and for the overall improvement of quality of life.

2.6.2.7 Technology rejection in underserved communities

ICT interventions are based on improved technology and the acceptance of technology by targeted users is critical to delivering a targeted outcome. Kambunga, Winschiers-Theophilus and Goagoses (2018) argue that technology acceptance is a major challenge in underserved communities. The impact of ICT is dependent on the extent of use by the community, while the utilisation of technology is dependent on the acceptance of users. Kambule, Yessoufou, Nwulu and Mbohwa (2019) cite an example, although not an ICT intervention, members in Soweto, the largest township in South Africa, revolted against the supply of pre-paid meters for assessing electricity consumption in their community. According to the authors, their study reveals that community members were not adequately consulted and educated on the technological introduction coupled with a bias against government initiatives generated by failed politically motivated promises.

Several authors investigated the causes of technological resistance or rejection in underserved communities in South Africa (Cilliers&Flowerday, 2014; Foko, Thulare, Legare&Maremi, 2017). Factors affecting the acceptance of technology by targeted users have also been explored by these authors, who adopted and proposed different frameworks to guide the adoption or the evaluation of adoption.

2.6.2.8 Lack of alignment between ICT interventions and community needs

It has been argued that ICT interventions to enhance the wellbeing of the youth in underserved communities in Africa lack the ability to meet the unique needs and characteristics of these specific communities (Lorini, 2015). These communities have different challenges and there is a need to understand their uniqueness in order to address them effectively in different ways. The variant and unique challenges in underserved communities imply that a common ICT intervention would affect one community more than another. Moreover, Bon et al. (2016) provide support by stating that international donors and developers often remain in their native communities when deciding on interventions for underserved communities in Africa. This practice is not aligned with the fact that the wellbeing needs of a community are often influenced by the value system inclusive of their cultural and the socio-economic capacity. In order to align ICT interventions to the contextual characteristics of these communities, the geographic and social distinctions of such communities should be identified since they vary in terms of language, culture, and composition, which influence their value systems (Bon et al. 2016). Thus, stakeholders need to understand the wellbeing, status, and priorities of underserved communities in order to facilitate proper assessment of applicable ICT tools that are necessary to develop an effective intervention. Therefore, interventions should be based on collective needs and priorities attached to the needs in the community.

Furthermore, stakeholders often fail to take stock of pre-existing ICT tools available in the community (Ouma & Herselman, 2008). This leads to the introduction of ICT interventions that lack the necessary infrastructure and tools to enable absorption by the community. Such practices often limit the impact of the intervention and result in wasted resources that negatively affect the users' experience and add to their frustration (Veldsman & Van Greunen, 2015).

Although authors offered various reasons for the failure of ICT interventions in underserved communities in Africa, some of the identified reasons and challenges may

be related to power supply, environment, and connectivity issues (Mamba & Isabirye, 2015). As such, to deliver a more inclusive and effective intervention, it is essential to consider the generalised perception of the wellbeing needs of a community and how it may impact the efficacy of such ICT interventions in achieving the identified wellbeing objectives (Gillett-Swan & Sargeant, 2015). Therefore, ICT interventions need to consider wellbeing indicators that can provide an overview of the needs and possibilities in the community. Barrett and Slavova (2017) assert that for ICT to benefit members of underserved communities, ICT and its users must be considered as a socio-technical system.

In summary, it has been established that ICT interventions lack connection with local context, wellbeing needs, and the priorities attached to these needs, and this often results in a mismatch between the technologies deployed and the actual needs of the community (Bon et al., 2016). The various challenges, which led to the identification of several ICT implementations and evaluation frameworks, were discussed in this section. The next section focuses on different frameworks and the theories that inform these frameworks.

2.7 Wellbeing indicators

The quest to provide adequate indicators through which socio-economic development, impact, and influence are measured is on-going (Maggino, 2016). This section presents a discussion on international and local indicator systems that deal with wellbeing and human development. Kozma and Wagner (2005:35) define indicator as “a piece of information which communicates a certain state, trend, warning, or progress to the audience”. Choi and Sirakaya (2006) state that indicators were first invented to statistically measure social changes and trends. The authors explain that indicators were invented due to the dissatisfaction of politicians and researchers with the quantity and quality of social information (Choi & Sirakaya, 2006).

Azzopardi, Kennedy and Patton (2017:3) define indicator as “a summary measure of an outcome of interest”. The authors add that indicators always relate to outcomes. The use of indicators is essential in the quality or outcome evaluation of public health interventions, consequences or treatment (Hall & Lynskey, 2016; Hamilton, Leskovec & Jurafsky, 2016). Indicators are necessary tools to monitor and evaluate programmes for the purposes of financial accountability and improvement (Shukla, Teedon & Cornish, 2016). Indicators can depict the quality of care that a group, service, users or a certain

population can access, which can be obtained from recorded data about specific aspects of the care they receive (Prosser-Snellings & Morris, 2017). Indicators are essential to monitor the progress of programmes and policies, or to identify problem areas that require action (Azzopardi et al., 2017). Azzopardi et al. (2017) list four criteria for defining quality indicators. An indicator must: (i) be reliable, valid, easy to interpret and similar across setting over time; (ii) be measurable with a strategy to measure it; (iii) be timely, addressing a topic of interest or of public policy; and (iv) facilitate action and be linked to policies or programme priorities.

A sustainable public health intervention requires the identification of the actual beneficiaries of the intervention (Rey-Garcia, Liket, Alvarez-Gonzalez & Maas, 2017). Despite the contributions of technology to different spheres of life, its ability to effect social change and improve human wellbeing has been contended. Often, there is controversy over indicators proposed for evaluating the impact of technology on social change (Tisdell, 2017). Due to the complexity of wellbeing and the lack of consensus on its definition across various disciplines, evaluating wellbeing can be challenging. However, Gillett-Swan and Sargeant (2015) argue that there is a need for an interdisciplinary definition of wellbeing so that wellbeing can be objectively measured using a common criterion. Although this yardstick may be lacking, the common measure for wellbeing in the economic/human capital domain is using indicators. Similar to wellbeing having two dimensions, wellbeing indicators are categorised into two types that are used for evaluation – objective and subjective indicators. The objective indicators reflect the opportunities and resources accessible to people, while subjective indicators measure the way individuals perceive their lives (Gilbert et al., 2016). Rastegar, Hatami and Mirjafari (2017) identify four indicators to measure wellbeing, namely economic, physical, environmental and cultural indicators, with each of these having its own variables that further define it.

However, one of the challenges in the evaluation of interventions targeted to enhance wellbeing lies in knowing which indicators to use within a particular context (Dolan & White, 2006; Bon et al., 2016). Although authors often use subjective wellbeing indicators to evaluate the success of interventions, their argument is that the result of tangible socio-economic factors can be measured through happiness and reported personal satisfaction or optimism of an individual (Kubiszewski et al., 2018; Reyes-García et al., 2016). Western and Tomaszewski (2016) submit that objective wellbeing measures achieved through relevant indicators despite being assessed in a

subjective manner (self-reported) represent the status of the individual better than subjective wellbeing measures. Kubiszewski et al. (2018) encourage a proper understanding and use of subjective and objective indicators in wellbeing assessment.

Moreover, emphasis is placed on the need for the continuous re-evaluation of indicators to determine their relevance to outcome within the context of the evaluation (Lila, Oliver, Catalá-Miñana & Conchell, 2014). In addition, Prosser-Snelling and Morris (2017) recommend that a rigorous process should be followed in the development of indicators to ensure their relevance to the objectives they seek to measure.

2.7.1 Subjective wellbeing indicators

Subjective wellbeing evaluation measures how much people are happy with their lives mostly based on their living conditions (Diener, Oishi & Tay, 2018). Van Tongeren and Burnette (2018) argue that a valid wellbeing account for a given set of people can be measured by their happiness and life satisfaction. It has been used extensively to determine the level of happiness of individuals with variations in their health, environment, economic status and other objective factors targeted by interventions (Cross & Lauzon, 2015; Kendall, Nguyen & Ong, 2017). Although subjective wellbeing measures are not often linked to policies, it is complementary to objective wellbeing because it provides insight into individuals' experiences, which most often stem from the impact that the objective factors have on their lives (Gilbert et al., 2016). Subjective wellbeing is influenced by societal outcomes; hence, it may also have an impact on policies (Gilbert et al., 2016).

According to Hicks (2011), subjective wellbeing is subjective because it is based on self-report and it measures subjective factors. Furthermore, subjective wellbeing may correlate with objective wellbeing because data on subjective wellbeing can be presented as consequences of the status of objective wellbeing (Hicks, 2011). The subjective wellbeing measure (life satisfaction) is most frequently used for a quick insight into the wellbeing status.

In conclusion, Bakar et al. (2015) argue that although sustainability and wellbeing are targeted at improving the quality of life of people, sustainability is future-oriented while wellbeing is concerned with the present. The authors add that although the factors denoting wellbeing may not necessarily indicate sustainability, there is a need to marry the two concepts in order to achieve sustainable wellbeing for people and communities.

Moreover, Adler and Seligman (2016) argue the importance of understanding both the indicators and the wellbeing of a given group before attempting to resolve issues and find appropriate solutions to specific challenges. The authors add that measuring changes in the quality of life of individuals using wellbeing metrics can be useful to decision policy makers to influence change.

Although many wellbeing indicators have been used over the years, there are still shortcomings in the statistics, such as unreliability of the data and gaps in time series (Lila et al., 2014). If the objective of these indicators is to improve quality of life, investments need to be made to produce high-quality data that will make it possible to measure the quality of life. To measure subjective wellbeing in underserved communities, two types of subjective wellbeing indices are reported in the literature – the Personal Wellbeing Index (PWI) and the Community Wellbeing Index (CWI).

2.7.2 Personal Wellbeing Index (PWI)

PWI assessment has been used extensively in literature (Scott et al., 2017) to assess an individual's wellbeing and recovery from several health challenges such as drug addiction and chronic illness (Scott et al., 2017). PWI has also been used to validate the beliefs, spirituality, and functionality of family members and community members (Karimi & Zarei, 2017; Sarriera et al., 2014; Lai, Cummins & Lau, 2018).

PWI is used to compare the quality of life across cultures (Moller, Roberts & Zani, 2015). Moller et al. (2015) explain that the meaning of the wellbeing indices in PWI can get lost in translation; therefore, the authors translated PWI into IsiXhosa – one of the eleven official languages in South Africa. The study was carried out in Rhini, East of Grahamstown in the Eastern Cape (South Africa). The result of the study shows that spirituality ranked the highest, while living standard and future financial security ranked the lowest. By using PWI queries, Australia was able to develop the subjective wellbeing of its citizens (Cummins, Eckersley, Pallant, Van Vugt & Misajon, 2003).

2.7.3 Community Wellbeing (CWB) Index

The CWB Index is a means to examine the wellbeing of individual communities (Kee, Kim & Phillips, 2015). Various indicators of socio-economic wellbeing, including education, labour force activity, income, and housing are combined to give each community a “wellbeing score” (Kee et al., 2015). Community wellbeing “can be assessed across a large range of possible domains of life, but almost always includes

some variant of health, economy, social relations and security” (Atkinson et al., 2017:3). The CWB Index is made up of the four components: income, education, housing, and labour force (Kee et al., 2015). It is common to assume that the sole determinants of community wellbeing are the individuals in the community, as illustrated in Figure 2.1.

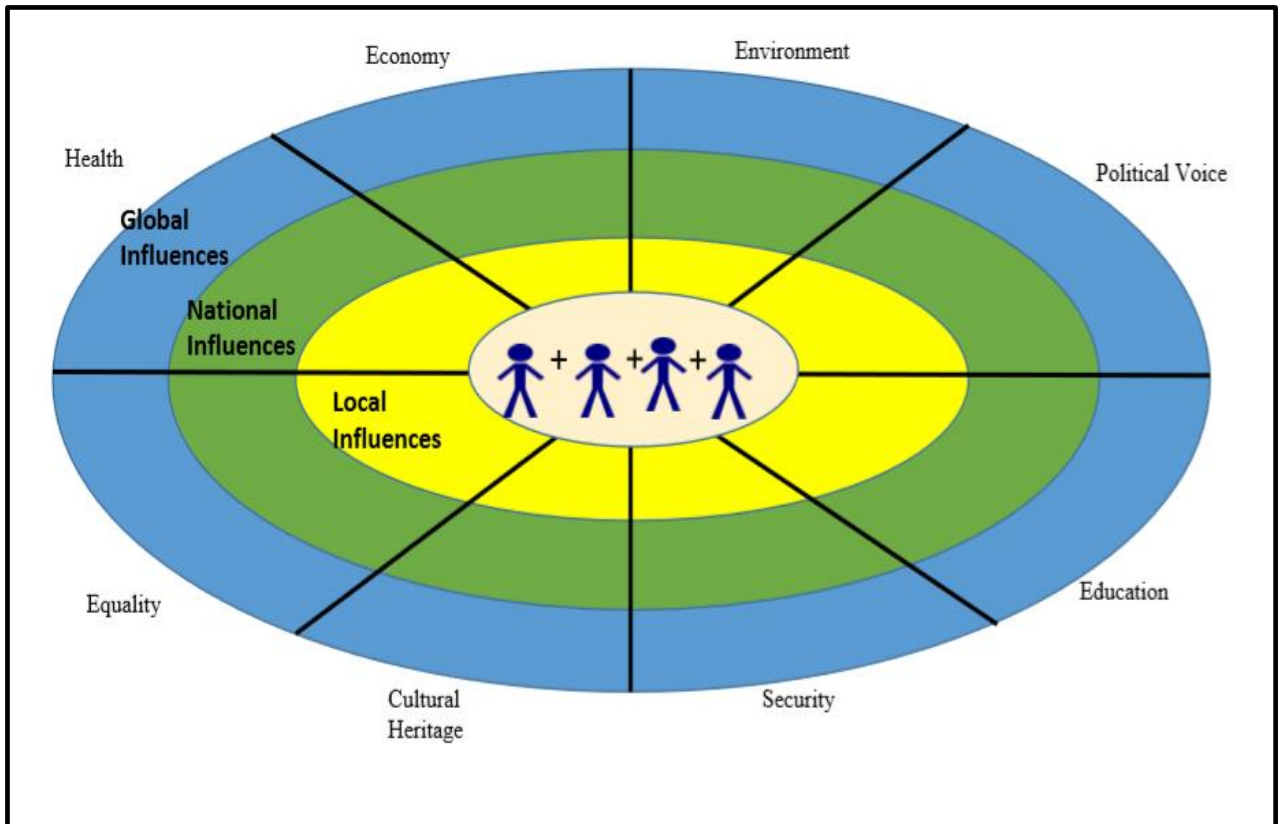


Figure 2.1: Assessment of CWB based on individual wellbeing (Atkinson et al., 2017:31)

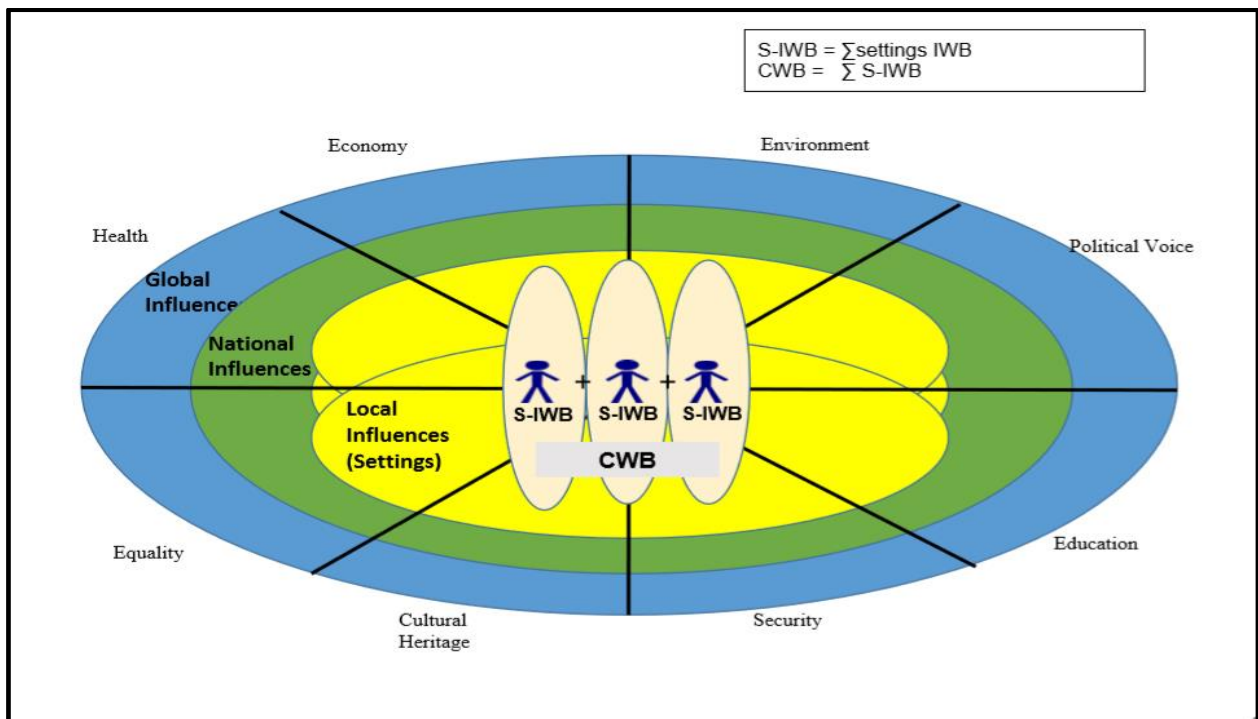


Figure 2.2: CWB determined by summation of IWB and other community factors(Atkinson et al., 2017:33)

However, Lee and Kim (2015) argue that community wellbeing is beyond the sum of the wellbeing of individuals. Atkinson et al. (2017) add that factors such as inequality, sustainability, inter-generational relations, and cultural heritage, which are important to community wellbeing assessment, are often excluded. Community wellbeing is beyond the summation of individual subjective wellbeing outcomes. As shown in Figure 2.2, community wellbeing is the summation of individual wellbeing outcomes added to the evaluation of distinct community assessment outcomes.

Davern, Gunn, Giles-Corti and David (2017) argue that impactful interventions using community indicators require a longstanding struggle, training, partnership and research. However, the CWB Index is considered a useful method of evaluating the socio-economic wellbeing at community level. The information drawn from these indicators may help inform policies, programmes, and interventions aimed at improving the wellbeing of underserved communities. The CWB Index also indicates where improvements in wellbeing have been achieved and where important gaps still exist. McCrea, Walton and Leonard (2016) emphasise the importance of role played by local communities in improving their own wellbeing. Community wellbeing can be assessed by capturing the narrative of community members, which articulates how they feel about their wellbeing and the interventions available in the community.

2.7.4 International wellbeing indicator systems

The concept of sustainable development in underserved communities has multiple dimensions and aims to improve the subjective and objective wellbeing of members of these communities. The study of wellbeing has gained considerable ground over the past decades, leading to the development of wellbeing indicators by a number of international institutions, including the EU and UN (National Research Council, 2014).

These indicator systems include:

- EU Sustainable Development Indicators (EU SDIs)
- UN Indicators for Sustainable Development (UN ISDs)
- OECD Better Life Indicators (BLIs)
- IEA/IAEA Indicators for Sustainable Energy Development (ISEDs)
- Indicators of the Environmental Performance Index (EPIs)
- Millennium Assessment Ecosystem Service Indicators (ESIs)
- PASHMINA Indicators
- Human Development Index (HDI)
- Genuine Progress Indicator (GPI)
- Index of Sustainable Economic Welfare (ISEW)
- NAMEA and Material Flow Accounts
- National Accounting Matrix including Environmental Accounts (NAMEA)
- Material Flow Accounts (MFA) (National Research Council, 2014).

This study focuses on three objective indicator systems, namely the Organisation for Economic Co-operation and Development (OECD), Human Development Index (HDI), and Global Youth Wellbeing Index (GYWI).

Table 2.2 lists the areas of wellbeing and corresponding indicator systems.

Table 2.2: Areas of wellbeing and corresponding indicator systems

Wellbeing category	Corresponding Indicator Systems
Energy and Emissions	
Housing	EU SDIs, UN ISDs, BLIs, ISEDs, NAMEA, PASHMINA
Transport	EU SDIs, UN ISDs, ISEDs, PASHMINA
Industry and Services	EU SDIs, ISEDs, NAMEA, PASHMINA
Energy supply	EU SDIs, ISEDs, NAMEA, PASHMINA

Wellbeing category	Corresponding Indicator Systems
Environment and Resources	
Material consumption, waste and recycling	EU SDIs, EPIs, ISEDs, NAMEA, MFA, GP / ISEW, GS
Land use	EU SDIs, UN ISDs, ISEDs, ESSIs, EPIs, PASHMINA, GP/ ISEW
Water	EU SDIs, UN ISDs, ESSIs, EPIs, GP / ISEW
Livestock and biodiversity	EU SDIs, UN ISDs, BLIs, ESSIs, EPIs
Equity	
Income, social security, poverty	EU SDIs, UN ISDs, BLIs, ISEDs
Work	EU SDIs, BLIs
Energy	ISEDs
Water	EU SDIs, UN ISDs
Health	
Health status	EU SDIs, UN ISDs, BLIs, HDI
Influencing factors [e.g. nutritional status, (indoor) air pollution]	EU SDIs, UN ISDs, EPIs
Work, Income and Consumption	
Income and Consumption	BLIs, EU SDIs, GP / ISEW
Work	EU SDIs, UN ISDs, BLIs
Economic structure	EU SDIs, UN ISDs, NAMEA, ISEDs, PASHMINA
Innovation	EU SDIs, UN ISDs
Security	
Physical security	UN ISDs, BLIs
Education	
Education	EU SDIs, UN ISDs, ISEW, GPI / ISEW, Genuine Savings, HDI
Governance and Civic Engagement	
Good governance	EU SDIs, UN ISDs
Civic engagement	EU SDIs, BLIs
Life satisfaction	BLI

2.7.4.1 The United Nations Development Programme (UNDP)

The United Nations Development Programme (UNDP) is the United Nations' development network that advocates for global change (Hall, 2016). It links countries to resources, knowledge, and experience to improve people's quality of life and help them build a better life. It provides expert advice and training; it grants support to developing countries, with increasing emphasis on assistance to the least developed countries; and

it promotes technical and investment cooperation among nations (Tarullo et al., 2017). The focus areas of the UNDP include the alleviation of poverty, dealing with the HIV/AIDS pandemic, democratic governance, energy and environment, social development, and crisis prevention and recovery. It also advocates the protection of human rights and the empowerment of women in all its programmes (Santos, 2017). The Human Development Report has since 1990 measured and analysed developmental progress in different nations using the Human Development Index (Lou, Wang, Xu, Ye & Ye, 2017).

2.7.4.2 Human Development Index (HDI)

The HDI is a composite index of life expectancy, education, and per capita income indicators (Hou, Walsh & Zhang, 2015). These indicators rank countries into four tiers of human development. A country with a higher HDI score has higher lifespan, education and Gross Domestic Product (GDP) per capita scores (Çilingirtürk & Koçak, 2018). The Human Development Report, published in 2010, introduced the Inequality-adjusted Human Development Index (IHDI), which broadens the scope of the HDI by taking inequality into consideration (Brown, 2016). The index is based on the human development approach and whether individuals feel they have the ability to 'do' and 'be' desirable things in life, such as being well fed, sheltered, healthy, and doing activities such as work, education, voting and participating in community life. It should be noted that freedom of choice is central. HDI works on the assumption that the economic status and development of a nation should positively affect its citizens' wellbeing. However, Dassonneville and Hooghe (2017) argue that the GDP per person has been the longest time series for measuring economic growth.

Although economic measures are used to determine the development and standard of people living in a country and economic indicators are used to ascertain the wellbeing of people, the systems using economic indicators ignore large aspects of wellbeing (Michalos, 2017). There is growing recognition that social factors such as health, environment, and access to basic infrastructure have a major influence on the wellbeing of people. Based on the understanding that the factors affecting the quality of lives of people are beyond economic factors, new wellbeing indicator systems such as the Social Progress Index, OECD, and GYWI were developed. These wellbeing indicator systems and their proposed wellbeing indicators are discussed next.

2.7.4.3 The Social Progress Index Component-Level (SPIC) Framework

The Social Progress Index (SPI) is an aggregate index of social and environmental indicators that capture three dimensions of social progress: basic human needs, foundations of wellbeing, and opportunity (Social Progress Index, 2015)(Figure 2.3). The Social Progress Index (2015)Report indicates that an adequate development model is not based on economic indices alone and that societies are not successful except when they address basic human needs, protect the environment, and improve the quality of the lives of their citizens by incorporating measures of social progress in its indices (Social Progress Index, 2015). The Social Progress Index includes data from 128 countries across 50 indicators. The SPIC Framework is used to measure national, environmental, and social performance (Figure 2.3). This framework can be an instrument for accelerating progress by the government and civil societies. The SPIC Framework measures social progress independent of the GDP and in a way that both compliment the other. The SPIC Framework has 52 indicators structured around twelve components. It covers 94% of the world population from 133 countries and ranks these countries in descending order (Social Progress Index, 2015).

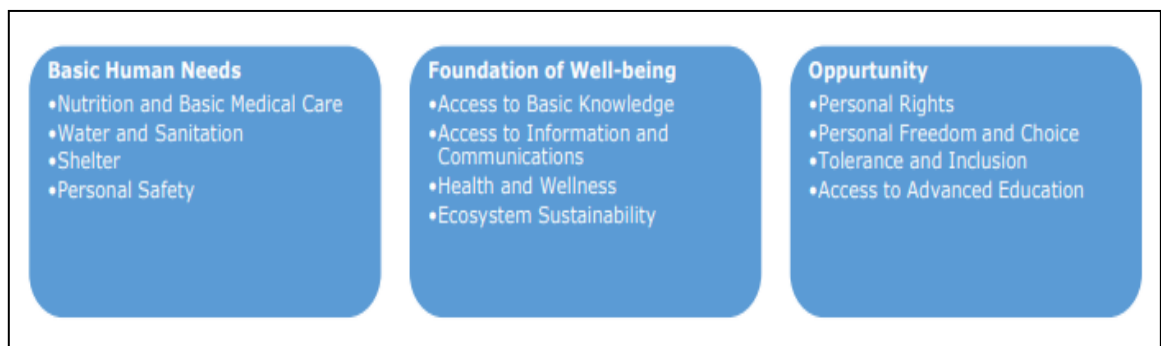


Figure 2.3: Social Progress Index and Component-Level Framework (Social Progress Index, 2015:1)

2.7.4.4 The Organisation for Economic Co-operation and Development (OECD) wellbeing indicators

The OECD is an inter-governmental organisation that has 35 member countries. It was founded in 1960 to stimulate economic progress and international trade (Schmelzer, 2014). According to the OECD, wellbeing exceeds the availability of money (Durand, 2015). Wellbeing is concerned with all the structures that shape people's lives, their access to comfortable housing, clean and safe water, ability to participate in political and social activities, the extent to which people are able to benefit from health,

qualitative education and more (Durand, 2015). It can be defined as the satisfaction of people about their life.

Financial and economic crises in nations support the claim that macro-economic statistics are not sufficient to express the living conditions of ordinary people adequately; hence, there is no sufficient measure for progress. It emphasises that progress in a society should be based on the wellbeing of people and the households in the society. Michalos (2014) recommends a framework for assessing wellbeing having three elements, namely the quality of life, material conditions, and sustainability, with each having its own dimensions. OECD compares the welfare of participating countries using the Better Life Index (BLI) and Purchasing Power Parity (PPP), which is based on the GDP per capita (Yilmaz, 2017).

The OECD's Report, "*How's Life?*" introduces personal wellbeing indicators in eleven different categories. Quality of life indicators as shown in Figure 2.4 include health, education, personal security, subjective wellbeing, environment, civic engagement and governance, social connections, and work-life balance (Michalos, 2014).

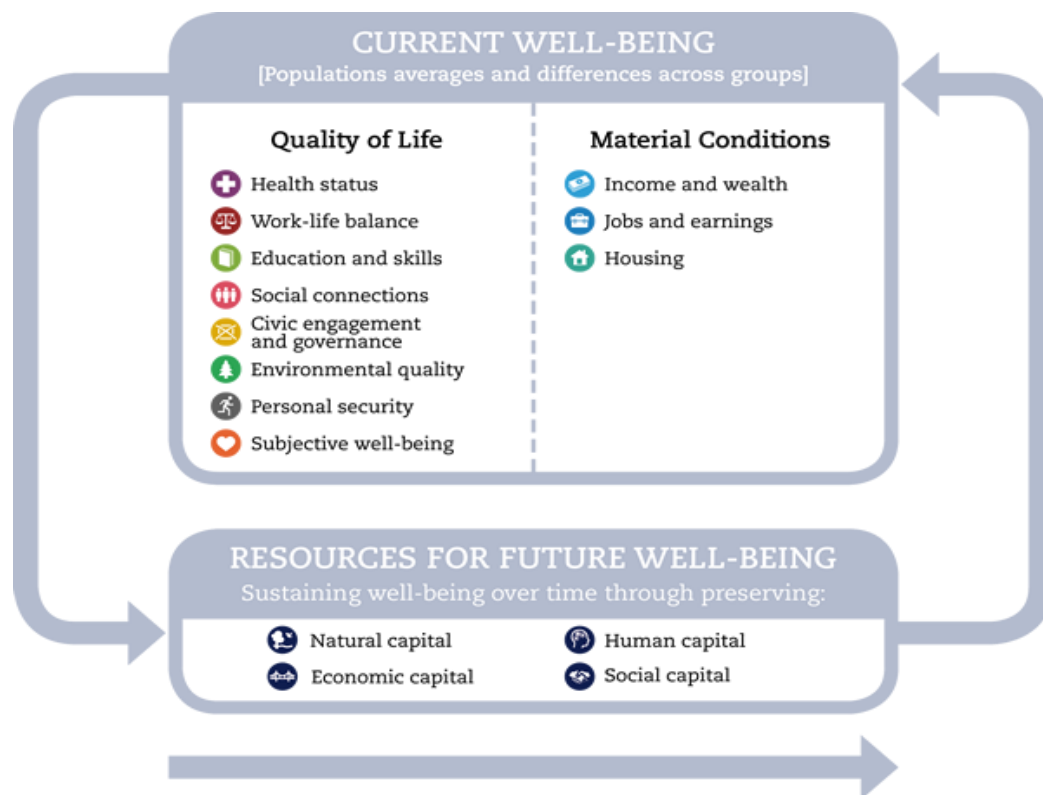


Figure 2.4: OECD Framework for measuring wellbeing and progress (OECD, 2017:3)

Since the OECD's formation in 1960, it always had a set of uniform indicators for countries across the world. In 2011, the OECD identified the need to involve people in the process of determining their own indicators, and made it possible through an interactive web-based platform (Michalos, 2014). This platform allowed people across countries to contribute to the eleven dimensions of wellbeing contained in the OECD Wellbeing Indicator Framework. The outcome of this exercise revealed the variation of the importance attached to each life element across countries and demographic characteristics. The exercise conducted by the OECD revealed that demography and context are determinants of wellbeing indicators and that the important aspect of people's wellbeing is what they say is important to them.

Furthermore, according to the *"How's Life in Your Region?"* publication (OECD, 2014), the answer to the question, "How is life?" depends on the region in which an individual lives. It argues that the factors affecting the wellbeing of people are local issues such as access to healthcare services, employment, and security (Michalos, 2014) and concludes that policies considering local differences above national averages will achieve a larger impact on the wellbeing of a nation as a whole.

2.7.4.5 Global Youth Wellbeing Index (GYWI)

The GYWI was developed by the International Youth Foundation (Goldin, Patel & Perry, 2014). The GYWI Framework was designed to increase the overall prosperity of a nation by increasing access of the youth to opportunities and services (Sharma, 2017). The ranking aims to present the gaps in the national wellbeing of the youth by comparing it to the performance of 29 other countries. Sharma (2017) adds that the outcome of the surveys is intended to identify and understand opportunities critical to investing in the youth. Investments made in youth wellbeing need to be structured in a way that contributes to the nation, communities, families and the world in general.

Goldin(2014:7) defines wellbeing as a combination of "welfare, utility functions, and multidimensional measures of societal growth and progress". Hence, the GYWI has progressed with interpreting wellbeing from an income and economic growth perspective by also including behavioural, subjective, and objective factors. Six indicator categories/domains were identified, namely economic opportunities, education, civic participation, health, safety and security, and ICT (Figure 2.5 and Figure 2.6). A seventh domain,gender equality, was added in 2017. A set of 40

indicators across six connected domains offer a comprehensive account of young people's quality of life (International Youth Foundation, 2018).



Figure 2.5: Global Youth Wellbeing index by domain (Goldin et al., 2014:3)

Twenty-nine (29) participating countries took part in the GYWI Report survey (Sharma, 2017), namely Australia, Brazil, China, Colombia, Egypt, Germany, Ghana, India, Indonesia, Japan, Jordan, Kenya, Mexico, Morocco, Nigeria, Peru, Philippines, Russia, Saudi Arabia, South Africa, South Korea, Spain, Sweden, Thailand, Turkey, Uganda, United Kingdom, United States of America and Vietnam. Thirty countries targeted by the GYWI account for approximately 70% of the world youth population. In the 2017 survey, South Africa ranked 22nd out of the 29 countries that participated. South Africa's ranking according to the index categories is 16th on gender equality, 28th on economic opportunities, 8th on education, 27th on health, 24th on safety and security, 6th on youth participation, and 17th on ICT (Sharma, 2017).

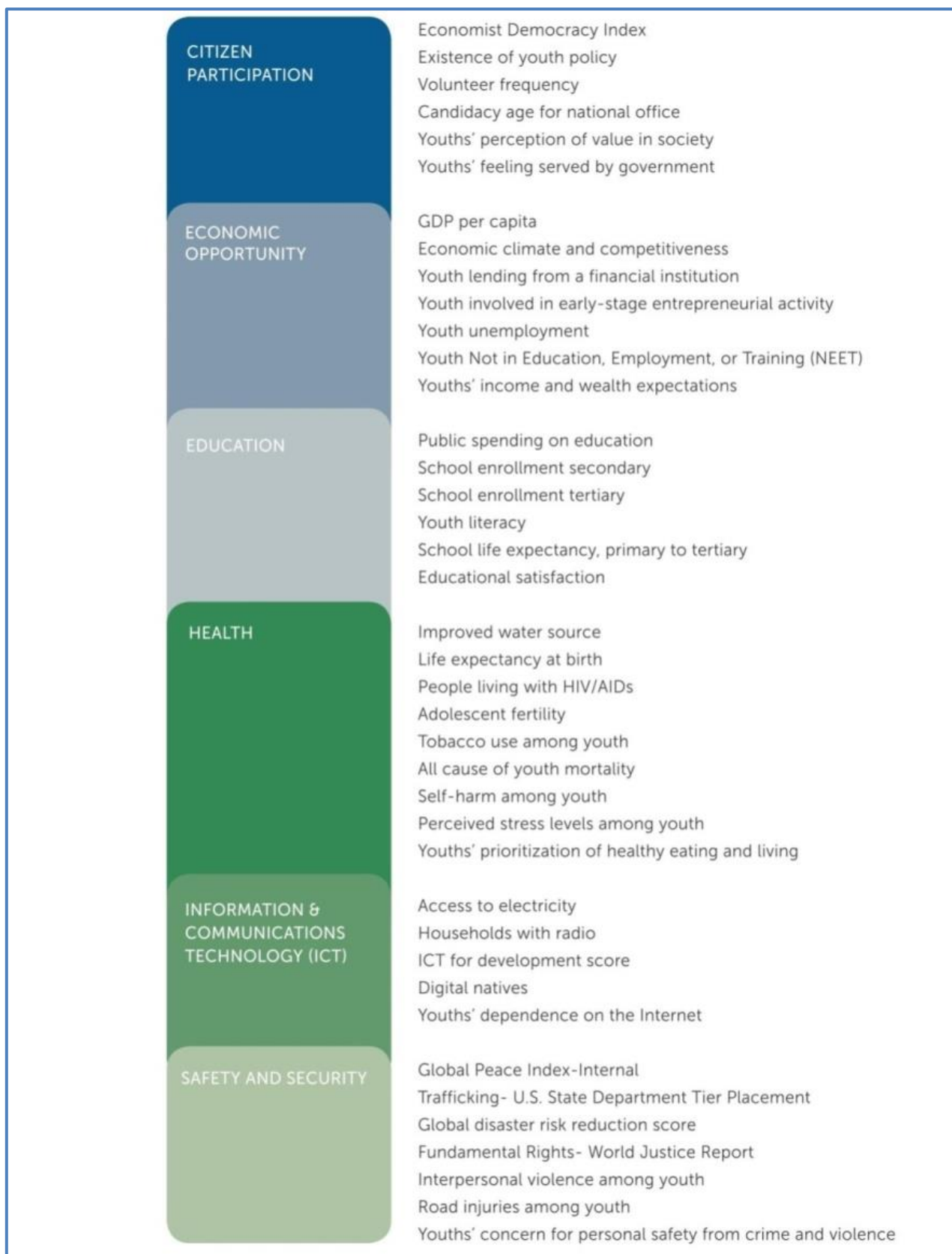


Figure 2.6: Global Youth Wellbeing Index by domain - detailed (Goldin, 2014:9)

In conclusion, Bakar et al. (2015) argue that the failure of wellbeing indicators capturing issues of inequality such as climate change, scarcity of natural resources, and inequality produces a lack of sustainability in the wellbeing of people. The authors add that sustainable wellbeing is achieved when wellbeing indicators reflect both economic and social aspects of the people. Manolom and Promphakping (2016) support this by stating that a high level of development might not guarantee significant improvement in the wellbeing of a nation's citizens. The authors emphasise that some of the population may still suffer greatly from social problems.

2.8 Frameworks guiding the development and assessment of ICT interventions

The need to meet community needs, reduce the impact of challenges on community members, and achieve alignment between user needs and institutional agendas has led several authors to propose different frameworks in order to guide the implementation of ICT, especially in underserved communities.

Most of the frameworks that recommend the implementation and impact assessment of interventions in underserved communities are built on the Capability Approach proposed by Sen (2005), or this approach is used alongside other theories in other frameworks. The Capability Approach posits that the evaluation of ICT interventions and decisions of suitable interventions should be based on two factors – capability and functioning. Sen (2005:153) describes capability as “the opportunity to achieve a valuable combination of human functioning which provide individuals the opportunity to make own choice”. Functioning in this regard refers to the ability of humans to act. Yousefzadeh, Biggeri, Arciprete and Haisma (2018:8) summarise Sen's Capability Approach as “an element of freedom to choose a type of functioning over another and could be considered as a set of vectors of different functioning”. The framework is built on the concept of freedom and opportunities. Similar to the Capability Approach, the wellbeing of people is determined by the opportunities available to them and the number of available options from which they can choose as most suitable to them. The perception of the users is important, and wellbeing is what the individual perceives it to be. Hatakka and Dé (2011) indicate that several authors have operationalised the Capability Framework within and outside the ICT4D domain.

A few ICT intervention development frameworks are discussed in the next section.

2.8.1 Capability Approach to implementation and evaluation

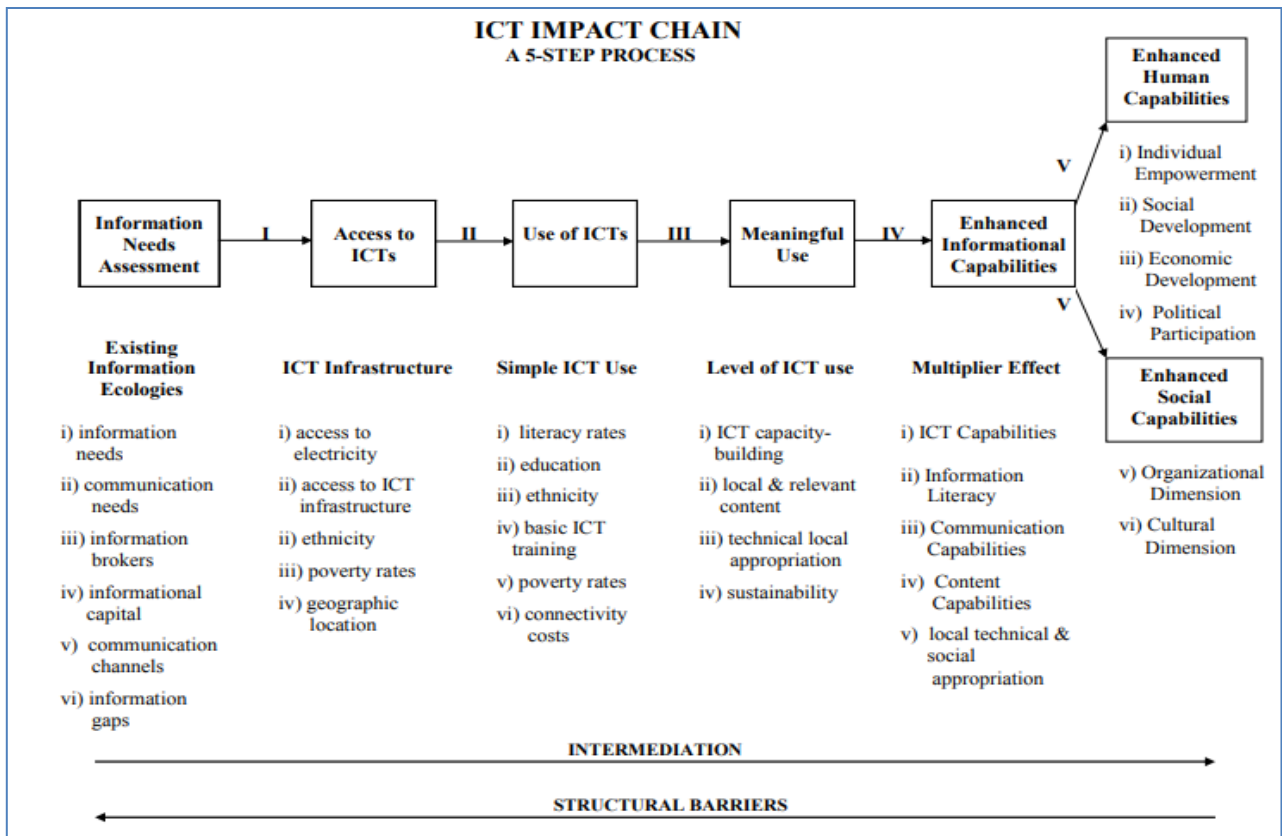


Figure 2.7: ICT Information Capability Framework by Gigler (2014:32)

Gigler (2014) highlights the need to link ICT, social economic development, and the wellbeing of people living in underserved communities in developing countries. According to Gigler, the Capability Approach to implementation and evaluation is determined by considering the capacity of the local community where the intervention is to be deployed. Gigler argues that an effective ICT intervention requires assessment of the information needs of a community in order for the intervention to be properly entrenched into the existing information resources.

Figure 2.7 shows a five-step guide from needs identification to the socio-economic impact of an ICT intervention on the wellbeing of beneficiaries.

In summary, appropriating the technology locally and contextualising the information provided by the intervention is needed for communities to benefit from ICT interventions.

2.8.2 Framework combining institutional and capability theories

In response to the failure of ICT interventions in underserved communities, Bass, Nicholson and Subhranian (2013) argue that previous frameworks designed to guide the implementation of interventions in underserved communities were limited in approach. Bass et al. therefore suggest the merger of the Capability Framework with Institutional Theory as a solution to identify factors that inhibit or stimulate development in the use of ICT interventions. The authors further explain that Institutional Theory is applied as a lens in the implementation and use of information technology, information systems, and ICT4D domains. Institutional Theory is used to understand contextual issues and the role of institutional persistence in the implementation of ICT. On the other hand, the Capability Approach (Figure 2.7) shows the influence that social context has on capacity creation, which Bass et al. (2013) define as providing the freedom to accomplish factors such as transactions, production, goods, and services. The authors add that a relationship exists between social influences and the capabilities deployed through ICT for achieving specific goals.

Bass et al. (2013) submit that within the proposed framework, institutional mechanisms can influence the capabilities of a determined population. The authors add that the relationship between three factors – ICT, Capability Approach, and Institutional Theory – may be positive or negative, which they refer to as exciters or inhibitors (Figure 2.8). For example, in the relationship between Institutional Theory and the Capability Approach (Dimension A), institutional policies such as government policies and informal institutional norms may affect capabilities both positively and negatively. Specific government policies may present as exciter or inhibitor of the use and impact of ICT among specific people.

Dimension B, the relationship between ICT and Capability Approach is that ICT may promote user capabilities while complex ICT interventions may be an inhibitor to use. Lastly, the relationship between ICT and Institutional Theory (Dimension C) is primarily on the premise of transparency, a means of addressing accountability and issues of corruption.

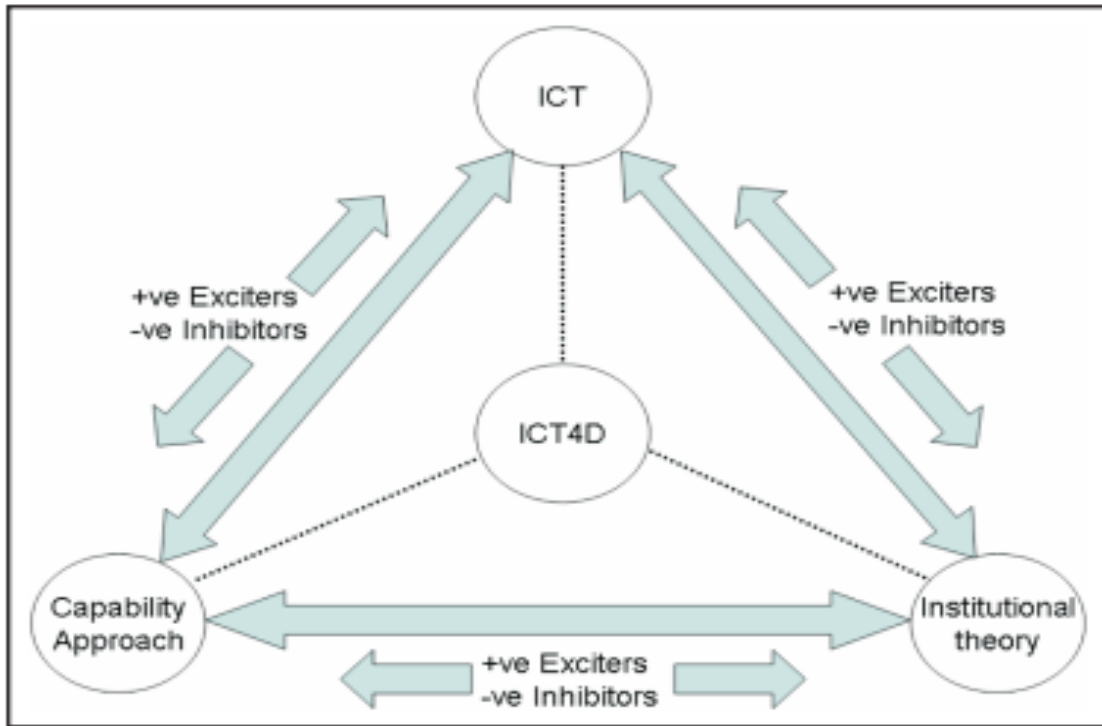


Figure 2.8: ICT Implementation Framework showing relationships (Bass et al.,2013:24)

2.8.3 ICT4D Service Development Framework

Although Mbiti and Weil (2011) note that ICT innovation can rapidly diffuse even in poor communities, Marais (2011) argues that ICT interventions have recorded a high rate of failure, which arose from a lack of aligning these interventions with local context. In analysing this challenge, Bon et al. (2016) proposed a Five-Component Framework (Figure 2.9) for the development of relevant and effective ICT interventions. The authors posit that an important component in the framework is “needs assessment”. A sound framework should focus on the actual needs of the beneficiaries and ensure that ICT interventions target the provision of value to end-users. Furthermore, the goals of the donor-sponsors must be well aligned with the goals of the beneficiaries to avoid conflict of interest.

Chib (2015) argue that although ICT has a number of intangible benefits, researchers need to be aware of the intangible negative consequences. The author cautions that although ICT can be a tool for the empowerment of marginalised individuals, it can also be used to exploit them (Chib, 2015). Biradavolu et al. (2015) add that ICT Interventions can have an unintended negative impact on communities; therefore, it is important to evaluate interventions.

Components	Possible methods	Techniques & tools
Context analysis	Action research Roadshow Literature review	Field visits Focus groups Demos Interviews
Needs assessment	Field research Collaborative workshops Participatory rural appraisal (PRA model suite)	Field visits Focus groups Demos Interviews
Use case & requirements analysis	Use case modeling Requirements elicitation Agile Development Methods	Demos & focus groups Rapid prototyping Conceptual modeling
Sustainability assessment	Functional evaluation Business case evaluation Technology assessment Scenarios	Interview, focus groups E3 Value modeling Dynamic systems conceptual modeling
Developing, testing, deploying	Living Labs Agile Development Methods User-centered evaluation	Demos & focus groups Prototypes

Figure 2.9: Five-Component Framework for ICT4D Service Development (Bon et al., 2016:89)

Gigler (2011:2) highlights a number of factors that are important for evaluating ICT interventions adequately and states that evaluation using “access to ICT” as an indicator can be misleading because not all the people who have access to ICT are “actual users” of ICT interventions. The author further argues that socio-economic challenges and the improvement of users’ wellbeing can be achieved through ICT when it is used in a meaningful manner. Adequate evaluation should take into account the ability people have to make meaningful use of ICT interventions.

Gigler (2011) further emphasises the importance of prevailing conditions under which ICT interventions are meaningfully used, and indicates that these conditions should be evaluated. According to Pade-Khene and Sewry (2012), indicators to evaluate ICT should be developed by seeking to identify the existing values and challenges in the community and the gaps between local information communication and the information needs in the community. The isolation of such gaps is important for the adequate evaluation of digital interventions and the separation of interventions with positive impact from those with unintended negative consequences.

2.8.4 Community-based ICT Impact Assessment Framework

Ashraf et al. (2008) explain that ICT impact assessment on development is carried out to understand the effect of ICT on socio-economic development or to assess the

impact of ICT based on different quantifiable indicators. The authors posit that impact may be assessed based on education, the economy of health, or other indicators of socio-economic development. The need to understand the impact of several ICT interventions deployed into communities motivated the need for several opinions presented through different frameworks in literature. Ashraf et al. (2008) further criticise some of the frameworks that preceded their work. The authors highlight shortcomings such as the assessment of the short-term effect of ICT interventions and the lack of reference to the socio-economic development of communities. Another weakness reported is the lack of contextual flexibility of the frameworks designed as one-size-fits-all for communities. The authors argue that the context of the deployed ICT intervention is important to evaluate. They opine that the assessment framework needs to consider local context and issues. Lastly, the authors oppose the evaluation of ICT impact without consultation of the beneficiaries. Their argument is that only beneficiaries can tell if deployed ICT interventions have a significant impact on their wellbeing, and only beneficiaries have the ability to determine what constitutes development to them. Therefore, there is a need to assess impact based on beneficiaries' perspective of impact. A framework addressing the highlighted limitations has been proposed by Ashraf et al. (2008).

The framework in Figure 2.11 evaluates the social and economic development within a local context and from a beneficiary's perspective using the Information Chain Model in Figure 2.10. The framework depicts ICT as input and development as output of the intervention process.

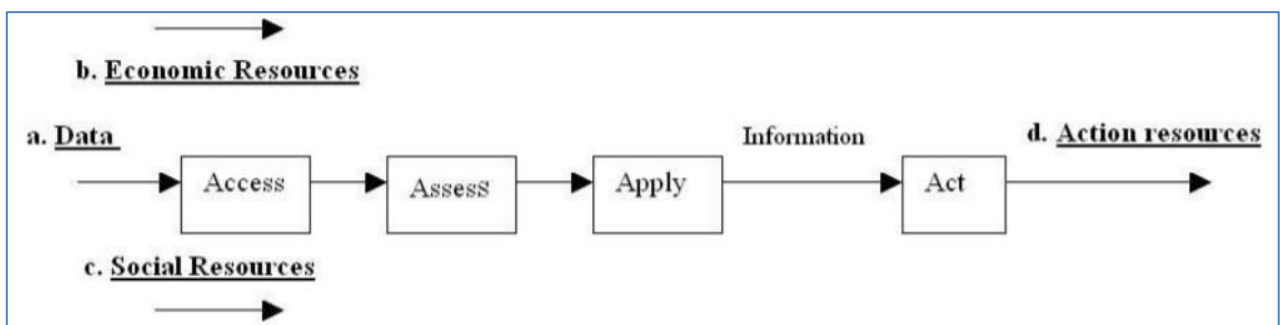


Figure 2.10: Information Chain Model (Heeks, 2005, cited in Ashraf et al., 2008:5)

However, consequent to the adoption of the framework (Figure 2.11) in a Bangladesh context, Ashraf et al. (2008) posited that the unidirectional information chain used by Heeks (2005) is

suitable only as starting point for analysing ICT interventions. The authors argued that the framework (Figure 2.11) failed to integrate the perspective of beneficiaries in practice fully. Therefore, Ashraf et al. (2008) included Sen's (2000) theory, which presents development as freedom, with the argument that development can be achieved by promoting human freedom. Subsequently, a framework (Figure 2.12) combining the information chain by Heeks (2005) with the freedom as development theory of Sen (2000) was designed.

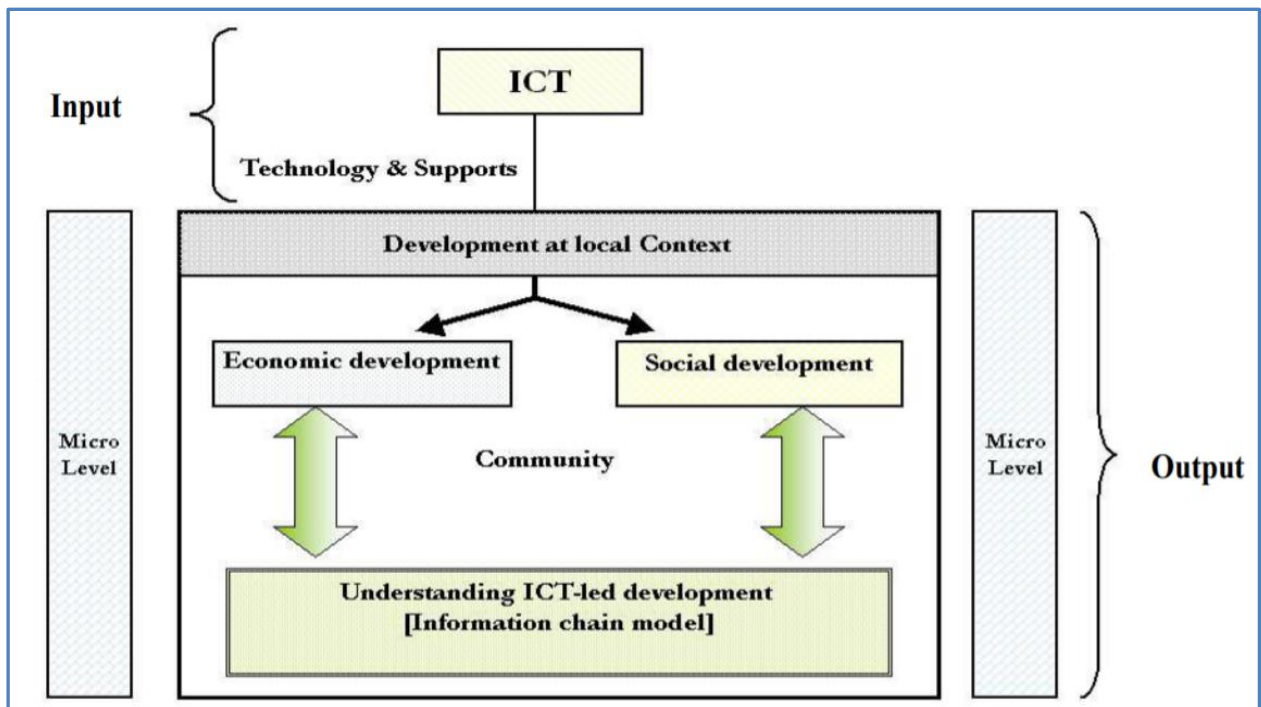


Figure 2.11: Framework to investigate ICT impact towards development (Ashraf et al., 2008:5)

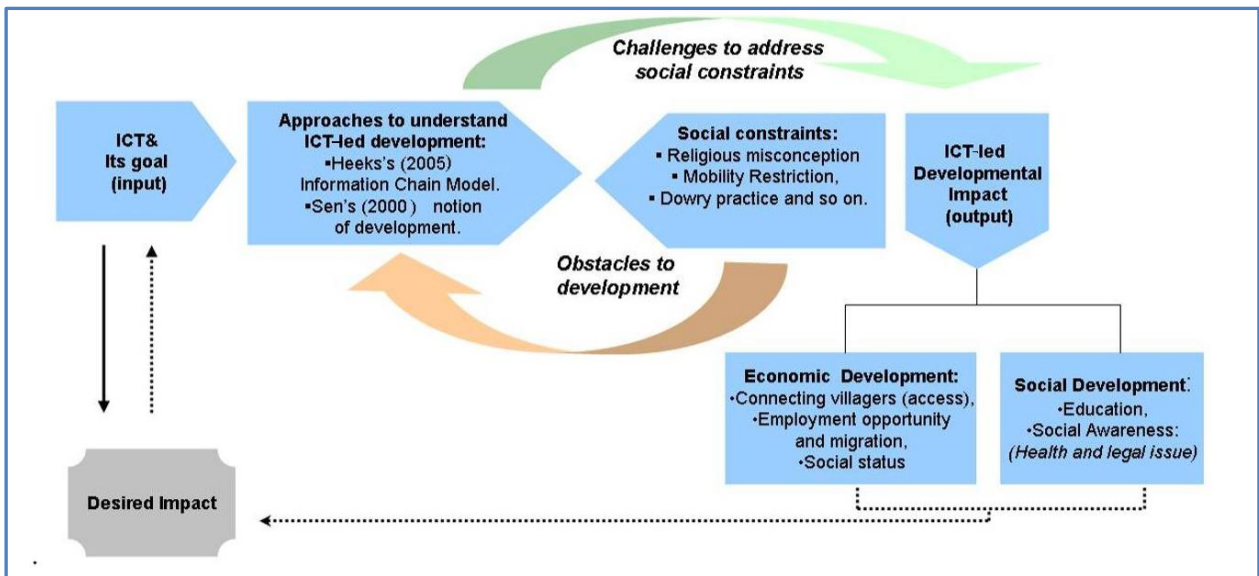


Figure 2.12: Framework to investigate ICT-led development at community level (Ashraf et al., 2008:10)

2.9 Summary

The literature review provided insight into wellbeing in general, as well as the challenges to the wellbeing of members of underserved communities, with special interest in the youth. Efforts made by the South African government, NGOs, and international agencies to improve wellbeing in underserved communities were also scrutinised. Moreover, the review covered the different wellbeing indicator systems and their metrics for measuring individual, community, and national wellbeing.

However, most of the articles that target the wellbeing of the youth are in relation to their health. Furthermore, recent articles indicate that identified challenges in underserved communities are still prevalent.

Although interventions target the poor, the youth, and members of underserved communities, it is important to note that purposeful attempts to understand the plight of the youth in underserved communities in South Africa are limited. More research is needed that focuses on understanding the challenges of improving the wellbeing of the youth in underserved communities through promoting relevant ICT interventions.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

According to Saunders and Lewis (2012), research can be the realisation of existing lack, carried out in a systematic way, in order to provideadequate information on a specific situation. Dellis, Skolarikos and Papatsoris (2014:121) add that research can also be defined as “the process of using [a] scientific approach to enquire and to improve scientific knowledge”. To establish assurance and confidence in research, it is needed to demonstrate that the system of knowledge is based on sound foundations and processes. Research methodology, therefore, is comparable to a map that explains the researcher’s approach to solving the research problem (Jamshed, 2014). Through the application of research methodology, the thoughts and path of the researcher from the conceptualised problem to the solution becomes clear to the reader (Hunicke, LeBlanc &Zubek, 2004). Research methodology makes it possible to repeat the research process without the involvement of the original researcher (Brink, Van der Walt & Van Rensburg, 2006).

In order to make assumptions and establish claims in research, it is needed to seek information on what reality knowledge presents (ontology), how knowledge is known (epistemology), the value that is held within knowledge (axiology), and the processes carried out to obtain knowledge (methodology)(Creswell, 1994). This chapter explains the philosophical stand assumed by the researcher as well as the design and approaches of the research, and provides justification for the choice of methods. Through the adoption of the research design and methodology, insight was sought to address the research problem by answering the research questions in order to achieve a set of prescribed objectives. Thus, the research problem, questions, aim, and objectives guided the research methodology (Figure 3.1) adopted for this research study.

For ease of reference, the research problem, research questions, aim, and objectivesare re-stated below.

3.1.1 Problem statement

The lack of youth engagement in prioritising the wellbeing indicators in underserved communities often leads to the design of mismatched interventions, resulting in wasted efforts and resources with no visible impact on the wellbeing of the youth.

3.1.2 Research questions

To address the research problem, two main research questions (RQs) were posed, each subdivided into two research sub-questions (RSQs) to facilitate more effective data collection and analysis.

RQ1: How can youth wellbeing indicators for underserved communities be developed?

RSQ1: What are the factors affecting the wellbeing of the youth in underserved communities?

RSQ2: How can a comprehensive set of youth wellbeing indicators for underserved communities be developed?

RQ2: How can youth wellbeing indicators be used to determine ICT needs in underserved communities?

RSQ3: How can youth wellbeing indicators be prioritised to align with ICT interventions in underserved communities?

RSQ4: How can an ICT-based artefact be designed to prioritise youth wellbeing indicators in underserved communities?

3.1.3 Research objectives

The research objectives were formulated as follows:

- i) To determine the factors affecting the wellbeing of the youth in underserved communities in South Africa.
- ii) To propose a comprehensive set of youth wellbeing indicators from which the needs of the youth in underserved communities in South Africa can be prioritised.
- iii) To prioritise wellbeing indicators as a determinant of the needs of the youth for relevant ICT interventions in underserved communities in South Africa.
- iv) To design an ICT-based artefact that can be used to prioritise youth wellbeing indicators in underserved communities.

The research objectives were aligned to the RSQs.

A graphical presentation of the research methodology adopted for this research study is indicated in Figure 3.1.

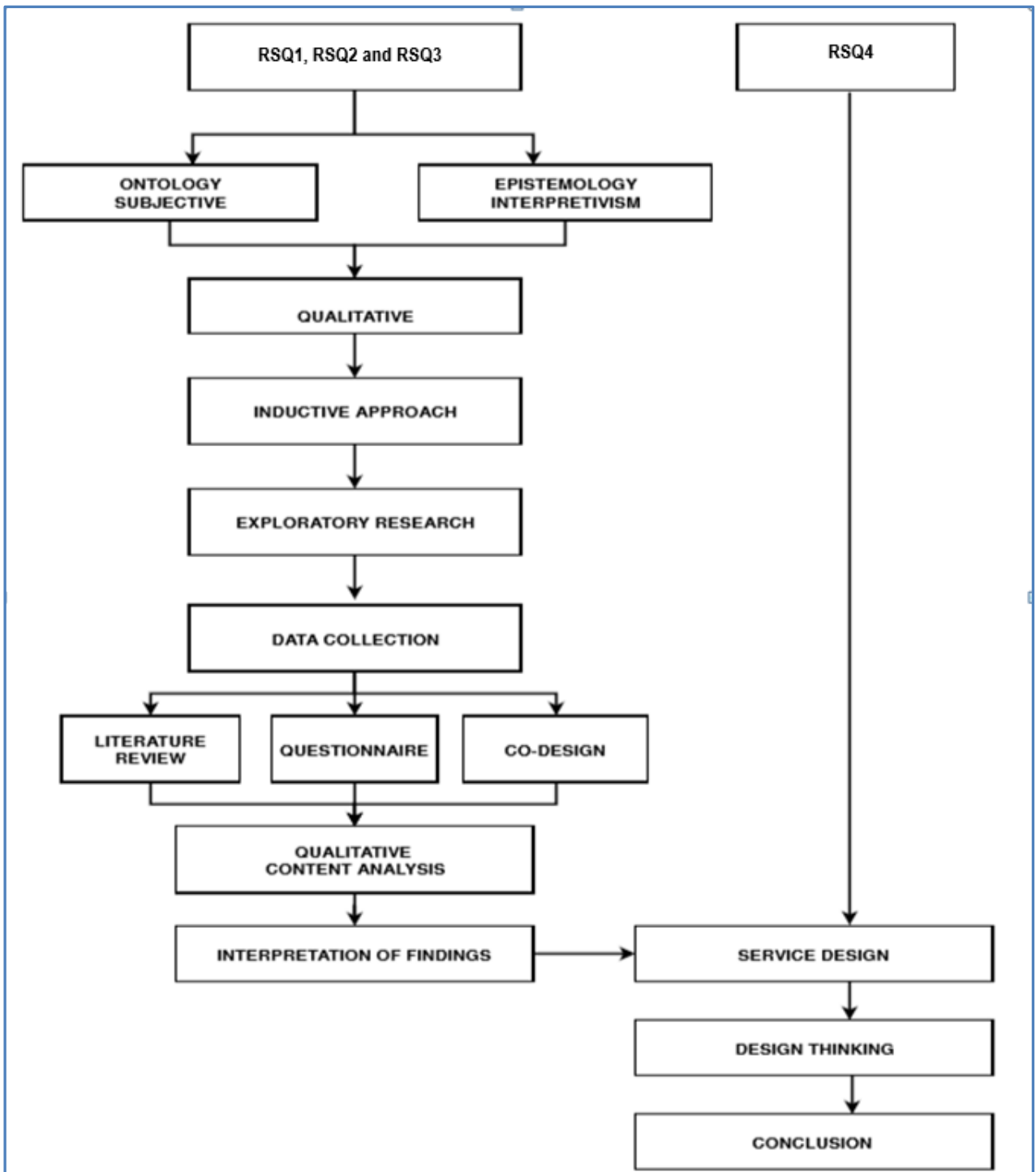


Figure 3.1: Research methodology diagram

3.2 Research philosophy

Research philosophy is described as “a system of beliefs and assumptions about the development of knowledge” (Saunders, Lewis & Thornhill, 2019:130). The philosophy of the researcher is important because every individual has beliefs and assumptions about

what is important, true and achievable (Byrne, 2001). The philosophy adopted for a research study indicates the researcher's perception about the world, which reinforces the research method, design, and strategy selected for the research (Saunders et al., 2009) Figure 3.2. Furthermore, the research philosophy connotes an essential part of the research methodology, as it guides the selection of an appropriate research design (Baert, 2005).

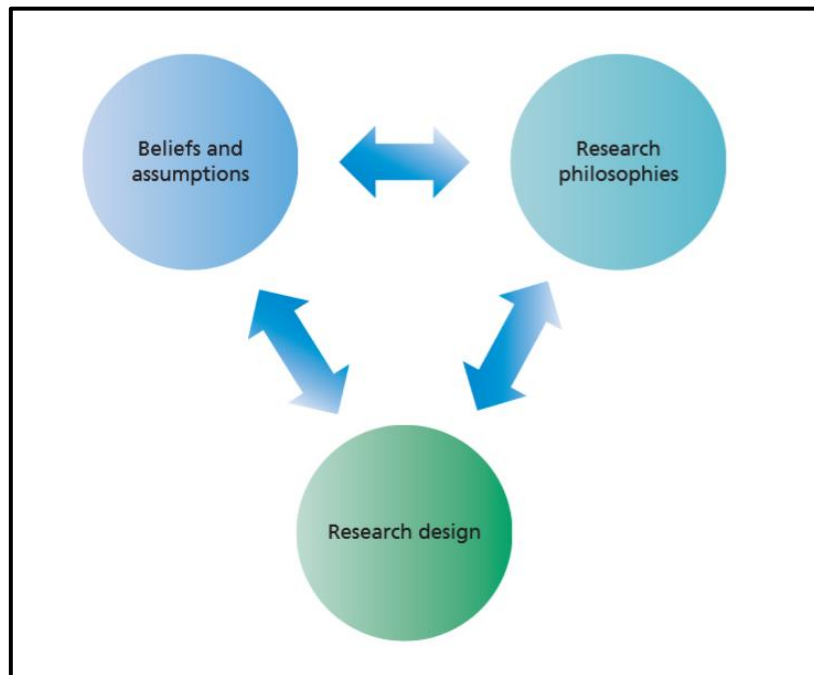


Figure 3.2: Researcher's beliefs, assumptions and research design (Saunders et al., 2019:132)

Research philosophy has two dimensions, referred to as ontology and epistemology. Ritchie, Lewis, Nicholls and Ormston (2013) state that the conduct of research is influenced by the purpose of the research as well as the ontological and epistemological view of the truth, among other factors. As such, it is believed that, consciously or subconsciously, researchers make a number of assumptions at each stage of the research (Saunders & Lewis, 2012). It is argued that researchers make assumptions about human knowledge and realities, as well as how their values influence the research; in other words, these are the epistemological, ontological, and axiological assumptions respectively (Wahyuni, 2012). The ontological and epistemological positions adopted by the researcher to achieve the set research objectives are further discussed in this section.

3.2.1 Ontological position

The ontological dimension is related to an individual's views of the nature of reality; it is concerned with the nature of social actors (Raddon, 2010; Slevitch, 2011). It is a system "that reflects how an individual interprets what constitutes a fact and answers the question of, if social entities should be regarded as objective entities, whose reality is external to social actors or built upon social actions and perception" (Bryman, 2016:28). Eriksson and Kovalainen (2015:14) define ontology as "the existence of, and the relationship between people and the world". Therefore, what constitutes reality to people is based on their perceptions, beliefs, and experiences, which differs from one individual to another. Thus, the ontological position of the researcher has an influence on how the research questions are formulated and how the research is ultimately carried out (Walliman, 2016). Objectivity and subjectivity are two aspects of the ontological dimension of research philosophy (Eriksson & Kovalainen, 2015:14). Objectivity concerns the true nature of social entities, while subjectivity involves the interpretation of social phenomena relevant to the study (Ritchie et al., 2013).

Objectivists believe that reality is external to social actors, and the existence of reality is not dependent on the social interaction and perceptions of actors (Bryman, 2016). Such a position affirms that social phenomena and interpretations exist independent of any form of rationalisation or socialisation of ideas (Eriksson & Kovalainen, 2015). In research, the objectivist only accepts the theory that social reality is independent of the researcher's assumptions, beliefs or values held during the course of an investigation (Sarantakos, 2012). However, contrary to objectivism is the subjectivist theory, which asserts that reality is reliant on social actors and interactions (Bahari, 2010). The theory presumes that the perceptions and actions of social actors are responsible for the creation of social phenomena and requires similar methods to understand it (Neuman, 2011). It is furthermore believed that reality, as presented by an individual, is the output of social and cognitive processes of an individual's mindset (Eriksson & Kovalainen, 2015).

The subjectivist presents an unstructured type of research, with a high possibility of researcher bias. Keeping the bias in mind, this research was conducted from a subjectivist point of view because of the exploratory nature of the research aim, which requires the perception and interpretation of both the researcher and the topic of the research (Bergold & Thomas, 2012).

3.2.2 Epistemological dimension

Unlike the consideration of what constitutes knowledge (ontological dimension), the epistemological dimension focuses on how knowledge is generated, and how knowledge may be understood or justified (Wahyuni, 2012). Epistemology provides an understanding of what should be considered as acceptable knowledge in a discipline (Bryman 2016). In other words, epistemology deals with the criteria that a researcher uses to classify, from the sources of knowledge, what forms credible knowledge and what does not. The epistemological philosophy relates an approach to knowledge according to three paradigms of beliefs: positivism, realism, and interpretivism (Orlikowski & Baroudi, 1991).

3.2.2.1 Positivism

Positivists are of the view that valid knowledge can only be created through empirical evidence, thereby limiting the creation of knowledge to what can be perceived and measured; thus, positivists depend on theories that can be measured (Bhattacharjee, 2012). This involves the application of natural science in the understanding of social realities (Walliman, 2016). Positivists are of the view that all theoretical terms must be susceptible to the rigors of observation, which attaches greater epistemological status to observation than theories (Bryman, 2016). On this account, the positivist's position is otherwise referred to as the scientific method (Creswell, 2013).

Rodwell (1987) argues that the positivist approach is not suitable for understanding complex and varying social phenomena. Positivism is mostly used with quantitative research, and it often assumes an objective ontological position. According to Myers (2013) and Hasan (2016), positivists seek to determine causes of social phenomena outside the subjective state of individuals. Sayer (1992) and Coffey (1999) both argue that the quantitative nature of positivism may hinder its suitability for use in exploring causal factors in social research, and when used, the information produced from such research may be superficial. On the other hand, Hasan (2016) argues that quantifiable methods may be used to understand the social world to a certain extent but may not be used for in-depth studies, as positivism has helped to develop more effective interventions and assessment methods in social research.

The exploratory nature of this research is however not suitable for focusing on data quantification or basing the outcome on scientific methods (such as statistical

analysis);rather, there is a need to explore and understand the underlining social phenomena faced by the youth in underserved communities.

3.2.2.2 Critical realism

Critical realists believe in the existence of a historical reality of the truth that is not reflective in the mind of a person; however, this premise is not readily accepted as the truth even if the truth does exist (Bhattacharjee, 2012). According to Saunders et al. (2019:147), critical realism is concerned with “explaining what we see and experience, in terms of the underlying structures of reality that shape the observable events”. It explains the world through a combination of observation and experience. Moreover, Orlikowski and Baroudi (1991) state that critical realist researchers are not concerned with the interpretation of views from a social context; rather, their aim is to criticise the phenomena actively with a view of changing the social status. Critical realists are of the perspective that the potential of human beings, societies, and organisations to change is constrained by prevailing circumstances that may be political, economic, or culturally dominated.

Neuman (2011) adds that the realist researcher is concerned with the basis of opposition and conflicts within a social context and aims to seek how subjects can be liberated. While the positivists and the interpretivists are concerned with elucidating or predicting the *status quo*, the critical realist critiques existing social systems with the aim of revealing conflicts and contradictions that exist within these structures (Orlikowski&Baroudi, 1991). Critical realism has a similar function to interpretivism and positivism; it can therefore be applied as critical positivism or critical interpretivism (Saunders et al., 2009). However, critical realism is closer to interpretivism because it recognises the existence of subjectivism in reality.

Although Fletcher (2017) argues that critical realism is suitable for use in qualitative research, critical realism was not adopted for this study. The researcher sought to emancipate the subjects within their social context; however, the aim of this study was not to criticize existing interventions, but to seek how these interventions can be better aligned to the needs of the participants (who are also the subjects of the study).

3.2.2.3 Interpretivism

The interpretive paradigm posits that, “reality is socially constructed” (Mertens, 2005:12), thus, the interpretivist considers the viewpoints or perceptions of the

participants. The philosophical position of interpretivism in research involves the interpretation of the elements of a study by the researcher. The interpretivist presupposes that “access to reality (given or socially constructed) is only through social construction such as language, consciousness, shared meaning, and instruments”(Myers, 2013:39). Moreover, interpretive research assumes that the social world is made up of social activities and human experiences that should be studied within the social context using suitable methods (Bhattacharjee, 2012).

Interpretivists oppose the philosophy of positivists, which asserts that the truth about a subject of observation can only be revealed through scientific processes. This philosophical stance establishes subjective meanings as a crucial part of social actions. Interpretivism is interested in how an individual or a group of people interpret social settings and events occurring in a specific context (Eriksson &Kovalainenn, 2015). Interpretivists do not focus on data presented through an empirical process, but rather on how the data are generated, with particular focus on how humans make sense of the subjects. Therefore, interpretivists often adopt a qualitative method because it allows an in depth exploration and understanding of an individual or group and how they make sense of the topic being researched. Furthermore, according to Orlikowski andBaroudi (1991), in practice, it is impossible for researchers to assume a neutral stance, as they are always involved or concerned with the phenomena of interest.

The study adopted an interpretivist approach to obtain reality in a subjective manner. The research aimed to explore the prioritisation of key indicators that are meant to provide insight into the current state of the wellbeing of the youth in underserved communities. The interpretivist approachasformulated by Raddon (2010) is depicted in Figure 3.3, which shows that the identification of the research problem and the formulation of the research questions have an influence on the research design, data collection, data analysis, and interpretation of the findings.

The research was designed to understand the perception of the youth regarding their wellbeing in an underserved community, and to seek the level of priority assigned to each wellbeing indicator from individual experiences and from the impact on their lives. Therefore, the research was done from an interpretivist philosophical stand to enable the type of subjective interaction required for in-depth exploration of the subject.

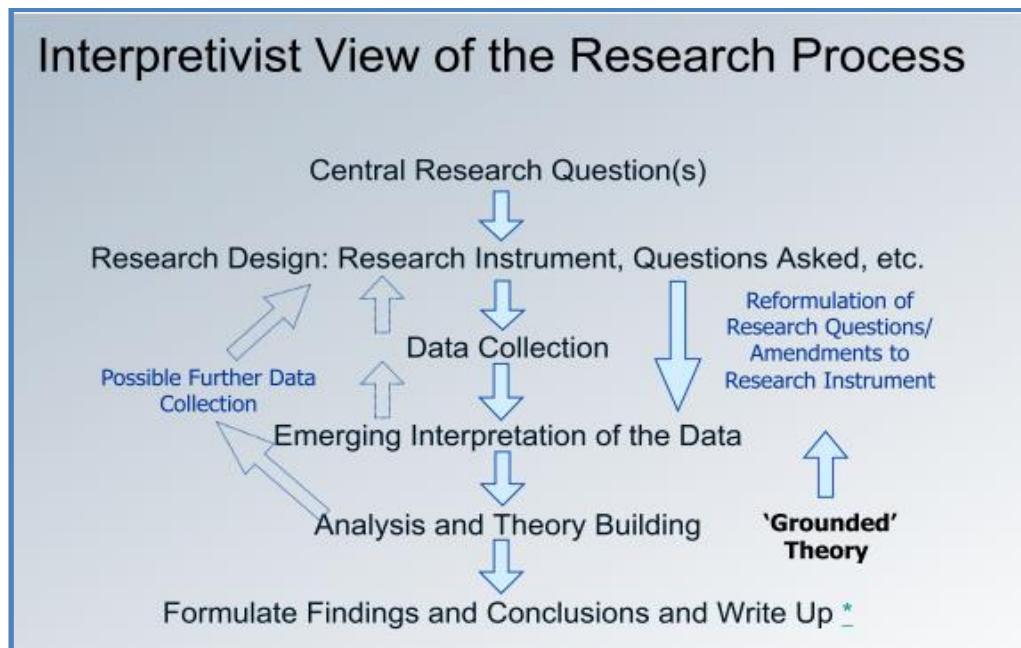


Figure 3.3: Interpretivist view of the research process (Raddon, 2010:14)

3.3 Research approach

Walliman (2012) states that the choice of how to acquire knowledge can only be made from two possible options: empiricism (inductive reasoning) or rationalism (deductive reasoning). The inductive approach is primarily used in qualitative studies, while the deductive approach is more favoured in quantitative studies (Bahari, 2010).

3.3.1 Deductive research approach

The deductive approach is the opposite of the inductive approach. In this approach, an argument starts from a specific statement, through logical reasoning, to a generalised statement, as illustrated in Figure 3.4.

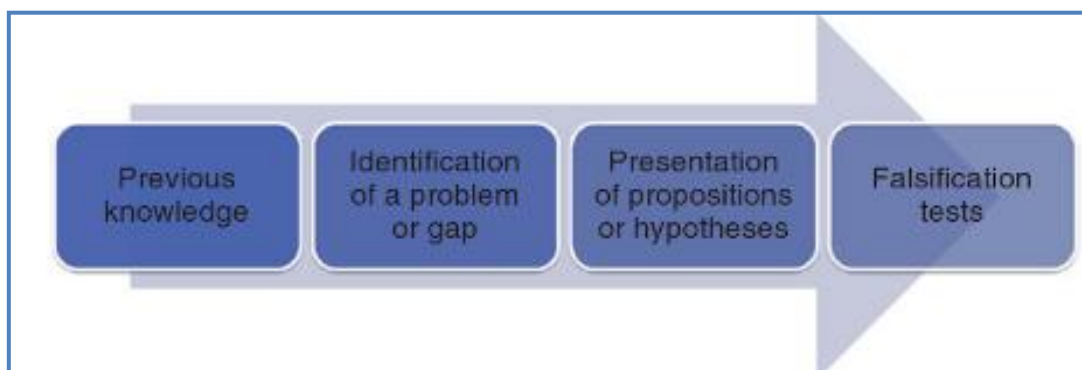


Figure 3.4: Hypothesis-deductive method (Dresch, Lacerda & Antunes, 2015:19)

An example of deductive reasoning can be described given the following two statements: “all mammals produce milk from their mammary glands”, and “pigs are mammals”. It can therefore be deduced that “a pig produces milk”.

According to Eriksson and Kovalainen (2015), deductive reasoning thrives on the perception that theory is a major source of knowledge, and that through deductive reasoning the validity of the premise of the argument validates the conclusion. This type of research is typically based on validating the theoretical knowledge available on the subject. The starting point of an investigation is often a theory, hypotheses are then made, followed by data and an analysis of the data; theories are subsequently supported or refuted by the results, which then leads to revisions of the theory (Creswell & Clark, 2007).

Bryman (2016) warns that deductive reasoning may not always be linear, and one step may not follow the next step in a logical sequence as described; thus, it is not always possible to revise theory based on data generated from a study. Furthermore, such data must be subjected to empirical scrutiny and at times supported by further studies before any valid revisions can be made. Therefore, the deductive approach is frequently related with quantitative studies, and often not suitable for exploratory qualitative research.

3.3.2 Inductive research approach

An inductive approach built on inductive reasoning is used to generate a broad understanding from specific observations (Grant & Quiggin, 2013), as illustrated in Figure 3.5 and Figure 3.6. Inductive reasoning is a logical process where multiple premises, found to be true, are combined to reach certain conclusions that can be generalised to similar contexts. Figure 3.6 shows the relationship between theory and observation for both inductive and deductive approaches.

Eriksson and Kovalainen (2015) surmise that the strongest way to build theories in research is by applying the inductive approach to derive relationships and patterns from data that can be used to construct new theories or modify existing ones. The inductive approach is usually referred to as a bottom-up approach because it seeks to develop theories from the analysis of data (Dresch et al., 2015). Three conditions must be met to generalise findings or build theory from using the inductive approach. Firstly, a number of the population adequate for the research scope must be sampled; secondly,

observations should be replicated under different circumstances and conditions; and lastly, the derived consensus must not be contradicted by the observations from the study (Walliman, 2016).

The inductive approach is often used in qualitative research, as the nature of research seeks to explore a specific subject, and the data collected can then lead to the development of theories that address the problem. Nevertheless, Bryman (2016) argues that the adoption of the inductive or deductive approach in research only specify tendencies and not strict rules. Hence, the inductive approach is often used by researchers in the naturalistic field of inquiry (DePoy& Gitlin, 2015).

This research study adopted an inductive approach because of the need to explore the state of the community's wellbeing. Data were collected and analysed, and the knowledge gained from the specific context was inferred back to the existing theory for further enhancement.

The inductive approach is also applied in the development of an artefact, based on observation and experience, which is fundamental to the provision of new knowledge and solutions (Dresch et al., 2015). Hence, the foundation to designing an artefact in this study was based on the observation of how youth wellbeing indicators were prioritised and made available in underserved communities. The observations and interpretations of the data provided a basis for designing an automated system for prioritising youth wellbeing indicators to facilitate effective interventions required in underserved communities.

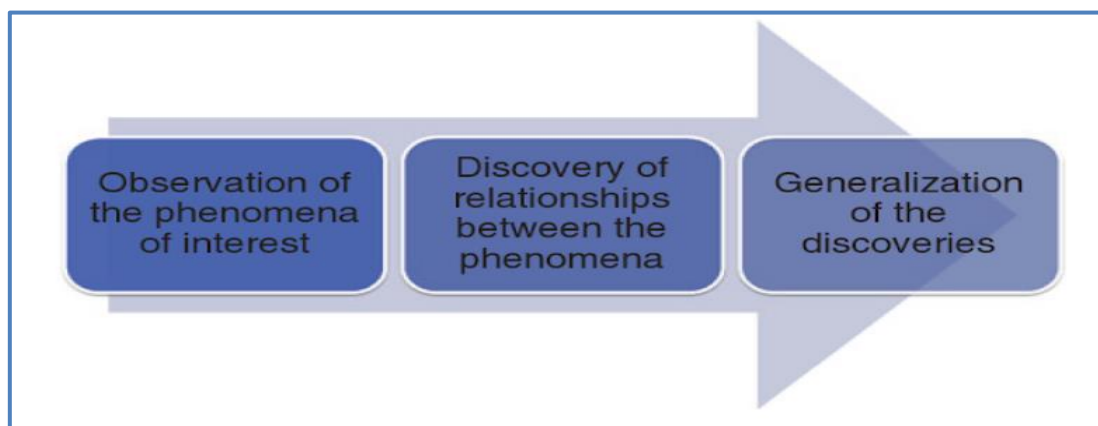


Figure 3.5: Steps of the inductive approach (Dresch et al., 2015:18)

Figure 3.6 illustrates the relationship between the inductive and deductive approach to theory.

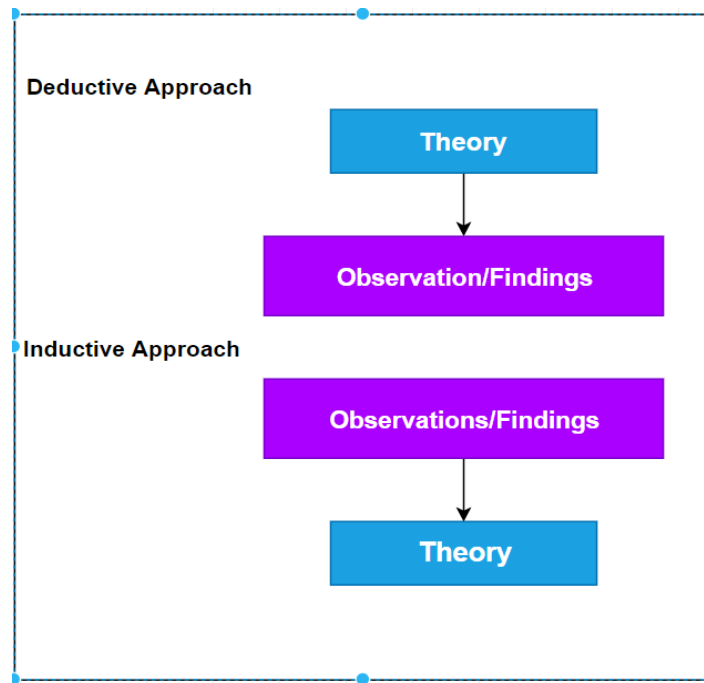


Figure 3.6: Deductive and inductive approach in relation to theory (Bryman, 2016:23)

3.4 Research purpose

Research may be conducted for several reasons. It is therefore important to clarify the purpose of the research. This study aimed to explore how youth wellbeing indicators can be used to facilitate effective ICT interventions for youth empowerment and development in underserved communities in South Africa. A further aim was to develop an ICT-based artefact to prioritise youth wellbeing indicators in underserved communities in South Africa. The purpose of this research dictated the method chosen for the study. The methods engaged in this study are elaborated on in subsequent sections of this chapter.

3.5 Research methods

Draper and Swift (2011) argue that the quality achieved in research is related to the suitability of the research method adopted by the researcher. There are two classical types of inquiry in research, namely naturalistic and experimental research (DePoy & Gitlin, 2015). Naturalistic inquiry deals with the attempt to understand the experiences of people within a specific context, while the experimental nature of enquiry is primarily focused on hypothesis testing and predictions. However, a third type of inquiry, the

mixed-method, contains characteristics of both experimental and naturalistic inquiry. Based on the nature of these three enquiries, there are three connected methods in research (DePoy& Gitlin, 2015). The three types of methods used in research are qualitative, quantitative, and mixed methods respectively (Creswell, 2003). The type of approach used by a researcher depends on the research questions, aim, and objectives of the research. Soiferman (2010) argues that the differences between qualitative and quantitative research methods are more philosophical than methodological. The author further states that the choice of methods by researchers is influenced by their belief in the nature of reality.

3.5.1 Quantitative research

Bryman (2016) describes the quantitative research method as emphasising quantification in data collection and analysis. Bryman (2016) lists the characteristics of the quantitative method as research that employs a deductive approach in considering the relationship between theories and research, and incorporates the natural scientist and positivist stance, which propagates the view that social reality is external and does not form part of an objective reality. Given the position of quantitative methods, none of the characteristics listed by Bryman (2016) was relevant to this research. The research was designed using an inductive approach, which builds on the interpretivist view that social reality is a key component of participatory research. Due to the exploratory nature of the research where subjective perception and experience of the topic of study were required, a qualitative research method was deemed appropriate, and it is subsequently described in the next section.

3.5.2 Qualitative research

Taylor et al. (2015) submit that qualitative research methods deal with research where the output is a narrative, reported in the spoken words of participants, and the observation of these participants' experiences. According to Denzin and Lincoln (2000:4), qualitative research is "a situated activity that locates the observer in the world. It consists of a set of interpretive, material practices that make the world visible". Qualitative research collects and evaluates data through purposeful inquiry and process as a means of gaining knowledge or understanding of a phenomenon (Carey, 2017). Hence, qualitative research methods are more concerned with words rather than quantification during the data collection and analysis process (Bryman, 2016). The method allows for in-depth understanding of the subject, presenting an opportunity to comprehend social actions rather than generalising from a population as is the case

with the quantitative method (Lewis, 2015). Qualitative study attempts to communicate the reasons for the feelings, thoughts, and behaviour of people within a certain context (Sutton & Austin, 2015). Therefore, qualitative research holistically considers the meaning assigned to each setting and people unlike in quantitative research where the people and settings are reduced to variables.

Eriksson and Kovalainen (2015) posit that qualitative research can use multiple theoretical concepts, whereas the quantitative method explores a singular theory. Furthermore, researchers form part of the research process and are “not independent” of the social actions. As such, qualitative research is concerned with processes rather than the outcomes and therefore tries to provide answers to questions such as “how”, “why” and “what” (Ritchie et al., 2013). In answering these questions, a clear understanding is provided of the feelings and thoughts that research participants ascribe to their experience.

According to Creswell (2013), qualitative researchers are often as close to their target population as possible, studying the participants as well as the places where they work or live with the intent of reporting multiple realities. Bryman (2016) characterises qualitative studies to include research that adopts the inductive approach in considering the relationship between theory and research, which rejects the scientific model of practice. Ritchie et al. (2013) posit that qualitative data mostly comprise texts and images contrary to numbers often used in quantitative research. The authors further explain that qualitative research generates rich, detailed, and sometimes complex data, and the analysis attempts to integrate the uniqueness of all participants. Qualitative study enables researchers to experience the daily struggle of people to understand their pain, beauty, love and frustrations (Taylor et al., 2015).

According to Sutton and Austin (2015), three commonly used methodologies in qualitative studies are ethnography, grounded theory, and phenomenology. While ethnography studies participants in their actual environment through observation over a long period, grounded theory researchers use physical interaction such as interviews or focus groups to explore a subject. Phenomenology explores the actual feelings and thoughts of how participants experience their world by collecting data through physical interaction. However, in addition to the three methods, Hancock and Algozzine (2016) mention narratives and case studies as other types of qualitative research. Narrative studies depend on storytelling by participants as well as retrieving data from archival

materials and documents that are related to a subject's life (Hancock & Algozzine, 2016). Therefore, a case study is designed to study and analyse subjects falling within a geographical or contextual boundary.

3.6 Research purpose

This section describes the purpose of the research. According to Saunders et al. (2009), the three main purposes of a research are explanatory, descriptive, and exploratory. Research can be conducted for several purposes, which are to describe, explain, and explore, and sometimes a combination of more than one purpose.

3.6.1 Exploratory research

Stebbins (2001:V) defines exploratory research as “a perspective, a way of approaching and carrying out a social study”. The author adds that exploratory research involves a deliberate attempt of exposing oneself not only to the possibility of discoveries, but also to broad discoveries. McNabb (2015) argues that exploratory research can be used to achieve one two purposes: to gain insight into an idea by exploring a specific issue, and to gain insight that can be applied immediately to an administrative problem. The author adds that the first step of an exploratory study is often carried out using the qualitative method because the aim is to derive in-depth findings from the topic of interest. White and Roth (2009) state that the act of exploring combined with the application of cognitive activities directed at the acquisition of knowledge, are important aspects of exploratory studies. Therefore, the purpose of the study was to explore the use of wellbeing indicators to facilitate and design a solution to the failure of ICT interventions in underserved communities. This was done through innovative thought and design, which will be elaborated on further in this chapter.

3.7 Research design and strategy

According to Creswell (2013:84), research design is “the set of methods and procedures used in collecting and analysing measures of the variables specified in the research problem”. It provides guidelines to the researcher on how to achieve a valid result (Mouton, 1996:107). Pierandrei, Remotti, Tang, Chivuno-Kuria and Anfossi (2018) posit that participatory design is useful for achieving user-centred solutions for the need to improve service delivery and to encourage the youth to become agents of change in their communities; hence, a participatory research design was adopted for this study.

3.7.1 Participatory research

According to Ritchie et al. (2013), one of the many approaches that can be used with qualitative research is the participatory research approach. Participatory research is a collaborative approach that includes both researchers and participants, with the intent to bring about a positive change for the participants. The literature identifies variations of participatory research such as participatory action research, organisational participatory research, participatory design research, and community-based participatory research (Halskov& Hansen, 2015; Jagosh et al., 2015; Masuda, 2016; Bush et al., 2017). A common feature to all the variations of participatory research is the collaboration between researchers and users of services or products. The disparity, however, is based on the purpose of the research, for example, action research seeks to produce an artefact, while design research focuses on designing a service or product. Another distinction is evident in the name, place or 'for whom' the participatory design is implemented. The organisational participatory design is carried out within an organisation, while community-based participatory research involves collaboration with a certain community. Jagosh et al. (2015:1) indicate that, "Community-Based Participatory Research (CBPR) is an approach in which researchers and community stakeholders form equitable partnerships to tackle issues related to community health improvement and knowledge production".

Based on this description, the study followed a Community-Based Participatory Research (CBPR) approach or Community-Based Participatory Design Research (Halskov& Hansen, 2015; Jagosh et al., 2015; Masuda, 2016; Bush et al., 2017). However, the naming convention adopted by several authors is based on the purpose of the research (action, design) and the participant (community, organisation) exclusively. Furthermore, the focus of the research is more towards the participant, and the output is determined by the engagement of the participation. Therefore, this research adopted a CBPR approach.

Community participation is a way of "promoting the human right of the community members and may stimulate improvement in the quality of service to members of underserved community" (Marston et al., 2016:376). Davis et al.(2018:282) indicate that CBPR "supports collaboration between scientific researchers and community members that is designed to improve capacity, enhance trust, and address". Service design adopts participatory design, and it is used extensively in literature to understand and improve community-based services and interventions (Foley & Martin, 2000; Ross &

Wright, 2017). Service design uses a participatory approach where users are involved in the design of the services to improve their own wellbeing and advance the satisfaction derived from the service (Andreassen et al., 2016). Therefore, the participatory approach is suitable to be used with the service design strategy and for designing wellbeing indicators that can be used to improve service delivery to the underserved community.

The case studied in the research was the underserved community of Grabouw in the Western Cape in South Africa, purposively selected. An NGO resident in Grabouw who works with the youth in the community facilitated data collection in collaboration with the local municipality. Their main functions were to identify youth willing to participate in the study and manage the administration of the workshops.

3.7.1.1 Description of participatory workshops

Data were collected from the participants at two separate workshops facilitated by CPUT (the host organisation), a Non-Governmental Organisation (NGO), and the local municipality. One of the workshops was conducted at Soulfood meeting venue in Snake Park, Grabouw, and the second workshop took place at the Grabouw library. The coordinator of Soulfood Community Organisation was contacted and briefed on the intention of CPUT's research team to conduct training workshops with the youth. Soulfood was also briefed on the criteria for participation in the workshop, namely that participants must be within the 15 to 35 year age group and resident in the Grabouw community. Soulfood arranged for a number of the youth to be available for the first workshop. The second workshop was coordinated by Theewaterskloof Municipality. The contact person at this municipality was responsible for informing the youth about the second workshop at the Grabouw library. A workshop was conducted over a period of eight days with different researchers interacting with the youth in relation with the research scope. Data for the study were collected from participants over a two-day period in a workshop session. Data collection was done along with other activities to stimulate and benefit the youth on two fronts: (i) to bring about a positive influence of change in the lives of the youth; and (ii) to ensure that the youth are available throughout the duration of data collection process. The approach was to maintain participants' interest throughout the process of data collection by introducing short games and drawing, and the participants were told to adopt a pseudo name of their choice. The youth were excited to adopt pseudonyms and happy to contribute in a fun-filled environment. Lastly, the researchers were fully immersed in the process

that solicited insight from the youth on their wellbeing needs and the priorities assigned to the wellbeing indicators by interacting with the youth as friends.

3.7.2 Service design

Kotler (2001:291) defines service as “any activity or benefit that one party can offer another that is essentially intangible and does not result in the ownership of anything”. Marquez and Downey (2015:2) add that, “services are intangible interactions that are tied to experience”. Thus, service design is a means of improving users’ experience of services that are perceived as intangible. Similarly, Sangiorgi (2009) argues that service design advanced to become tangible (objects of intervention) used in organisations and user communities.

In the process of designing a service, both the service organisation and the user communities are able to realise their potential to create innovative solutions (Sangiorgi, 2009). Applying service design in service organisations and user communities generally aims to develop awareness so that people can combine creativity and ideas to co-develop innovative solutions that deal with change and complexity. Iriarte, Alberdi, Urrutia and Justel (2017) posit that user-centred approaches and methods such as service design can improve users’ experience and service delivery. The authors further argue for the efficacy of service design as an enabler for strategic and organisational changes. Service design helps resolve conflicting viewpoints of stakeholders in the process of co-creating social innovations and the need for continuous improvement (Yang & Sung, 2016).

The identified challenges are common to situations in underserved communities where several stakeholders have different opinions about the needs of the community and how to improve the wellbeing of the youth in the underserved community. Rau, Zbiek and Jonas (2017) argue that service design can help align users’ needs to the ability of the service providers. This research intended to align ICT interventions to the needs of the youth in an underserved community. Reason (2016) adds that service design as a strategy can lead to better and sustainable service. The use of service design in an underserved community context was to help align ICT interventions with the wellbeing needs of the youth in the underserved community to bring about an improved service experience.

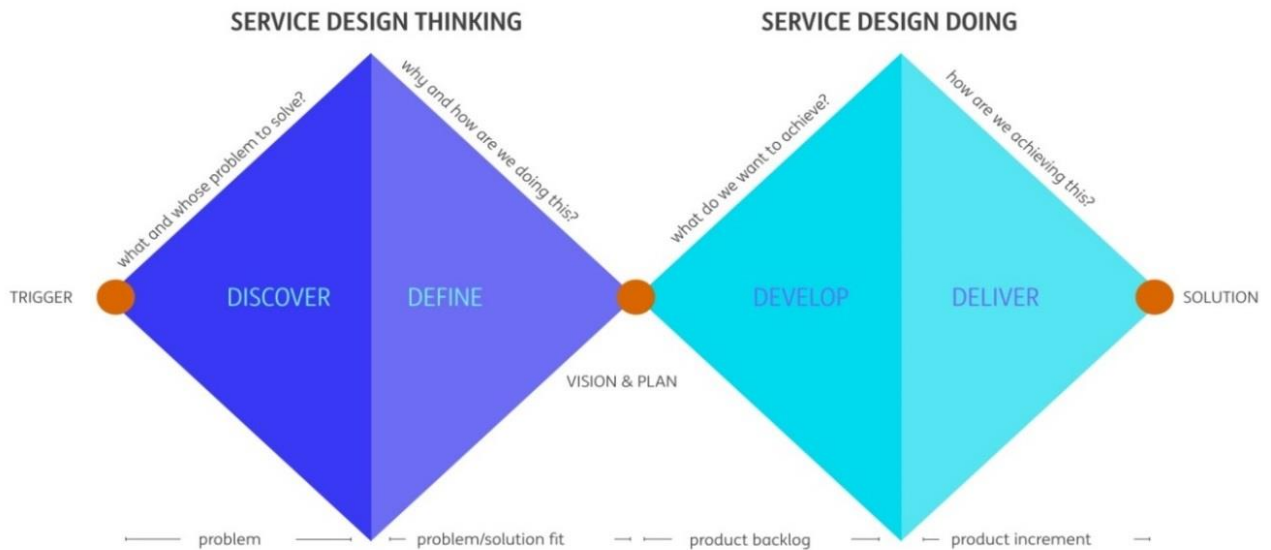


Figure 3.7: Service Design Schema (Design Council, 2013:3)

According to Reason (2016), service design is carried out in four major stages, which are to discover, define, develop, and deliver, as illustrated in Figure 3.7. The discovery stage helps researchers to gain insight into users' needs and the opportunities available to users. The second stage defines and analyses the needs in relation to opportunities available, the third stage helps to design and develop a solution to identified problems, which are then finally delivered to users in stage four. Holmlid and Evenson (2008) state that during the development stage, designers make use of different types of prototypes, models and other types of visualisation tools to present their ideas or proposed solutions to users for evaluation. The authors add that like any human centred design, the overall process is iterative in order to verify the alignment of the proposed solution with the users' needs.

Developing solutions that satisfy the users' needs requires design thinking. Dam and Siang (2018:1) define design thinking as "an iterative process in which we seek to understand the user, challenge assumptions, and redefine problems in an attempt to identify alternative strategies and solutions that might not be instantly apparent with our initial level of understanding". Design thinking focuses on how to develop innovations and provide solutions to business problems. However, design thinking is an aspect of service design because the outcome of design thinking is new or improved services for humans (Brown, 2008).

Although both design thinking and the service design methodology focus on the provision of value or improvement in value, design thinking is limited to innovation. Service design is concerned with the user of the service and the co-design (that is, the involvement of the user in the design process) of the service. It can therefore be said that service design involves the process of using design thinking to improve value through co-design, which in-turn improves user satisfaction. This research focused primarily on designing an innovative solution to the problem of the non-alignment of ICT interventions with the needs in underserved communities. This requires design thinking, an outcome intended to improve user satisfaction. Hence, the use of service design was deemed appropriate for the research. However, there is no stated philosophical position directed at understanding the design path to knowledge (Jones, Plowright, Bachman & Poldma, 2016).

Although the motivating idea of the study was to improve service design, which was also the underlining guide for the study, service design is only prominent in Chapter Five where the artefact design is discussed. Therefore, to achieve the fourth research objective, namely to design an ICT-based artefact that can be used to prioritise youth wellbeing indicators in underserved communities, the steps in the schema (Figure 3.7) were followed. The first diamond explains problem identification and planning. The second diamond elucidates the development and delivery of a solution. However, in this study, only the design of the artefact was achieved. The implementation of a solution was deemed to be outside the scope of study. The study stopped at the design stage, which is an aspect of the development stages, and included defining the design concepts and modelling of functional requirements that lead to a mock-up prototype of the artefact. After the initial co-design session, which provided basis for the design of the artefact, it was needed to engage the participants iteratively in order to seek their feedback on the design. However, due to limited time and availability participants, they were unable to provide feedback on the designed prototype.

3.8 Population and sampling technique

A research population is a complete set of all the entities that have the characteristics of interest in the research, or “all items in the category of things that are researched” (Denscombe, 2014:20). The target population of the study were the youth living in underserved communities in the Western Cape Province of South Africa. Underserved communities in South Africa consist of both urban and rural communities. While some provinces have mostly rural underserved communities, provinces such as the Western

Cape have more of urban underserved communities, often referred to as informal settlements. Informal settlements are poor communities that are often deprived of infrastructure, basic amenities, and economic opportunities. Informal settlements are mostly occupied by black and coloured people.

3.8.1 Sample size

An appropriate sample size for a qualitative study adequately answers the research question. For simple research questions, samples sizes might be in single figures (between 1 and 9), but for larger samples, a variety of sampling techniques might be required for more complex questions (Marshall, 1996). There is limited information on the population and statistical demography of people living in underserved communities in South Africa. However, statistics on the number of people living in urban informal settlements and those living in rural settlements could provide an insight into underserved population statistics. Statistics South Africa(2016) reported that towards the end of 2014, 13% (i.e.approximately 7 million of the South African population) live in informal settlements, while the United Nations reported that approximately 19 million people live in rural areas. It may not be correct to determine the actual number of people living in underserved communities by adding up these numbers, because not all rural parts of South Africa are necessarily underserved, and there are informal settlements in rural areas; thus, there is an intersection between the population in rural areas and the population living in informal settlements. Therefore, there is no specific information about the number of youth that currently live in underserved communities in South Africa. Similar to South Africa's profile, the Western Cape in its update on the status of informal settlements in this province, failed to provide any specific information on the youth. The report provided information on children aged 0 to 17 only. It is not also clear how many of the youth live in underserved communities in the Western Cape.

Marshall (1996) explains that a suitable sample size for qualitative research is the size that is sufficient to answer the research question, which depends on the simplicity or complexity of the study. Boddy (2016) adds that the sample size used for a research study depends on the research question and the epistemological approach adopted in the study. Fewer samples may be used with the constructivist approach compared to the interpretivist approach. Forty young individuals (youth) participated in the study. There were 24 participants in the first workshop and 16 participants in the second workshop.

3.8.2 Sampling method

Although research is carried out to achieve certain objectives with/for the population, a sample is often selected because it may be impossible to have access to the entire research population because of availability and the high cost needed to collect data from the population (Levy & Lemeshow, 2013; Berhimpon, Pangemanan & Rumokoy, 2018). A sampling method can be probabilistic (random) or non-probabilistic (non-random) (Levy & Lemeshow, 2013).

3.8.3 Probability sampling method

Probability sampling is a method to ensure that all the elements in the population have a fair chance of being selected and included in the sample (Pickard & Childs, 2013). This type of sampling is one of the criteria that “qualify the findings from a study to be generalised for the entire population” (Struwig & Stead, 2013:118). The probability sampling method involves a random selection of sample of the population. Different types of random sampling techniques include simple random sampling, cluster sampling, stratified random sampling, systematic random sampling, and multi-stage random sampling (Singh & Masuku, 2014). However, random sampling can be used given two conditions: (i) when all the elements in the sample frame (population) have an equal chance of being selected; and (ii) the selection of an element in the sample frame is based on chance (Acharya, Prakash, Saxena & Nigam, 2013).

Marshall (1996) posits that it is ineffective to use random sampling for qualitative research that intends to study human behaviour. Hence, it is not practical for all the young people (youth) of an underserved community to have an equal chance of being selected as part of the sample based on factors such as size of the community, accessibility, and knowledge of where and who the youth are in different households.

3.8.3.1 Non-probability sampling method

Non-probability sampling is a method that “depends on the subjective judgement of the researcher” (Struwig & Stead, 2013:116). Non-probability sampling does not make use of randomisation or chance for sample selection. By adopting a non-probability method, the researcher has the opportunity to determine suitable samples using one of the non-probabilistic sampling methods such as snowballing, convenience sampling, and quotas sampling (Marshall, 1996). A non-probability sampling method was used in this study, as it was not possible for all the youth in the community to have a fair opportunity of taking part in the study. Non-probability sampling was adopted because the sample had to

meet specific criteria, namely aged between 15 and 35, and must be living in, and have first-hand knowledge of the underserved community that was sampled.

3.8.3.2 Convenience sampling technique

The convenience sampling method is used to select samples because of their accessibility to the researcher (Marshall, 1996). Research participants are chosen because of the ease of recruiting them. It is an easy and inexpensive method for recruiting participants. It is also less time-consuming (Marshall, 1996). Taylor et al. (2015) maintain the best setting is one that is easily accessible to the researcher and where the researcher is able to establish easy rapport with the participants. Marshall (1996) opines that the outcomes of convenience sampling may be of poor quality and lack rational credibility. Acharya et al. (2013) add that a further challenge of using convenience sampling is that findings cannot be generalised beyond the selected sample.

3.8.3.3 Snowball sampling technique

The snowball sampling technique takes advantage of interpersonal relationships and connections among people to facilitate the identification of the ideal sample (Browne, 2005). When using the snowball technique, the researcher requests a respondent from the identified sample for a lead to the next potential sample (who has the qualities required to be part of the population) (Marshall, 1996). However, one major disadvantage of using snowball sampling is that samples may fall short of being representative of the population (Marshall, 1996).

3.8.3.4 Purposive (judgment) sampling technique

The purposive sampling technique is used in qualitative research to identify and select cases that can provide the researcher with rich information about the phenomenon of interest (Patton, 2002). It is used for selecting samples from a research population purposively (Singh & Masuku, 2014) based on pre-determined criteria (Ritchie et al., 2013). The technique is often used when participants are required to meet certain requirements that make the population sample representative of the population (Becker, Bryman & Ferguson, 2012). Etikan, Musa and Alkassim (2016) state that purposive sampling does not follow underlying theories like random sampling; rather, it enables the researcher to select the participants for the sample. This method is often used in qualitative research to select participants and is believed to be able to provide the researcher with rich data (Palinkas et al., 2015). Creswell and Clark (2011) submit that

purposive sampling can be used to identify and select participants that have experience or knowledge of a phenomenon that is of interest to the researcher.

The study adopted the purposive sampling technique to identify youth that have the knowledge and first-hand experience of living in the chosen underserved community. The purposive sampling technique adopted was based on the homogeneity of age. Palinkas et al. (2015) state that homogeneity is useful when an in-depth description of a sub-group is sought, as it reduces variation, facilitates group data collection, and simplifies analysis of the data. The homogeneous description for the two groups was the age of youth living in the chosen underserved community. The age group of the sample population were categorised as *youth* by the South African government, as stipulated in the 2015-2020 National Youth Policy, which recognises persons who fall in the 15 to 35 year age group. The participants in the study were youth under the guidance of Soulfood, an NGO in the Grabouw community, and the Theewaterskloof Municipality. The NGO was approached to select youth under their guidance for a 7-day workshop, which was a combination of training and data collection for different research projects, including this study. The co-ordinators of the NGO selected youth they deem suitable for the exercise based on the briefing about the purpose of the research and the type of participants required.

i) Sample selection of youth in underserved community

The participants of the study comprised youth from the underserved community of Grabouw. These young people were selected based on the assumption that they have first-hand experience and knowledge of issues in the community, and secondly, that they were willing to participate in the study. The sample comprised two groups (Group A and Group B) of youth, one group per workshop.

The first group (Group A) were youth from the Soulfood NGO, and the second group (Group B) were invited to the workshop by Theewaterskloof Municipality. There were 24 participants at the first workshop, referred to as Group A. The second workshop consisted of 22 participants, categorised as Group B. Although there were 24 participants selected for the first workshop, some of them excused themselves giving personal reasons why they could not be available for some of the sessions. Subsequently, not all of the participants took part in the entire data collection process. The number of participants for each of the sessions along with the activities that took place during each session is stated in section 4.2. Furthermore, six of the participants

who participated in the first workshop (Group A) were also present at the second workshop. These participants were not allowed to provide data during the second workshop, but were instead used as facilitators to help the participants understand what they were required to do. Therefore, data were collected from 16 participants during the second workshop. Thus, a total 40 participants took part in the study. Participants were young people from the ages of 15 to 35, with good knowledge of their community. It was observed that there were more females in Group A than males; this was reversed for Group B, as most of the participants in Group B were males.

3.9 Data collection

According to Ritchie et al. (2013), data collection methods in qualitative research include observations, semi-structured questionnaires, focus groups, and in-depth interviews. According to Draper and Swift (2011), in qualitative research there are several non-verbal techniques available that a researcher can use to collect data. For this study, the co-design method was chosen as data collection method because it is inclusive and has the ability to provide a more representative scenario. Questionnaires were used to gain an in-depth understanding of the wellbeing of the participants. The data collection instruments used in this research, are clarified in Figure 3.8.

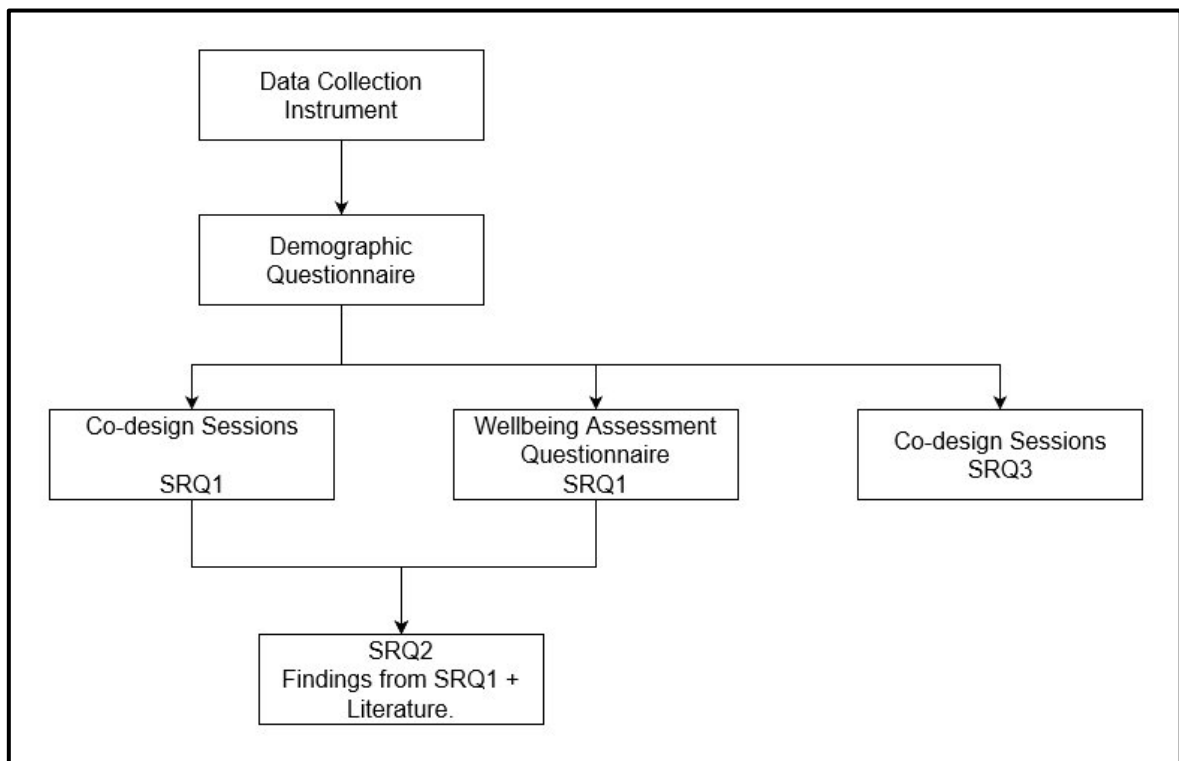


Figure 3.8: Data collection instruments

The next section explains co-design as data collection method. It also explains why and how it was applied to collect data from youth based in the chosen underserved community.

3.9.1 Co-design

Sanders and Stappers (2008:6) define co-design as “the (collective) creativity of designers and people not trained in design, working together in the design development process”. According to Ssozi-Mugarura et al. (2015), the need for more sustainable ICT interventions is one of the reasons why collective activities such as co-design are promoted.

Co-design is a participatory and open design process that allows people to make innovative contributions in the formulation of solutions to a problem. The method involves the active participation of researchers and stakeholders, collaborating in the design of a solution. Co-design is facilitated by a common understanding of the subject being researched jointly by the researcher and the participants (Vaajakallio&Mattelmäki, 2007).

Neidderer and Townsend (2010) posit that co-design research enhances joint actions and decisions making, and enables fair co-creation in the design process to meet the needs of the users. Lam et al. (2017) argue that engaging community members in co-design sessions could help them to discover their skills, knowledge, and creative potential.

Keinonen, Vaajakallio and Honkonen (2013) explain that co-design is carried out by reframing problems in an iterative manner, by searching for alternatives using visualisation and dialogues, and through the joint creation of prototypes by stakeholders and researchers. It was furthermore established that co-design started as an opportunity for community participation in services designed for the wellbeing of the community. Therefore, co-design, was deemed appropriate for the study, since service design is a co-creative approach for creating or improving services (Donetto et al., 2015; Soni& Freeman, 2017; Weston et al., 2018). Co-design provides details that may be difficult to relay when interviews or structured questionnaires are used, and is effective in studies that attempt to identify or prioritise indicators, as is evident with Chanal and Raynauld (2014).

Several authors have adopted the co-design method as a tool for community engagement and development in a research study (Hagen, Reid, Evans & Veal, 2018; Weston et al., 2018). Moreover, Sanders, Singh and Braun (2018) argue that co-design enables community members' involvement in seeking innovative solutions to their problems.

The co-design method was adopted because it symbolises an ideal technique for participatory research (Eyleset al., 2016). It provides a simple and interesting platform for participants to tell their stories in a creative manner, which may be difficult to relay and to analyse when the interview method is used. Thus, co-design was an appropriate tool for this research study, as the research intended to identify factors affecting the wellbeing of youth in an underserved community and prioritise the wellbeing indicators for ICT interventions.

The researcher and the community youth co-designed indicators and prioritised wellbeing indicators deemed necessary for adequate ICT interventions and assessment in the community. The collaboration between the user communities, the stakeholders, and the researcher was influenced by the need to consider local context in decisions concerning ICT interventions in underserved communities.

3.9.1.1 Co-design session (community specific issues)

The researcher engaged in conversation with the youth during the session by explaining the objective of the wellbeing indicator design session. The youth were instructed to identify issues they perceive as very prevalent in their community. Each participant was provided with paper stickers and a marker for writing, and requested to identify as many issues as possible.

Each issue identified was written on one piece of paper and placed on the whiteboard. The youth were encouraged to think about their community and then write any issue they consider a challenge in the community. The youth continued to write and paste the paper stickers with the issues on it, onto the whiteboard until all issues were exhausted.

Figure 3.9 shows a sample of the factors that were identified as affecting the wellbeing of the youth in Grabouw.

To prioritise the wellbeing indicators, the participants were engaged in a participatory co-design session. Following the argument of Wiles, Crow and Pain (2011) that a researcher may use a creative way to collect qualitative data, the Sorter, and the coloured dot were designed to determine the importance of each of the wellbeing indicators. Based on the number of indicators, it could have become overwhelming and laborious for the youth to determine the importance of each wellbeing indicator using the questionnaire. So, design thinking was employed by the researcher to design a form, called a Sorter, as shown in Appendix 6. The Sorter is an A3 sheet with six rows and two columns. Each row represents a priority (Priority 1, Priority 2, Priority 3, Priority 4, Priority 5, Priority 6) arranged in descending order, with the highest priority being the top row. The first (top) row represents the priority denoted by the apostrophe “!!!!!!”. For example, a single apostrophe denotes “Priority 1”, two apostrophes represent “Priority 2”, and so on. Thus, Priority 6 is the highest priority and has the most apostrophes. The second column, which is wider, provides space to place wellbeing indicators according to priority. Each of the respondents was given a Sorter and an envelope containing 70 pieces of paper. One wellbeing indicator was written on each piece of paper. Each written indicator (in English) was also translated into Afrikaans on the same piece of paper, as most of the participants were Afrikaans speaking and preferred the indicators in Afrikaans (see section 3.11.3). The steps involved in the prioritisation of the wellbeing indicators are summarised in Table 3.1.

Table 3.1: Co-design process for prioritising wellbeing indicators

Steps for wellbeing indicator prioritisation
The co-design process for prioritising wellbeing indicators was designed to answer RSQ3:How can youth wellbeing indicators be prioritised to align with ICT interventions in underserved communities?
Step 1: Sorting and prioritising
a)The data collection instruments comprised Sorter sheets and 70 pieces of paper with one indicator written on each (achieved from RSQ2); each indicator was written in English and Afrikaans.
b) Each participant was given a Sorter sheet (Appendix6) and an envelope containing a set of 70 wellbeing indicators.
c) The participants were instructed on how to use the instrument, with an emphasis on the importance of each row on the sheet (representingeach of the six priority levels).
d) The participants were asked to place each of the indicators on one of the six spaces, depending on their perception of the importance of the specific indicator (see Figure 5.3).
e) Participants were encouraged to use as many indicators as they found useful, meaningthere was a possibility that not all of the indicators would be used. They had to placethe wellbeing indicators not used back into the envelope.

Steps for wellbeing indicator prioritisation
Step 2: Re-prioritisation of priorities
<p>After all participants had pasted the indicators (written pieces of paper) on the Sorter sheet, ten(10) colour dots were given to each of the participants, one at a time, starting from the colour dot with the highest priority (priority1) to the colour dot with the lowest priority (Priority 10).</p> <p>The colour dotswere used to prioritise ten indicatorsfrom all the indicators selected by the youth. If participants understood what was requested, all ten colour dots would be placed in the first row, which indicated the highest priority on the Sorter except in a situation where the respondent had less than 10 priorities in the first row (Priority6 - highest).</p>
<p>Step 3 resulted in showing the highest ten priorities for each participant. It also served as a check to see if participants understood the concept as explained by the researcher. The solution to errors depended on the magnitude of the error. For example, if the participant did not understand the instructions and assigned the colour dots to lower priority indicators, participants were required to complete a new Sorter or indicate the desired order (see Figure 5.2for an example of error and correction).</p>

3.9.2 Questionnaire

Asking different participants, the same questions in the same way, is an important aspect of a research project (Brace, 2018).The questionnaire was designed to structure similar questions as were answered by the respondents in the co-design session. Acharya (2010) identifies the different types of questionnaires as structured, unstructured, and semi-structured. While structured and semi-structured questionnaires are always identified with quantitative research, semi-structured and unstructured questionnaires are aligned with qualitative research.

Furthermore, questionnaire questions can be categorised as either open-ended or closed (Krosnick, 2017). Open-ended questions are used in qualitative research because it gives participants the opportunity to express their position better than with closed questions where participants are required to make a choice from given options. Bryman (2017) adds that open-ended questions provide a better understanding of a subject.

The co-design method was used to list and sort wellbeing indicators in order of priority, but as an exploratory study it was important to have a deeper understanding of the perception of the participants on their wellbeing. Hence, the open-ended questionnaire was also used to collect data that further reveal the wellbeing status of the participants. Eneh (2008) posits that the use of questionnaires for data collection saves time. Therefore, questionnaires were used to collect demographic data, as it enabled the researcher to collect data quickly from respondents at the beginning of the workshop.It also helped to maintain the privacy of personal information.

Questionnaires were also used to collect wellbeing data, as unstructured questionnaires with open-ended questions provided the opportunity to obtain individuals' opinions, which better reflected the thoughts that participants would not want to share openly. Interviews were not used because of time constraints, although most authors in literature who investigated youth wellbeing used structured questionnaires with closed questions (Fillenbaum & World Health Organisation, 1984; Renshaw, Long & Cook, 2015). The need for in-depth study necessitated the use of open-ended questions (Tokmak, Baturay & Fadde, 2013; Bryman, 2017).

3.9.2.1 Questionnaire description

Two types of questionnaires were used in the study – the first questionnaire to collect demographic data and the second to collect data on the wellbeing of participants. Questionnaires have been used extensively in literature for collecting demographic data (Weigold, Weigold & Russell, 2013; Ahmad, 2015). Open-ended questionnaires are used to collect data in a manner that participants are able to express themselves adequately, which provides clearer insight into the research question (Morton et al. 2018).

i) Demographics questionnaire

A Demographics questionnaire was used to collect information on the demography of participants, which enabled the researcher to analyse the data based on the specified demographics. Demographic data enable the researcher to examine the nature of the sample (Jackson, Chow & Leitch, 1997) and understand the backgrounds of the respondents (Ragusa & Ward, 2016). This provided a deeper understanding of individual and group priorities of wellbeing indicators and the significance of the wellbeing indicators to the participants based on their demography.

Furthermore, demographic data can be used to compare findings across participants' demography (Perrot, Deloney, Hastings, Savell & Savidge, 2001). Demographic data were collected from 40 participants using an unstructured questionnaire. The questionnaire contained ten (10) open-ended questions, which allowed participants the opportunity to provide a brief background of themselves, their family, and their access to ICT

Appendix 4 provides the structure and questions of the Demographics questionnaire.

ii) Wellbeing questionnaire

The attempt to find answers to RSQ1 was co-ordinated using a co-design technique and two questionnaires. The second questionnaire used in this study is the Wellbeing assessment questionnaire. The aim of using the questionnaire was to provide an in-depth understanding of factors affecting the wellbeing of youth living in the community as supplementary data to the co-design technique. It comprised 15 open-ended questions to collect data on the wellbeing of the youth (see Appendix 5). The questionnaire was designed to address the wellbeing categories that affect the wellbeing of youth as listed on the GYWI. The targeted categories are health, economic opportunities, education, safety and security, civic participation, gender equality, and ICT.

3.10 Data analysis

According to Struwig and Stead (2013), the purpose of data analysis is to find meaning from the data. The analysis of data in research largely depends on the research approach, research methods, data collection methods, and the research instrument(s) used to collect data. The determinants of the method of analysis are not only research questions and the type of data collected, but also the underlying philosophical assumptions adopted in the study (Soiferman, 2010). Due to the subjective nature of qualitative research, answers are derived for research questions by making sense of data, which includes texts, images, observations, and narrations.

Qualitative researchers seek themes or patterns in the text or image analysis; they also seek out larger patterns for generalisations to specified context (Creswell & Clark, 2007). Qualitative data analysis is achieved by coding, scoring, and summarising using computer applications such as a word processor or spreadsheet and applying the correct data analysis tools to derive logical meaning from the data (Grbich, 2012).

Data collected through document analysis, interview observation, and other methods in qualitative research cannot be measured but are interpreted and organised into categories or themes. The commonly used analysis techniques in qualitative data are thematic analysis and content analysis (Vaismoradi, Turunen & Bondas, 2013). Vaismoradi et al. (2013) posit that there are no differences and similarities between thematic and content analysis.

3.10.1 Content analysis

Cole (1988) defines content analysis as a method used to analyse messages from verbal, written, or visual communication. Elo and Kyngäs (2008) add that content analysis makes it possible to sort words into related categories. The aim is to attain a summarised and broad description of a phenomenon, and produces an outcome in the form of categories that describe the phenomenon (Elo & Kyngäs, 2008).

Although both the thematic analysis and content analytic methods include thorough scrutiny comparing data in order to come up with patterns and themes, content analysis also provides an opportunity to quantify data (Vaismoradi et al., 2013). Elo and Kyngäs (2008) submit that content analysis can be used for analysing both quantitative and qualitative data by describing the phenomenon in a conceptual form by means of a model. The authors further argue that content analysis can be used for both inductive and deductive reasoning, where the deductive approach to content analysis aims at testing existing theory by varying situation and category comparisons at different periods. Inductive content analysis is suitable when a researcher is dealing with situations where there are no previous studies done on the subject or in cases where the available studies provided fragmented information or data on the phenomenon (Elo & Kyngäs, 2008). Therefore, qualitative content analysis is often used for analysing qualitative data in an exploratory research context.

Mayring (2000:5) defines qualitative content analysis as “an approach to empirical, methodological, controlled analysis of texts within their context of communication, following content analytic rules and steps and without rash quantification”. The author argues that content analysis may follow an inductive or deductive approach and either the qualitative or the quantitative method. The steps required in carrying out qualitative content analysis are illustrated in Figure 3.11. Contrary to thematic analysis, content analysis starts by determining categories that suit the research questions, followed by observation of the data to classify text according to the identified categories. After identifying the categories, researchers can analyse the result through a ‘seemingly’ quantitative means such as frequency.

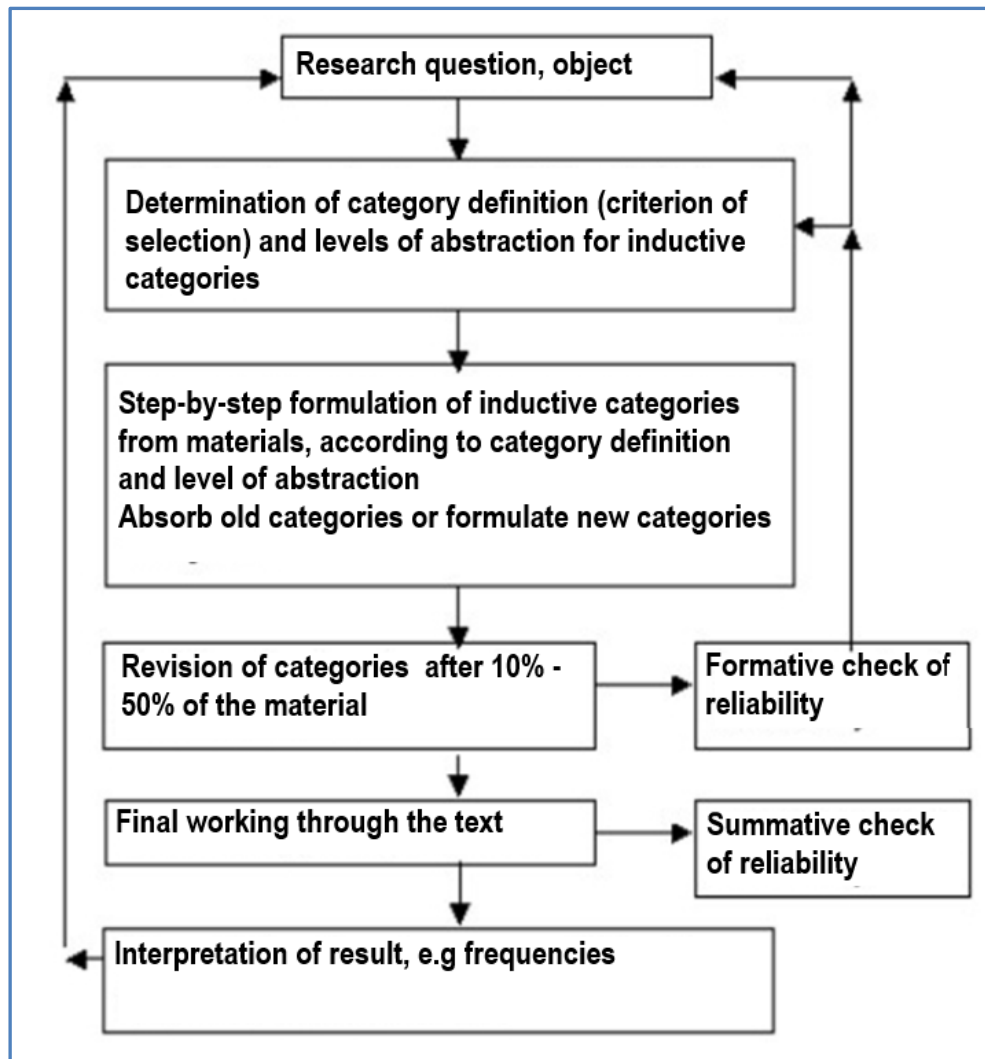


Figure 3.11: Step model of inductive category development (Mayring, 2000:4)

For this study, content analysis techniques were adopted given that there is no prior study done to assess or prioritise the wellbeing of youth in underserved communities. This method was suitable for analysing categorised variables from the questionnaires, collecting data on the perception of the youth about their community and wellbeing, and for categorising opinions from the co-design sessions based on the GYWI categories. Content analysis provided an opportunity to develop themes and categories based on the frequencies of prioritised youth wellbeing indicators. Although the simplicity of content analysis has been criticised, Elo and Kyngäs (2008) argue that it is only as difficult as the researcher determines it to be, and it offers various benefits to researchers. Some of the benefits mentioned are the content-sensitivity and flexibility to research design.

Despite several different studies on wellbeing indicators and youth wellbeing indicators, many of these are not relevant to the underserved community and to South Africa's context. Following the reasoning of the inductive approach adopted in the study to explore the phenomenon subjectively, content analysis was best suited as the analytical method for the study. It enabled the researcher to classify the data based on the categories identified from the Global Youth Wellbeing Index system. Simple statistical formulae such as sum and average were used in the analysis. Data collected during the co-design sessions and from the questionnaires were analysed using content analysis. The seven categories of the GYWI model were used as headline categories, and the identified wellbeing factors and priorities were grouped according to these categories.

3.11 Ethical considerations

Researchers must follow guidelines when conducting research because it is an ethical undertaking (Struwig & Stead, 2013; Flick, 2015). Eriksson and Kovalainen (2015) submit that research ethics is not limited to how a researcher gains access and collects data from participants, but the entire research process. Moreover, Struwig and Stead (2013) explain that researchers need to follow certain ethical principles, some of which are integrity, professionalism, the protection of dignity, and the rights of participants. A researcher needs to avoid discrimination and make provision for the safety and wellbeing of participants during the course of the research. Sarantakos (2012) categorises the topics covered by ethics as professional standards and ethical conduct, researcher-to-researcher relationship, researcher-to-respondent relationship, and the treatment of animals during the course of the research. The issues that need to be considered in social science research are dependent on the research method adopted (Kelman, 1982).

Silverman (2016) adds that the quest for rich data, which leads to researchers interacting with social actors in most qualitative research projects, places certain ethical demands on the researcher. The author posits that important issues for ethical consideration in research include confidentiality, trust, code, and consent. Furthermore, informed consent implies that the respondents have to be aware that they are being researched, they have a right to know what the research focuses on, and they may quit participation at any stage during the research process (Silverman, 2016).

However, the data collection process is critical to qualitative research; hence, emphasis is placed on access to the topic and the data collection process. Ethical

principles consider how sampling is done, how data are collected, the design of the data collection instruments, how participants' anonymity is protected, and how the researcher plans to handle conflict of interest, danger to animals, and the welfare of man, animals and the environment.

3.11.1 Access, consent and confidentiality

Due to the importance of ethics in research, many professional associations, universities, and government agencies have adopted specific ethical codes, rules and policies to guide research processes (Blake, 2007). Hence, the Cape Peninsula University of Technology has ethical guidelines for student and staff researchers. Participation in the study was achieved without any form of pressure and participants were not exposed to any kind of danger.

3.11.1.1 Access to community and participants

To ensure that participants were not pressured or endangered throughout the research process, the Faculty of Informatics and Design (FID) of the Cape Peninsula University of Technology requested a detailed methodology, which included the presentation of data collection processes and instruments to be used in the research before commencing the data collection. FID also requested information on how the anonymity of the participants would be protected. The researcher had to complete a form (Appendix 1) that provides all necessary information. After FID evaluated the form, clearance was issued that allowed the researcher to commence with data collection. Furthermore, clearance to approach the community for data collection was obtained from Theewaterskloof Municipality by the head of the research team before data collection began. Consent for data collection from the youth at Soulfood Community Organisation was also sought from the co-ordinator of the NGO (Appendix 2).

3.11.1.2 Participant consent

Before data collection could commence, potential participants were informed of the study's objectives and the full data collection process, where after the participants' consent was sought in writing by means of a consent form (Appendix 2). The content of the consent form was read by the researcher and interpreted in Afrikaans by another researcher. The form provided information on the purpose of the research, the need for the participants to sign the form, and how they would want their information, pictures, voice and video recordings to be used in media and publications. It informed participants of the non-anonymity clause and their right to quit the data collection

process at any time. Participants were under no obligation to answer questions they deemed to be uncomfortable. Participants were furthermore provided with a list showing the type of data output they consented to in terms of publications. Each option on the list was carefully explained to the participants, who were then asked to peruse the list and select their desired options. The list of options and the consent form were signed by the participants and collected by the researcher before commencement of the data collection process.

3.11.1.3 Anonymity of participants

To ensure that the anonymity of the participants was maintained, participants were asked to use pseudo names in place of their real names. Data were collected by the researcher and other researchers who attended the participatory workshops. The youth were informed of their right to choose which information to disclose, guaranteed anonymity by using pseudonyms to present the report. Participants were also informed about the safety and privacy of their data. The researcher ensured that the identities of the participants were not disclosed, such that participants cannot be connected with responses discussed in the study.

3.11.2 Validity

Validity focuses on the integrity of the conclusions reached from research work (Bryman, 2016). Creswell and Clark (2007) argue that the validity procedures of qualitative research rely on the researcher, the participants, or the reader. The authors add that one of the methods used to maintain the accuracy of qualitative research is the use of several sources to verify a theme. Different types of validity include measurement as well as internal, external, inferential, and ecological validity. According to Bryman (2016), most validity types are useful for evaluating quantitative research, but trustworthiness has been proposed as a similar method to validating conclusions reached using qualitative research. Bryman (2016) further explains that credibility, transferability, dependability, and confirmability are aspects of trustworthiness used in validating qualitative research conclusions. The types of trustworthiness listed include believability, applicability of findings to other contexts, and the extent to which the values of the researcher influenced the findings.

In this research, the researcher validated the findings on the issues that are prevalent in the community by applying triangulation. Prevalent issues in the underserved community were collected three times using two methods – twice by means of the co-

design sessions and once using a questionnaire. These different data sets were used for internal validity. The similarity of data showed consistency in the thoughts and perspectives of the youth about their wellbeing.

Face validity was also employed. The supervisors who are specialists in the field of technology and other professors in the Department of Information Technology provided suggestions and inputs on the design and content of the data collection instruments. The face validity was strengthened by the scrutiny of the data collection instruments.

Content validity is the degree to which an instrument has appropriate items for the construct being measured (Polit & Beck, 2013). Content validity of the instrument was achieved through a review of wellbeing indicator systems, and most importantly, the GYWI, which was used as the basis for the development of the Wellbeing questionnaire.

3.11.3 Translation

The data instruments were originally developed in English, but Afrikaans options were also provided as some of the participants were from Afrikaans speaking backgrounds. Although some of the participants' first language was isiXhosa, they did not require translation because they indicated that they could read, write, and understand the English language.

3.12 Summary

This chapter provided a detailed understanding of the scientific process engaged to achieve the set objectives and motivate the choices made in the process of the study. Firstly, the worldview of the researcher in terms of ontology and epistemology were subjective and interpretive. The researcher adopted a qualitative method to explore answers to the research questions, using a case of the Grabouw community. The sample population was chosen using purposive sampling, which allowed the researcher to choose participants based on the age range of the youth (15 to 35) and their knowledge of the underserved community they live in. Data were collected from the 40 selected participants using questionnaires and co-design as data collection instruments.

Although co-design was the main technique in the study, questionnaires were used to gain a more in-depth understanding of the study. The data collected using the two instruments were analysed by applying the content analysis technique. The chapter also explained the ethical processes engaged by the researcher to ensure the

confidentiality, safety, and anonymity of the participants as well as the security of the participants' information.

The next chapter provides details on how the data were analysed using the processes discussed in Chapter Three. The findings, which are answers to the research questions, are also indicated.

CHAPTER FOUR: ANALYSIS AND FINDINGS

4.1 Introduction

This chapter presents the analysis and findings reached in the exploration study on how wellbeing indicators can be used to facilitate effective ICT interventions in underserved communities in South Africa. This chapter provides information on the context and respondents, and presents an analysis of the data collected using the methodology described in Chapter Three. The findings derived and interpretations made based on the analysis of the data are indicated. The findings and categories are then summarily presented in relation to the corresponding research sub-questions.

For ease of reference, the problem statement, research questions, and research objectives are again stated.

4.1.1 Problem statement

The lack of youth engagement in prioritising the wellbeing indicators in underserved communities often leads to the design of mismatched interventions, resulting in wasted efforts and resources with no visible impact on the wellbeing of youth.

4.1.2 Research questions

RQ1: How can youth wellbeing indicators for underserved communities be developed?

RSQ1: What are the factors affecting the wellbeing of the youth in underserved communities?

RSQ2: How can a comprehensive set of youth wellbeing indicators for underserved communities be developed?

RQ2: How can youth wellbeing indicators be used to determine ICT needs in underserved communities?

RSQ3: How can youth wellbeing indicators be prioritised to align with ICT interventions in underserved communities?

RSQ4: How can an ICT-based artefact be designed to prioritise youth wellbeing indicators in underserved communities?

4.1.3 Research objectives

- i) To determine the factors affecting the wellbeing of the youth in underserved communities in South Africa.

- ii) To propose a comprehensive set of youth wellbeing indicators from which the needs of the youth in underserved communities in South Africa can be prioritised.
- iii) To prioritise wellbeing indicators as a determinant of the needs of the youth for relevant ICT interventions in underserved communities in South Africa.
- iv) To design an ICT-based artefact that can be used to prioritise youth wellbeing indicators in underserved communities.

4.1.4 Research aim

This study aimed to explore how youth wellbeing indicators can be used to facilitate effective ICT interventions for youth empowerment and development in underserved communities in South Africa. A further aim was to develop an ICT-based artefact to prioritise youth wellbeing indicators in underserved communities in South Africa.

4.2 The case – Grabouw

The research case study is located in the informal settlement of Grabouw. Grabouw is a medium-sized town in the Western Cape Province of South Africa, situated approximately 65 kilometres southeast of Cape Town. Grabouw is the commercial centre of the Elgin Valley, a vast farmland and export area producing approximately 60% of the national apples of South Africa and is considered one of the top producers of wine in the country. Thus, the employment opportunities for people living in the area are limited to working on the apple farms and at wine producing factories in the area.

Grabouw forms part of Overberg District Municipality/Theewaterskloof municipality. The population was estimated to be 30,337 in 2011, showing an increase of 8,384 more people than the number of people who lived in this community in 2001, based on a predicted annual growth rate of 6% (Statistics South Africa, 2011). This figure encompasses 14,967 males and 15,370 females. The racial classification shows that there are more “coloured” people in Grabouw than any other South African races. Statistics show 55.78% coloured and 38.47% black South Africans, while whites, Indians and other races form part of the minority groups.

Statistics provided by Frith (2018) indicate that the predominant languages in Grabouw are Afrikaans, IsiXhosa, Sesotho and English, and spoken by 61.83%, 28.50%, 4.99% and 2.48% respectively. Figure 4.1 shows the geographical location of Grabouw in the Western Cape. Figure 4.2 shows a cross-sectional picture of the Grabouw community.

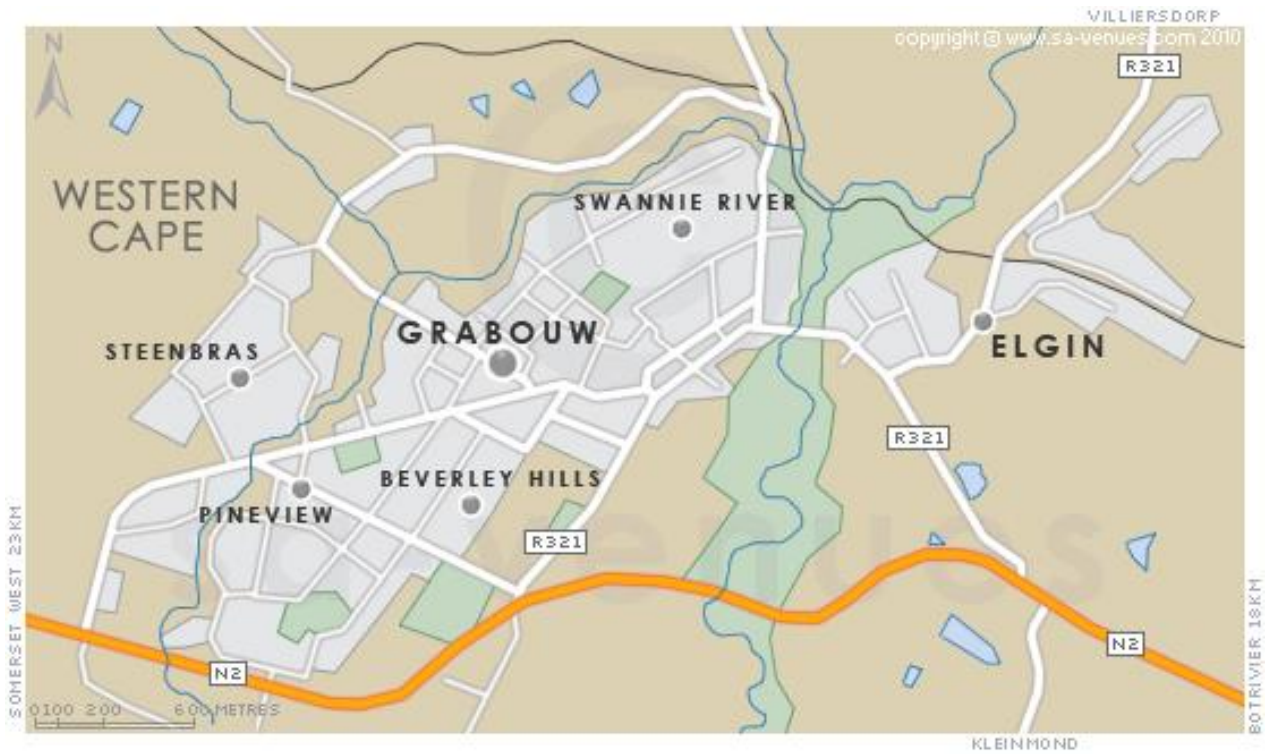


Figure 4.1: Grabouw and its neighbouring communities



Figure 4.2: Picture of Grabouw community

Although only a few people in the population speak English as their first language, many speak English as their second language. Like other underserved communities, Grabouw has its fair share of a lack of resources, poverty, and disenfranchised members of the community. These issues have led to several non-governmental organisations (NGO) and volunteers working in the community to help improve this community's state of wellbeing. Because of the importance of the youth to society, most of these NGOs primarily concentrate on improving the wellbeing of the youth using different measures. The researcher collaborated with an NGO to gain access to the youth in the community.

A research team from CPUT involved in collaborations with some NGOs resident in Grabouw organised a series of workshops for youth empowerment in the community. The workshops were targeted at exploring lived experiences in order to secure valuable information and obtain a clear picture of youth wellbeing in the community. The workshop also facilitated skills-based training for the youth, such as printmaking. Data collection for this research was carried out as part of larger research and collaboration between the researcher and other senior researchers from the Faculty of Informatics and Design at CPUT.

As a community whose youth experience economic and social challenges, several stakeholders are involved in bringing interventions to the community. One such intervention is Soulfood, an NGO that was initiated in 2012 by Lynette de Bruyn Davids. It offers basic social care to children and youth of the Snake Park Community in Grabouw. Soulfood started out by providing after-school care and educational support to help the community. Presently, services offered by Soulfood in Grabouw community includes a feeding scheme, family support, gardening, women support, support for resistance or recovery from substance abuse and other programmes targeted at supporting specific needs, given the challenging living conditions of the community. One of the two workshops for data collection was facilitated by Soulfood and carried out on its premises. The second workshop was held at the Grabouw library and was coordinated by Theewaterskloof Municipality. A brief demography of the 40 participants that took part in the workshops is provided in Table 4.1. The pseudonyms used by the participants were not used, as some participants in the first and second workshops used the same pseudonym, which made it difficult to distinguish between them. Therefore, the names of the participants are represented by an array variable 'P' with incremental values (P1, P2...P40).

Table 4.1: Brief demography of all participants

Participant Number	Age	Gender
WORKSHOP 1 (GROUP A)		
P1	21	Female
P2	19	Female
P3	19	Female
P4	21	Female
P5	22	Male
P6	23	Female
P7	20	Male
P8	18	Female
P9	18	Female
P10	19	Male
P11	18	Female
P12	30	Male
P13	21	Female
P14	21	Female
P15	19	Male
P16	20	Female
P17	19	Female
P18	21	Female
P19	22	Male
P20	23	Male
P21	21	Female
P22	23	Female
P23	20	Female
P24	24	Female
WORKSHOP 2 (GROUP B)		
P25	21	Female
P26	26	Male
P27	20	Male
P28	21	Male
P29	18	Female
P30	19	Male
P31	18	Male
P32	23	Male

Participant Number	Age	Gender
P33	18	Male
P34	21	Male
P35	21	Male
P36	25	Male
P37	20	Male
P38	23	Male
P39	25	Male
P40	19	Male

4.3 Analysis of data

The researcher collected data from the participants with the assistance of other researchers. The data were collated and analysed using the content analysis method (see section 3.10.1). This technique was used to analyse data collected through questionnaires and co-design sessions (see section 3.9). Initially, the seven categories presented in the Global Youth Wellbeing Index were predetermined for the analysis of data relating to youth wellbeing indicators. These categories are ICT, safety and security, civic participation, gender equality, education, economic opportunities, and health. Subsequent sessions provided better insight into how data from each of the sessions were analysed using content analysis and the corresponding findings.

4.3.1 Questionnaire analysis

All data from the questionnaires of the first and second workshops were collated and entered into a Microsoft Excel sheet. The participants' responses were coded and assigned appropriate categories. The responses and the analysis are presented below.

4.3.1.1 Analysis of Demographics questionnaire

The purpose of demographic data is to gain insight into the background of the participants. The demographic data describe the ages, gender, educational background and other related information about the participants. In total, 40 participants completed the questionnaires across two workshops – 24 participants at Workshop A and 16 at Workshop B. Ten questions were asked in the Demographic questionnaire (Appendix 4). The data were collated and entered into a Microsoft Excel sheet and themes were identified (Figure 4.3), where after the researcher determined the frequencies of each theme. The findings for each of the questions in the Demographics questionnaire are presented next.

		WORKSHOP A								
Emo	Johny English	Wieda	Lily	Smally	Hennis	Surprise	Vaselinetjie	Angela	Havanah	
SA	SA	SA	South Africa	South Africa	South Africa	South Africa	South Africa	South Afrika	South Afrika	
Grabouw Snake	Grabouw	Grabouw	Grabouw SlangPark	Grabouw	Grabouw	Grabouw	Grabouw	Grabouw	Grabouw	
family	Mother	Family	Family	Mother	Sister	Family	Family	Mother	Parents	
female	Male	Female	Female	Female	Male	Male	Female	Female	Female	
	21	19	20	19	21 years	22	23	21	23	20
afrikaans	Afikaans	Afrikaans	Afrikaans	Xhosa	Xhosa	Xhosa	Afrikaans	Afrikaans	Afrikaans	
None	none	1 child	none	None	None	None	None	None	None	
Clean house and other things	with uncle	Unemployed	student	From Parents	Siblings & Partime w	Parents	Hairdressing	Unemployed	Unemployed	
Gr 12	Grade 12	Grade 12	College	Matric	Grade 12	Grade 12	Grade 8	Grade 8	Grade 10	
Yes, cousin	Yes, Cousins	Yes, Many	Yes, Self	No one	Brother & sister	None	None	None	None	
Only cell phone	Cell Phones	Yes, Cellphone	Cellphone and Laptop	Cellphone	Cellphone	Cellphone and T	Cellphone	Cellphone	None	

Figure 4.3: Sample of demographic data with colour themes

Question 1: What is your nationality?

This question was asked to determine the nationality of the participants. All participants involved in the two workshops identified as South African citizens.

Question 2: Where do you currently reside?

This question was asked to determine if all participants reside in the Grabouw community. All the participants indicated that they are resident in Grabouw and provided their residential address for verification.

Question 3: Do you live alone or with anyone?

This question was asked to understand the type of support available to the participants within the family structure. Most (18) of the participants responded that they live with their parents or family members. Eight participants were raised by their mothers. One participant indicated living alone while another participant indicated living alone with her daughter. Four participants reported that they live with relatives (sister, uncle, and grandmother). One of the participants, a female, indicated that she lived with her husband and child.

Question4: What gender do you identify with?

The question was asked to identify the gender of the participants to analyse possible preferences of wellbeing indicators prioritised by a specific gender. A total of 21 males and 19 females attended the workshops. More females (17) attended the first workshop compared to the males (7), while there were more males (14) in the second workshop compared to the females (2). None of the participants indicated that they are bi-sexual or transgender, which may be associated with the stigma associated with these gender identities.

Question5: How old are you?

The fifth question was asked to identify the ages of the participants, which were used to establish the relationship between the age of the participants and their choice of wellbeing indicators. Twenty-one (21) participants fall within the 21 to 26 age group, while 18 fall within the 15 to 20 age group. Only one participant is above the age of 26 (P12). This may be because people above 30 years may choose not to identify as a youth, especially when they are gainfully employed and taking on the same responsibilities as older adults.

Questions6: What is your home language?

This question was asked to determine the language(s) of the participants. Most (31) of the participants reported that their home language is Afrikaans, while IsiXhosa is the home language of nine. This was representative of the Grabouw population, indicating that community members are predominantly Afrikaans speaking people.

Question 7: How do you earn money to support yourself and others?

Nine participants were self-employed, engaging in activities such as hairdressing and bicycle repair for sustenance. P13 stated that, "I do event management on weekends and bicycle repair maintenance services..." Four participants were still studying, relying on their parents for financial support. Four of the participants were gainfully employed. The rest of the participants, 13 in total, were not employed nor in education and depended on their parents for financial support. Thus, they were categorised as youthnot in employment, education, or training (NEET) whose wellbeing is a source of concern to stakeholders (John &Cox, 2018).

Question 8: What is your highest level of education?

Many (19) of the participants reported that they are in Grade 12 or completed Matric. Four participants were in college or have college degrees. The other 16 participants had qualifications below Grade 12, which implies that most of the participants do not have a higher education qualification and are limited to searching for jobs that require matric or below matric qualifications.

Question 9: Has anyone in your family studied at a university?

Some (10) participants reported that they have members of their extended families who are studying or who have studied at different tertiary institutions. Some (7) reported that members of their core families (their "sister" or "brother") were studying at tertiary institutions. Most of the participants (23) reported that none of the members of their families was studying at a tertiary institution.

Question 10: Describe the type of technological device that you have.

Participants were asked what type of ICT device(s) they own or have access to. Most (30) reported that they own mobile phones. Some (3) participants reported that they own mobile phones and television, with one participant owning a laptop. Four participants reported that they do not have mobile phones.

Table 4.2 shows the summary of findings from the demographic data.

Table 4.2: Findings from Demographic questionnaire

No.	Question	Findings from demographic data
1	What is your nationality?	All participants are South Africans
2	Where do you currently reside?	All participants live in Grabouw
3	Do you live alone or with anyone?	Most of the participants live with both parents or their mothers
4	What gender do you identify with?	There were 19 female and 21 male participants in the study
5	How old are you?	Most of the participants were from 19 to 23 years old
6	What is your home language?	The majority of the participants speak Afrikaans, with a few IsiXhosa speakers
7	How do you earn money to support yourself and others?	Most of the participants reported that they are not gainfully employed. A few reported working part-time, while others depended on their parents and relatives for their upkeep
8	What is your highest level of education?	The highest educational level of the participants ranged from Grade 8 and Grade 12. Only one participant reported being in tertiary education
9	Has anyone in your family studied at a university?	Most participants reported having relatives at university, while a few did not have any family members at university
10	Describe the type of technological device that you have.	Only four participants did not have a mobile phone

4.3.2 Analysis of data for RSQ1

The objective of the first research question was to identify the factors affecting the wellbeing of the youth in the selected underserved community. The data collection in this section was carried out with the intention to answer RSQ1, “What are the factors affecting the wellbeing of the youth in underserved communities?” To answer RSQ1, two types of instruments were used for data collection – co-design and questionnaires. The co-design technique was used to provide a list of factors affecting the youth in the community, while the Wellbeing questionnaire (with open-ended questions) was used to gain deeper insight into the wellbeing of the youth in the Grabouw community.

4.3.2.1 Analysis of co-design data (wellbeing factors)

The first set of data for RSQ1 was collected and analysed using the co-design technique. The objective of the session was to provide a list of factors (challenges) perceived to affect the wellbeing of the youth living in Grabouw, an underserved community in the Western Cape. The process of identifying and categorising wellbeing factors was carried out by following the steps highlighted in Table 3.1. In total, 24 participants identified wellbeing factors affecting Grabouw community. To analyse the data collected from the co-design sessions, the seven pre-determined categories from

After categorisation, most of the wellbeing factors were categorised into four of the seven predetermined categories. However, some wellbeing factors were isolated and did not fit under any of the predetermined categories. The four categories populated were health, safety and security, economic opportunities, and ICT. The researcher together with participants found a suitable category for the isolated wellbeing factors, namely infrastructure and social support.

The wellbeing factors under each of the categories were cleaned by removing synonyms, duplicates, and words with the same interpretation (some of the factors were written in Afrikaans). After cleaning the data, 33 wellbeing factors emerged, categorised into six (6) categories, as depicted in Table 4.4.

Table 4.4: Factors by category affecting wellbeing in Grabouw

Health	Safety and Security	Economic Opportunities	ICT	Infrastructure and Services	Social Support
Obesity	Drug abuse	Poverty	Access to internet	Pollution	Culture
Chronic disease	Violence	Unemployment		Housing problem	Faith
Anxiety	Suicide	Lack of money			
Chronic disease	Crime	Lack of employment opportunities			
Anxiety	Disrespect				
Addiction	Lack of discipline				
STI/HIV	Peer pressure				
Fear	Bullies				
	Racism				
	Domestic violence				
	Pornography				
	Jealousy				
	Respect for others				
	Prostitution				
	Robbery				
	ICT hacking				

4.3.2.2 Analysis of Wellbeing questionnaire

The questions presented in the Wellbeing questionnaire helped to provide a richer understanding of how the wellbeing factors affect the life of the participants. The Wellbeing questionnaire is the second tool used to collect data towards seeking answerstoRSQ1. This section presents a summary and findings of the Wellbeing questionnaire. The Wellbeing questionnaire consists of 15 wellbeing related questions designed to cover the seven GYWI categories, namely:

- Health
- Safety and security
- Economic opportunities
- Civic participation
- Gender equality
- ICT
- Education

Open-ended questions were used to provide insight into how the participants perceive their lives in relation to each of the seven listed categories of wellbeing. Some participants were absent from the two workshops during the questionnaire session for wellbeing data collection. Eighteen (18) of the 24 participants at the first workshop and 13 participants at the second workshop completed this questionnaire. In total, 31 participants completed the questionnaire across the two workshops. As indicated earlier, participants are identified as (P) for the study. Group A participants ranged from P1 to P24 and Group B from P25 to P40.

The main statements were captured on a Microsoft Excel sheet (Figure 4.5) and categorised according to the responses. By using the content analysis method, the responses were categorised based on the GYWI categories.

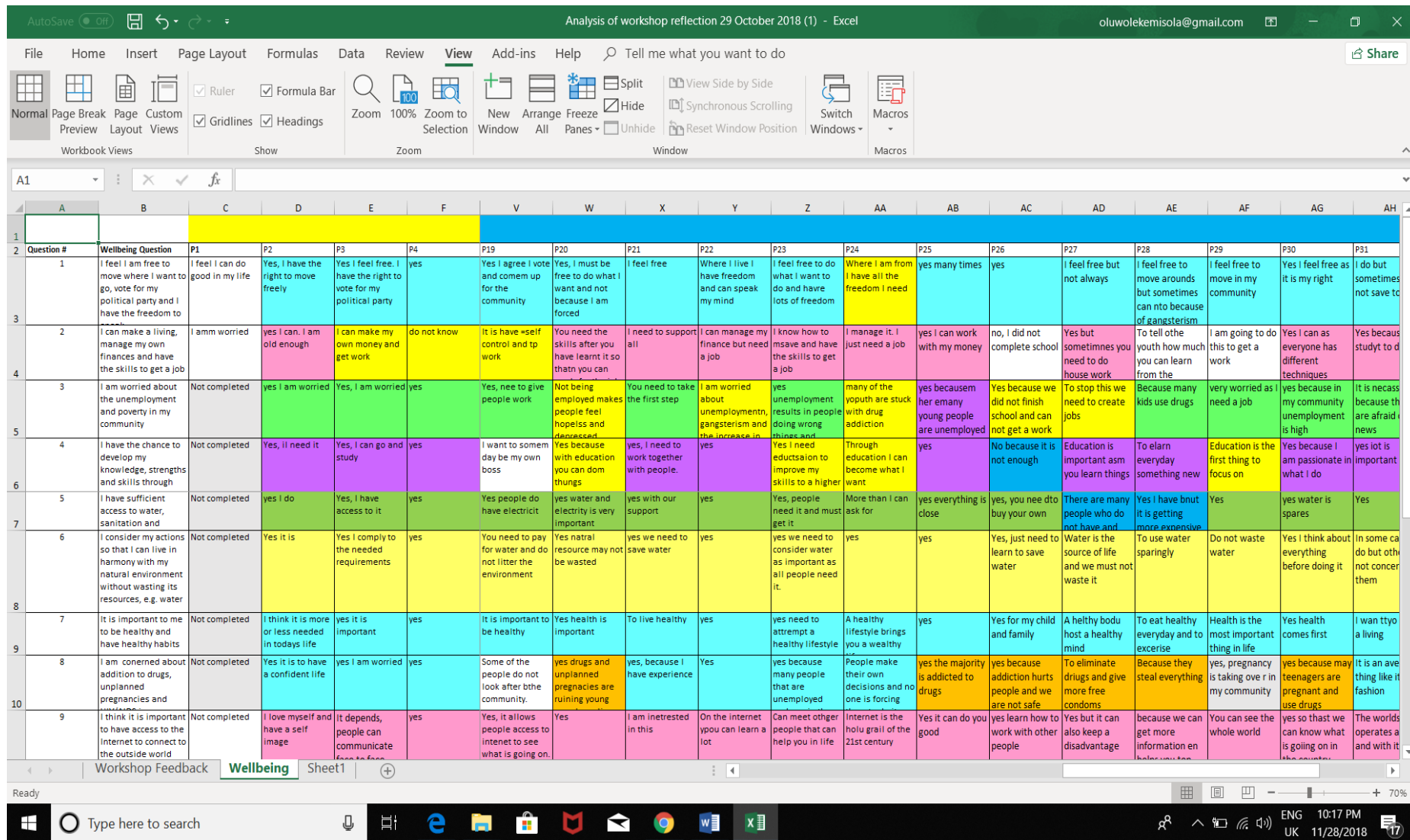


Figure 4.5: Sample of data captured from wellbeing indicators

(Q1) I feel I am free to move where I want to go, vote for my political party, and I have the freedom to speak.

On review of the report sheet of all respondents, the majority (27 out of 31) confirmed that they enjoy freedom of movement, political expression, and speech. P3 stated, "Yes I feel free, I have the right to vote for my political party". Similarly, P29 said, "Where I live I have freedom and can speak my mind". However, three participants (P35, P36, P40) indicated that their freedom was sometimes restricted due to an unsafe environment. P36 said that, "I feel free to move around but sometimes can't because of gangsterism". P40 mentioned, "I do, but sometimes it is not safe to do it".

Finding 1: The youth enjoy freedom of movement, speech, and political expression

Finding 2: The youth feel unsafe in their communities

(Q2) I can make a living, manage my own finances, and have the skills to get a job.

The aim of this statement was to determine how the youth felt about the prospects of earning a living and whether they were equipped with the necessary skills to get employment. In terms of making a living, the majority of the youth in this study (22 out of 31) indicated that they are able to make a living and manage their own finances. P3 stated, "I can make my own money and get work". P33 affirmed, "Yes, I can work with my money (P33)". Similarly, P23 said, "I know how to save and have the skills to get a job". However, three respondents (P15, P20, P27) related that they did not have the necessary skills to find employment. P15 stated, "I do not have the necessary skills, I only have a grade 12", and P20 affirmed, "Got no skills".

Finding 3: The youth feel positive about the prospects of finding employment

Finding 4: The youth need skills development for better employment opportunities

(Q3) I am worried about the unemployment and poverty in my community.

The purpose of Q3 was to understand the perspective of the youth on unemployment and poverty in their communities. Almost all participants (30 out of 31) confirmed that the rate of unemployment and poverty was high in their communities and major source of concern for them. P38 stated, "Yes, because in my community unemployment is high". The negative impact of poverty and unemployment were also highlighted through terms such as children suffering, depression, gangsterism, increase in criminal activity,

drug addiction, and drug use. P20 stated, “Yes, it can be very negative in this community,” and P18 said, “Yes many innocent children are suffering”. P27 indicated the psychological impacts of unemployment: “Not being employed makes people feel hopeless and depressed”, whereas P29 expressed concern about crime: “I am worried about unemployment, gangsterism and the increase in criminal activity”. In terms of the causes of unemployment and poverty, P34 indicated that the lack of education was a major cause: “Yes, because we did not finish school and cannot get a work”. Similarly, P35 identified employment opportunities as a solution to this problem: “To stop this we need to create jobs”. The participants understand the relationship between poverty, unemployment drug use, and abuse probably because they have been directly affected, or their family members/friends have been affected by unemployment, poverty, drug use, and abuse.

Finding 5: The youth are aware of the impact of unemployment and poverty on their communities

Finding 6: The youth identified the need for employment in order to alleviate poverty

Finding 7: Unemployment and poverty are rife in underserved communities

Finding 8: Poverty has negative impacts such as drug addiction and drug abuse on communities

(Q4) I have the chance to develop my knowledge, strengths, and skills through education.

The purpose of this question was to understand the youth’s perception on the importance of education and the way it affects their knowledge, strength, and skills. Most of the participants (23 out of 31) agreed that they have the opportunity to develop these qualities through education. On the importance of education, P27 said, “Yes, because with education you can do things”. Similarly, P31 stated that, “through education I can become what I want”. P30 agreed with these sentiments: “Yes, I need education to improve my skills to a higher level”. In addition, P29 also recognised that “education is the first thing to focus on”. However, some of the participants were not as enthusiastic about the role of education. P34 was of the belief that education is not sufficient for development, stating, “...because it is not enough”. Similarly, P23 concurred education was “not always” enough. The perception of the participants varies on the importance of education to improve their wellbeing. Their perception may depend on the type or

quality of information available to them in terms of how education can improve their wellbeing.

Finding 9: Many of the participants believe education is essential to their development, but there is scepticism about the sufficiency of education alone to empower themselves; their perception of the impact of education on development can be associated with the current trend of unemployment among educated youth

(Q5) I have sufficient access to water, sanitation, and electricity.

The purpose of this statement was to determine participants' access to water, sanitation, and electricity in their communities. The majority of participants (29 out of 31) confirmed that they have access to these basic amenities. P35 and P36 mentioned challenges such as, "there are many people who do not have and they struggle" (P35), the cost of water is high, "but it is [still] getting more expensive by the day" (P36). The high cost of water may be associated with the drought situation in Cape Town, which led to several control measures implemented by the City of Cape Town. One measure put in place is the increase in the water rates.

Finding 10: The youth in the community have adequate access to water, sanitation, and electricity

Finding 11: Challenges to basic amenities include the escalating cost of water in the community

(Q6) I consider my actions so that I can live in harmony with my natural environment without wasting resources such as water.

This statement sought to establish the perceptions of the youth on wastage of resources such as water. Almost all (30 out of 31) participants agreed to the importance of saving water and preserving natural resources. P18 said, "Yes, we buy electricity and may not waste water". P20 stated, "We need to protect our natural habitat". P30 also noted the importance of water for life, "Yes we need to consider water as important as all people need it", and P17 mentioned the importance of not littering, "You need to pay for water and do not litter the environment".

Finding 12: The youth understand the importance of saving waster and protecting natural resources

(Q7) It is important to me to be healthy and have healthy habits.

The aim of this statement was to determine the perception of the youth on the importance of maintaining a healthy lifestyle. Most of the youth in this study understand the importance of living healthy. P37 emphasised the importance of health: "Health is the most important thing in life". Similarly, P31 stated, "A healthy lifestyle brings you a wealthy life".

Finding 13: The youth have adequate understanding of the importance of living a healthy lifestyle

(Q8) I am concerned about addition to drugs, unplanned pregnancies, and HIV/AIDS in my community.

The purpose of this statement was to determine the perception of the youth regarding challenges such as drugs, unplanned pregnancies, and HIV/AIDS in their communities. All participants expressed their concern about these challenges. P30 believed that a lack of education was the root cause of these problems: "Yes, because many people that are unemployed end up in these things and as a result of not getting the correct education". In terms of drug addiction, P33 said, "Yes, the majority is addicted to drugs". The consequences of drugs include theft, as P36 mentioned: "Because they steal everything". P20 pointed out that "many teenagers get pregnant", and P37 confirmed that, "pregnancy is taking over in my community". Despite the alarming rate of HIV/AIDS infection in South Africa, none of the participants mentioned the dangers of unprotected sex and consequences such as HIV/AIDS. This may be reflective of the fact that the youth still do not properly understand the consequences and dangers of HIV/AIDS and have to be educated in this respect.

Finding 14: Drug addiction and teenage pregnancies are challenges faced bythe youth in the community

Finding 15: The youth do not have adequate understanding of the consequences of unprotected sex and the gravity of HIV/AIDS infection

(Q9) I think it is important to have access to the Internet to connect to the outside world.

The purpose of this statement was to examine access the youth have to the Internet and how they stay connected to the outside world. All the participants agreed on the importance of internet access. Some of the advantages mentioned include access to information. P29 stated that “you can learn a lot” and P34 said, “Because we can get more information”. Some participants highlighted connectivity to the outside world: “You can see the whole world” (P37), and “To meet other people” (P20).The knowledge may be linked to the fact that the youth are more technology savvy than other agegroups.

Finding 16: The youth have a fair understanding of the importance of the Internet as a means of connecting to the outside world

(Q10) My image and appearance are important to me to reach my full potential.

The aim of the above statement was to understand the perception of the youth onself-image and the waythisaffects their ability to fulfil their potential. All participants agreed on the importance of self-image and appearance. P34 and P35 both believed in the importance of self-image and how it is portrayed to the world: “Yes, what other people think of me is important” (P34), and “Image is important as this is how people see you” (P35). P30 mentioned self-esteem as important to reach full potential: “You need to believe in yourself in order to improve yourself”. P28 mentioned “self-respect”. P15 affirmed that, “It is very important to me to achieve in life”, while and P26 and P27 both mentioned the ability to do good as an important factor to reach their full potential: “I want to do good for what is right” (P26), and “I want to do something good with my life” (P27).The responses show that the participants understand the perception others have of them, and that a positive image and appearance is beneficial to oneself.

Finding 17: A positive self-image is essential to the youth for attaining their full potential

Finding 18: The youth have an aspiration to achieve life goals

(Q11) My identity is important and I have meaning and purpose in my life.

The purpose of the above statement was to determine the perceptions of the youth in terms of their identity, and how it gives them meaning and purpose in life. Almost all

participants (30 out of 31) agreed that identity is important for meaning and purpose of life. P40 mentioned that identity was linked to lifestyle: "That's my way of living". Similarly, P27 linked identity to culture: "My identity proves from what culture I am coming from". Furthermore, being a role model gives meaning to identity, "because I want to be an example for my kid and he needs to look up at me" (P34). P35 mentioned the importance of a good reputation: "Yes, it is important as this is how people recognise you". P33 stated that, "I got many goals to achieve". Similarly, P36 confirmed that, "I want to reach it [goals] and make a success". The participants expressed understanding of the purpose of a positive identity and expressed their hope in the future by setting goals they would like to achieve. It is interesting to understand that despite the challenges expressed by the youth, they still have hope for a better future.

Finding 19: The youth understand the importance of a strong identity to achieve life goals

Finding 20: The youth believe that a meaningful and purposeful life is earned through good reputation and commitment to one's cultural background

(Q12) I enjoy participating in cultural, creative, and sport activities.

The aim of the above question was to determine if the youth enjoy participating in activities in their communities. Although the majority indicated that they do enjoy participating in these activities, P37 indicated the opposite: "Because most people are not interested". P40 and P35 mentioned staying healthy as a benefit of participating in such activities; "It keeps me healthy and motivated" (P40) and, "Yes, because keeping active means staying healthy" (P35). P36 mentioned other benefits such as engaging with different cultures: "To meet people of different culture are great" (P36). "Many opportunities" was mentioned as a benefit by P37.

Finding 21: The youth enjoy participation in cultural, creative, and sport activities, and keep healthy and focused through participating in cultural and recreational community engagements

(Q13) I am affected by the violence in my community and I often feel unsafe.

The purpose of this statement was to understand how the youth are affected by the violence in their communities. Most of the youth in this study (25 out of 31) indicated that

they are affected by violence and that they feel unsafe in their communities. P30 said that, “Yes, I am affected by the violence in the community and [it] is a very big issue”. P19 mentioned, “I feel unsafe in my environment, want to stay where it is safe”. Violent acts in the community include rape as mentioned by P8: “Many rapes are taking place and I am unsafe”. P40 indicated the root of violent crimes as, “gangster groups grow by the day”. P27 mentioned that youth deaths are often a consequence of this violence: “Violence makes young people to die early”. It is expected that the participants would be affected by the violence in their community because they have first-hand experience of the crime and violence that perpetrated in the community.

Finding 22: The youth display a fair awareness of the impact of violence on their communities and on themselves

(Q14) It is important to me to have meaningful relationships with my family and friends.

The purpose of the above statement was to understand the perception of the youth regarding the importance of meaningful relationships with family and friends. All participants agreed on the importance of maintaining good relationships. “Family and friends are always there” (P37). “Family comes first”(P38). P27 mentioned the importance of family support in achieving goals: “Family can support you to become something in life. P31 supported this view by saying that family and friends “are the ones that support you”.

Finding 23: The youth understand and value the importance of family relationships and cordial friendships

(Q15) I am hopeful about my situation and the future based on my faith.

The purpose of this statement was to determine if the youth are hopeful about their situation and the role that faith plays in their future. P36 said, “Religion is very important and what you believe in”. P30 indicated the importance of religion as an anchor in one’s life: “My religion is very important and without it I do not have a solid foundation”.

Finding 24: The youth perceive religion as an important part of their lives and identity

The researcher identified themes that do not fall within the GYWI categories, namely the social support and aspiration category (Table 4.5).

Table 4.5: Findings categorised under youth wellbeing indicators

Civic Participation	
Finding 1	The youth enjoy freedom of movement, speech, and political expression
Finding 19	The youth understand the importance of a strong identity to achieve life goals
Education	
Finding 4	The youth need skills development for better employment opportunities
Finding 9	Many of the participants believe education is essential to their development, but there is scepticism about the sufficiency of education alone to empower themselves; their perception of the impact of education on development can be associated with the current trend of unemployment among educated youth
Safety and Security	
Finding 2	The youth feel unsafe in their communities
Finding 22	The youth display a fair awareness of the impact of violence on their communities and on themselves
Economic opportunities	
Finding 3	The youth feel positive about the prospects of finding employment
Finding 5	The youth are aware of the impact of unemployment and poverty on their communities
Finding 6	The youth identified the need for employment in order to alleviate poverty
Finding 7	Unemployment and poverty are rife in underserved communities
Finding 8	Poverty has negative impacts such as drug addiction and drug abuse on communities
Health	
Finding 10	The youth in the community have adequate access to water, sanitation, and electricity
Finding 11	Challenges to basic amenities include the escalating cost of water in the community
Finding 12	The youth understand the importance of saving waster and protecting natural resources
Finding 13	The youth have adequate understanding of the importance of living a healthy lifestyle
Finding 14	Drug addiction and teenage pregnancies are challenges faced by the youth in the community
Finding 15	The youth do not have adequate understanding of the consequences of unprotected sex and the gravity of HIV/AIDS infection
Finding 17	A positive self-image is essential to the youth for attaining their full potential
Information and Communication Technology	
Finding 16	The youth have a fair understanding of the importance of the Internet as a means of connecting to the outside world

Social Support	
Finding 20	The youth believe that a meaningful and purposeful life is earned through good reputation and commitment to one's cultural background
Finding 24	The youth perceive religion as an important part of their lives and identity
Finding 21	The youth enjoy participation in cultural, creative, and sport activities, and keep healthy and focused through participating in cultural and recreational community engagements
Finding 23	The youth understand and value the importance of family relationships and cordial friendships
Aspiration	
Finding 18	The youth perceive goodwill as an important factor to achieve life goals

4.3.2.3 Summary of findings for RSQ1

Analysis of the data for RSQ1 revealed that during the co-design sessions, 33 factors grouped into main categories were identified as affecting the wellbeing of youths in the underserved community they live in. The questionnaire data also revealed 23 findings grouped into eight categories. In conclusion, the combination of factors from the co-design sessions and the questionnaire presented eight main factors, which are health, safety and security, economic opportunities, infrastructure, ICT, social support, education, aspiration and civic participation (Table 4.6).

Table 4.6: Summary of findings for RSQ1

Factors from the co-design sessions	Factors from the questionnaire session	Categories
Health	Health	GYWI
Safety and security	Safety and security	GYWI
Economic opportunities	Economic opportunities	GYWI
Infrastructure	Infrastructure	New
ICT	ICT	GYWI
Social support	Social support	New
-	Education	GYWI
-	Civic participation	GYWI
-	Aspiration	New

The factors identified in RSQ1 are similar to the six GYWI categories, which are health, safety and security, economic opportunities, education, civic participation, and ICT.

However, the last GYWI category, gender equality, did not feature in the results of this study. Furthermore, two categories not available on the GYWI were revealed by the youth. The two factors (categories) are social support and infrastructure.

4.3.3 Analysis of data for RSQ2

The objective of RSQ2 was to achieve a comprehensive set of youth wellbeing indicators from which the needs of the youth could be prioritised. In order to address RSQ2, wellbeing indicators were extracted from six indicator systems in literature. Indicators were collected from the Global Youth Wellbeing Index (GYWI), OECD, EPI, World Health Organisation (WHO), United Nations (UN), and Community Indicator Domain (CID). The list of the organisations that the corresponding wellbeing indicators extracted from them is presented in Table 4.7.

Table 4.7: List of wellbeing indicators from indicator systems

Indicator (UN)	Indicator(UN)	Indicator (OECD)	Indicator(OECD)	Indicator (CID)	Indicator (EPI)	Indicator (GYWI)	Indicator(WHO)
Poverty	Digital skills	Democracy	Freedom to participate in politics	Shelter	Access to water	Citizenship	Self-esteem
Sanitation	Access to computer	Family support	Confidence in government	Nutrition	Access to sanitation	Safety and security	Social support
Being healthy	Access to internet	Feel part of community	Knowledge and skills	Health	Taking care of plants	Education	Personal relationship
Educational level	Suicide	Access to skills and training	Child abuse	Access to ICT	Water quality	Health	Physical environment
Crime	HIV (illness)	Being healthy	Bullying	Freedom of choice	Spirituality and religious value	ICT	Spiritual strength
Water quality	Diseases	Violence	Drug addiction	Access to advance education	Environment (climate and water)	Economic opportunities	Hope and optimism
Air quality	Hopelessness and despair	Feeling secured	Playing	Eco-system sustainability	Nutrition	HIV/AIDS	Meaning and purpose of life
Nutrition	Gender equality	Unemployment	Art, drama and music		Taking care of animals		
Healthy habits	Energy and fitness	Educational level	Sports		Climate pollution		
Connection with the global world	Environment (pollution, noise, traffic)	Safety and security	Quality of life				
	Road fatalities	Civic duty	Watching TV, reading				

Indicator (UN)	Indicator(UN)	Indicator (OECD)	Indicator(OECD)	Indicator (CID)	Indicator (EPI)	Indicator (GYWI)	Indicator(WHO)
		Freedom to participate in politics	Spending time with friends				
		Confidence in government	Political freedom				

The indicators collected are applicable within a community context and to individuals.

Some of the wellbeing indicators in some of the indicator systems are not applicable to a community context, for example the Global Peace Index and life expectancy at birth, both on the GYWI. Some indicators were exempted because the participants would only be able to prioritise these if they had sufficient information on them, for example, youth lending from financial institution, which is categorised under economic opportunities on the GYWI. In total, 70 wellbeing indicators were extracted from the various wellbeing indicators systems. The dataset containing the 33 wellbeing indicators identified in Table 4.4 was merged with the dataset obtained from various indicator systems that contain the 77 wellbeing indicators (Table 4.7). In total, 110 wellbeing indicators were identified.

The list was cleaned by removing duplicates and indicators having the same meaning, resulting in each wellbeing indicator being unique and stated in a way that was easy for the participants to understand. Many changes and considerations were made to arrive at the final set of wellbeing indicators. The comprehensive set of wellbeing indicators obtained consists of 70 wellbeing indicators. This list of wellbeing indicators is presented in Table 4.8 in no particular order.

Table 4.8: Comprehensive set of wellbeing indicators

No.	Indicators	No.	Indicators	No.	Indicators	No.	Indicators
1	Relating with animals	19	Personal finances	37	Access to internet	55	Access to leisure and recreation
2	Taking care of plants	20	Poverty	38	Digital skills	56	Sport
3	Civic duty	21	Skills to get a job	39	Future expectations	57	Corruption
4	Confidence in government	22	Unemployment	40	Gender equality	58	Road fatalities
5	Democracy	23	Education level	41	Having my own identity	59	Safety and security

No.	Indicators	No.	Indicators	No.	Indicators	No.	Indicators
6	Freedom of expression	24	Access to water, sanitation	42	Hope and optimism	60	Violence
7	Freedom of movement	25	Environment (climate and water)	43	Inner peace	61	Relationship with peers and friends
8	Participating in government	26	Environment (pollution, noise, traffic)	44	Knowledge and skills	62	Romantic relationship
9	Political freedom	27	Family support	45	Meaning and purpose of life	63	Religious practice
10	Value in society	28	Situation at home	46	Shelter	64	Spirituality and religion
11	Connected with the global world	29	Being healthy	47	Quality of life	65	Pregnancy
12	Family structure	30	Diseases	48	Sexual identity	66	Child abuse
13	Feeling isolated	31	Energy and fitness	49	Reaching full potential	67	Bullying
14	Feel part of community	32	Healthy habits	50	Hopelessness and despair	68	Addiction
15	Heritage and cultural identity	33	HIV/AIDS	51	Self-harm	69	Sexual abuse
16	Speaking my own language	34	Nutrition	52	Self-image	70	Gangsterism
17	Access to skills and training	35	Access to electricity	53	Stress		
18	Financial literacy	36	Access to computer	54	Art, drama, music		

The wellbeing indicators listed in Table 4.8 are categorised under the GYWIndex. However, the indicators that could not be categorised in the seven listed GYWI categories were sorted under other appropriate categories. The categorised, comprehensive set of wellbeing indicators is presented in Table 4.9.

Table 4.9: Categorised comprehensive set of wellbeing indicators

Economic Opportunities	Education	ICT	Safety and Security	Civic Participation	Social Support
Financial literacy	Access to skills and training	Connected with global world	Freedom of movement	Confidence in government	Value in society

Personal finances	Skills to get a job	Access to internet	Self-harm	Democracy	Family structure
Poverty	Educational level	Digital skills	Road fatalities	Freedom of expression	Feeling isolated
Unemployment	Knowledge and skills		Security and safety	Participating in government	Part of a community
Corruption			Violence	Political freedom	Heritage and cultural identity
			Child abuse		Speaking own language
			Bullying		Family support
			Addiction		Situation at home
			Sexual abuse		Self-image and appearance
			Gangsterism		Sport
					Relationship with peers and friends
					Romantic relationship
					Religious practice
					Spirituality and religion
					Pregnancy
Gender Equality	Health	Environment	Infrastructure	Aspiration	
Gender equality	Being healthy	Relating with animals	Access to water, sanitation	Future expectations	
Sexual identity	Diseases	Taking care of plants	Access to leisure and recreation	Future expectations	
	Energy and fitness	Environment (climate and water)		Having my own identity	
	Healthy habits	Environment (pollution, noise, traffic)		Hope and optimism	

	HIV/AIDS			Meaning and purpose of life	
	Nutrition			Quality of life	
	Inner peace			Reaching full potential	
	Hopelessness and despair				

4.3.3.1 Summary of findings for RSQ2

The comprehensive set of wellbeing indicators presented in RSQ2 consists of 70 wellbeing indicators, grouped into 11 major categories: economic opportunities, education, ICT, safety and security, civic participation, social support, gender equality, health, environment, infrastructure, and aspiration. The comprehensive set of wellbeing indicators is the basis on which the priorities were made (RSQ3) such that the most pressing needs of the youth could be determined.

4.3.4 Analysis of co-design sessions for RSQ3

The objective of this research question was for the youth to prioritise their wellbeing needs by using the identified wellbeing indicators. Hence, RSQ1 and RSQ2 were fundamental to the data collection and analysis for RSQ3.

The comprehensive list of wellbeing indicators summarised in Table 4.8 was presented to all the participants, with the request to prioritise each wellbeing indicator according to the perception of their needs using a Sorter (see Chapter 3 for explanation on how to use the Sorter). The participants pasted each indicator in a column depending on how important they deemed the wellbeing indicator to be in terms of their wellbeing in the community. They also used coloured dots to prioritise the ranked priorities further.

Table 4.10 explains the activities involved in determining the perception of the youth concerning their wellbeing priorities in the community.

Table 4.10: Analysis of wellbeing indicator priority

Step 1: Weighting

A weight of 1 to 6 was attached to the spaces on the Sorter sheet (Appendix 6) in order 6, 5, 4, 3, 2, and 1, from the highest priority to the lowest priority.
Weighting using the colour dots: A weight of 10 was attached to the first (highest) priority (P1) and a weight of 1 to the lowest priority (P10).
Weights 10,9,8,7,6,5,4,3,2 and 1 were attached to priorities 1,2,3,4,5,6,7,8,9 and 10 respectively.
Subsequently, the weight of the position on the Sorter sheet (1-6) was added to the priority of the dot (1-10) for indicators that were assigned dot stickers by the participants. For example, if an indicator is placed in the first row of the Sorter sheet (indicating the highest priority on the Sorter, which is 6) and it receives the red dot (Priority 1), it attracts a weight of 10 for the highest priority, added to a weight of 6 for the first row of the Sorter. The total weight for this indicator is thus 16.
A weight of zero (0) was allotted to indicators that were not selected by any of the participants.

Step 2: Collated data
The wellbeing indicators, as indicated by each participant, were recorded as follows: a) The pseudonym of each participant was entered into a Microsoft Excel sheet with options for each of the 70 indicators. b) The weight of the indicator depending on its row on the Sorter and the colour code attached to this indicator (if any) were entered under the indicator for each participant. c) This routine was carried out for all the indicators on each participant's Sorter and for all the participants. <u>Note:</u> in some cases, some indicators were not assigned a weight by a participant because not all the indicators were important to each participant.
Step 3: First round of analysis to draw out categories
The total weight for each of the 70 indicators was calculated, per participant.
The indicators were sorted in descending order depending on their total weight.
Step 4: Repetition
Steps 1 to 3 were repeated for the second workshop and categories were formed.
Priorities per group and per gender were determined: The priorities of Group A were determined, 20 wellbeing indicators were identified. The priorities of Group B were determined, 20 wellbeing indicators were identified. Priorities of Males were determined, 20 wellbeing indicators were identified. Priorities of Females were determined, 20 wellbeing indicators were identified.
Step 5: Mapping of sub-groups
The first 20 wellbeing indicators of Group A were mapped to Group B. Wellbeing indicators common to both Group A and Group B were determined (H1) (see Table 4.11). The first 20 wellbeing indicators of the Males were mapped to the Females. Wellbeing indicators common to the males and females were determined (H2) (see Table 4.12).
Step 6: Aggregation of groups

The data of the two workshops were merged to form an Aggregate group. This data set contained data from the Males and Females from both Group A and Group B.

New priorities emerged and the highest 20 wellbeing indicators were selected, shown in Figure 4.12.

Step 7: Achieving the wellbeing ranking for the study

Wellbeing indicators common to H1 and H2 were combined with the first 20 priorities of the Aggregate data.

Wellbeing indicators common to groups H1, H2, and the Aggregatedata were selected and presented in Table 4.13.

The averages of the priority number (e.g. the priority number of Priority 1 is 1) for each wellbeing indicators common to H1, H2 and the Aggregate data were calculated.

The wellbeing indicators common to H1, H2, and the Aggregatedata were sorted in ascending order based on the value of their averages.

The indicators were ranked from the lowest average to the highest average. The lowest average indicatedthe highest priority (Table 4.14).

4.3.4.1 Priority ranking for Group A andGroup B

By implementing steps 1 to 4 in Table 4.10,a priority set of wellbeing indicators wasidentified for Group A and Group B. The 20 top priorities for Group A are: self-image, being healthy, family support, unemployment, access to water, sanitation and electricity, environment (climate and water), reaching full potential, religious practice, meaning and purpose of life, future expectations, safety and security, freedom of movement, speaking my own language, romantic relationship, skills to get a job, pregnancy, freedom of expression, educational level, healthy habits,and access to skills and training (Figure 4.6).

		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13
3														
4	51 Self image		5	0	13	0	7	13	7	7	15	3	16	10
5	29 Being healthy		0	3	0	11	4	9	4	9	13	5	5	5
6	27 Family support		0	1	0	3	11	8	14	12	14	15	0	5
7	22 unemployment		10	15	0	8	0	0	0	6	6	16	15	15
8	24 access to water sanitatic		11	4	0	12	0	4	1	15	11	4	6	5
9	25 environment (climate ar		2	2	0	13	16	4	0	0	6	0	5	9
10	48 to reach my full potentia		3	2	8	0	0	0	3	10	7	0	10	7
11	63 Religious practice		12	0	0	0	2	15	3	6	10	6	5	0
12	44 Meaning and purpose of		0	0	0	5	12	0	4	13	0	13	14	8
13	38 future expectations		5	0	0	16	0	14	16	0	4	8	0	5
14	59 Safety & security		2	6	4	0	2	5	4	8	12	2	12	5
15	7 Freedom of movement		3	0	4	4	3	0	13	5	0	0	13	5
17	16 speaking my own langua		0	0	0	10	14	5	0	8	5	0	6	0
18	62 Romantic relationships		4	3	3	0	0	6	0	4	4	4	1	0
19	21 skills to get a job		0	5	0	4	13	4	5	4	6	0	6	5
20	65 Pregnancy		8	14	4	0	0	5	0	2	5	2	0	4
21	6 Freedom of expression		0	5	6	5	0	11	0	0	5	0	9	12
22	23 education level		5	12	0	14	0	0	0	5	5	12	0	0
23	32 Healthy habits		4	3	0	0	5	3	5	6	0	14	4	4
24	17 Access to skills training		5	0	5	6	0	0	3	5	0	9	0	5
25	33 HIV/AIDS		14	6	0	9	0	0	5	11	4	0	0	10

Figure 4.6: Wellbeing indicator priorities of Group A

Group B has a slightly different priority ranking. The top 20 priorities for Group B are: unemployment, reaching full potential, educational level, meaning and purpose of life, access to water and sanitation, having own identity, violence, freedom of expression, family support, self-image, skills to get a job, HIV/AIDS, future expectations, personal finances, religious practice, addiction, access to skills and training, being healthy, sports, and poverty (Figure 4.7).

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
3				P16	P17	P18	P19	P20	P21	P22	P23	P24	P25	P26	P27	P28
4		Indicators		Group B												
5		22 unemployment		16	0	16	0	6	6	2	1	3	5	15	16	
6		48 to reach my full potentials		0	15	8	0	6	9	16	6	2	6	0	12	1
7		23 education level		6	12	5	3	5	6	0	11	2	6	4	14	1
8		44 Meaning and purpose of life		0	9	1	8	6	16	0	3	1	5	8	3	1
9		24 access to water sanitation		14	7	4	10	6	11	5	6	5	1	0	7	
10		40 Having my own identity		6	6	3	0	0	12	7	9	6	6	5	5	1
11		60 Violence		0	4	12	0	6	5	8	6	1	6	10	5	
12		6 Freedom of expression		6		5	0	5	6	4	5	11	4	14	5	
13		27 Family support		6	10	2	0	0	8	3	14	12	5	5	5	
14		51 Self image: body& appearance		5	11	4	0	6	14	0	3	8	6	0	2	
15		21 skills to get a job		6	1	5	3	5	6	0	12	4	0	7	5	1
16		33 HIV/AIDS		6	3	9	0	6	5	3	0	4	6	12	6	
17		38 future expectations		0	4	4	0	3	15	0	5	9	2	13	5	
18		19 personal finances		13	0	1	0	2	6	9	3	0	6	3	15	
19		63 Religious practice		6	14	13	0	1	10	0	5	2	5	0	2	
20		68 Addiction		1	0	11	0	6	4	12	4	4	0	3	0	
21		17 Access to skills training		0	0	3	15	0	13	3	5	3	0	5	11	
22		29 Being healthy		0	5	4	0	4	6	0	13	1	5	6	3	
23		56 Sport		4	4	15	0	6	3	0	5	14	6	6	0	
24		20 poverty		15	0	6	0	6	0	0	5	1	2	16	6	
25		45 Quality of life		0	0	2	0	6	6	0	3	5	6	0	6	

Figure 4.7: Wellbeing indicator priorities of Group B

4.3.4.2 Mapping wellbeing indicators of Group A and Group B

In an attempt to identify the wellbeing indicators common to Group A and Group B, the first 20 indicators common to both groups were mapped (Figure 4.8) and shown in Table 4.11. Mapping simply identifies wellbeing indicators common to the first 20 wellbeing priorities of the two groups.

Although the mapping showed differences in the choice of certain wellbeing indicators, commonalities were also identified for the two groups. In total, 13 wellbeing indicators were found to be common to both Group A and Group B, namely: self-image, being healthy, family support, access to water and sanitation, unemployment, reaching full potential, religious practice, meaning and purpose of life, future expectations, skills to get a job, access to skills and training, educational level, and freedom of expression. Although the listed wellbeing indicators were common to both groups, different priorities were assigned to these by each group. The wellbeing indicators and the priority levels (H1) for each group and assigned category are presented in Table 4.11.

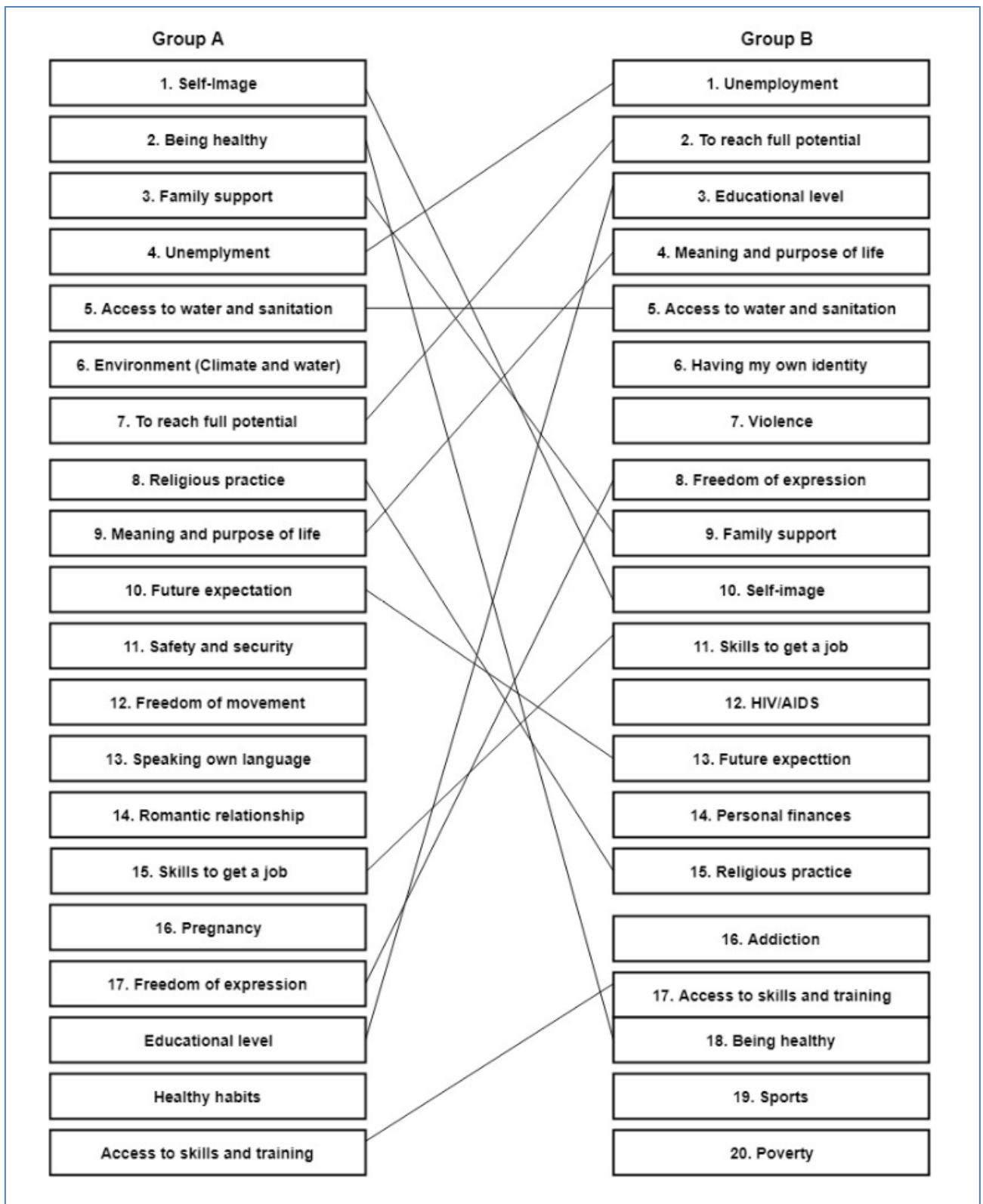


Figure 4.8: H1: Mapping of indicators (Group A to Group B)

Table 4.11: Wellbeing indicators common to Group A and Group B (H1)

No.	Wellbeing Indicator	Priority Level(Workshop A)	Priority Level(Workshop B)
1	Self-image	Priority 1	Priority 10
2	Being healthy	Priority 2	Priority 18
3	Family support	Priority 3	Priority 9
4	Access to water and sanitation	Priority 5	Priority 5
5	Unemployment	Priority 4	Priority 1
6	Reaching full potential	Priority 7	Priority 2
7	Religious practice	Priority 8	Priority 15
8	Meaning and purpose of life	Priority 9	Priority 4
9	Future expectations	Priority 10	Priority 13
10	Skills to get a job	Priority 15	Priority 11
11	Freedom of expression	Priority 17	Priority 8
12	Educational level	Priority 18	Priority 3
13	Access to skills and training	Priority 16	Priority 17

4.3.4.3 Priorities based on gender

The data on the priorities of the participants were sorted further based on gender. The gender analysis was to determine if there is a relationship between the gender of the participants and their prioritised wellbeing indicators. The dataset of the Males group contained the data of the males from both Group A and Group B.

The analysis of the priorities of the Males group is presented in Figure 4.9.

The outcome of the analysis of the Females group (combined data of the females in both Group A and Group B) is presented in Figure 4.10.

The first 20 priorities of the combined Females group were then mapped to the first 20 priorities of the combined Males group (Figure 4.11).

Table 4.12 shows the wellbeing indicators that are common to the males and females of Group A and Group B (H2).

	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
5	(Males)															
6	unemployment			0	16	0	0		16	0	16	0	2	1	3	5
7	to reach my full potentials			3	0	13	14		0	15	8	0	16	6	2	6
8	Family support			14	15	0	3		6	10	2	0	3	14	12	5
9	education level			0	12	0	5		6	12	5	3	0	11	2	6
10	access to water and sanitation			1	4	3	13		14	7	4	10	5	6	5	1
11	Meaning and purpose of life			4	13	0	5		0	9	1	8	0	3	1	5
12	Having my own identity			0	4	2	6		6	6	3	0	7	9	6	6
13	Religious practice			3	6	10	10		6	14	13	0	0	5	2	5
14	future expectations			16	8	2	6		0	4	4	0	0	5	9	2
15	Being healthy			4	5	15	6		0	5	4	0	0	13	1	5
16	Freedom of expression			0	0	5	6		6	0	5	11	4	5	11	4
17	Self image			7	3	4	5		5	11	4	0	0	3	8	6
18	skills to get a job			5	0	3	5		6	1	5	3	0	12	4	0
19	Healthy habits			5	14	5	5		0	3	3	0	10	10	3	6
20	Quality of life			4	3	4	15		0	0	2	0	0	3	5	6
21	personal finances			6	1	0	5		13	0	1	0	9	3	0	6
22	Violence			0	2	0	0		0	4	12	0	8	6	1	6
23	Access to skills training			3	9	2	5		0	0	3	15	3	5	3	0
24	Freedom of movement			13	0	5	6		10	0	1	0	0	6	3	5
25	feel part of community			12	0	0	5		5	4	1	0	4	15	3	6
26	HIV/AIDS			5	0	0	0		6	3	9	0	3	0	4	6

Figure 4.9: Wellbeing priorities of combined Males group

	B	C	D	E	F	G	H	I	J	K	L	M	N	O
4	(Females)													
5	Self image	5	0	13	0	7	13	7	15	16	10	4		6
6	unemployment	10	15	0	8	0	0	6	6	15	15	0		6
7	access to water sanitatic	11	4	0	12	0	4	15	11	6	5	0		6
8	Meaning and purpose of	0	0	0	5	12	0	13	0	14	8	4		6
9	environment (climate an	2	2	0	13	16	4	0	6	5	9	16		0
10	Being healthy	0	3	0	11	4	9	9	13	5	5	3		4
11	Family support	0	1	0	3	11	8	12	14	0	5	6		0
12	HIV/AIDS	14	6	0	9	0	0	11	4	0	10	0		6
13	Safety & security	2	6	4	0	2	5	8	12	12	5	0		4
14	Freedom of expression	0	5	6	5	0	11	0	5	9	12	0		5
15	skills to get a job	0	5	0	4	13	4	4	6	6	5	6		5
16	to reach my full potentia	3	2	8	0	0	0	10	7	10	7	0		6
17	Religious practice	12	0	0	0	2	15	6	10	5	0	1		1
18	future expectations	5	0	0	16	0	14	0	4	0	5	0		3
19	Situation at home	0	4	0	4	0	5	5	5	11	5	12		2
20	education level	5	12	0	14	0	0	5	5	0	0	5		5
21	Freedom of movement	3	0	4	4	3	0	5	0	13	5	9		4
22	Access to skills training	5	0	5	6	0	0	5	0	0	5	14		0
24	Pregnancy	8	14	4	0	0	5	2	5	0	4	5		0
25	speaking my own langua	0	0	0	10	14	5	8	5	6	0	1		0

Figure 4.10: Wellbeing priorities of combined Females group

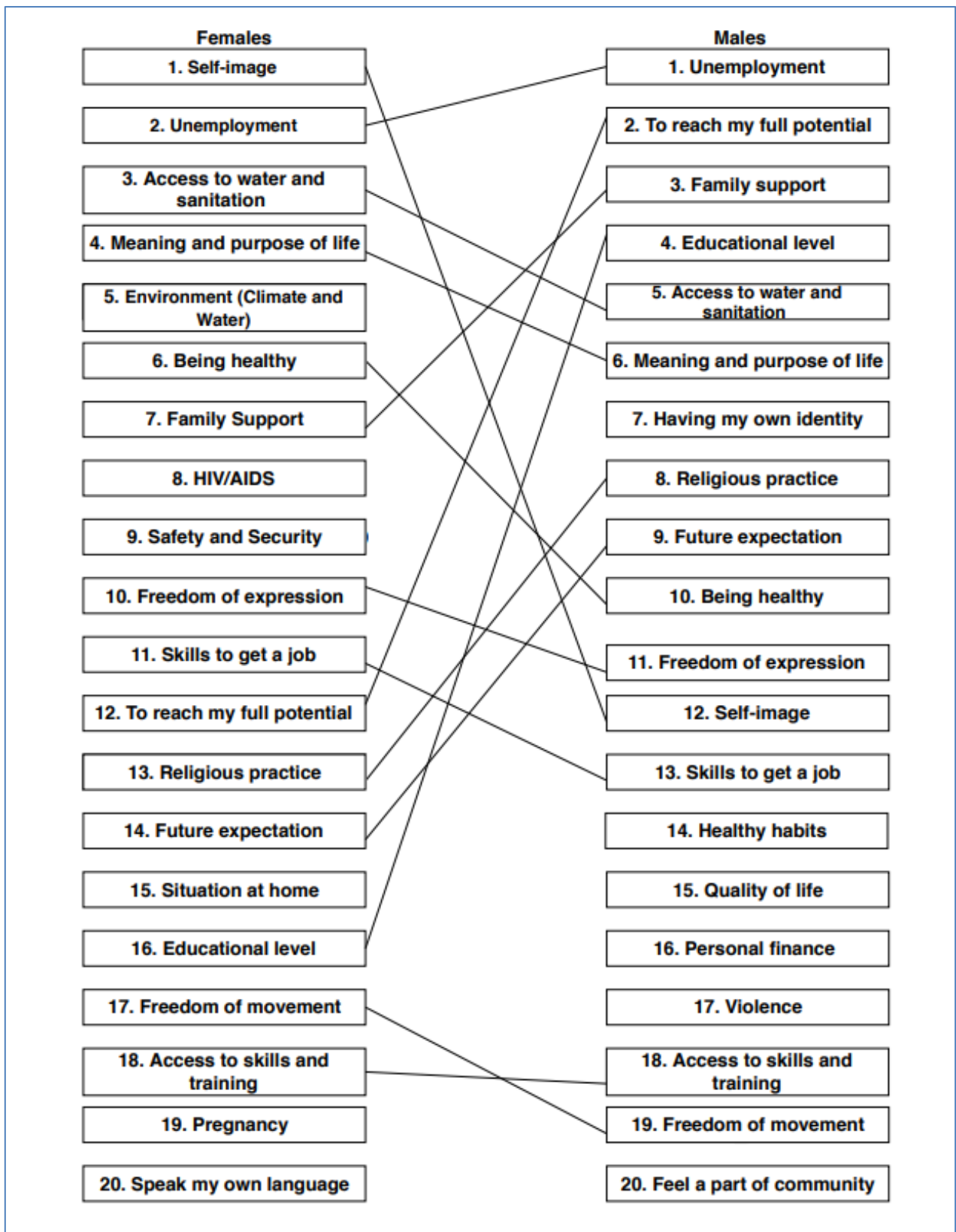


Figure 4.11: H2: Mapping of indicators (Males group to Females group)

Table 4.12: Wellbeing indicators common to Males and Females group (H2)

No.	Wellbeing indicator	Priority (Females)	Priority (Males)
1	Self-image	Priority 1	Priority 12
2	Unemployment	Priority 2	Priority 1
3	Access to water, sanitation and electricity	Priority 3	Priority 5
4	Meaning and purpose of life	Priority 4	Priority 6
5	Being healthy	Priority 6	Priority 10
6	Family support	Priority 7	Priority 3
7	Freedom of expression	Priority 10	Priority 11
8	Skills to get a job	Priority 11	Priority 13
9	Reaching full potential	Priority 12	Priority 2
10	Religious practice	Priority 13	Priority 8
11	Future expectation	Priority 14	Priority 9
12	Educational level	Priority 16	Priority 4
13	Freedom of movement	Priority 17	Priority 19
14	Access to skills and training	Priority 18	Priority 18

4.3.4.4 Aggregate wellbeing indicator priorities for youth in Grabouw (Males and Females, Group A and Group B)

The data collected from the two workshops were merged together to form Aggregate data. The merged data consisted of all collected data – Males and Females, Group A and Group B (Figure 4.12). The data were merged before prioritisation was effected. Prioritisation of the data followed the steps described in Table 4.10. This process provided a singular set of priorities for the youth in the selected underserved community. Results reveal that the first set of 20 wellbeing indicators relevant to the youth in Grabouw (Table 4.13) are: unemployment, self-image, reaching full potential, access to water and sanitation, family support, meaning and purpose of life, educational level, being healthy, religious practice, future expectations, freedom of expression, skills to get a job, environment (climate and water), HIV/AIDS, personal finances, freedom of movement, access to skills and training, safety and security, having my own identity, and violence. These are the highest priorities of the youth in the underserved community.

Indicators	Group A & B	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12
22	unemployment	10	15	0	8	0	0	0	6	6	16	15	15
51	Self image	5	0	13	0	7	13	7	7	15	3	16	10
48	to reach my full potentials	3	2	8	0	0	0	3	10	7	0	10	7
24	access to water sanitation ar	11	4	0	12	0	4	1	15	11	4	6	5
27	Family support	0	1	0	3	11	8	14	12	14	15	0	5
44	Meaning and purpose of life	0	0	0	5	12	0	4	13	0	13	14	8
23	education level	5	12	0	14	0	0	0	5	5	12	0	0
29	Being healthy	0	3	0	11	4	9	4	9	13	5	5	5
63	Religious practice	12	0	0	0	2	15	3	6	10	6	5	0
38	Future expectations	5	0	0	16	0	14	16	0	4	8	0	5
6	Freedom of expression	0	5	6	5	0	11	0	0	5	0	9	12
21	Skills to get a job	0	5	0	4	13	4	5	4	6	0	6	5
25	Environment (climate and w	2	2	0	13	16	4	0	0	6	0	5	9
33	HIV/AIDS	14	6	0	9	0	0	5	11	4	0	0	10
19	Personal finances	4	5	15	4	4	3	6	0	4	1	0	4
7	Freedom of movement	3	0	4	4	3	0	13	5	0	0	13	5
17	Access to skills training	5	0	5	6	0	0	3	5	0	9	0	5
59	Safety & security	2	6	4	0	2	5	4	8	12	2	12	5
40	Having my own identity	0	4	0	1	3	0	0	0	6	4	0	4
60	Violence	0	16	10	0	0	1	0	0	0	2	0	5
32	Healthv habits	4	3	0	0	5	3	5	6	0	14	4	4

Figure 4.12: Aggregate wellbeing indicators (Males and Females, Group A and Group B)

4.3.4.5 Wellbeing indicators for the youth in Grabouw

In order to obtain a set of priorities common to all participants, the common indicators obtained as outcome of mapping the Males and Females (H1) and Group A and Group B (H2) to the first twenty wellbeing indicators of the Aggregate priorities. Thirteen (13) indicators common to all groups emerged from this mapping, which are listed in Table 4.13.

To achieve the priority levels for each of the thirteen (13) wellbeing indicators obtained from the mapping of H1, H2 and the Aggregate Group, the averages of the individual priority level number of the three (3) groups were determined by adding the priority positions of the three groups (H1, H2 and Aggregate) and dividing the result by three (3). Examples of priority positions are “1” for “Priority1”, “2” for “Priority2”, etc., as shown in Table 4.14. Subsequently, the wellbeing indicators were sorted in ascending order based on the averages of each wellbeing indicator. New ranking for the thirteen priorities were obtained as displayed in Table 4.15.

Table 4.13: Final mapping of wellbeing indicators (H1, H2 and Aggregate)

No.	Wellbeing Indicator	Priority level Group A, Group B (H1)	Priority level Males, Females (H2)	Aggregate Data	PriorityAverages
1	Self-image	Priority1	Priority 1	Priority 2	$(1+1+2)/3 = 1.333$
2	Being healthy	Priority 2	Priority 6	Priority 8	$(2+6+6)/3 = 4.666$
3	Family support	Priority 3	Priority 3	Priority 5	$(3+3+5)/3 = 3.666$
4	Access to water, sanitation and electricity	Priority 5	Priority 3	Priority 4	$(5+3+4)/3 = 4.000$
5	Unemployment	Priority 1	Priority 1	Priority 1	$(1+1+1)/3=1.000$
6	Reaching full potential	Priority 2	Priority 2	Priority 3	$(2+2+3)/3=2.333$
7	Religious practice	Priority 8	Priority 8	Priority 9	$(8+8+9)/3=8.333$
8	Meaning and purpose of life	Priority 4	Priority 4	Priority 6	$(4+4+6)/3=4.666$
9	Future expectations	Priority 10	Priority 9	Priority 10	$(10+9+10)/3=9.666$
10	Skills to get a job	Priority 11	Priority 11	Priority 12	$(11+11+12)=11.333$
11	Freedom of expression	Priority 8	Priority 11	Priority 11	$(8+11+11)/3=10.000$
12	Educational level	Priority 17	Priority 4	Priority 7	$(17+4+7)/3=9.333$
13	Access to skills and training	Priority 16	Priority 18	Priority 17	$(16+18+17)=17.000$

Table 4.14: Final wellbeing indicators and ranks

NewRanks	Wellbeing Indicator	H1 = Highest priority level for Group A, Group B mapping	H2= Highest priority level for Male and Female mapping	H3 = Highest priorities for (Aggregate)	Average of H1, H2 and Aggregate
1	Unemployment	1	1	1	1.00
2	Self-image	1	1	2	1.33
3	Reaching full potential	2	2	3	2.33
4	Family support	3	3	5	3.67

NewR anks	Wellbeing Indicator	H1 = Highest priority level for Group A, Group B mapping	H2= Highest priority level for Male and Female mapping	H3 = Highest priorities for (Aggregate)	Average of H1, H2 and Aggregate
5	Access to water, sanitation and electricity	5	3	4	4.00
6	Meaning and purpose of life	4	4	6	4.67
7	Being healthy	2	6	8	5.33
8	Religious Practice	8	8	9	8.33
9	Educational level	17	4	7	9.33
10	Future expectations	10	9	10	9.67
11	Freedom of expression	8	11	11	10.00
12	Skills to get a job	11	11	12	11.33
13	Access to skills and training	16	18	17	17.00

To conclude the analysis of data for RSQ3, the wellbeing indicators were categorised according to seven predetermined GYWI categories. Four of the GYWI categories, economic opportunities, education, health, and civic participation were identified; however, three (3) new categories, social support, infrastructure, and aspiration emerged (Table 4.15). These categories are the immediate wellbeing factors depicting the needs of the youth in Grabouw community, which can change over time depending on changes in environmental, personal or community factors.

Table 4.15: Youth wellbeing indicator ranking and categories for Grabouw community

RankNo.	Wellbeing indicator	Category
1	Unemployment	Economic opportunities
2	Self-image	Health
3	Reaching full potential	Aspiration
4	Family support	Social support
5	Access to water and sanitation	Infrastructure and services
6	Meaning and purpose of life	Aspiration
7	Being healthy	Health
8	Religious practice	Social support

RankNo.	Wellbeing indicator	Category
9	Educational level	Education
10	Future expectations	Aspiration
11	Freedom of expression	Civic participation
12	Skills to get a job	Education
13	Access to skills and training	Education

The list of 13 wellbeing indicators in Table 4.15 are the final set of priorities for the youth selected from 70 wellbeing indicators. The priority is listed in order of importance, where rank number 1 is the highest priority and rank number 13 is the lowest priority in the list.

4.3.4.6 Summary of findings for RSQ3

Data analysis for RSQ3 shows thirteen (13) youth wellbeing indicators covering seven (7) priority factors and ranked in the order of importance. The result indicates that for an ICT intervention to be meaningful and suitable for improving the wellbeing of the youth in the Grabouw community, this intervention needs to address the following seven (7) wellbeing factors:

- Economic opportunities
- Health
- Aspiration
- Social support
- Infrastructure and services
- Education
- Civic participation

4.4 Summary of findings

This section provides the summary of findings for the first three research sub-questions, RSQ1, RSQ2 and RSQ3. Eleven (11) wellbeing indicator categories, of which only nine (9) were identified by the youth as relevant to their wellbeing, were identified for RSQ1 and RSQ3. Furthermore, the same set of wellbeing indicators were identified in RSQ2.

Table 4.16 lists the categories along with the corresponding RSQs.

Table 4.16: List of all categories according to research sub-questions

RSQ2 Categories from comprehensive set of wellbeing indicators	RSQ1 Categories from co-design sessions	RSQ1 Categories from questionnaire session	RSQ3 Categories from co-design	Categories status
Health	Health	Health	Health	GYWI
Safety and security	Safety and security	Safety and security	-	GYWI
Economic opportunities	Economic opportunities	Economic opportunities	Economic opportunities	GYWI
Infrastructure	Infrastructure	Infrastructure	Infrastructure	New
ICT	ICT	ICT	ICT	GYWI
Social support	Social support	Social support	Social support	New
Education	-	Education	Education	GYWI
Civic participation	-	Civic participation	Civic participation	GYWI
Aspiration	-	Aspiration	Aspiration	New
Environment	-	-	-	-
Gender equality	-	-	-	-

The findings for RSQ4 are provided in the next chapter. The first three RSQs and corresponding findings are summarised in Table 4.17.

Table 4.17: Summary of findings

RSQ	Findings
RSQ1: What are the factors affecting the wellbeing of the youth in underserved communities?	Nine (9) factors (categories) were listed by the participants as important to their wellbeing. Six (6) of the factors, civic participation, safety and security, economic opportunities, education, health, and ICT are similar to those recognised by the GYW Index. However, three (3) wellbeing factors, social support, aspiration and infrastructure, are new factors that emerged from this research.
RSQ2: How can a comprehensive set of youth wellbeing indicators for underserved communities be developed?	The comprehensive set of wellbeing indicators was obtained through the combination of global wellbeing indicators and local wellbeing indicators. Seventy (70) wellbeing indicators were identified, addressing eleven (11) factors (categories). The comprehensive set of 70 wellbeing indicators formed a pool from which the youth wellbeing indicators could be prioritised. Although the indicators may not be exhaustive, the procedure used in achieving the comprehensive set of indicators can be useful for any given group of people.

RSQ	Findings
<p>RSQ3: how can youth wellbeing indicators be prioritised to align with ICT interventions in underserved communities?</p>	<p>Youth wellbeing indicators were prioritised from the comprehensive set of wellbeing indicators that were identified to answer RSQ2. Wellbeing indicators were prioritised according to the needs of the youth. The ranking provided a good understanding of the importance of each of indicator to the wellbeing of the youth.</p> <p>Thirteen (13) wellbeing indicators were ranked according to importance. The wellbeing indicators are:unemployment, self-image, reaching full potential, family support, access to water, sanitation and electricity, meaning and purpose of life, being healthy, religious practice, educational level, future expectations, freedom of expression, skills to get a job, and access to skills and training.</p> <p>These priority wellbeing indicators cover seven (7) wellbeing factors:economic opportunities, health, education, aspiration, social support, infrastructure and services, and civic participation.</p> <p>Four of the seven factors are recognised by GYWI: economic opportunities, health, education, and civic participation.However, three other factors,social support, aspiration, and infrastructure are not included in the GYWI.</p> <p>The three new factors points to the awareness that the youth in Grabouw might have special needs different from the global perspective.</p> <p>Therefore, to improve the wellbeing of the youth, these three factors must also be addressed through ICT interventions. This indicates that apart from the recognised globalyouth wellnesscategories, the youth in Grabouw needs an additional three categories (factors) for an improved quality of life.</p>
	<p>Three new categories, not similar to the GYWI and its wellbeing indicators, are listed as follows:</p>
	<p>Aspiration: Reaching full potential, meaning and purpose of life, future expectations</p>
	<p>Social support: Culture, religious practice, family support</p>
	<p>Infrastructure and services: Access to water and sanitation, pollution and services</p>

4.5 Summary of chapter

The findings in Table 4.17 provide answers to the first three RSQs. The results provide: (i) factors affecting the wellbeing of the youth living in Grabouw; (ii) a comprehensive set of wellbeing indicators from which the needs of the youth can be prioritised (determined); and (iii) the ranking of the wellbeing indicators depicting the needs of the youth in order of importance. The factors attained through the co-design sessions and those obtained through ranking the youth Wellbeing Indicators show the needs of the Grabouw youth. These factors are in agreement with factors listed in the literature, pointing to the fact that the wellbeing status of the youth living in underserved communities in South Africa remains the same despite several attempts by

various stakeholders. However, the information provided in the study may assist stakeholders of ICT interventions and even non-ICT interventions to target the wellbeing factors prioritised by the youth strategically. Furthermore, some of the factors identified in this study are aligned with the main factors of the GYWI; however, some variations exist. The similarities and variations are further discussed in Chapter Six.

4.6. Automating data collection and analysis

The methodology (process) established in the process of collecting and analysing data and then presenting the results are subsequently used as input for designing an artefact. This artefact may be useful for: (i) identifying wellbeing factors that are peculiar specifically to the underserved community; (ii) collating a comprehensive set of wellbeing indicators for use by the youth in underserved communities; and (iii) prioritising wellbeing indicators for the youth in underserved communities.

The next chapter provides a motivation for the artefact, the choice of ICT platform that may be suitable for the deployment of the artefact, and the technical background required to develop the artefact.

CHAPTER FIVE: ARTEFACT DESIGN

5.1 Introduction

This chapter presents the design process of an artefact for the assessment of youth wellbeing in underserved communities in an attempt to answer RSQ4. In Chapter Four, the empirical processes that were followed to gain insight into the challenges of the youth in underserved communities were reported on. The process was used to establish the priority level assigned to these wellbeing challenges by the youth in underserved communities to understand the needs better and to shape the design of ICT interventions in order to meet the prioritised wellbeing of youth in underserved communities.

The overarching research strategy for this research was service design, given the first aspect of the aim of the study was to explore how youth wellbeing indicators can be used to facilitate effective ICT interventions for youth empowerment and development in underserved communities in South Africa. A further aim was to develop an ICT-based artefact to prioritise youth wellbeing indicators in underserved communities in South Africa.

When the needs of the youth are amplified through priority setting, it enables donors to decide on the most relevant intervention that can significantly improve the wellbeing of the youth. The prioritisation of youth wellbeing indicators by the youth provides insight to stakeholders on suitable ICT interventions that satisfy the wellbeing needs of the youth.

A service is described as the “integration of assets, people, materials and processes”(Goldstein, Johnston, Duffy & Rao, 2002:2). Although users may define a component simply by the outcome of the design, the authors argue that a service is designed after due consideration has been given to physical and non-physical components of the service. Therefore, the suitability of the service to the user depends on the attention that the designer pays to the service concept. Goldstein et al. (2002) posit that service concepts drive the decisions made when planning service design. Service design uses the principle of design thinking to improve the user’s satisfaction of services.

The previous chapters focused on how users were engaged in the process of determining the ICT interventions deployed for to their wellbeing, thereby improving the satisfaction they gain from the interventions. The design of the artefact is guided by the mode of design. Figure 5.1 is an elaborate version of the design diamonds indicated inFigure 3.7. It indicates activities that take place within each section of the two diamonds and the process of design from problem definition to delivery.

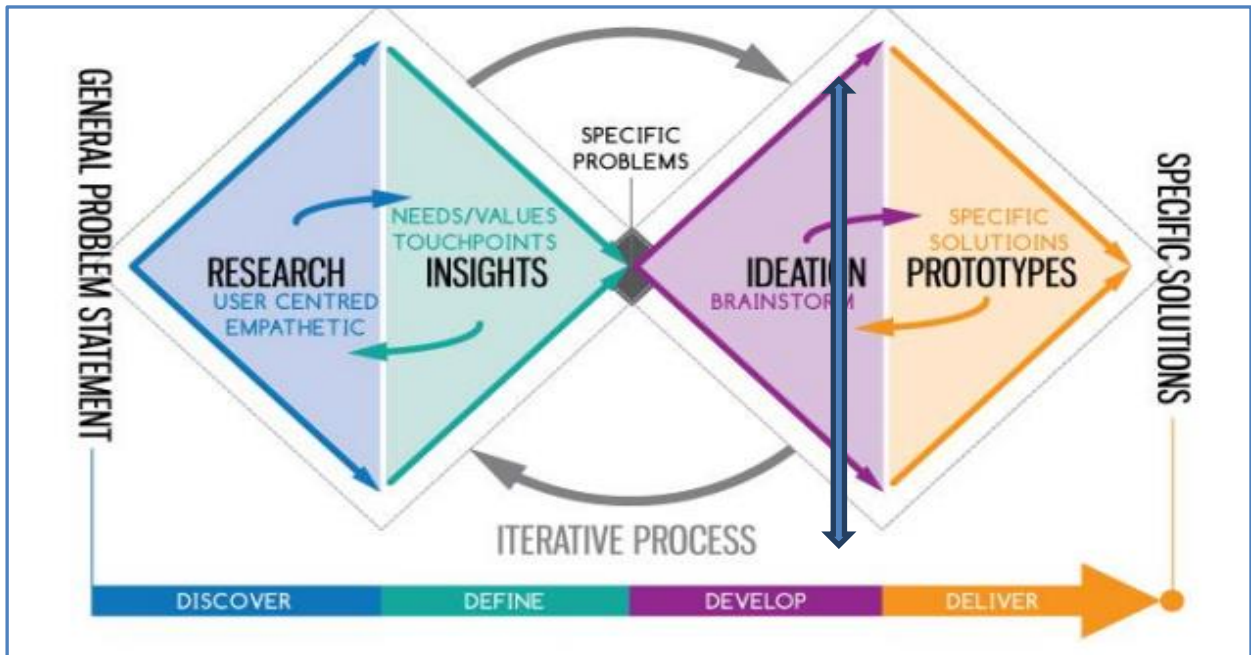


Figure 5.1: Design Diamond (Chu, 2016)

The design process is divided into four main stages: discover, define, develop, deliver. The next section explains how these steps are implemented in the process of designing a suitable artefact to prioritise youth wellbeing indicators in underserved communities.

5.2 Discovering the problem(research)

The first stage in the design process is to discover the problem. The problem can be discovered through research, which provides an insight into the problem. In this study, Chapter One provides a motivation for the research through the identification and justification of the research problem, formulation of corresponding research questions and, objectives, and establishing the significance of the research to address the lack of adequate youth wellbeing indicators that will facilitate effective ICT interventions in underserved communities in South Africa. Chapter Two elaborates on the historical and

related studies on the topic, where the case for actionable research into the prioritisation of youth wellbeing indicators were made and strongly supported in order to enable sustainable ICT interventions for youth in underserved communities.

5.2.1 Definition of problem

The methodology and process of collecting empirical evidence and analysis are highlighted, discussed, and justified in Chapter Three. The methodology guides the research towards prioritising youth wellbeing indicators that will facilitate sustainable ICT interventions in underserved communities. Chapter Four presents narratives of the actual data collected, the method employed by the participants during the data analysis phase, and emergent findings in relation to RSQ1, RSQ2 and RSQ3.

The major highlights from the data analysis include the identification of factors affecting youth wellbeing in underserved communities, the development of a set of local wellbeing indicators for youth in these communities, and establishing a comprehensive list of prioritised wellbeing indicators for youth in the underserved community. The highlights of the data analysis discussed in Chapter Four serve as support for the development of an artefact to prioritise and align youth wellbeing indicators with ICT interventions that will address the priorities and wellbeing needs of the youth in underserved communities. The emergent findings from the data analysis necessitated the need for an ICT-based artefact in an effort to facilitate the empowerment and inclusion of the youth in matters that concern their wellbeing and to inform stakeholders of the nature of appropriate interventions.

A service design approach was followed to develop an artefact that will prioritise youth wellbeing indicators in underserved communities. The process incorporated service concepts that were unveiled through engagement with the youth at the workshops, with additional service touch points required to engage the youth in the decision making of ICT interventions in their community. Through the arguments, methodology and findings in Chapters One to Four a convergence was reached, and focus for the concept and functionality of the artefact was established. As a means of answering RSQ4, the artefact is intended to improve user satisfaction in the delivery of ICT interventions in a way that adequately addresses the wellbeing of the youth based on findings for RSQ1, RSQ2 and RSQ3. The purpose (what) and technological architecture (how) of the artefact are presented in this chapter. The chapter also includes designed prototypes of the artefact for youth wellbeing priorities.

5.3 Pre-development of artefact

To develop an artefact, possibilities need to be explored first through describing the concept, ideation, and brainstorming. Ideation is needed in the design of the artefact, which is often based on the concept or purpose of the artefact. The process of conceptualising, ideating, and brainstorming can be enhanced by creating prototypes. Some of the terms and their usage in the study are explained in subsequent sections.

5.3.1 Concept of artefact

Chapter One provides a comprehensive background on the status of the wellbeing of the youth living in underserved communities, with emphasis on South Africa, highlighting challenges of maximising ICT interventions to improve their wellbeing. The highlighted problem prompted the formulation of the first three research sub-questions, RSQ1, RSQ2 and RSQ3. The stakeholders lack adequate information on the wellbeing needs of the youth living in underserved communities. As mentioned in Chapters One and Two, one of the problems identified is that the process of gathering relevant information on the wellbeing needs of the youth lacks the involvement of the youth (Dearden & Haider Rizvi, 2015). Consequently, there is a lack of necessary information on the wellbeing needs of the youth, which is identified as a major challenge leading to failure of ICT aimed to improve the wellbeing of the youth (Adler & Seligman, 2016; Bon et al., 2016). The wellbeing needs become clear when the youth prioritise their needs. The study attempted to answer the first three RSQs in a bid to understand and meet the needs of the youth.

5.3.1.1 Current system

There is limited information in literature on how the needs of youth in underserved communities are prioritised and how necessary ICT interventions for the youth are decided on. However, the methodology used for prioritising the wellbeing needs in this study, which is a manual system, forms the basis for the introduction of the artefacts.

i) Paper-based system

The researchers designed the paper-based system employed in this study. The paper-based system engaged for data collection using the co-design technique and questionnaires was in the co-design technique is described in Chapter Three. The manual system comprises an exploratory process that employed the co-design technique for attaining local wellbeing indicators, and for prioritising wellbeing indicators based on the youth's perception of the needs in the community. The researcher used

paper stickers and Sorter sheets to collect data from participants during the co-design sessions, (see examples in Appendix 6 and Appendix 7). In addition to the co-design technique, questionnaires (Appendix 5) were used to collect data on the factors affecting the wellbeing of the youth. From the reflections of the process undertaken, comments from participants, and lessons learned, it is evident that the paper-based system, albeit the most presentable option at the time, was limited and restrictive in administration, representation, and effectiveness. The limitations of the paper-based system and other motivations for the design of the artefact are discussed in the next section.

ii) Challenges of paper-based system

The motivation for developing the artefact lies in the following three factors:

- The underlining research question
- Challenges encountered by the researcher in the process of data collection
- The lessons learnt from implementing the manual process of solving the research problem

The design of the artefact is the last of four objectives for the study. The intent was to follow the research methodology to obtain answers to RSQ1, RSQ2 and RSQ3, where after this manual research process (of deriving priority wellbeing indicators) would be automated through designing an artefact. Although the methodology was sufficient to provide guidance on achieving the first three objectives, the researcher observed certain limitations that could be improved through the artefact.

The researcher observed that the execution of the process described in Chapter Three might be difficult, and that non-researchers mainly concerned with providing ICT interventions to the underserved communities could find it too laborious and complicated to replicate. Hence, the potential benefit of designing technology (i.e. an artefact) that offers convenience and the ease of performing iterative functions such as identification, prioritisation, and re-prioritisation, motivated choosing technology over a paper-based system.

A further limitation observed by the researcher is the difficulty encountered with gaining access to the participants. There was resistance by the 'gatekeepers' because the community was considered to already be 'over-researched'. Furthermore, community members complained that they did not benefit from several research projects already

conducted in the community. Therefore, subsequent research activities required to facilitate the deployment of ICT may have a low reception by the youth in the community. Youth may be reluctant to participate because of the logistics (time and location) involved in future research activities. The objective of designing the artefact was to achieve a wide-reaching e-participation audience, representing an electronic version of the participatory research approach facilitated to the youth in this study. Using the artefact, the youth will in future be able to participate electronically (e-participate) in a manner that influences the type of ICT interventions deployed by donors for the wellbeing of the youth. This platform is also envisaged to offer opportunities for collaboration, polling, and submissions in a bid to reach an acceptable level of consensus among the targeted participants. When the youth are able to identify and communicate their wellbeing priorities effectively, the stakeholders of ICT interventions will be able to better determine the most appropriate ICT intervention to be deployed for a sustainable impact on the youth.

Observations made during the co-design sessions were incorporated in the design of the artefact. One of the lessons learnt in the field is the need to place more effort on clarifying the priority level represented by each of the rows in the Sorter sheet, as some of the youth did not understand the priority level of each row. The researcher noted that a participant placed all the colour indicators in the last row with the lowest priority (Figure 5.2) instead of the first row with the highest priority. Ideally, all the colour codes representing priorities 1 to 10 should fall within the first and second row depending on the number of indicators selected in each row (Figure 5.3). The indicators in the first row represent the highest priority, and when the second round of prioritising is done using the colour dots, most of dots should be in the first two rows.

When colour codes (Appendix 7:) are all placed in the last row or even arbitrarily across the page, it shows that the participants do not understand the given instruction. To solve this problem, more instructions and guidance are provided in the artefact. The instructions should indicate the priority level of each of the rows and explain each priority in relation to the previous and next priority, such that users are able to understand and follow the instructions accordingly.

Your Workshop Name / Jou Werkwinkel Naam: *Incredible Hulk*

! ! ! ! ! !	24 Toegang tot water, sanitasie en elektrisiteit	25 Omgewing (klimaat en water)	16 Praat my eie taal
! ! ! ! !	59 Veiligheid en sekuriteit	43 Kennis en vaardighede	7 Vryheid van beweging
	64 Spiritualiteit en geloof	18 Finansiële gelettertheid	31 Energie en fiksheid
	32 Gesondheids gewoontes	6 Vryheid van spraak	9 Politiese vryheid
! ! ! !	48 Om my volle potensiaal te bereik	27 Familie ondersteuning	
! ! !	55 Speel, TV kyk, lees, spandeer tyd met vriende	62 Romantiese verhoudings	
	39 Geslagsgelykheid	37 Digitale vaardighede	
! !			22 Werkloosheid
	5 Demokrasie	57 Korrupsie	69 Seksuele teistering
!	68 Verslawing	65 Swangerskap	58 Padsterftes
	70 Bendegewel	67 Boelie	30 Siektes
	20 Armoede	66 Kindermishandeling	60 Geweld

Handwritten annotations on the right side of the table include arrows pointing to specific cells and vertical columns of exclamation marks with numbers below them (e.g., 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70).

Figure 5.2: Sample of error caused by incorrect priority understanding

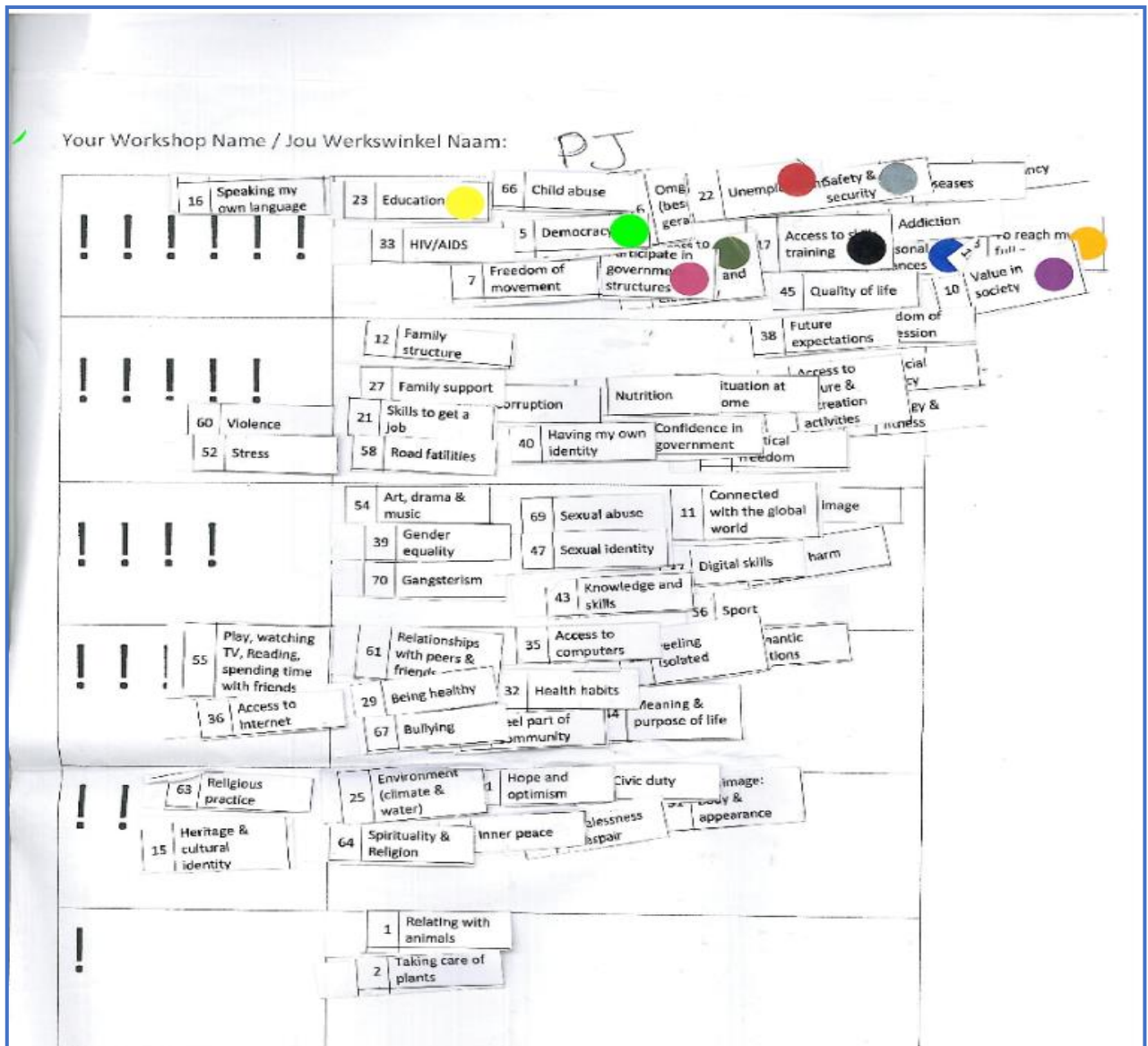


Figure 5.3: Sample of correctly populated Sorter

iii) Other motivations

To achieve the fourth objective, an artefact that prioritises wellbeing indicators was designed as a supplement to the existing metrics used for analysing community and national progress, with an understanding of their wellbeing. The artefact may provide a solid information base upon which relevant policies can be enacted (Adler & Seligman, 2016). The design of the research is in agreement with arguments made by Flick (2015). The author states that limitations of conducting qualitative research include emphasising the use of face-to-face data collection, while using online data collection instruments is not encouraged. The author further mentions challenges encountered with data collection for qualitative studies that are similar to challenges experienced in

this study, such as dispersed locations and inaccessibility of participants. Apart from the two challenges provided by Flick (2015), a further motivation for designing the artefact is the desire to involve more participants in a manner that ensures the wellbeing indicators attained are truly representative of the needs of the specific underserved community.

5.3.1.2 Objectives for design of artefact

The research objective for RSQ4 aimed to design an artefact for the identification and prioritisation of youth wellbeing indicators in underserved communities. To achieve this, the objectives of the proposed artefact were re-defined to include the following:

- i) To identify the factors affecting the wellbeing of the youth as a basis for determining the most pressing needs of an underserved community.
- ii) To develop a comprehensive set of youth wellbeing indicators that can be used to prioritise the needs of the youth.
- iii) To prioritise wellbeing indicators as a determinant of the needs of the youth for relevant ICT interventions in underserved communities.
- iv) Assess the PWI of individual young persons (youth).

The Personal Wellbeing Index (PWI) helps to determine the subjective wellbeing of individuals (Lai et al., 2018). As with youth wellbeing priorities, a subjective wellbeing measure of a population can be used to influence governmental policies for enhancing wellbeing (Richardson, Tyszkiewicz, Tomyń & Cummins, 2016). It can measure life satisfaction or depression (Greenaway et al., 2015) and may be useful for encouraging the youth to seek help by providing relevant information about how to reach out for help. Several authors have developed psychometric properties for the PWI by using classic test theory (Misajon, Pallant & Bliuc, 2016; Tomyń, Stokes, Cummins & Dias, 2019). There is a continuous need to determine the PWI of people because happiness can change in the blink of an eye and is related to environmental circumstances (Nes & Røysamb, 2017). Although the literature indicates the need to examine the PWI, it was not included in the objectives for data collection and analysis in this research study. PWI was excluded, as it is a community-based indicator more inclined towards improving individual wellbeing. Hence, the scope of the study was limited to objectives that reveal the wellbeing needs of the community. Notwithstanding, PWI can be an added functionality to the artefact. The inclusion of a feature that provides immediate gain to the youth by helping them to realise their personal wellbeing can be a motivation for them to use the artefact. Hence, the artefact may provide an opportunity to the youth

to assess their PWI by providing them with an interface to answer the psychometric questions.

5.4 The design of the artefact

This section deals with the design of the artefact, with a user interface that provides access to features of the artefact. Various design diagrams were used to create a prototype of the artefact. These designs show the interactive user interfaces and functionalities. The design process was guided by a service design approach, which aimed specifically to design an interactive service tool for the youth in underserved communities in the Western Cape Province of South Africa.

5.4.1 Functionality of the artefact

To meet the objectives set for the artefact, it was necessary to define the required functionality (features) in detail by explaining the overall characteristics of the software application. This section details the expected functionality, characteristics, technical features, and design prototype of the artefact.

The objectives of the artefact provided guidelines for the overall consideration of the design. The functionality of a system is the most important aspect in the design of a system. A system may have a friendly and usable user interface, but it may never be used if it lacks the capability to function according to the intended objectives of the design. The functionality of a system is based on the extent to which the system meets the set objectives. In other words, the functionality is based on how well a system does what it is designed to do or achieves the set objectives for the design.

Most systems are built to solve problems, test prepositions, or take advantage of opportunities. The functionalities of the artefact are described as follows:

- i) The artefact has been designed to capture data from the youth by using create, read, update and delete (CRUD) features (Tan, Fan, Ghoneim, Hossain & Dustdar, 2016). First, the artefact was designed to provide access to users through a registration process; users are then subsequently validated on return usage. The youth and other stakeholders, especially donor agencies, may require wellbeing related information such as factors affecting wellbeing, wellbeing priorities, and the PWI, which are read by software from the database and displayed in the prescribed format.

- ii) Apart from capturing data, the system must also be able to process the data in a meaningful manner. The system is able to do some arithmetic (addition, multiplication, and division) and logical operations on the data captured in order to provide a meaningful set of data in a prescribed manner. The system captures wellbeing related information and then processes the data to provide information on the CWI and wellbeing priorities of the youth in an underserved community.
- Methods and formulae for attain wellbeing priorities are replicated in the system
 - The system understands and isolates registration for each community, youth registered to the community, and donors registered to specific communities
- iii) Providing reports to stakeholders of underserved community youth wellbeing in a prescribed format.

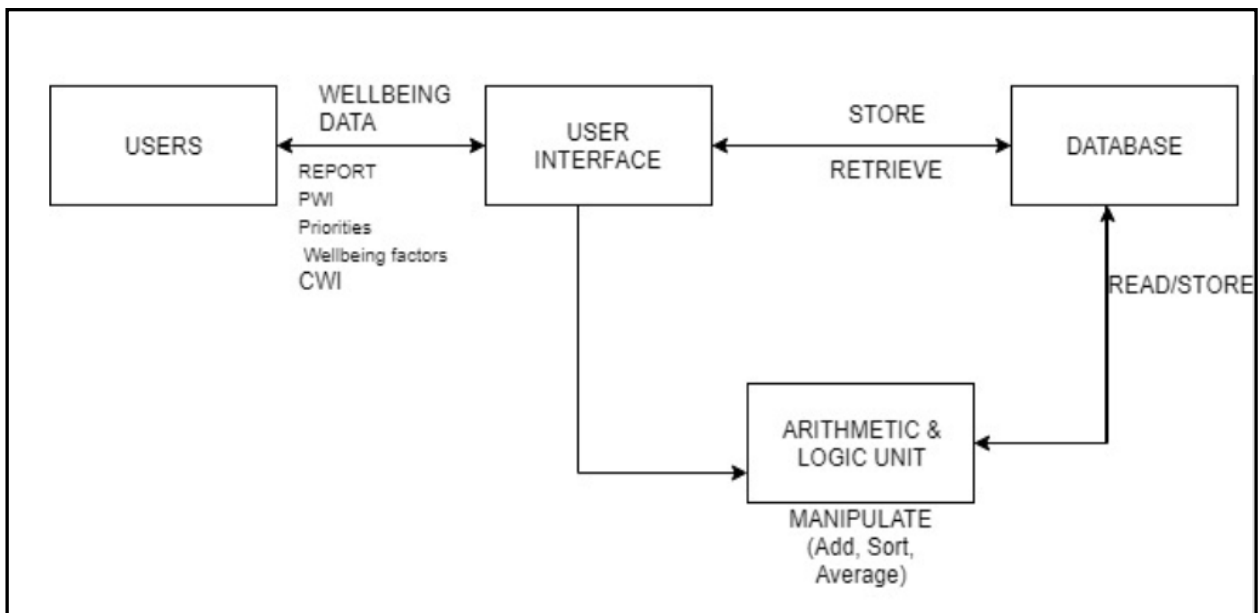


Figure 5.4: System function and activities

Based on the functionalities, the features of the artefact are as follows:

- Storing the list of wellbeing indicators collected from literature into its database.
- Capture the demographic data of users.
- Secure usage by providing and restricting access to users.

- iv) Capture a user's perception of the factors unique to the community in no particular order as achieved in the co-design session (section 4.3.1). Users are prompted to enter a list of factors considered common to the community.
- v) Merge all the factors entered by users into a long list of factors and remove duplicates and synonyms.
- vi) Merge the factors with the baseline (indicator systems) wellbeing indicators and remove duplicate or synonyms to record a comprehensive list of wellbeing indicators.
- vii) Capture the importance of each wellbeing indicator by individual youth.
- viii) Collate and rank the wellbeing indicator in order of importance using frequency and mapping as described in section 4.3.4.
- ix) Provide a report on ranked wellbeing indicators to stakeholders.
- x) Provide a comprehensive list of wellbeing indicators to users and allow them to identify the priority of each wellbeing indicator.

For clarity, an illustration of activities and relationships are presented using the flowchart (Figure 5.5).

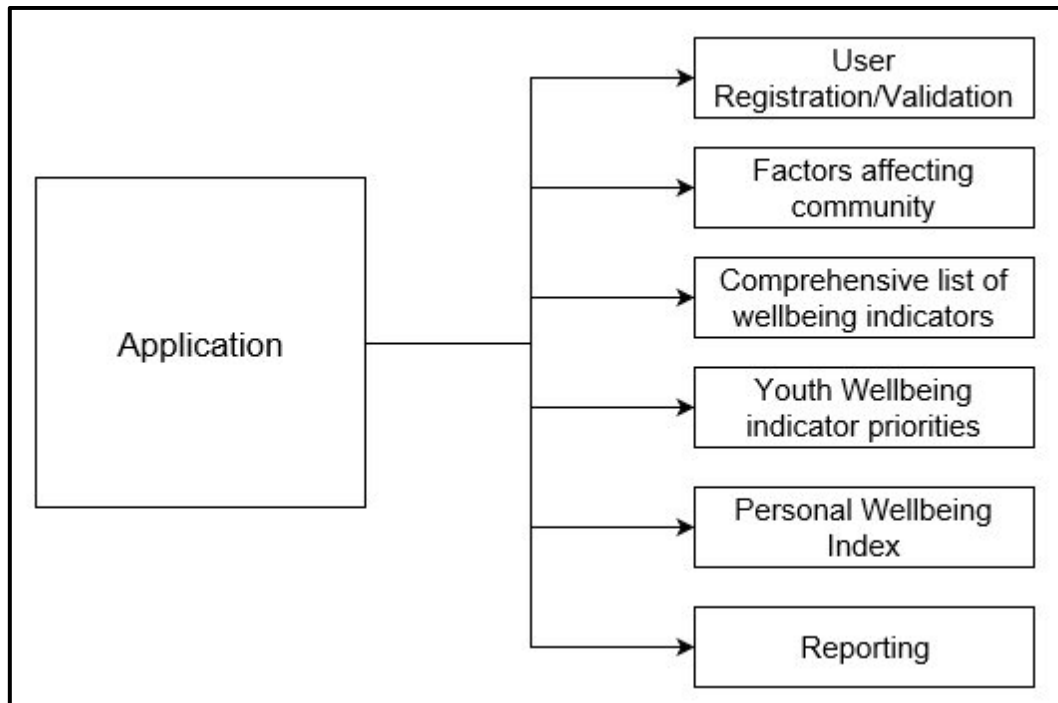


Figure 5.5: Functions of youth wellbeing priority ranking artefact

Figure 5.6 shows the relationship between all the entities of the artefact as well as their links and cardinalities.

Users of the artefact (youth, donors, and other stakeholders) are expected to sign-on to the platform using their credentials. The system is expected to accept various types of input from the youth and the internal functioning of the artefact such as add, sort and compare, which are used to prioritise the aggregate specification of users based on the logic of the code supplied by the programmer. Furthermore, the artefact is expected to provide reports on wellbeing priorities of the youth and the PWI of individuals.

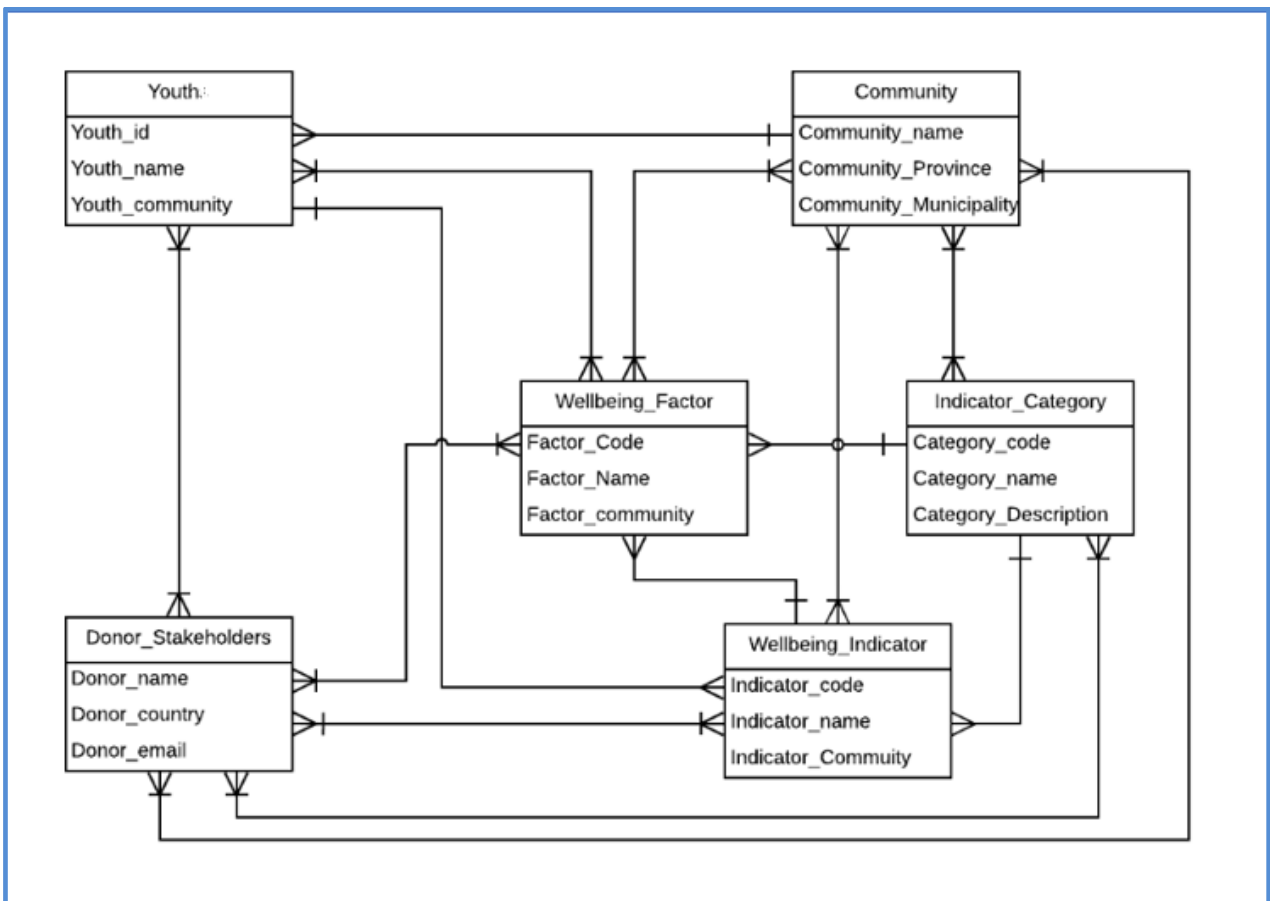


Figure 5.6: Entity Relationship Diagram of artefact

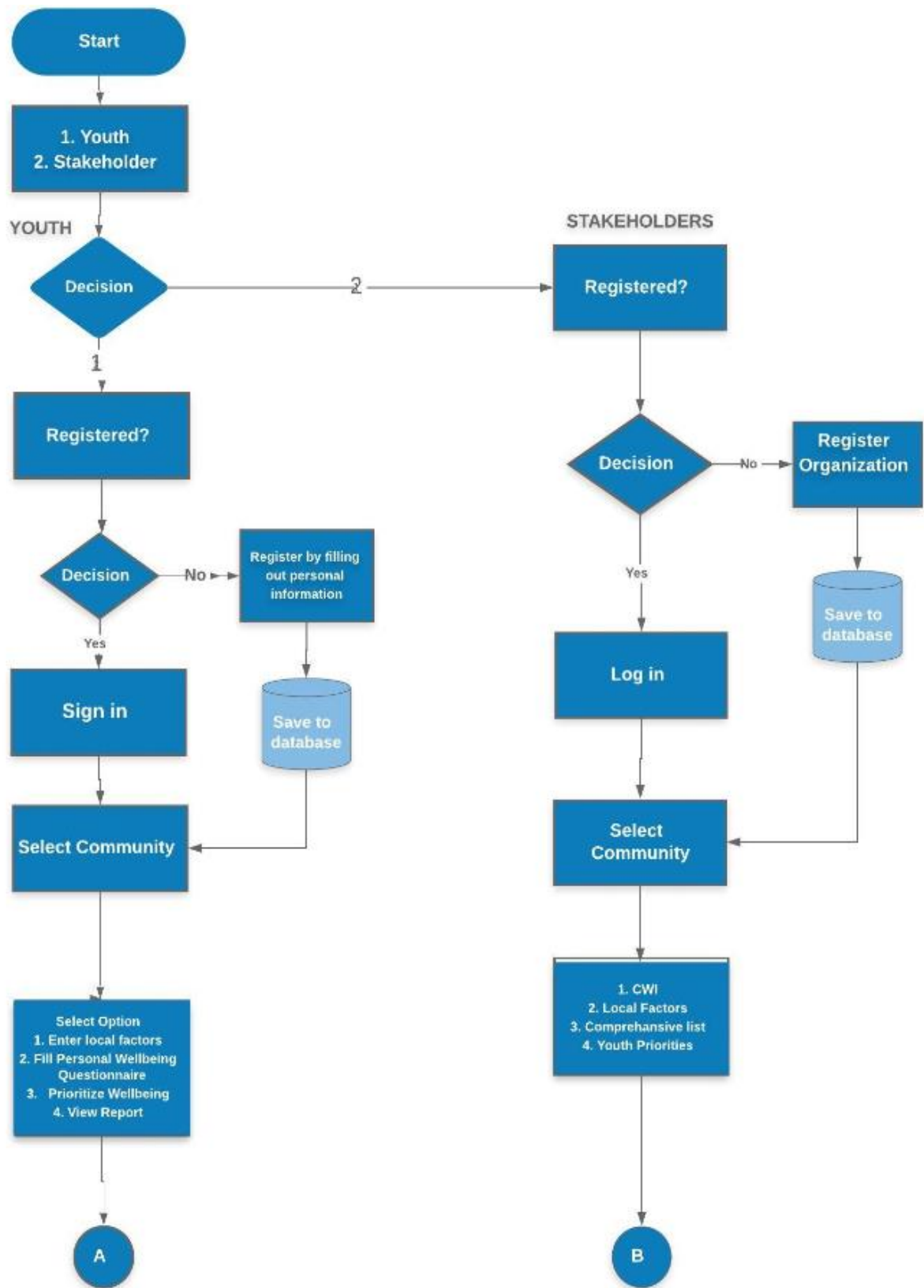


Figure 5.7: Software flowchart for prioritisation of youth wellbeing indicators

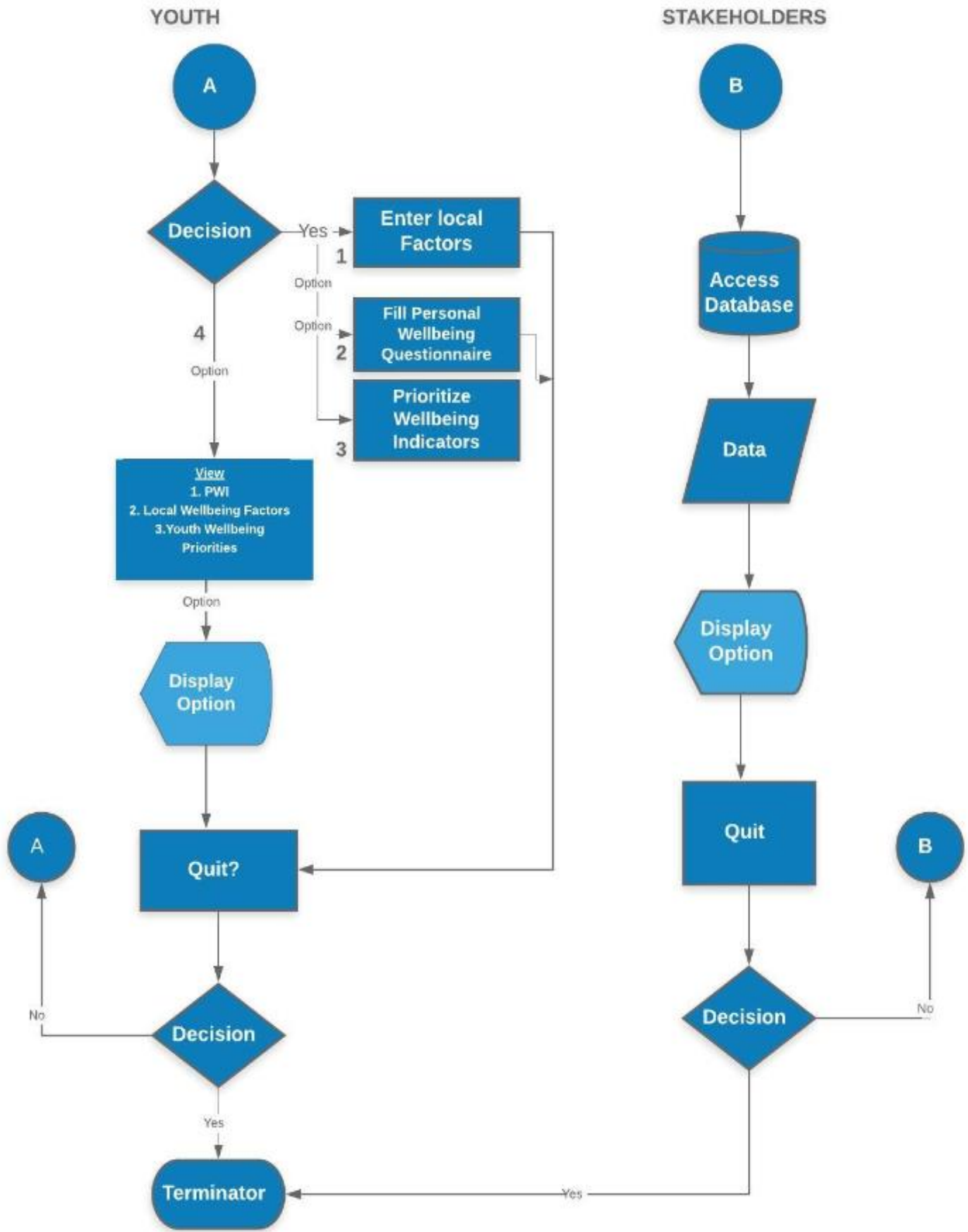


Figure 5.8: Software flowchart for prioritisation of youth wellbeing indicators(continued)

5.4.2 User interfaces of the artefact

The UI, also called the human-machine interface, is an important part of an ICT-based system. In some cases, systems do not have a UI because they solely interact with other systems without direct human input. For systems with a UI, it serves as a point of interaction between humans and machines with the aim of achieving effective operation and communication between the computer, application, and user. Most of the time the UI serves as a channel for two-way communication, presenting the user with the opportunity to provide input and receive feedback. In terms of providing services, Carvalho and Goodyear (2018) describe the service interface as a tangible and visible part of a system with which users can interact. Most system users are usually not aware of the logic, application, and hardware layer processes going on within the computer system.

For effective interaction between human and machine, the UI design needs to be easy to use, user friendly, efficient and produce the desired result. The UI largely determines users' experience with an application, and UI designs are mostly judged on usability and likeability. Therefore, it is essential for the designer to create UIs with easy to use features that are appealing and interactive to promote efficient and optimal use of the application.

Having a good UI design is however not sufficient; UI design with poor functionality defeats the purpose of the system. Gibbons (2017) argue that if a user interface is created based on a deliberate design process in which user's experiences are not considered, it cannot be addressed as user-experience design. Therefore, a good user experience is created when a system combines the high functionality with a dynamic interactive and usable UI. The artefact is thus designed to fulfil the functionality optimally, complemented by a responsive UI to achieve the desired objectives and create a fulfilling user experience.

5.4.3 Prototyping

A prototype is a model that represents a mock-up of the final envisaged system. It forms part of the planning process for software development. Prototypes are designed to be flexible for modification, subject to observations, and redefinition of the needs or preferences of users. Prototypes are created to transfer ideas into visible form and it enablestangible evaluation of the underlining ideas and concept (Zezovski&Hultgren, 2016). A prototype informs building the artefact for brainstorming and

granting permission to explore the behaviour of the artefact with limited risk involved (Coughlan, Suri & Canales, 2007). The prototyping phase entails iterations where ideas, design concepts, and requirements can be thoroughly explored and sometimes tested in real-life scenarios. Translating concepts into model diagrams helps to connect and visualise the outlook of the system for better understanding by the designer. It is also used to obtain relevant feedback on the suitability of the intended product for user purposes.

There are three types of prototypes, namely low, medium and high fidelity (Zezovski & Hultgren, 2016). A medium fidelity prototype involves transferring the idea into a visible product using computer software. The medium fidelity prototype includes navigation or interaction flow using prototyping tools, which helps to refine the design or functionality through observation of the operational components and interactions. The highest fidelity prototype is often designed after iterations at the medium fidelity stage.

In this study, a medium fidelity prototype for the mobile application was developed by creating model diagrams of the user interface using Adobe Photoshop software. The medium fidelity prototype was preceded by low fidelity prototypes through which the researcher transferred design idea to visible concepts by means of free-hand drawing. However, the low fidelity prototype may not be effective to present in a co-design session for user input and improvement because users are not knowledgeable on software design. According to Liedtka, Salzman and Azer (2017), non-designers involved in design studies are often afraid and uncomfortable to experiment with design for the first time. Therefore, the authors recommend that user engagement should be more of ideation, exploration, and testing.

The medium fidelity prototype was deemed easier for non-technical participants to understand and apply design thinking in order to make constructive criticism and contribute to the design. Sanders (2003) argues that there is no distinction between the role of the designer and the researchers with a participatory design approach. Therefore, design thinking was applied to the required functionalities of the mobile application and it informed the user interface designs. Various interfaces were drawn on paper (low fidelity) (Figure 5.9), and redrawn (Figure 5.10) until all the functionalities of the proposed software application were incorporated. Subsequently, a medium fidelity prototype was designed using Adobe Photoshop for application screen-design 1 to screen-design 11.

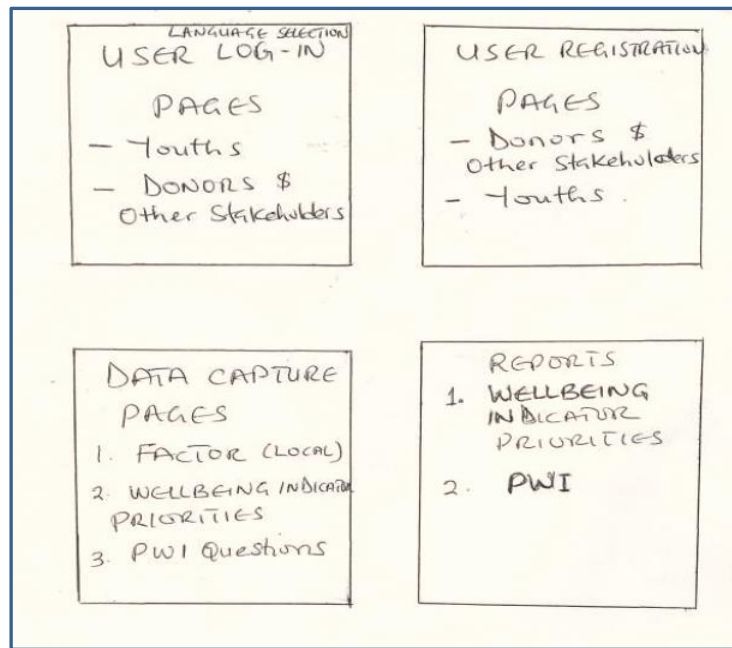


Figure 5.9: Sample of Stage 1 of application design (Low fidelity)

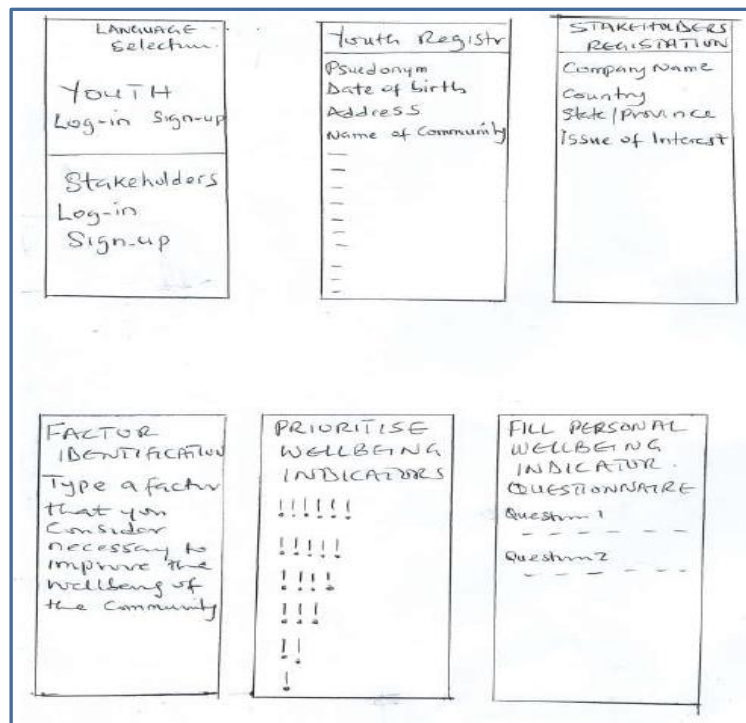


Figure 5.10: Sample of Stage 2 of application design (Low fidelity)

5.4.4 User interface design

The user interfaces were designed based on the determined functions of the artefact. Each screen-design has a function directly related to one or more of the other screen-

designs. The next sub-section (section 5.4.4.1) explains the functions of each screen-design and its relationship to other screen designs.

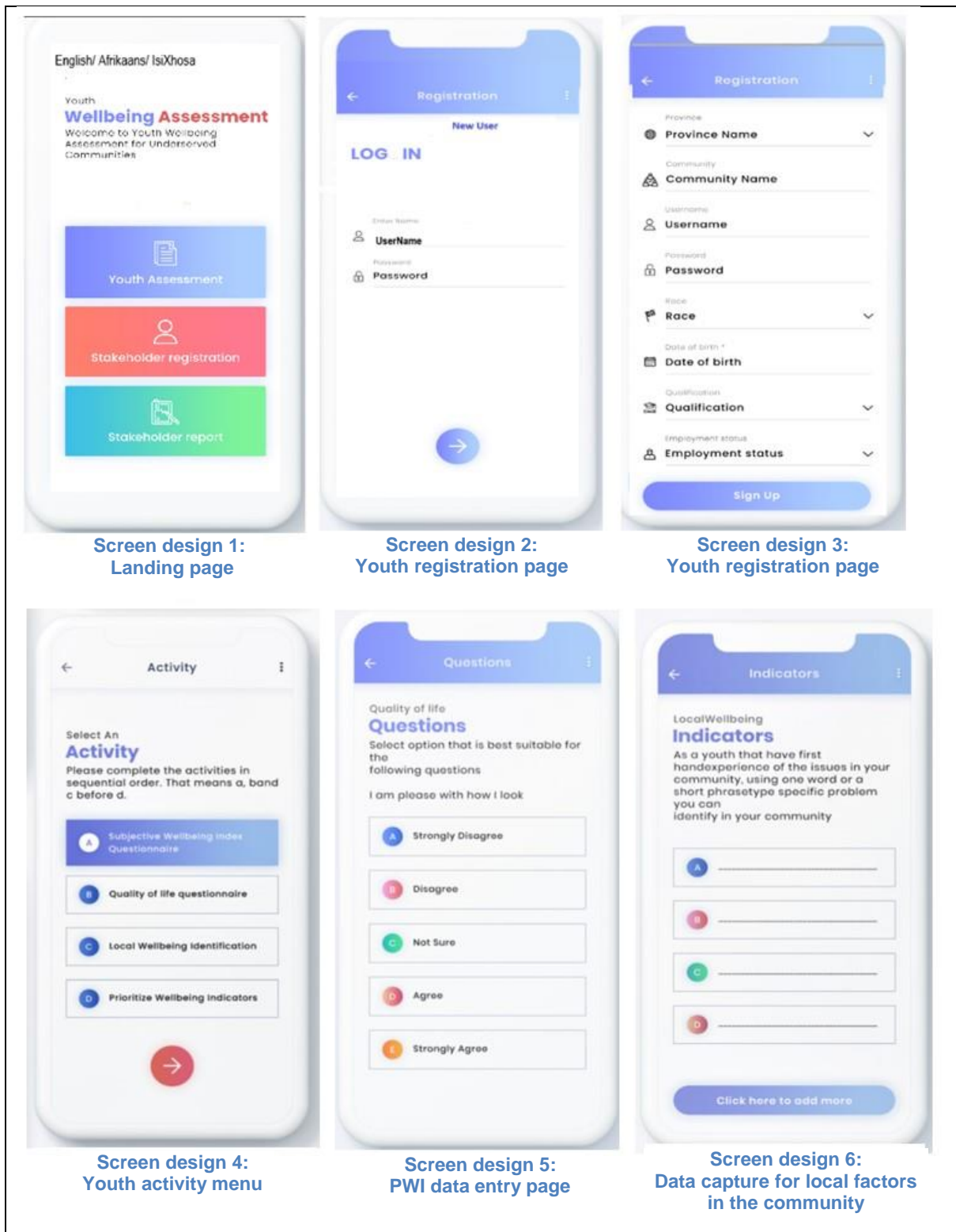
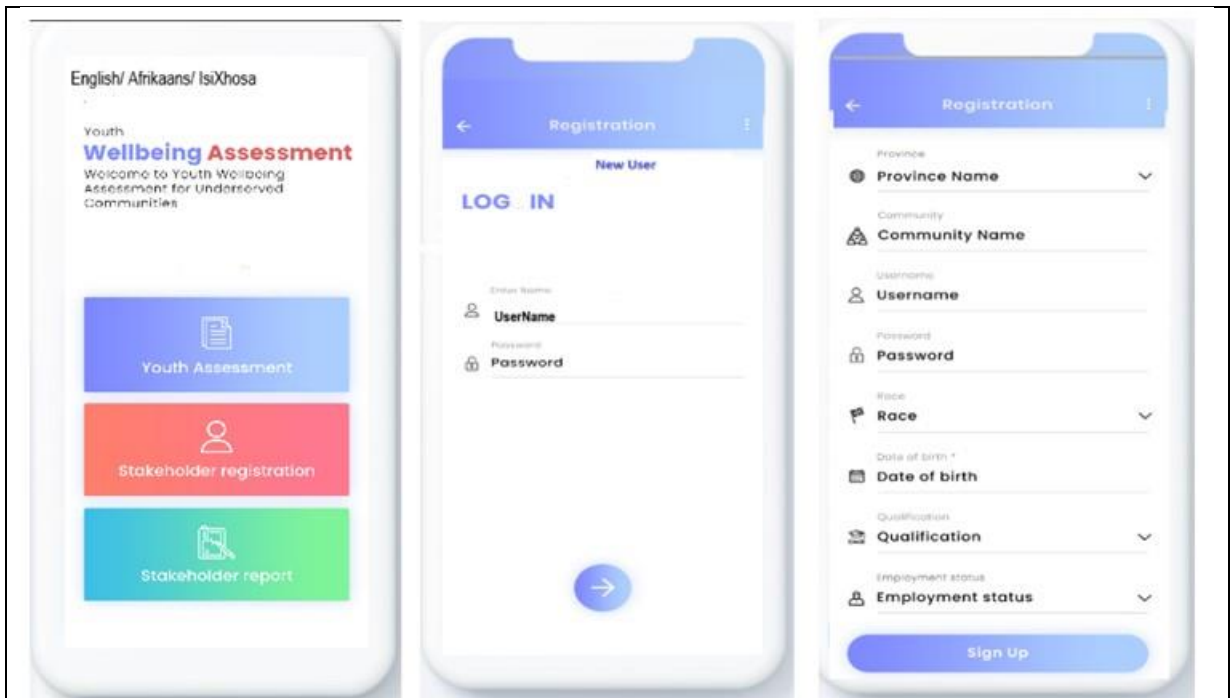


Figure 5.11: Artefact screen designs



Screen design 7:
Wellbeing prioritisation Page 1

Screen design 8:
Wellbeing prioritisation Page 2

Screen design 9:
Stakeholders Registration Page



Screen design 10:
Stakeholder login page

Screen design 11:
Wellbeing report page

Figure 5.12: Artefact screen design (continued)

5.4.4.1 Youth access to the mobile application

The first page (landing page) for all users is shown on screen design 1. On this page, users are able to select the language of interaction. Although only three of the eleven official languages in South Africa are currently represented, this can be changed to include all eleven languages, as there seems to be sufficient demand for this. Users are required to select between “Youth” and donor “Stakeholder”. The youth are required to select “Youth Wellbeing Assessment”, which is the first option. Users are automatically taken to screen design 2, which allows them to either enter their “Username” and “Password” in order to gain access to the application or to register as a new user. New users are taken to screen design 3 where they are required to enter the demographic data needed in the analysis of the overall data.

5.4.4.2 Youth activities on the application

When users (youth) have gained access to the application through the login procedure, the next prompt is to select the desired activity as indicated on screen-design 4. Activities to select from are: (A) Subjective Wellbeing Index Questionnaire (PWI); (B) Quality of Life Questionnaire (screen design 5); (C) Local Wellbeing Identification (screen design 6); and (D) Prioritise Wellbeing Indicators (screen designs 7 and 8).

5.4.4.3 Stakeholder access

Stakeholders in this case are an endless list of donors, government, NGOs, International aid agencies and higher education. To register on the system as stakeholder, they choose the second option on screen design 1, “Stakeholders Registration”. The system takes stakeholders to screen design 9 where they are required to provide relevant information that gatekeepers would have the opportunity to view and review.

To register their intention to sponsor an intervention, existing gatekeepers need to approve the stakeholders’ request for access by sending them an access code (password). Stakeholders (donors) are mandated to seek access to the community through the gatekeepers of the current system; hence, controlling access is retained by the community. In addition, stakeholders’ access to personal information of the youth is controlled in order to ensure security to personal and community information. After stakeholders have been granted permission to access the system, they log in using their access codes (Username and Password) (screen design 10).

5.4.4.4 Stakeholder activities

After stakeholders have been granted access, they are automatically directed to screendesign 11 where they can generate reports. Screen design 11 presents three types of reports:(i) Local Indicators (i.e. the local wellbeing list);(ii) Wellbeing Assessment Report; and (iii)Wellbeing Indicator Priorities (i.e. the list of priorities that indicate the needs of the youth).

The application is not limited to the screendesigns provided above, but thesescreendesigns are fundamental to performing the desired functions.

5.5 Summary

The artefact presented in the study is a prototype of a projected final solution, which is open to criticism, refinement, and further modification before the final product is developed. It is important to get feedback from the participants of the study on the design and functionality of the UI interface, and their observations and input are considered in the final design and implementation of the artefact. One of the objectives of the study was to design the artefact, not to develop it; hence,a service design strategy was employed. Due to time constraints caused by the inability to access the community in a timely manner, the researcher was unable to implement the last stage of the design that requires users to access, provide their input, and edit the design iteratively. The concepts, design, and components presented in this research are an important foundation for the development of the mobile application or web-based application, with the primary functions of identifying, prioritising, and communicating youth wellbeing indicators in an underserved context. This conceptualisation and design of a service system provides groundwork for further research in other related contexts.

The next chapter provides a discussion of the findings of the four RSQs andcomparesfindings with theories and related findings by other authors.

CHAPTER SIX: DISCUSSION

6.1 Introduction

This chapter presents a discussion of the detailed findings from the analysis of the single case on youth wellbeing indicators in an underserved community. The case of this research was selected youth located in the informal settlement of Grabouw, a medium-sized town in the Western Cape Province of South Africa.

The aim of this study was to explore how youth wellbeing indicators can be used to facilitate effective ICT interventions for youth empowerment and development in underserved communities in South Africa. A further aim was to develop an ICT-based artefact to prioritise youth wellbeing indicators in underserved communities in South Africa.

Chapter Three and Chapter Four elaborated on relevant research processes and findings formulated to achieve the first three research objectives (RSQ1, RSQ2 and RSQ3) of the study. Questionnaires and co-design methods were used to collect and analyse data using content analysis. The fourth research question was answered by designing an artefact using the answers (outputs) for RSQ1, RSQ2 and RSQ3. The artefact provides reports on youth wellbeing factors and the wellbeing priorities of the youth in underserved communities. The design was guided by service design as a strategy and provided a technical background for the development of the artefact.

Findings were derived for all the research questions and subsequently discussed and organised according to the objectives of the study.

6.2 Factors affecting the wellbeing of the youth in underserved communities

Objective 1: To determine the factors affecting the wellbeing of the youth in underserved communities in South Africa

The first objective was to determine the factors affecting the wellbeing of the youth in underserved communities. The findings in the study revealed eight major factors affecting the wellbeing of the youth. The factors are: i) economic challenges, ii) safety and security, iii) health challenges, iv) infrastructure, v) social support, vi) ICT, vii) civic participation, and viii) education (Table 4.6). The factors identified by the youth in this community are similar to those mentioned in literature. With reference to the

literature review in Chapter Two, several socio-economic challenges are attributed to underserved communities. The factors identified by the youth are discussed next, guided by the issues identified for each of the factors.

6.2.1 Economic challenges

6.2.1.1 Unemployment and lack of employment opportunities

Compared to other citizens of South Africa, the people of informal settlements depend on earning their livelihood through social grants and remittances (Mathebula, Molokomme, Jonas & Nhemachena, 2017). The youth are excluded as social grant recipients, except for the youth living with a disability. This means there is a high possibility that youth living in underserved communities do not have any means of generating income and cannot support themselves and their families. These youth may have to survive on the social grants paid to their aged parents or children.

Challenges facing adults and older people in the underserved community have a ripple effect on the lives of the youth. Youth in underserved areas are often under-resourced, which affects their overall wellbeing (Cross & Lauzon, 2015). Morrow, Panday and Richter (2005) submit that although youth education has expanded, especially among the African youth, the rate of unemployment has increased. Despite more jobs being created in the formal economic sector, the youth, especially those living in underserved communities, have not necessarily benefited from this (Morrow et al., 2005). The realisation that unemployment is a major challenge facing the youth of South Africa dates back to over a decade ago, when Makiwane and Kwizera (2009) in their article identified that apart from the HIV epidemic, unemployment is the next most severe factor affecting the South African youth. Authors such as du Toit, de Witte, Rothman and van den Broeck (2018) state that unemployment remains a source of pain and concern to the youth living in underserved communities. Despite several efforts by the country and international aid organisations, unemployment is still ranked the highest factor that influences wellbeing in the underserved community negatively. Thirty (30) out of the 31 participants who completed the questionnaire indicated that unemployment is a challenge in the underserved community. One participant stated, "Because in my community unemployment is high" (P38).

According to Statistics South Africa (2018), in the first quarter of 2018, the unemployment rate in South Africa was 26.7% and unemployment among the youth aged 15 to 34 was 38.6%, which indicates that one or more of every three youth

is unemployed. One of the factors that led to unemployment is low educational levels. Low education, unemployment, and poverty are often related. In recent times, unemployment has been reported among educated young adults. This, new trend of unemployment among qualified youth should be a source of major concern to all stakeholders. One of the factors leading to unemployment among university graduates is the non-alignment of the qualifications they choose to study with the skills and qualifications that are in demand. Chipunza, Thasi, Jonck and van der Walt (2016) argue that most African and Coloured matriculants do not pass the necessary subjects required to study courses that are listed as critical skills in South Africa. Therefore, a limited number of youth graduate in fields such as engineering and medicine, which offer more opportunities for employment.

Moreover, entrepreneurship has been proposed as an alternative to employment (Mahadea, Ramroop & Zewotir, 2011). A lack of adopting entrepreneurship among the South African youth is one of the reasons for the consistent increase in unemployment. However, the South African government has made an effort to improve the economic capabilities of the youth through several interventions such as the creation of the Department of Small Business Development (DSBD) in May 2014. DSBD was created to assist small businesses by providing financial support through cooperative banks. Despite DSBD and other government-sponsored initiatives, apart from the current high unemployment figure, which does not reflect the interventions, South Africa still lacks behind in initiating business ventures compared to other countries within and outside of Africa. The level of entrepreneurship adoption especially in underserved areas remains unsatisfactory (Gwija, Eresia-Eke & Iwu, 2014). It is important for donors to understand that success in promoting entrepreneurship among the youth is not limited to the provision of funds. Entrepreneurship is a combination of factors, such as the funding model, management, mentoring, infrastructure, networks, and skills development (Meyer, Meyer & Kot, 2016). Sandrock (2011) recommends the need to equip matriculants and university graduates with entrepreneurial skills in order to curb the growing rate of unemployment among the youth.

The evolution of technology has brought about the possibility of digital entrepreneurship. This type of entrepreneurs may need limited financial resources and higher technical capability. There are several business opportunities available on the Internet to youth. They can market products for existing businesses without stockholding, and add value to existing products through using the Internet. Besides

using the internet for social networking, the youth need to know about the prospects available to them on the Internet and should be equipped with skills that can improve their economic wellbeing. Although the Grabouw youth are located in close proximity to fruit farms, there are more people in search of farm work than available job opportunities. On the other hand, the youth may be reluctant to take up menial jobs with very little reward, and this may lead them to become as poor as their parents. The youth who engage in farm work due to financial difficulty may not be able to meet their growing financial needs.

Unemployment may lead to a lack of financial capability, which in turn leads to poverty. Poverty is considered a defining feature of an underserved community. With the rate of poverty decreasing in developing countries since the industrial revolution, it is no surprise that approximately 95% of global poverty is concentrated in sub-Saharan Africa, East Asia, and South Asia. The cycle of poverty is hard to break and most of the time is passed on from one generation to the next. For many who moved out of poverty, the improvement is relatively temporary and variables such as food insecurity, economic shocks, and climate change may return them to a state of poverty.

6.2.1.2 Poverty

One of the issues listed as affecting the wellbeing of the youth in the community is poverty. Similar to this finding, Naicker, Mathee and Teare (2015) posit that poverty is often reported among members of informal settlements in South Africa, although Marais, Ntema, Cloete and Lenka (2018) argue that the level of poverty in these communities is on the decrease.

Poverty has many consequences on the subjective and objective wellbeing of the individual and the community as a whole. Poor housing, unemployment, alcohol and substance abuse, limited access to education and health care, poor living conditions, and increased levels of disease (HIV, AIDS, STI, chronic illnesses), contribute to the overall wellbeing of these individuals. Heightened poverty and unemployment are likely to cause increased tensions and anxiety in underserved communities, leading them to seek alternative forms of income. Families living in affluence can afford to support their children or wards through tough times while the youth are unemployed. However, in most cases, the youth living in underserved communities, most of which are without family or social support, make use of illegal alternatives that lead to a rise in crime rates, drug peddling, drug use, and prostitution in order to alleviate the state of poverty.

Poor children and youth are more likely to become poor adults, more likely to drop out of high school, not furthering their education, and more likely to become teenage parents (Makiwane, 2018) and the cycle of poverty will be repeated. Bantjes et al. (2018) argue that one of the influences of poverty on the youth is the tendency to commit suicide, which is often identified as a means of escape from the realities of their living conditions.

6.2.2 Safety and security

6.2.2.1 Crime

The youth agree with findings in literature that poverty is the root cause of escalating crime in their areas. The major causes of crime in these areas are linked to extreme poverty, lack of job opportunities for the youth and poor economic growth. People live in desperate circumstances and often feel that the possibility of a better life is impossible. Some of the youth therefore commit robbery, theft, burglary, and shoplifting because of the desperate situation that they find themselves in. Chronic unemployment and underemployment, low wages, lack of property, lack of savings, absence of food reserves in the home, and chronic shortage of cash imprison the family and the individual in a vicious circle. There exists an urgent need in these communities for quality service delivery.

6.2.2.2 Violence

According to the Merriam-Webster Dictionary, the definition of violence is “the use of physical force so as to injure, abuse, damage, or destroy”. The culture of poverty produces little wealth and those who have little, receive little in return. Violence is not the cause of poverty but a symptom of poverty. As long as poverty exists, violence will perpetuate. Violence is perpetuated in these communities because the chances of escaping poverty are exceptionally limited. The inability to provide food and basic amenities to family drives the youth of underserved areas to turn to crime, and that usually means selling drugs. Furthermore, the rise in violence and crime can be linked to illegal drug trading and abuse, as is prevalent in South Africa and more commonly in underserved communities (Naidoo al., 2016). The illegal drug trade fuels most of the violence in these areas. Persons selling or using drugs will at some point commit a violent act when they are under the influence or when they are desperate to purchase drugs to feed their addictions. The outcomes of drug abuse, drug pedalling and resultant violence are not positive for the youth. Usually, the options are prison or death. Drug pedalling means quick cash, and often the only way to protect that money

is with a gun. Pieterse et al. (2016) state that there is a direct relationship between crime and violence and unemployment in informal settlements of South Africa.

6.2.2.3 Substance abuse and addiction

The youth identified that issues related to drug abuse and addiction affect their wellbeing (Table 4.4). As previously mentioned, poverty is the underlying cause of most of the problems faced by the youth in underserved areas. Substance abuse is more prevalent among the poor and a lack of money has been reported to be associated with drug abuse. There are similarities between the features of poverty and the conditions that affect drug use, such as low-status, low-skilled jobs, high arrest rates, dropping out of school, unstable family, poor physical health, illegitimacy, high incidence of mental disorders and high mortality rates. Naidoo et al. (2016) argue that between 23% and 41% of the youth aged below 20 years were treated for substance abuse in 2013.

Barton et al. (2018) submit that there is a relationship between growing up in a poor family and the use or abuse of drugs. An individual who lives in an impoverished situation is prone to drug or alcohol abuse as a coping mechanism to deal with the physical, psychological, social, and financial stresses of their lives. Drugs and alcohol are readily available and accessible in poorer and underserved areas, are often sold by members of that community, and are bought with the hope that they would help to overcome the depression that occurs because of poverty. Young women are especially affected by drug use and poverty and they often find themselves forced into risky sexual relations with partners and prostitution to alleviate their financial burden or feed their addiction (Carney et al., 2019). However, the challenges that may further progress poverty and illness in this community are the inaccessibility and un-affordability of treatments and rehabilitation facilities for drug users. Underserved communities do not have access to basic health services. So, the necessary health care services to help drug users are not provided by the government, which merely serves to perpetuate the cycle of poverty and drug abuse even further.

Moreover, young people who take to drugs may become teenage mothers because they often lack the capacity to protect themselves. The results of a study in an informal settlement in the United States, conducted by Wernette, Bonar, Blow and Walton (2018), show that teenagers who take drugs are more likely to become pregnant than teenagers who do not use drugs. The authors state that young girls involved in drugs do not use condoms and they are often exposed to negative peer influence.

Although a number of NGOs engage the youth and sensitise them against drug abuse, more input from the government is needed. The NGOs should provide support in accordance to the provisions made by the government and not *vice versa*. A holistic effort that includes policing of drug peddlers, sensitisation towards the negative consequences of drug use and rehabilitation facilities should be provided by all stakeholders. ICT interventions in the form of counselling software can be introduced.

6.2.2.4 Prostitution

Outshoorn (2018) defines prostitution as, “sexual demands and exchanges, usually with heterosexual men buying the sexual services of women, within a set of social relations which imply unequal power relations between the sexes”. Prostitution is predominantly a female trade but may be practiced by males as well. Because of low or no income, lack of education and access to job opportunities, many young women resort to prostitution as a means to sustain themselves and often their extended families. Prostitution presents itself as an opportunity for uneducated and impoverished women as it does not require education, references, and experience. Prostitution has also been described as one of the consequences of drug abuse and an association between drug use, prostitution, and HIV in South Africa, as reported by Carney et al. (2019). Farley (2018) argues that the female gender is at a higher risk in prostitution compared to the male.

6.2.3 Health problems

6.2.3.1 HIV and other sexually transmitted infections (STIs)

The youth are at the exploratory stage in their lives and sometimes fall prey to delinquent behaviours and risky sexual behaviours such as unprotected sex. Unprotected sex leads to teenage pregnancy and the high school dropout rate, which only further perpetuates the cycle of poverty. Despite the efforts undertaken by the South African government to provide preventive programmes to address the HIV/AIDS epidemic, South Africa continues to have one of the highest HIV/AIDS rates in the world with an estimated number of 6.8 million PLWHA (UNAIDS, 2002). Some of the driving factors behind the epidemic are poverty, social inequalities, poor public policies, lack of education, sexual violence, and inadequate public health services in underserved areas. Furthermore, misconceptions and myths about HIV/AIDS impede the success of HIV/AIDS prevention programmes. A study researching the perception of the youth concerning condom-use in Cape Town, South Africa, confirmed that the youth often

failed to use condoms and were unaware of the implications of their actions (Grebe & Natrass, 2012).

6.2.3.2 Chronic illness

Poverty, health, and social inequalities may result in the development of chronic diseases in members of underserved communities, further complications, and eventually dying (Tomita et al., 2019). The lack of basic preventive strategies, guidelines, and health facilities in underserved communities affect the prevalence of non-communicable diseases. The poor members of rural underserved areas are more likely to die after developing a chronic disease. The lack of access to quality health care services, material deprivation, psychological distress, unsanitary living conditions, and unhealthy eating habits places them at higher risk of developing chronic illnesses (Lembani et al., 2018). Furthermore, the chance of suffering from adverse conditions after diagnosis as opposed to their wealthier counterparts is much higher. This is especially true with young women who form part of the more vulnerable section of society, suffer from social inequality, and generally have difficulties in accessing resources (Spies, Konkiewitz & Seedat, 2018).

Furthermore, people who suffer from chronic illnesses in underserved communities are more likely to be uneducated and may maintain risky behaviours and unhealthy eating habits. They may have fewer opportunities to substitute unhealthy habits with healthier, more expensive options. One study revealed that obesity rates were higher among the poor and that high-fat content foods such as fried and processed foods were estimated to cost less than healthier alternatives such as fresh fruit and vegetables (Claassen, Klein & Corneille, 2016).

6.2.3.3 Anxiety

Poverty may have particular psychological consequences that can lead to risky behaviours in an attempt to escape it. Poverty causes psychological stress and anxiety and has numerous negative impacts on the subjective and objective wellbeing of the individual (Haushofer & Fehr, 2014). Anxiety also leads to risky decision-making and goal-directed behaviours. Cross and Lauzon (2015) view that stress, anxiety and depression have been found among the youth in underserved communities due to peer pressure, causing them to engage in drug abuse and risky sexual activities.

There is a need for stakeholders to improve health care services, especially through primary health care in underserved communities so that challenges leading to chronic conditions can be addressed from the onset. It is essential that stakeholders of youth wellbeing intensify the use of ICT, especially mobile phones to propagate healthy lifestyle information to ensure that the youth are health consciousness (Coetzer, 2018).

6.2.4 Infrastructure

Poor infrastructure is a common phenomenon in Africa (Du Toit et al., 2018) and one of the challenges experienced in underserved communities (Bekoe et al., 2018). Infrastructural challenges in rural areas are the most common in literature (Amzat&Razum, 2018; Mojapelo, 2018; Watkins, Goudge, Gómez-Olivé & Griffiths, 2018). However, informal settlements in urban areas, not minding their close proximities to well-served communities also suffer from poor infrastructures (Pan, Armitage & Van Ryneveld, 2015; Cirolia, Görgens, Van Donk, Smit & Drimie, 2017). The poor state of roads, sanitation, and a lack of effective management of water and electrification equipment are some of the common problems that are products of poor infrastructure in underserved communities. Another factor is the lack of alignment between the needs of the underserved community and the type of infrastructure made available, leading to facilities being abandoned and abused (Okurut, Kulabako, Chenoweth & Charles, 2015). An in-depth investigation of the infrastructural need of the community could help to ensure that resources expended to improve the wellbeing of the users in these communities yield the anticipated result.

The lack or poor infrastructure affects the ability of the youth living in underserved communities to improve their economic power; an example is the dependency of small-scale businesses like barbing and hairdressing salons on the provision of stable electricity and water (Eryanto, Swaramarinda&Nurmalasari, 2019). Furthermore, poor sanitation and water supply infrastructure are linked to outbreaks of epidemics such as cholera. Underserved communities often lack adequate drainage systems or experience a blockage of drainage systems due to poor maintenance, which is responsible for flooding in some areas. The lack of proper sanitation in informal settlements in South Africa has been under scrutiny over the years and is still an on-going issue (Richards, O'Leary & Mutsonziwa, 2007; Pan et al., 2018).

6.2.5 Civic participation

The youth have a positive perception of civic participation. Youth believe that they are not restricted from expressing their views on political issues and enjoy freedom of movement. Although the youth are not disenfranchised, the extent to which their views count is reflected in their standard of living and quality of living. Also, the need to include the youth in decisions that pertain to their wellbeing is an aspect of civic participation.

Yang and Ogawa (2018) report a relationship between internet access and civic participation. The youth will be able to access relevant information about government and understand the different perspectives of other citizens by accessing the Internet. This information is provided in chat groups, through comics or news on the Internet. Access to this information helps youth to form a knowledge-based opinion of national and international issues that may affect their wellbeing. A strategy that can improve civic participation of the youth is the improvement of ICT infrastructure in underserved communities (Wamuyu, 2018). Rafique and Khoo (2018) argue that social connectedness may determine the level of civic participation. Therefore, the inclusion of the youth in community related issues might present the opportunity to awaken their consciousness to civic participation. The authors add that community-based organisations (such as NGOs) might be useful in establishing social connectedness among the youth in underserved communities.

6.2.6 Education

Education is considered an important factor to the wellbeing of the youth in underserved communities. Participants indicated that they were unable to access employment due to a lack of skills and required qualifications. One participant said, "I do not have the necessary skills, I only have a grade 12" (P18), while another stated, "[I] got no skills" (P20). Factors such as lack of economic opportunities, drug use and peddling, and teenage pregnancy are responsible for high dropout rates among high school learners. The lack of the required entry requirement and financial capacity as well as the quest for immediate gain may be responsible for the inability of the youth to access higher education.

A challenge that limits school completion, according to Burger, van der Berg and Von Fintel (2015), is the effect of the government's policy, which excludes over-aged learners from enrolment into high school in South Africa. The authors posit that a

reasonable number of learners are excluded and they may end up not having sufficient qualification to get a job. Consequently, this excluded portion of the youth may not be able to complete secondary education because of the exclusion. It is important to note that underserved communities have a tendency to have more over-aged students than communities of privileged people due to a financial crisis and their level of ignorance, hence increasing existing educational and employment exclusion. The current type of education provided to students empowers them to work as employees. However, there is a need to improve educational content at basic and tertiary levels to include information that empowers youth to be self-reliant and capable of becoming entrepreneurs. E-learning interventions can also increase the number of youth in these communities to be allowed access to education and training.

In recent times, a more holistic concept has been adopted towards understanding the wellbeing of the youth. This concept entails the attempt to identify the youth who are “Not in Education, Employment or Training” (NEET) (Holte, Swart & Hiilamo, 2019). Youth in this category are the most challenged and have a higher risk of taking to crime.

6.2.7 Social support

Youth are often faced with emotional issues and stress related to growing into adulthood. Issues include love and sexual relationship problems, financial issues, and peer pressure (Paulsen & Berg, 2016). Moreover, the youth in underserved communities are exposed to violence, either as witnesses or as victims of social violence. Consequently, they are often in need of social support. Social support is “the emotional and practical assistance an individual believes is available to him or her during times of felt needs” (Dressler, 2016:2). The first line of support for the youth is the family. Hence, they prioritised (4th) “family support” as an important indicator of their wellbeing. Many of the participants indicated that they are either living with a single parent (often the mother) or with extended family members. The non-availability of family members are sometimes the source of pressure and anxiety. Newton and Ponting (2013) in their study report that the youth identified family and friends as being helpful for socialising by boosting their confidence and shaping their morals. Woodman and McArthur (2017) argue that family relationship is a major factor in determining youth wellbeing, and Indumathy and Ashwini (2017) add that family relationship is connected with psychological wellbeing (health).

However, Hall, Richter, Mokomane and Lake (2018) reveal that many South African children live apart from their biological parents, meaning that these parents are absent from the daily life experiences of their children. According to the authors, some of the factors responsible for parent-children separation include population control linked to customary care arrangement, the dynamics of apartheid, poverty, migration for labour purposes, high rate of cohabitation, and low rate of marriage. Furthermore, an increasing number of absentee fathers are reported in South Africa (Richter & Morrell, 2006; Salami & Okeke, 2018). The demographic data obtained in the study shows that most of the youth live either with their mothers and without a father or with other family members. Growing up separately from parents or fathers can affect children by creating an unbalanced psychological growth for children. Mohamed et al. (2018) argue that the youth crave for love and affection from family members and express a need to have a happy family as an important aspect of their wellbeing. DiClemente, Rice, Quimby, Richards, Grimes, Morency, White et al. (2018) emphasise the need for family support for victims of community violence, which is a common phenomenon in underserved communities.

“Religious practice” was also prioritised (8th) by the youth. Apart from assistance in times of crisis, religious groups, with the example of the church, play a role in ensuring that the youth are positively engaged and in strengthening their hope for a better future. Among other aspects, religion also plays the role of awakening the consciousness of the youth to the consequences of perpetrating crime. Similarly, this finding supports the report by Mohamed et al. (2018), which indicates that Malaysian youth prioritise religion as highly important.

Therefore, wellbeing stakeholders need to work on how to encourage a good family structure, and how to reduce the number of teenage pregnancies that result in children being born outside wedlock and youth having to live apart from one of their parents. Youth wellbeing stakeholders should discourage habits that are found to be destructive to good family structures such as alcoholism, drugs, and spousal abuse, which are common in underserved communities (Rotheram-Borus, Tomlinson, Le Roux & Stein, 2015). ICT is often used for communication and achieving social interaction among the youth. ICT interventions can also be introduced to motivate change, and to provide pre-marital counselling, family conflict resolution, and the prevention of destructive habits.

6.2.8 ICT

Youth listed access to ICT as one of the factors affecting their wellbeing. Access to ICT for members of underserved communities has been an on-going concern. The youth have been found to have the highest adoption rate of ICT. They use ICT for socialising, communication, and seeking information on employment opportunities. Samsudin and Hasan (2017) argue that the challenges of ICT among poor people are both adoption and usage. The authors explain that uneducated youth are not able to take advantage of the potential of ICT. However, in South Africa, youth literacy was 94.37% in 2015 (Statistics South Africa, 2019), thereby enabling ease of ICT adoption. The cost of mobile phones has significantly reduced, motivating a higher adoption rate of mobile phones as a commonly used ICT among the youth. Although living in an underserved community, almost all participants in the study indicated that they own a mobile phone.

However, usage of ICT can be influenced by access to ICT (Nikolopoulou & Gialamas, 2016). Furthermore, access to ICT can be hindered by a number of factors, including infrastructure and cost (Nduati, Ombui & Kagiri, 2015). Many underserved communities lack supporting infrastructure for adequate access to ICT. It is important to improve access to ICT for the youth living in underserved communities so that they are able to take advantage of the potential of ICT for the improvement of their wellbeing. More ICT-based interventions should be introduced and the necessary infrastructures should be introduced to ensure access to ICT and successful ICT interventions. Although government has made effort to improve access by providing free Wi-Fi spots in underserved communities (Clark, Veitch, Shah & Fabrizio, 2016), such as available in the Grabouw library, it is not clear to what extent it has helped to improve the youth's access to ICT.

6.2.9 Summary of Objective 1

In conclusion, the lives of the youth are shaped by the economy of the context in which they live, and it determines the type of economic opportunities available to them (Meikle, 2014). The discussion on factors listed by the youth as affecting their wellbeing identified the lack of economic opportunities as well as the peddling and the use of drugs as underlining challenges in the community. The negative decisions and actions taken by the youth in the underserved community can be linked to idleness fuelled by unemployment and a lack of financial capacity. As illustrated in Figure 6.1, the lack of economic opportunities brings about an economic condition that is related to prostitution, drug peddling, criminal activities, inability to make healthy food choices and

consequently, chronic illnesses. Moreover, a major contributor to the lack of economic opportunities is lack of education and skills necessary to access available jobs.

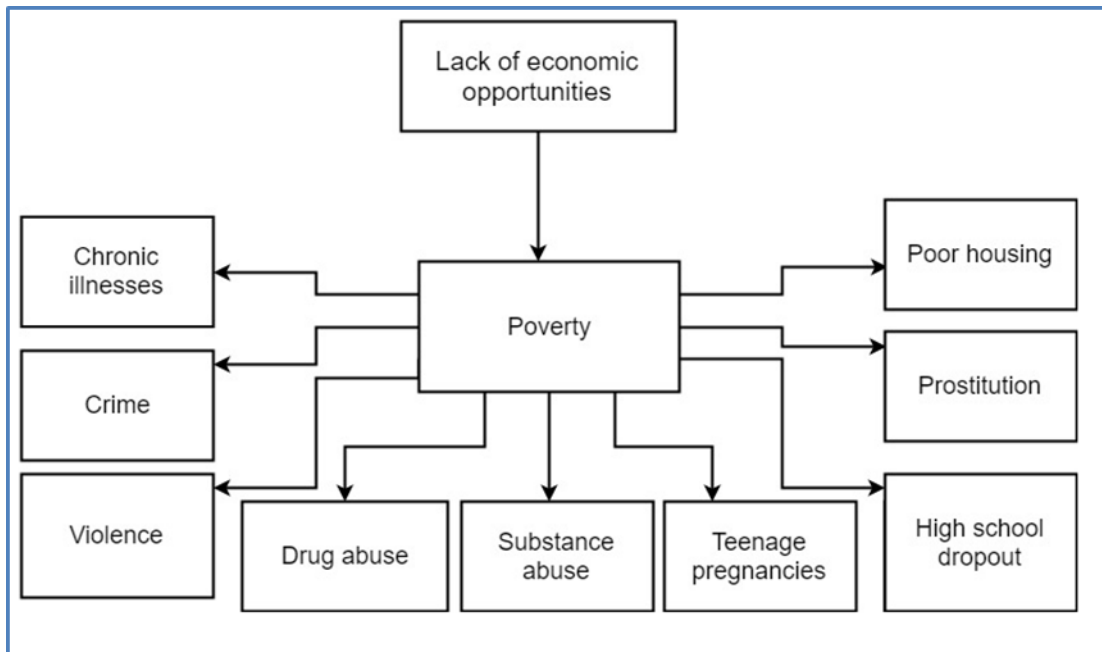


Figure 6.1: Relationship between poverty and other wellbeing indicators

Secondly, drug peddling and abuse are connected to violence, crime, anxiety, high school dropout rate, teenage pregnancies, and the inability to protect oneself against sexually transmitted diseases. Therefore, the wellbeing of the youth can significantly improve if these two factors are successfully targeted by the stakeholders of ICT interventions in underserved communities. A prominent ICT intervention applicable to most of the factors is an ICT-based counselling intervention. This indicates the existence of an information gap, as the youth lack the necessary information needed to improve their wellbeing.

6.3 A comprehensive set of wellbeing indicators

Objective 2: To propose a comprehensive set of youth wellbeing indicators from which the needs of the youth in underserved communities in South Africa can be prioritised

The findings of the RSQ2 delivered 70 indicators (Table 4.8). This set of indicators is related to young people aged 15 to 35 years and living in the underserved community. The set of wellbeing indicators is an all-inclusive pool of indicators through which the

needs of the youth in the community were determined based on prioritised wellbeing indicators. Moreover, the listed wellbeing indicators cover social and economic factors that could affect the lives of people. Hence, the indicators reveal both the social and economic needs of youth within the community.

The comprehensive set of wellbeing indicators consists of baseline wellbeing indicators compiled from literature as well as those determined by the youth in Grabouw. When the two sets of wellbeing indicators are merged, the list may not be generalised for use in other communities. The comprehensive list is unique to the Grabouw community and remains valid until other issues are identified which alters the number and type of wellbeing indicators currently in the list. However, the set of wellbeing indicators (Table 4.7) attained from the literature may be used as a foundation on which local and more specific indicators may be added in an attempt to build a comprehensive set of wellbeing indicators for underserved communities.

Categorisation of the set of comprehensive wellbeing indicators revealed eleven major factors that are addressed (Table 4.9). The factors are as follows: economic opportunities, education, safety and security, civic participation, gender equality, health, environment, aspiration, social support, infrastructure and services, and ICT. These factors are identified as having the capacity to affect the wellbeing of youth in general. The list provided a robust pool of socio-economic factors from which the youth were able to prioritise their wellbeing needs. This implies that all the issues with the capacity to affect the youth can be grouped under these factors. To identify individual needs, or priority needs, it is important for the youth to have an understanding of those factors that have the capability to affect their wellbeing. Although people may understand that they are in a difficult situation, they may fail to identify the factors needed to improve their wellbeing. The visualisation of a pool of wellbeing indicators (screen-design 1 to screen-design 11) provided by the artefact will help participants identify factors that are needed to improve their wellbeing and compare the importance of one factor against the others.

The number of wellbeing indicators available in this list (Table 4.8) influences the extent to which the wellbeing issues in the community are understood and how the youth are able to prioritise their needs.

6.4 Grabouw youth priority wellbeing indicators

Objective 3: To prioritise wellbeing indicators as a determinant of the needs of the youth for relevant ICT interventions in underserved communities in South Africa

The mappings of the common wellbeing indicators of the first twenty indicators in Group A and Group B, Male and Female, are shown in Figure 4.8 and Figure 4.11 respectively. The discussion is based on the 13 final priorities in the study, which are: unemployment, self-image, reaching full potential, family support, access to water, sanitation and electricity, meaning and purpose of life, being healthy, religious practice, educational level, future expectations, freedom of expression, skills to get a job, and access to skills and training. The findings in the groups and the mappings of the groups are intended to assist in reaching sound representative findings and to provide a deeper understanding of individual groups, which may help to further buttress or clarify opinions. In order to gain a better understanding of this list of priorities and the motivation behind their selection, a discussion of Maslow's theory outlining the hierarchy of needs is presented in the next section.

6.4.1 Youth wellbeing priorities based on Maslow's hierarchy of needs

Figure 6.2 illustrates Maslow's hierarchy of needs, with the most basic needs forming the foundation of the pyramid (Maslow & Lewis, 1987). The theory of needs comprises five layers, namely the physiological, safety, belonging and love, esteem, and self-actualisation levels, arranged from the bottom up. These levels or layers describe the manner in which the motivations of people move. According to Maslow and Lewis (1987), the aim or driving motivation behind any action is to reach the final level of self-actualisation.

The most basic of all levels is what has been called deficiency needs. The theory advocates that if the most basic needs are not met, then the individual cannot proceed to be motivated to move to the next level. In terms of the study, the objective was to prioritise the wellbeing indicators of youth. By prioritising the wellbeing indicators of the youth, they are showing what their needs are in order for them to enjoy a relatively good state of wellbeing. The list of priorities provides a deeper insight into what the youth feel they need in their lives to achieve wellbeing. The discussion is aligned with Maslow's theory of needs.



Figure 6.2: Maslow's hierarchy of needs (Maslow, 1943:370)

6.4.1.1 Level 1: Physiological needs

Maslow's theory suggests that the physiological needs are those needs that are essential for the survival of a human being. They are the foremost needs and without them, a human being cannot function properly and is unable to move upwards or be motivated to reach the next level. The physiological needs are breathing, water, food, sleep, clothing, shelter and sex (core needs). Both Group A and Group B have highlighted access to water as one of their priorities, which falls within the physiological needs. However, other basic needs have not been prioritised. Group A highlighted being healthy as their second priority, which falls within the ambit of physiological needs. Basic amenities such as food and water are necessary for the survival of people. It cannot be said that these amenities are absent in this community, but it can be said that it is not sufficient to provide basic comfort or satisfaction to the youth. The scarcity of water in Cape Town (severe drought) may be a reason for concerns expressed by the youth. Adverse weather conditions made water supply a concern for all during the time when the data were collected.

6.4.1.2 Level 2: Safety and security needs

Once the physiological needs are met, the safety and security needs of a person take precedence and become a driving factor behind their actions. These needs are designed to keep humans safe from harm and include personal, emotional, and financial security as well as health and wellbeing, safety needs against accidents/physical attacks and their adverse impacts. Factors such as shelter, job

security, health and a safe environment are pivotal parts of this level. Safety also encompasses the physical safety of the person, such as safety from violence and abuse, as well as economic safety, which includes lack of employment, lack of job opportunities and economic crisis. The priorities classified on this level are priorities, 1, 7, 9, 12, and 13, which are unemployment, being healthy, educational level, skills to get a job, and access to skills and training respectively.

Two of the first twenty priorities of female participants in this category are safety and security, and freedom of movement, where the latter shows a deep concern by the females for their safety within the community. The concern of male participants on freedom of movement slightly differs from the female participants as they list priorities 19 and 17 respectively. It is not surprising that females would assign a higher priority to freedom of movement. This is important because the level of violence against women and children especially in South Africa has been a major challenge to their wellbeing. The World Health Organisation at its 67th World Health Assembly has prioritised violence against women as a health priority in its 2013 guidelines. In particular, South Africa has witnessed an increase in violence perpetrated against women and children in recent times.

Moreover, while members of both the male and female groups included freedom of expression in their first ten priorities, only members of the female group indicated freedom of movement. It is expected that parents have oversight over their children, especially in a community that is perceived as not safe; however, a more intense control or monitoring may be exhibited towards their female children compared to males.

Although HIV/AIDS is especially prevalent among people and youth living in underserved communities, findings show that HIV/AIDS was not listed by the youth as one of the factors affecting their wellbeing. The youth also failed to identify the negative impact of HIV infection using the questionnaire. HIV/AIDS was not listed as a priority issue by the youth in the overall findings of this study. However, it was noted that the HIV/AIDS has the 8th priority in the female grouping. This indicates that the females were more concerned about HIV/AIDS infection than males. This is expected because several authors have established that there are major differences between males and females regarding HIV/AIDS (Kharsany& Karim, 2016; Sia et al., 2016; Treves-Kagan,El Ayadi, Pettifor, MacPhail, Twine, Ramanet al., 2017). One of the notable

areas of differences is that females with HIV/AIDS have to endure more stigmas compared to their male counterparts (Asiedu & Myers-Bowman, 2014; Amin, 2015). Women also reported a lower quality of life in terms of their health compared to men (Chopet et al., 2017).

In general, HIV/AIDS is considered a major problem in South Africa. This could be attributed to a lack of knowledge or education about the dangers of HIV/AIDS in their communities. Secondly, it could be that NGOs and government have not sufficiently sensitised the youth in these communities about prevention, screening tests, and treatment of HIV/AIDS. This may be one of the reasons that the youth attached more importance to other issues than to HIV/AIDS.

6.4.1.3 Level 3: Love/Belonging

The third level of human needs according to Maslow's theory involves interpersonal relationships and relates to the feeling of love and belonging. An absence of this need of love and belonging and self-identity will negatively affect the ability of the individual to have emotional connections and relationships in general and includes intimacy, friendships, and family. This deep need of belonging may fuel people to want to belong to a group. These groups may be religious or professional organisations; if the sense of belonging is absent, feelings of loneliness will be experienced. It is common for the youth to be involved in risky behavior to 'fit in' and succumb to peer pressure in order to 'belong'. This motivation of belonging drives the youth to commit crimes, use drugs, and perform illicit activities, and may overcome their physiological and security needs. Family support is one of the indicators that were common to all the groups. It is common to feel the need for family support in terms of finances and to provide emotional support when the youth face financial and emotional challenges. Family support becomes more important when the youth lack parental love or when they are raised by single parents. Youth, especially those in the early years of adulthood, need social support. This is mostly true for youth living in underserved communities that may lack financial means and support as well as parental support. Lack of social support may encourage their acceptance to belong to groups that can have a negative impact on their lives.

6.4.1.4 Level 4: Self-esteem

Maslow advocates that esteem needs are ego and status, motivated by a need for recognition, respect, and importance from others. All humans have a need to feel

respected, which includes the need to have a self-esteem and self-respect. Self-image and freedom of expression are categorised on this level. Females tend to be more concerned about their bodies and the perception of others about them. The highest priority of the female group is self-image. Although the males also prioritised self-image (12th), the priority assigned to it was lower compared to the female group. The male group is more concerned with how to earn a living, which may be attributed to the role-playing of responsibilities that is culturally assigned to men.

Youth often love to 'look good' and sometimes love to dress, look or speak like celebrities. It becomes a source of pressure when they cannot keep up with desired appearances. The ability for self-expression and being heard is important to the youth.

Di Blasi, Cavani, Pavia, Lo Baido, La Grutta and Schimmenti (2015:1) define self-image as "the subjective perception about one's own self, body, mental functioning, social attitudes, and adjustment in different aspects of life". A good self-image is important for everyone, especially to adolescents and youth. There is a positive relationship between behavioural problems, psychiatric symptoms and a negative self-image (Di Blasi et al., 2015). Health challenges such as anxiety, depression, and obesity may become visible in adolescents who lack a positive self-image. Furthermore, behavioural problems such as mental health problems, risky sex, delinquency, and drug use have been associated with a low self-image (Kim, Bassett, Takahashi & Voisin, 2018). The Grabouw youth identified self-image as an important aspect of their wellbeing. Therefore, a negative self-image may be one of several factors responsible for delinquent behaviours, drug use, and the reason for engaging in a risky sexual relationship in the underserved community. Factors such as unemployment and the inability to purchase clothing and accessories make youth feel inadequate and may trigger negative behaviour.

The youth reside lined and most often decisions are taken on their behalf. The need for the youth to participate in governance, community building and decisions on issues that concern them is advocated. The youth of the Grabouw community often do not have avenues to express themselves and when they do, there are no responses to indicate that they are heard. Lack of communication may be one of the factors responsible for several pro-service protests by the youth living in underserved communities.

6.4.1.5 Level 5: Self-actualisation

Self-actualisation refers to a person's understanding of his/her full potential and the realisation of this potential. It differs from person to person, and it may be expressed in a variety of ways. Some people may have a strong desire to become an academic, a dedicated parent, or maybe creatively express their desires in paintings and artwork. Maslow believes that this level cannot be attained unless the underlying levels have been achieved. It might be in support of Maslow's view that many young people feel a sense of despair and cannot dream of becoming someone better, as they are primarily concerned with survival. The male group prioritised reaching their full potential as Priority 2, which is categorised on level 5. Meaning and purpose of life was listed as Priority 6 (males) and Priority 4 (females) in Table 4.12, which actually forms part of the sixth transcendental level. Although the data provided in RSQ1 show that some of the youth expressed hope, they are concerned about their future and reaching their goals due to their challenged backgrounds. Hope is an important motivation for attaining any goal. Hope is needed to embrace any opportunity provided by stakeholders for improving their wellbeing and for success at work (Uusiautti, 2017).

6.4.2 Findings and GYWI ranking for South Africa

In general, the study revealed nine wellbeing categories (RSQ1 and RSQ2) of wellbeing indicators relevant to the Grabouw community. These categories are as follows: economic opportunities, health, safety and security, ICT, education, civic participation, aspiration, social support, and infrastructure and services. In this section, comparison is drawn between categories common to the findings in this study and the GYWI Index.

For the 2017 youth wellbeing ranking, 29 participating countries took part in the GYWI survey, namely Australia, Brazil, China, Colombia, Egypt, Germany, Ghana, India, Indonesia, Japan, Jordan, Kenya, Mexico, Morocco, Nigeria, Peru, Philippines, Russia, Saudi Arabia, South Africa, South Korea, Spain, Sweden, Thailand, Turkey, Uganda, United Kingdom, United States of America, and Vietnam (Sharma, 2017). The GYWI considered participants aged 15 to 24, while the ages of the youth this study considered ages 15 to 35. However, the actual ages of participants were mostly in the 18 to 26 range, while only one participant, aged 30, exceeded this range. In the 2017 survey, in the overall youth wellbeing ranking, South Africa ranked 22nd of the 29 participating countries (Sharma, 2017).

Table 6.1: GYWI ranking and Grabouw youth priorities

Category	GYWI ranking out of 29 countries	Youth priority out of 70 wellbeing indicators
Economic opportunities	28 th	1 st
Health	27 th	6 th
Safety and security	24 th	19 th on aggregate
ICT	17 th	47 th on aggregate
Education	8 th	9 th
Civic participation	6 th	11 th
Gender equality	16 th	59 th only on aggregate

Table 6.1 shows South Africa's GYWI ranking against the ranking for the same wellbeing categories by the youth (respondents). However, a lower ranking on the GYWI signifies progress and good performance, while a lower ranking in the study indicates deprivation and need. Factors are ranked higher when they are a source of concern to the youth. Higher priority in this study reveals the level of deprivation and need for the specified wellbeing indicator. The similarities and differences between the Grabouw youth wellbeing priorities as identified in the study and the GYWI categories are discussed in the next section.

6.4.2.1 Economic opportunities

South Africa was ranked 28th out of the 29 participating countries on the economic opportunities indicator. The youth prioritised economic opportunities as the indicator having the highest importance. This ranking points to a lack of economic opportunities for the youth in the specific underserved community. The GYWI indicates that the South African youth have low economic opportunities. Therefore, it is expected that the youth who are already disadvantaged by their location with lower educational qualifications and training are more likely to be affected by the challenges. The South African government has increased the education and training opportunities for black South African youth, with special preference to black females who were previously more disadvantaged than their male counterparts were (Mutanga, 2018; Walker, 2018). However, there is still misalignment between the type of skills possessed by South African youth and the skills in demand (Baldry, 2016). This is an indication that the South African government needs to increase effort and develop a more radical approach to solving unemployment problems for the youth by encouraging

entrepreneurship and motivating the youth to study courses that may lead them to employment.

The GYWI revealed that 53% of the South African youth are unemployed. Before the GYWI survey, Graham and De Lannoy (2016) highlighted that unemployment negatively affects African and Coloured youth more than their White and Indian counterparts. The authors explained that 32% of Coloured youth and more than 40% of African youth are unemployed compared to 11% of White and 23% of Indian youth. Given these statistics, it may be correct to say that the majority of the youth living in rural and urban underserved communities are most affected by the racial segregation which happened the past. The authors linked the disproportionate rate of unemployment to the skills levels of the different races and the shift towards technology, which has led to high productivity economic policies that excluded many of the youth.

This finding exposes the need of underserved communities (where most unemployed youth live) for the government and other stakeholders to change their strategy and to find a more productive means of combating the scourge of unemployment. In recent times, ICT has been employed as a solution to most resistant problems. However, not all ICT solutions are productive; hence, a strategically directed ICT intervention is important, and the artefact introduced in this research has the potential to make a significant difference.

6.4.2.2 Safety and security

Of the 29 participating countries, the GYWI (2017) ranked South Africa 24th for safety and security. Similar to this, the findings for RSQ1 also point to various issues that compromise the safety and security of the youth living in underserved communities. Sixteen (16) of the 33 wellbeing indicators identified in Table 4.4 have been categorised under the safety and security category. Although the indicator was ranked 9th by the female group, the male group ranked violence 26th; the overall priority ranking by the youth places safety and security in the 19th position (Table 6.1). The lower ranking on the aggregate findings may be attributed to the fact that the youth concentrated more on economic factors due to the rate of poverty and deprivation in the community. Also, the male group ranked factors that might negatively influence the safety and security of the youth such as violence and poverty higher than the effect (safety and security).

According to Statistics South Africa (2019), there is a continuous increase in crime rates within the Grabouw community. Data shows how different types of crime increased over a period of nine years (2009 to 2018). The number of murders and attempted murder cases increased from 27 in 2009 to 60 in 2018, and robbery increased from 52 in 2009 to 193 in 2018. As stated earlier, violence against children and women is on the rise, and this is mostly true for informal settlements and rural communities.

6.4.2.3 Education

Education was ranked 8th on the GYWI and listed as the 12th priority by the youth in this study. The position of South Africa in the ranking for education indicates that quality education is available widely spread in South Africa. Contrary to this, the results of the study show that education is still a challenge to the youth of this community. Participants indicated that they “got no skills” (P20) to get a job and “only got grade 12” (P18). It is possible that this community does not have access to quality education or that the youth are not aware of the opportunities available to them. Another possibility is that the education of the youth is affected by other factors, which are not directly related to education itself. Factors such as financial constraints could influence learners dropping out of high school to fend for themselves or for dependants such as parents or children (borne by teenagers).

One of the GYWI metrics for accessing education was “lower secondary school completion”.

6.4.2.4 Gender equality

Gender equality was rated 17th on the GYWI, but did not feature in the priority list of the youth of Grabouw. None of the sub-groups listed gender equality under their first 20 priorities. Non-prioritisation of gender equality by the youth may be attributed to two reasons. First, the youth may not consider gender discrimination as a serious challenge compared to other priorities such as economic, safety and security aspects. Another reason could be that the youth are used to patriarchal domination of the male gender and therefore do not consider it a challenge. Although one of the GYWI indicators specified for gender equality is “female fear of walking alone”, this is related to the 17th priority of the female group, freedom of movement, which did not make it to the final joint set of priorities. It could also be associated with the safety and security challenges in the

community, which may be common to both males and females, but more expressed by females because the males do not want to be perceived as weak.

6.4.2.5 Health

The health domain was ranked as 27th on the GYWIndex. The ranking was poor for South Africa in general but health disparity between the privileged and the underserved is still a major concern in South Africa(Booyesen, Gordon &Hongoro, 2018). Although South Africa is ahead of many African countries, it is still lagging behind in the provision of quality health care to its citizens. Brown-Luthango (2016) reports that members of informal settlements are on the receiving end of healthinequality,and this may relate to poor living conditions in these communities, which explains why the youth in Grabouw were concerned about their health. Health wasprioritised as the 6th most important indicator of their wellbeing. The metric indicators used by the GYWI for the ranking show that most of the South African youth have a negative perception of their health and are likely to indulge in self-harm. Although self-harm did not receive a high priority in the study, being healthy received a high priority in all the groups, which reflected in the final aggregate priority list (Table 4.15). The perception of the youth regarding their health can be affected by the quality of food available to them, access to basic health care facilities, and generally by the extent to which their health concerns are addressed by health care professionals. There is a need to improve health access and quality of care for the youth living in underserved communities. One of the challenges to the provision of healthcare to underserved communities is a lack of willingness for healthcare professional to live in rural areas and to work in places they perceive as unsafe(Jonas et al., 2018). However, ICT has proved to be useful for bridging this divide and the use of telemedicine promises to be one of the few solutions that are successful in addressing this challenge.

6.4.2.6 Civic participation

Civic participation of the youth is listed as 6th on the GYWI, indicating that the South African youth have a fairly good opportunity to participate in government and for their voices to be heard. Although this category was prioritised by the youth as lacking, it has a lower ranking compared to economic opportunities, education, social support, aspiration, infrastructure, and health. A wellbeing indicator, freedom of expression, which fallsin the category of civic participation, was ranked 11thof the 13 most important wellbeing indicators (Table 4.14). Freedom of expression was ranked 8thwith the mapping of Group A and Group B (Table 4.11), and 11thwith the mapping of the Males

and Females (Table 4.12) as well as with the aggregate mapping. All the groups and sub-groups considered freedom of expression as an important wellbeing indicator. This may be attributed to the fact that the youth are often a marginalised sector of society, not treated as equals but as ‘adults in waiting’. In the South African context, the youth living in underserved communities are portrayed as victims of unemployment and abuse or neglected and as promiscuous members of society who engage in criminal activities. They are often categorised as problems to society who drain national resources and who are in need of national development programmes for their transition into adulthood. This may be one of the reasons that the youth were concerned about “participating in government” and indicated this as a priority.

Moreover, the youth feels that they have not been given sufficient opportunity to air their views, not being heard or not having sufficient opportunity to make a difference in the country through civic participation. It is possible that the youth have the perception that if they become active participants in governance, they may be able to influence positive changes for their community. There is a need to provide inclusive opportunities to the youth. Opportunities enabling the youth to speak about their wellbeing conditions, participate in debates on government activities, indicate their grievances, and get a response of the government need to be fostered by stakeholders. Results from an analysis of youth participation in civic duties across Africa indicate that African youth tend to participate less compared to the older population, and participation levels are reported to be declining (Lekalake & Gyimah-Boadi, 2016). Furthermore, Schwartz, Theron and Scales (2017) report civic disengagement among the youth living in underserved communities of South Africa. ICT has the potential to offer support to the youth in terms of civic participation. Youth living in underserved communities might be excluded if the factors required for ICT interconnection are not provided by the government and other stakeholders of wellbeing to these communities. Vivier, Seabe, Wentzel and Sanchez (2015) recommend differentiated approaches for the adoption of e-governance and identifying the preferred platform of communication for South Africans.

6.4.2.7 ICT

Although the youth indicated that access to the internet, which is one of the major elements of ICT, as a factor affecting their wellbeing, not much emphasis was placed on the use of ICT. Furthermore, ICT did not feature in the list of the highest 20 priorities of Group A and Group B. Subsequently, ICT was not part of the final 13 wellbeing

indicators. This may be attributed to a number of factors. Access to ICT in rural and underserved communities is sometimes limited and unavailable to the youth. These communities are often victims of digital exclusion, which is a major challenge in countries such as South Africa (Salemink et al., 2017). The youth might therefore not have realised the potential benefit of ICT. Moreover, there is an assumption that the youth in underserved communities do not possess ICT-related knowledge, skills, and competencies and are therefore not able to harness the benefits of ICT interventions, even if these interventions are deployed in their areas (Dzansi & Amedzo, 2014). However, Dalvit and Miya (2017) report that members of underserved communities do possess digital literacy and information awareness to mediate their local context using their phones.

For many of the youth in these areas, ICT is a means to an end to meet the specific needs of their community, but not an end in itself. The limited interest in ICT shown by the youth helps to understand that ICT in itself may not be desirable, except that it may help to achieve other desired factors in an attempt to meet their needs. It is possible to use ICT as a means to bring about positive changes in almost all of the categories listed on the GYWI and in the findings. Therefore, it may be important to place ICT in the centre of the GYWI model such that the prominence of ICT is emphasised and that ICT is presented as a means to an end.

In summary, there appear to be major similarities in the GYWI ranking for South Africa and the findings of the study in terms of economic opportunities, health, and safety and security. However, there seem to be discrepancies between the GYWI and the priorities of the youth in the education, gender equality, ICT, and civic participation categories.

6.4.3 Grabouw youth wellbeing indicator priorities and GYWI categories

The wellbeing indicators prioritised by the youth can provide insight into challenges that are relevant to them. A list of prioritised wellbeing indicators by Grabouw youth are presented in Table 4.15. The categories that emerged from the priorities, which are also the social-economic factors represented by the wellbeing indicators, can be compared with the GYWI categories (factors) that were discussed in Chapter Two. The purpose of the comparison is to establish the appropriateness of the youth wellbeing categories indicated by the GYWI to the underserved community. The findings for RSQ1 and RSQ3 show that generally, the youth in this community are concerned about nine factors,

namely economic opportunities, health, safety and security, education, aspiration, social support, infrastructure and services, ICT, and civic participation.

The similarities and differences between the categories revealed in the study and the GYWI categories are listed in Table 6.1. The six categories common to both are economic opportunities, education, health, ICT, civic participation, and safety and security. There are three main differences between the categories identified in this study and the categories of the GYWI. The categories not covered by the GYWI are aspiration, social support, and infrastructure and services. Gender equality, a new category of the GYWI, did not feature in the findings as none of the groups listed this category among the top 20 priorities.

Most of the categories have been discussed earlier. The new categories that emerged are discussed in the next section. To represent the categories that were unveiled in the study, it is important to note that infrastructure has characteristics that make it a subset of other categories, for example, education is a category that needs infrastructure, and infrastructure can be included in assessment indicator list. The same applies to health and ICT. Infrastructure can thus be excluded from the list of categories. The categories that represent the wellbeing of the youth in Grabouw are as follows (Figure 6.3):

- Economic opportunities
- Education
- Safety and security
- Civic participation
- Health
- Aspiration
- Social support
- ICT

All these factors, with the exception of aspiration, have been discussed in section 6.2.

The two outstanding categories not common to the GYWI categories but are deemed important to the youth, are social support and aspiration. Hence, social support and aspiration are added to the GYWI categories. The categories relevant to the findings are presented next.

6.4.4 Aspiration

The objective of the aspiration category is to know if the youth are living in the present, or are they in any way thinking or having hope for the future. Aspiration as a category is not included in the GYWI. The wellbeing indicators that resort under this category are meaning and purpose of life, reaching full potential, and future expectations. By having prioritised these three wellbeing indicators, the youth indicated that they are concerned about their future wellbeing. In fact, aspiration and education are the two wellbeing categories with the highest number of wellbeing indicators.

Three wellbeing indicators were prioritised under each of the two categories. Economic challenges can lead to despondency. The youth, having been exposed to poverty and deprivation for most of their lives, may become doubtful about the prospects of their future, about the meaning of life, and about their individual purpose in life. They may become concerned about the not being able to achieve a better quality of life. A positive relationship has been found between a low perception of the meaning and purpose in life and a low self-esteem (Barnett, Moore & Garza, 2018). The hope expressed in “future expectation” can help the youth in underserved communities with the psychological adjustment needed to confront obvious obstacles (Su, Li, Lin & Zhu, 2017). Moreover, Krok (2018) adds that the wellbeing of the youth is established through goals that are entrenched in the desire to live a purposeful and meaningful life.

Aspiration is a factor that can lead the youth to choose a life filled with crime because they consider the future bleak and without prospect, and therefore decide to create a better future at all cost. At this stage, the youth will have only one focus and that is money. They may deal in drugs, and rob and kill to achieve this means. However, the indicators in this category can become positive when other categories of wellbeing are positively inclined. When the wellbeing of the youth is improved through categories such as economic opportunities, safety and security, and education, their aspirational outlook may become positive.

Figure 6.3 shows the Youth Wellbeing Index for the selected underserved community.

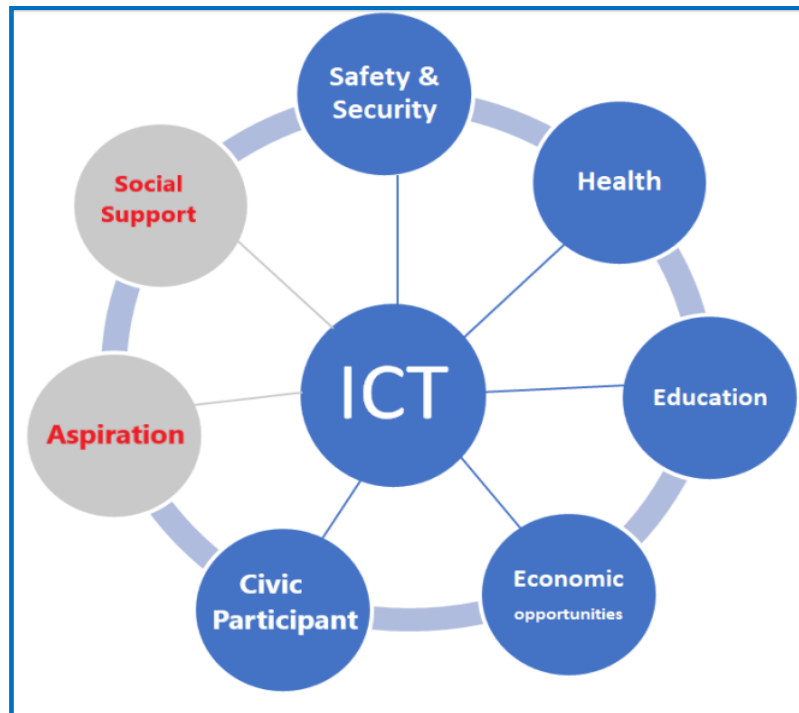


Figure 6.3: Youth Wellbeing Index for underserved community

6.5 Artefact and wellbeing of youth in underserved communities

Objective 4: To design an ICT-based artefact that can be used to prioritise youth wellbeing indicators in underserved communities

To achieve this objective, an artefact that prioritises wellbeing indicators was designed as a supplement to the existing metrics used for analysing community and national progress with an understanding of their wellbeing. An artefact with these qualities can provide a solid information base upon which relevant policies can be enacted (Adler & Seligman, 2016). The research design of the study is in agreement with arguments made by Flick (2015). The author states that the limitations of conducting qualitative research include an emphasis on face-to-face data collection and the fact that it does not encourage the use of online data collection instruments. The author further mentions that the challenges encountered in data collection for qualitative studies are similar to those experienced in this study, which include a dispersed location of relevant participants and the inaccessibility of participants. Apart from the two challenges provided by Flick (2015), one of the motivations for designing the artefact was the desire to include more participants to ensure that the wellbeing indicators achieved are truly representative of the needs of the specific underserved community.

To improve the socio-economic wellbeing of the youth and ensure active participation in decisions made concerning their wellbeing, researchers have used different methods for collecting information on the needs of the youth. Literature points to many methods that have been applied to achieve user participation. Frequently used techniques for collecting wellbeing data are focus groups, interviews, and surveys (Rodina & Harris, 2016; Carney et al., 2019). Focus groups are a carefully planned discussion designed to obtain perceptions on a defined area of interest in a non-threatening environment where participants share and respond to comments, ideas and perceptions (Litosseliti, 2003). Audio data collected from interviews are often transcribed into written form and then analysed. Apart from that, a frequently mentioned shortcoming of using focus groups is the dominance of some of the participants during the session (Punch & Graham, 2017), which may lead to gathering data that are unrepresentative of the intended population.

Bon et al. (2016) are convinced that some of the international aid organisations introduce ICT interventions without investigating the needs of the beneficiaries, or they are under the assumption that the contexts in Africa are similar to those in the Western World. Hence, in some cases, no deliberate efforts were made to assess the needs of benefiting communities. In other instances, prior to introducing ICT interventions, providers obtain information on the needs of the beneficiaries by collaborating with existing NGOs in these communities (Ssozi-Mugarura et al. 2015). These NGOs become a source of information between the donor organisation and the beneficiaries of the interventions. However, it is not sure how much the NGOs know about the needs of the youth. Moreover, the GYWI provides a wellbeing index for youth in South Africa using surveys, but it is not clear how the participants were selected and to what extent the underserved community was represented. There is limited information on existing methods that accesses the socio-economic wellbeing needs of underserved communities in a holistic manner prior to the introduction of an ICT intervention.

6.5.1 Conceptual framework

The two major stakeholders identified in the design, implementation, use, and evaluation of interventions in underserved communities are the donor organisation (international aids, government, and higher institutions), and the community youth involved. The essence of the artefact is therefore to ensure a platform where both parties can effectively communicate on the design and implementation of suitable

interventions to improve the wellbeing of the youth. This involves a series of iterative interactions among the participating youth to determine and prioritise wellbeing needs and communication of such needs to the donor organisations. The exchange of information and interaction can be used to strategise and create a feedback loop to the youth in order to arrive at a consensus of suitable interventions for their needs (**Error! eference source not found.**). Furthermore, the artefact may also be used to assess the impact of ICT interventions on the socio-economic development of underserved communities. This premise is based on the argument by Palvia, Baqir and Nemati (2018), who argue that there is a distinct lack of information on the socio-economic impact of ICT interventions in underserved communities. The impact of ICT interventions on the community can be evaluated better through a pre- and post-assessment of wellbeing indicators to establish the aftermath status.

Using this strategy, a national database for the wellbeing of underserved communities can be developed. This can be implemented by connecting the artefact to the database. Consequently, a list of underserved communities in South Africa along with their wellbeing indicator priorities attained within a scheduled period, as well as the ICT interventions deployed in each community and the impact of the intervention on the wellbeing of the youth, can be collated.

Figure 6.4 illustrates the use of the artefact for data collection dissemination, as well as how the artefact can be used to collate wellbeing indicator information of underserved communities in South Africa.

The artefact can be used by the youth to prioritise their wellbeing indicators. The ranked wellbeing indicator can be accessed by donor organisations and used to determine suitable ICT interventions for the specific community. ICT interventions provided are assessed by obtaining another set of wellbeing indicator rankings from the youth, which can be compared against pre-ICT intervention rankings to determine the impact of the intervention on the socio-economic wellbeing of the youth. Ranked wellbeing indicators, ICT interventions, and impact can be stored in the database. The stored information can assist in replicating the ICT intervention in communities that have similar wellbeing indicator priorities. It can also be used to identify interventions that are non-impactful and help to avoid a repetition of such interventions, thereby avoiding a waste of resources.

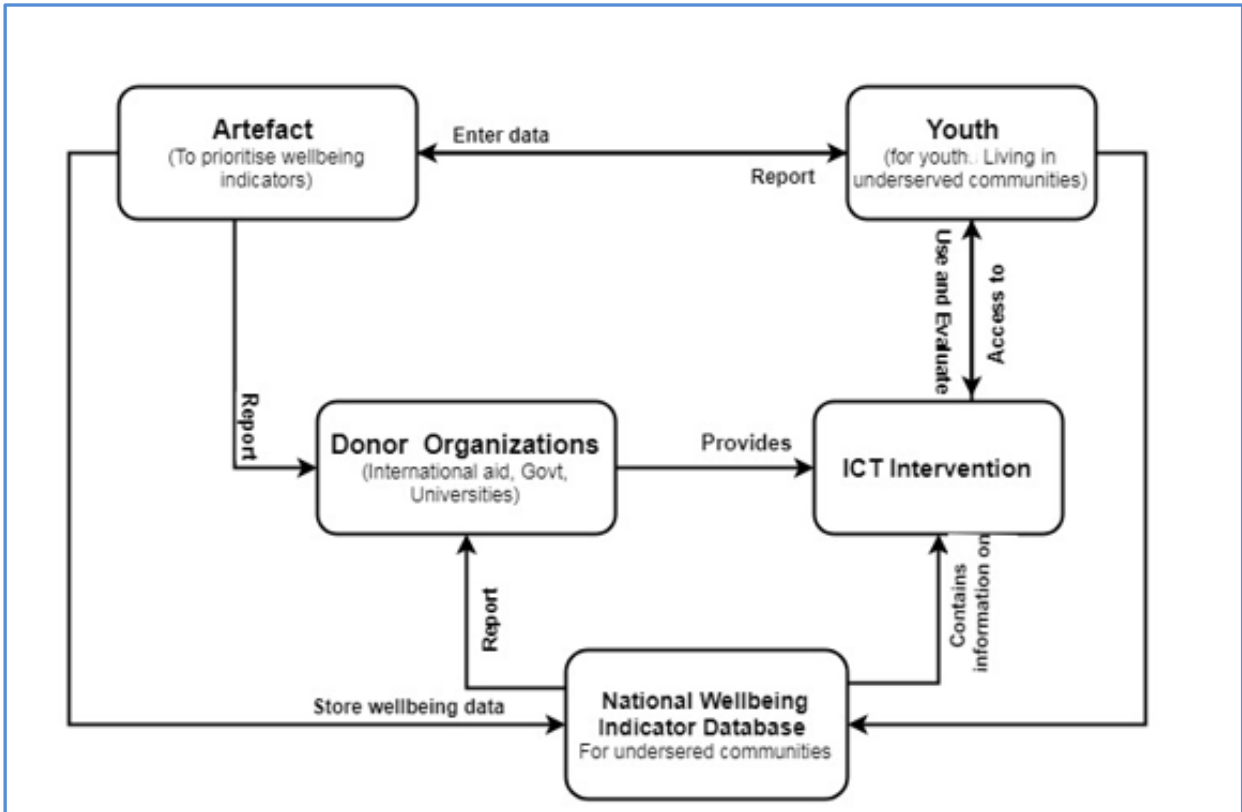


Figure 6.4: Conceptual framework for prioritising wellbeing indicators using the artefact

However, when the artefact is used, it may be difficult to ascertain whether the survey questions are completed by participants who fall within the age category relevant to the purpose of the survey, but the potential benefit of using ICT for data collection is high. The need exists for researchers to pay more attention to how these benefits can be explored.

6.5.2 ICT interventions for socio-economic wellbeing in underserved communities

One of the challenges of ICT interventions identified in literature is the question of the intervention's impact on the socio-economic development of beneficiaries and their communities (Gomez et al., 2013). Stakeholders have been criticised for evaluating ICT interventions based on tangible indicators for success without considering how these interventions influence the socio-economic development of the beneficiaries (Gomez & Pather, 2012). In an attempt to solve problems related to ICT interventions, which include the impact of ICT on the wellbeing of the beneficiaries, several frameworks

have been proposed. Some of the frameworks were examined in Chapter Two. One of these frameworks, proposed by Ashraf et al. (2008), is based on a combination of the unidirectional information chain of Heeks (2005) and Sen's (2000) information chain model as a means of understanding how to analyse ICT interventions (Figure 2.12).

The diagram illustrates how ICT is introduced into the community; it also depicts an analysis of ICT on development using the information chain model and Sen's capacity theory. It evaluates impact, with consideration for social constraints such as religious and cultural practices. The output of the framework shows the impact of the ICT intervention on the economic and social development of the community. One of the shortcomings of the framework is the notion that no method or consultation is indicated before introducing the ICT intervention, meaning there may be no alignment. Although the evaluation intends to measure the extent to which the desired objectives of setting up the ICT intervention are achieved, there is no indication of how these objectives (or desired impact) are achieved. It is possible that this step is omitted because the framework simply intends to evaluate ICT interventions rather than being a holistic framework to guide introduction and evaluation. The framework furthermore fails to indicate the process of identifying the community needs that the interventions are deployed to address. Subsequently, it is not possible to assess the relationship between the needs evaluation process and the impact evaluation. The impact evaluation will be more successful if the process used for the needs assessment can be used to evaluate the impact on the needs of the beneficiaries. It is therefore suggested that a different process is used for achieving the objectives that the ICT intervention is designed to meet, and an impact assessment that checks the extent to which the determined objectives were met after prolonged usage of the intervention.

Hence, the proposal to use wellbeing indicators as a yardstick for determining relevant ICT interventions to underserved communities is illustrated in **Error! Reference source not found.** When wellbeing indicators are assessed by collecting and prioritising data on the youth, the result makes the pressing needs of the youth in the community obvious. Moreover, after a specified prolonged time of using the ICT intervention, a re-assessment needs to be done. A conceptual framework that depicts the incorporation of wellbeing indicators for needs assessment and impact assessment is illustrated in Figure 6.4. The process of needs assessment is repeated with an intention to determine whether the wellbeing indicator addressed by the intervention is stagnant, or whether it has moved up or down the priority list of the youth.

Stagnation of the wellbeing indicator indicates a lack of impact, i.e. neither positive nor negative impact is achieved. An upward movement, for example when the priority of an indicator moves from fourth place to second place, indicates that there may be a negative impact. However, a downward movement of the targeted indicator signifies that the ICT intervention may have a positive impact on the targeted social or economic wellbeing indicator.

The aspect of Ashraf et al.'s (2008) framework that seeks to identify social constraints to the impact of the ICT intervention is not included in the proposed framework, because it is possible for users of the framework to identify social constraints through the wellbeing indicators. The literature reveals that indicators can be used to measure social and economic factors. Therefore, social constraints can be identified by analysing socially inclined wellbeing indicators. However, it is possible to expand the comprehensive wellbeing indicators set further. Stakeholders can work towards achieving a larger set of wellbeing indicators in order to provide an adequate process for needs assessment and evaluation.

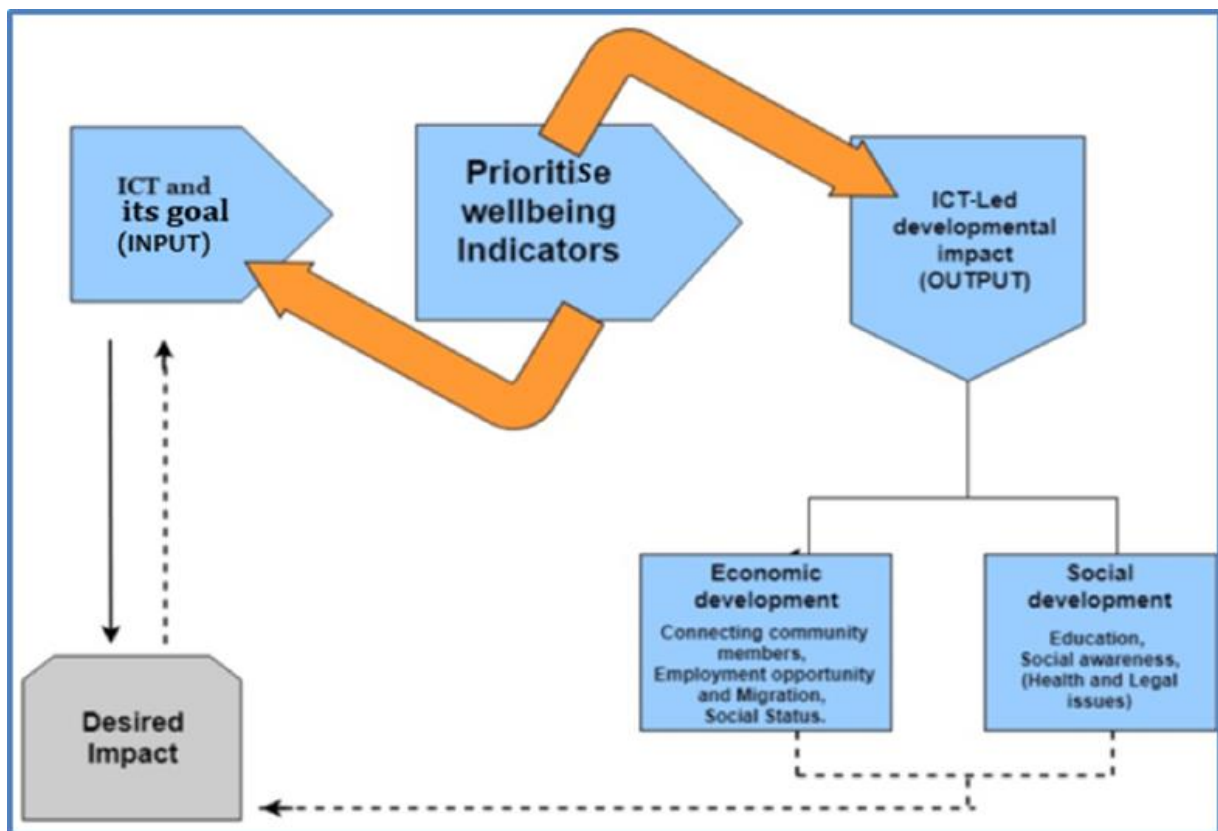


Figure 6.5: Framework for ICT intervention in underserved community (adopted from Ashraf et al., 2008:10)

6.5.3 ICT platform for the artefact

Accessibility is considered paramount to the successful assimilation and use of any intervention by the community (Scherer, Rohatgi & Hatlevik, 2017). The ability of users to access the intervention is a determinant of usage. In order to ensure usage of the artefact designed for this study, an analysis of possible platforms for deployment of the artefact were considered. Devices commonly used are laptops, tablets, mobile phones, and other forms of mobile devices. The use of mobile devices to access interventions guarantees reaching a wider population and reduces issues related to accessibility, thus, more people are able to benefit from the interventions. Electronic data collection methods that enable youth participation may provide the researcher with alternatives to access problems, representation of the population, and economic means of data collection. The design of the artefact shows that it is possible to achieve most of the manual processes implemented in the co-design method by using an electronic platform. Moreover, the methodology indicated in this research to determine and prioritise the wellbeing needs of the youth in underserved communities will be repeated if the co-design instrument is used to facilitate a relevant ICT intervention. This methodology may become cumbersome and difficult to non-researchers and even researchers when the process is frequently repeated. Hence, the automation of the process (data collection and analysis) becomes a tool to determine the wellbeing needs of the youth in underserved communities easily and to assess the impact of ICT interventions on their socio-economic development.

The South African government, as indicated in the South African eHealth Strategy (National Department of Health, 2012), has identified mobile devices as an instrument for service delivery. It built the health strategy around mobile technology as a means of reaching out to people living in underserved communities in South Africa. In the white paper, it was explained that approximately 90% of South Africa is covered by mobile telephony. Watkin, Goudge, Gomez-Olive and Griffiths (2018) recognise the high usage of mobile phones in rural South Africa (places that can be categorised as underserved communities). In support of the strategy adopted by the government, Asongu and Nwachukwu (2016) submit that mobile phones can be used to achieve a more inclusive exercise towards human development and empowerment. Moreover, it has been noted that the cost of internet usage is still one of the challenges hindering the optimisation of mobile phones for advancing youth wellbeing in underserved communities (Dalvit, Kromberg & Miya, 2014). Moreover, Porter et al. (2016) posit that the mobile phone is extremely popular and much used by young people, even among the poor. In addition,

DalvitandMiya (2017) argue that people living within a marginalised context are enabled to access the Internet through a mobile phone. The authors identified that the current trend of inexpensive mobile phones are affordable to members of underserved communities.

Although the availability and cost of the Internet are two challenges prominent to the use of mobile phones in underserved communities, Tungela and Iyamu (2018) report that the South African government has provided free Wi-Fi for disadvantaged communities. Tungela and Iyamu (2018) further state that accessibility to free Wi-Fi is still low, but most ICT4D projects involve the provision of telecentres that assist with internet access in underserved communities (Du Bois & Chigona, 2018). It is common knowledge that the youth is more adept to technological innovations, especially when it is easily accessible from their mobile devices. However, to encourage more participation, it is ideal to grant access to youth that do have access to mobile phones as well as to those who still depend on public internet spots, which was the case with the Grabouw library where the second workshop took place. The artefact may also be designed as a web application. Although the study focused on a mobile application design, this design, together with the observation and feedback for mobile applications, could be incorporated in a web-based application design and development.

The adoption of mobile phones and the Internet by youth has been found to be exploding (Vanden Abeele, 2016). Communicating the artefact among the youth in the community is expected to be easy because of the strength of communication made possible by these instruments. Through socialising and 'hanging out', information seems to disseminate faster among the youth than among other age groups.

6.6 Summary

The findings of the study were discussed according to the research questions. Through the discussion, it was revealed that the wellbeing of the youth in underserved communities has been compromised. Despite the efforts of NGOs, government and international aid agencies, significant improvement in the wellbeing of these youth are yet to be recorded. The discussion on factors that compromise the wellbeing of the youth revealed two major overarching factors that influence other factors. These factors are a lack of economic opportunities, and drug and alcohol peddling and abuse. Furthermore, the relevance of the GYWI categories to the youth in underserved communities in South Africa was assessed. One of the seven factors of the GYWI,

gender equality, was not indicated as a relevant category to the youth. Two new categories of wellbeing indicators, social support and aspiration, were identified as priorities of the youth in the underserved community. The similarities and differences were used to develop a new wellbeing category model for the underserved community.

Moreover, the findings in the study revealed a relationship between the GYWI rating and the ranking in this study on two categories – economic opportunities, and health. A major discrepancy was reported for the education category; the GYW Index indicated education to be successful in the South Africa, while the youth emphasised education as an area of challenge. The civic participation, education, gender equality, and ICT categories also display slight differences in terms of the GYWI and the youth priorities.

A framework to facilitate the introduction of ICT interventions and the evaluation thereof was adopted. Finally, the designed artefact was discussed with emphasis on its significance.

The next and final chapter elaborates on the conclusions and recommendations for this research.

CHAPTER SEVEN: CONCLUSION, RECOMMENDATIONS AND REFLECTION

7.1 Introduction

Although a range of ICT interventions have been developed specifically for the youth in underserved communities, the digital divide is still poignant (Miah et al., 2017). ICT interventions targeted for the wellbeing of the youth in underserved communities in Africa have been unable to meet the unique wellbeing needs of the youth, as these interventions were developed prior to establishing the wellbeing needs of the relevant communities. This lack of consideration for local context caused a disparity between the deployed ICT interventions and the needs of the community. Therefore, the aim of this study was to explore how youth wellbeing indicators can be used to facilitate effective ICT interventions for youth empowerment and development in underserved communities in South Africa. A further aim was to design an ICT-based artefact to prioritise youth wellbeing indicators in underserved communities in South Africa.

Moreover, a service design strategy using participatory design was adopted to improve the youth experiences of ICT interventions deployed by stakeholders. The study's aim and objectives were achieved by using questionnaires and co-design methods. Participants were purposefully chosen on the assumption that they have first-hand experience and knowledge on issues in the community, and secondly, that they would be willing to participate in the study and provide the relevant data needed to explore the research problem. Findings from the study reveal that although the youth have a fair understanding of the importance of ICT for a better wellbeing, priorities that are more pertinent (such as lack of employment, and safety and security) need to be addressed by the stakeholders. The gained understandings do not resolve the problem of misaligned ICT interventions with the priorities and needs of the youth in these communities, but it contributes to the resolution by discovering problems to be resolved by stakeholders and government as a whole and it provides a relevant target for ICT interventions.

This chapter concludes the study by presenting answers to the two RQs as well as the four RSQs stated in the beginning of the study. Recommendations are presented based on the knowledge gained from the study. Furthermore, the chapter addresses the research contributions and limitations and recommends further research topics.

7.2 Answers to research questions

7.2.1 RSQ1:What are the factors affecting the wellbeing of the youth in underserved communities?

The youth identified nine factors that are important to their wellbeing status, namely economic opportunities, education, health,civic participation, ICT,safety and security, aspiration, social support, and infrastructure and services. The most pressing issues are related to the fear of unemployment as well as safety and poverty in the community. The youth also expressed an awareness of the impact of unemployment and poverty in their communities and identified a need for employment to alleviate poverty. Positive sentiments were also captured, as the youth felt positive about the prospects of finding employment and they expressed hope for the future. Other social vices indicated include drug peddling, addiction and unplanned pregnancies, but data show that the youth have a limited understanding of the gravity of HIV/AIDS infection. The youth displayed fair awareness of the impact of violence on their community and on themselves.

7.2.2 RSQ2:How can a comprehensive set of youth wellbeing indicators for underserved communities be developed?

There is a need to assemble a pool of wellbeing indicators from the priorities identified. By using co-design sessions, the data collection was focused on determining the factors affecting the wellbeing of the youth in the underserved community. Co-design sessions are effective for social development in underserved communities (Dearden &Haider Rizvi, 2015). The factors listed as wellbeing indicators affecting the youth are reflective of, and specific to their community. The set of local wellbeing indicators was merged with wellbeing indicators obtained in literature, and a set of 70 wellbeing indicators from which the needs of the youth could be identified, were compiled. This set of wellbeing indicators presented the opportunity for the youth to prioritise their needs by ranking the wellbeing indicators in the order of need.

7.2.3 RSQ3: How can youth wellbeing indicators be prioritised to align with ICT interventions in underserved communities?

Again, a co-design technique was applied for priority ranking. The comprehensive set of indicators attained in RSQ2 provided a list of priorities from which selection was made. The process revealed the priority needs of the youth with a final list of 13 wellbeing indicators. The prioritised wellbeing indicators are:unemployment, self-image, reaching full potential, family support, access to water, sanitation and electricity, meaning and

purpose of life, being healthy, religious practice, educational level, future expectation, freedom of expression, skills to get a job, and access to skills and training. These 13 wellbeing indicators resort under the following six categories: economic opportunities, aspiration, social support, infrastructure and services, health, education, and civic participation.

7.2.4 RSQ4: How can an ICT-based artefact be designed to prioritise youth wellbeing indicators in underserved communities?

The research findings were achieved through a rigorous process of data collection and analysis, which may not be visible and may discourage the use of the process. Therefore, an ICT intervention in the form of a software application has been introduced. The intervention is intended for use by prospective stakeholders of ICT interventions in order to determine the needs of the youth in underserved communities easily and quickly. The study provides insight into why mobile phone may be the most suitable for the deployment of the artefact, but recommends that web-based applications be included to avoid further exclusion of the poor who may not be able to afford smart phones.

7.3 Research contributions

The contributions of this research are as follows:

- i) The set of unique factors attained in this study provides an insight into the challenges of the youth living in an underserved community in the Western Cape Province of South Africa. If the youth living in urban underserved communities, who are able to move out of the community on a daily basis encounter the listed challenges, it could be more intense for the youth living in the rural area.
- ii) The research provided a comprehensive set of wellbeing indicators that can be used for any age group in the community. The basis for the comprehensive set of wellbeing indicators, which is the comprehensive set of indicators obtained from literature, can be used as a base for any community.
- iii) The wellbeing priorities of the youth in the Grabouw community have been unveiled, and this can help stakeholders of ICT interventions identify possible areas of intervention in the community.
- iv) In total, nine wellbeing factors were identified, namely economic opportunities, safety and security, health, aspiration, social support, infrastructure and services, education, ICT, and civic participation. Although factors identified in

this study have many similarities with the factors specified by Global Youth Wellbeing Index, some differences were identified. By comparing similarities and differences, the researcher was able to design a Youth Wellbeing Index (YWI) model for the underserved community. The YWI model presents the wellbeing factors relevant to youth in the underserved community as revealed by the factors and priorities listed in the study.

- v) The study revealed three new wellbeing factors (categories) that are not included in GYWI categories. The factors are aspiration, social support, and infrastructure and services. Wellbeing indicators for each of these factors were also revealed.
- vi) More than the prioritised list of wellbeing indicators, the innovative methodology engaged in the study is a major contribution. The methodology can be adapted to repeat the process in Grabouw or in any other underserved community not limited to South Africa, thus anywhere in the world.
- vii) The artefact designed in this study can be a tool for improving the rate of success for ICT interventions for development (ICT4D) when developed and adopted by stakeholders.
- viii) A framework to for the deployment and evaluation of impactful ICT interventions is presented in Chapter Six(section 6.5.1). This framework can be used to determine ICT needs of the youth in underserved communities and evaluate the impact of ICT interventions on the socio-economic development of the youth. This process relies on the use of the artefact designed in this study to prioritise needs, which can be used for ICT needs assessment depending on whether it is a pre- or post-intervention prioritisation. This can assist with determiningthe impact of huge ICT intervention projects. The information obtained from the assessment can help avoid a repetition of non-impactful ICT projects and advocate the replication of impactful ICT coverage. This action may prevent a waste of resources and a faster coverage of underserved communities with impactful interventions.

In summary, the study addressed the four RSQs. The factors relevant to the wellbeing of the selected underserved community were identified. The factors were used as wellbeing indicators and merged with wellbeing indicators available in literature to attain a comprehensive set of wellbeing indicators, which were then prioritised to determine their wellbeing needs. To conclude the study, an artefact that can be used to automate the process of identifying wellbeing factors and their priorities was designed.

The study is an addition to the body of knowledge in terms of its methodology and findings. It provides insight into the wellbeing status of underserved communities. It also provides a comparison between youth wellbeing indicator categories in the GYWI and those in the underserved community. Furthermore, it provides a framework capable of guiding the stakeholders in the implementation and evaluation of ICT interventions in underserved communities in South Africa.

7.4 Recommendations

The process of understudying the population of this research through the selected sample provided insight into the wellbeing status of the selected underserved community, their priority needs, how their wellbeing can be improved, and the requirements to improve these significantly. This section provides recommendations based on the researcher's exposure in the study.

7.4.1 Implementation of research findings

One of the challenges of conducting research in underserved communities is that these communities are said to be 'over-researched'. Researchers have gone to underserved communities to carry out several studies with the intention to improve the wellbeing of the community members. However, community members express disappointment as the state of their wellbeing remains the same despite the many research projects that have been conducted there. No significant differences in their socio-economic conditions are expressed. The lack of impact explains the resistance demonstrated by gatekeepers (community leaders and members) to allow further research activities within their community.

Brownson (2017) associates the inability of stakeholders to implement research findings as one of the factors that consistently maintain the poor wellbeing of members of underserved communities. Therefore, it is important for stakeholders, national and provincial government, local municipalities, NGOs, local community heads, and international aid agencies to collaborate in order to resolve how research findings should be implemented in underserved communities. Furthermore, the South African government could consider following the example of the strategy adopted by the Australian government. The Australian government implemented an initiative called Australian Research Alliance for Children and Youth (ARACY) (Smith, 2016). This initiative is focused on ensuring the implementation of evidence achieved for the positive wellbeing of children and the youth in Australia.

7.4.2 Improving wellbeing through applicable targets

A review of literature shows that most interventions by national and international aid organisations do not target the youth. In cases where the youth are targeted, limited information or specifications are available on how interventions target the youth living in underserved communities in South Africa. Although, Statistics South Africa provides information on the number of households and estimated population of people living in informal settlements and rural areas in South Africa, there are no statistics of the youth living in these underserved communities. There are statistics for children, but these are non-specific for the youth. To bring about significant improvement in the wellbeing of the youth living in underserved communities, they need to be targeted by all spheres of government and international donors. ICT interventions that target the youth must be introduced, as the youth have been established to have more interest in using technology and are reportedly knowledgeable on using it for their benefit.

7.4.3 Recommendations to address wellbeing needs

In an attempt to achieve the objectives of the National Development Plan (NDP) 2030 (South African National Planning Commission, 2013) and improve quality of life in underserved communities, the following recommendations are proposed by the researcher:

- i) The South African government should strive towards improving the wellbeing of people living in underserved communities. The research unveiled two major influencers of poor wellbeing among the youth in underserved communities as unemployment and drug use/abuse. An intense effort is needed by the government to combat the two evils such that the wellbeing of youth in underserved communities improves. The government needs to empower the youth by equipping them with skills that will enhance their employability and motivation in order to increase the number of entrepreneurs among youth living in underserved communities. Furthermore, the use and abuse of drugs should be discouraged by making drugs inaccessible to the youth. More effort should be placed on arresting drug peddlers and stricter punishments should be meted out to anyone found guilty of drug peddling.
- ii) Improved budget allocation is needed to enhance the wellbeing of the underserved community in order to yield maximum impact on the youth population.

- iii) The government should develop adequate strategies to address the growing needs of citizens with limited resources; intervention alignment instruments such as the methodology and artefact produced in this study may be useful.
- iv) Develop strategies that harness the work of local and international aids in underserved communities.
- v) The youth should be encouraged to join stakeholders' forums as a way of giving back to empower other youth. The youth will be encouraged when they can see examples of other youth whose lives have been transformed through interventions in underserved communities. The youth will believe more in what they see than what they are told could happen or what is expected to happen after adopting interventions.
- vi) Although it seems that a stakeholder forum exists in the Grabouw community, this forum should be strengthened to become involved in the introduction, evaluation, and documentation of intervention lifecycles in this underserved community. This will help to ensure that interventions are not repeated and that interventions that have negative consequences or those found to be not impactful can be isolated.

7.4.4 Recommendations for ICT interventions

- i) Government needs to explore the potential of ICT interventions that will improve the lives of the youth living in underserved communities in South Africa.
- ii) Most of the ICT interventions available in literature are health related. Although health is an important aspect of wellbeing and underpins other wellbeing categories, the youth requires more than just health. A holistic view of all the categories affecting the youth, especially with consideration to their priorities, will be of immense benefit to the overall wellbeing of the youth and their families. ICT interventions not limited to health care delivery, but also impact on economic opportunities, safety and security, education, and civic participation should be introduced.
- iii) The government, stakeholders, and NGOs need to develop and embrace the use of more ICT instruments to achieve the wellbeing needs of people living in underserved communities in South Africa, especially for underserved communities located in the rural areas. Special focus should be placed on the

alignment of ICT interventions with the particular needs of underserved communities.

- iv) A national database should be developed that comprises the following: names of underserved communities, existing interventions in the community, wellbeing priorities of the youth in the community, interventions introduced (with dates), success of the intervention, measures of success of the intervention, impact of a specific set of interventions on the development of the youth in the community, and contact details of the providers of these interventions. The national database will help to: i) achieve an understanding of existing interventions in specific underserved community;ii) understand the need of the youth in the community;iii) provide well-targeted interventions for youth in underserved communities;iv) avoid the repetition of unproductive interventions; and v) reduce delays and confusions associated with understanding needs of the youth in specific underserved communities.
- v) Stakeholders of other underserved communities need to identify sources of successful intervention and request for such interventions in underserved communities with similar wellbeing priorities.
- vi) Stakeholders, especially those living in underserved communities, should implement scheduled evaluations of the impact of ICT interventions on youth and community development. Instruments such as the artefact designed in this study can help to achieve this. Introducing more measuring instruments that can answer the rhetorical question in the literature about the impact of ICT interventions on development is encouraged.

In general, a summary of the recommendations in this study follows the earlier recommendation by Brown-Luthango (2016),namely thatthe challenges in underserved communities require sustainable, well-targeted, quality education so that the circle of poverty can be broken through job provisioning. Although the challenge to eliminating inequality has often been associated with financial constraints, it is possible for stakeholders to work smarter so that they can achieve more within the funds available. The interventions carried out by the governmentand charitable works done by NGOs and international aid organisations may be futile if certain strategies and systems that coordinate and adequately evaluate the impact of ICT interventions are not employed. Therefore, needs assessment and impact assessment, whichrecognises the participation of beneficiaries, are two important factors in ensuring that the efforts of

stakeholders to improve the wellbeing of the youth in underserved communities become a reality.

7.4.5 Recommendations for further research

Taking into consideration some of the limitations of this research, future research is recommended to gain a better understanding of the wellbeing needs and priorities of the youth in underserved communities. Future research should focus on a larger sample size selected across South Africa. It is also important to develop the artefact together with the youth, and to evaluate its use for needs assessment and the impact of the ICT intervention in underserved communities. Further research could be carried out to ascertain the possibility of using the instrument to determine the wellbeing priorities of older adults in underserved communities.

Furthermore, the artefact can be improved by transforming it into a holistic tool to be used for the wellbeing of the youth in underserved communities. This can be achieved by adding other functional units that provide information on health, social support, information related to avoiding gender-based violence, discrimination, education, and economic opportunities.

7.5 Research limitations

This study was limited to the youth living in the underserved community of Grabouw, located in the Western Cape Province of South Africa. Participants were between the ages of 19 and 30 years (both inclusive). Furthermore, the findings cannot be applied to all underserved communities, although the general characteristics of an underserved community are present in the sample.

On the design of the artefact, the initial prototype design was not achieved through a co-design session because of the participants' lack of technical knowledge on application development; hence, the researcher designed a medium fidelity prototype to obtain the view of the youth regarding the developed application.

Moreover, although the process in this study seems viable for achieving wellbeing priorities that may precede the deployment of any type of intervention, the findings in this study are limited to using the output as a determining factor for the type of ICT intervention that should be deployed to improve the wellbeing of the youth in the community.

The wellbeing indicators used in this study can further be broken down to include more wellbeing assessment indicators capable of providing a more detailed insight into the needs of the youth. The need for well-targeted technology-based interventions cannot be overemphasised.

7.6 Reflection

In retrospect, some misunderstanding with the use of the sorters was encountered. Some of the youth did not understand how to use the sorters and reversed the priorities of the rows; they had to be shown a few times how to use the sorters. This study has shown that co-design is a fast and effective way of collecting data and getting to the 'bottom' of issues, as categories can be drawn immediately along with the participants. No real difficulties have been experienced during the data collection process, and participants were happy to be part of the study.

Organising a workshop for participants is an effective way of gathering qualitative data. It allowed for beneficial interaction with the participants and enabled them to ask questions where there was ambiguity. It provided an atmosphere where the participants were able to relax because they felt empowered by the researchers, thereby creating a win-win situation. Furthermore, it allowed the researcher to use various data collection tools such as co-design and questionnaires.

Another observation is that some of the participants in the first workshop also attended the second workshop. These participants engaged as facilitators in the second workshop. It was observed that the youth learned all the processes involved during the data collection and were happy to assist new participants. In other words, where there were several data collection sessions, previous participants were able to assist the researcher in the data collection process.

7.7 Conclusion

In conclusion, the findings derived on the youth in the underserved Grabouw community corroborate with what was found in literature, which points to a poor wellbeing status of members living in underserved communities in South Africa. The wellbeing of the youth in underserved communities is challenging. Furthermore, the consistency in the data collected through the co-design sessions and the questionnaire shows that the youth understand their challenges and have the capability to determine their needs and to contribute to community growth.

The research findings further reveal that it is possible to understand the factors affecting the wellbeing of the youth living in the underserved community. It indicates that the needs of the youth in underserved communities can be assessed through their wellbeing indicators. Furthermore, it shows that an alignment can be achieved between the needs of the youth and the ICT interventions deployed to improve their wellbeing. Moreover, it provides a background to the technology through which factors affecting the community and the prioritisation of youth wellbeing indicators can be achieved. Finally, the findings suggest that the process of prioritising wellbeing indicators can be automated.

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APPENDIX 1: ETHICAL CLEARANCE FROM FACULTY OF INFORMATICS AND DESIGN, CPUT



P.O. Box 652 • Cape Town 8000 South Africa • Tel: +27 21 469 1012 • Fax +27 21 469 1002
80 Roeland Street, Vredehoek, Cape Town 8001

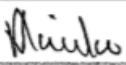
Office of the Research Ethics Committee	Faculty of Informatics and Design
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The Faculty Research Ethics Committee hereby grants ethical clearance to Mrs Oluwakemi Olufunmilayo Oluwole, student number 215014707, for research activities related to the MTech in Information Technology at the Faculty of Informatics and Design.

Title of thesis:	Co-design of youth well-being indicators for ICT intervention in an underserved community
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Comments

Research activities are restricted to those details in the research proposal.

 Signed: Faculty Research Ethics Committee	<u>1/11/2017</u> Date
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APPENDIX 2: SOULFOOD CONSENT FORM



Soulfood Community Organisation

4256 Williams street, Snake Park, Grabouw, 7160

Mobile: +27 76 547 8459

E-mail: soulfoodharmony@gmail.com

NPO Number 181-949

Tax Number: 9407963181

19 July 2018

I, Lynette De Bruyn-Davids in my capacity as Centre Manager at Soul Food Community Organisation give consent in principle to allow Kemisola Oluwole, a student at the Cape Peninsula University of Technology, to collect data in this organization as part of her Masters Degree research. The student has explained to me the nature her research and the nature of the data to be collected.

This consent in no way commits any individual staff member to participate in the research, and it is expected that the student will get explicit consent from any participants.

I reserve the right to withdraw this permission at some future time.

Research will be done on the time and dates as agreed with the student.

In addition, the company's name may or may not be used as indicated below.

(Tick as appropriate)

	Thesis	Conference paper	Journal article	Research poster
Yes				
No				



 Me L De Bruyn-Davids

 19 July 2018

APPENDIX 3: PARTICIPANT CONSENT FORM

PLEASE COMPLETE THE FOLLOWING:

I acknowledge that I am willing to participate:

_____ (name)

A) Permission to record me through audio/ video/photographic media, to be used in academic publications (your name and identity will not be used).

Please can you tick yes (agree), or no (disagree) to show what you are willing to share, if the materials will be used in academic journals. Data generated by this workshop will be stored securely.

Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>

Audio Recordings: Recorded talking from discussions and interviews.

Video Recordings: *Remember, a video can also have your voice in it.

Photography: Photographs of you taking part in the session.

B) Permission to be published through audio/ video/photography in social media (your name and identity will be shown): Website, Facebook, Twitter.

Please can you tick yes (agree), or no (disagree) to show if you are happy to be on the internet. The videos, pictures or recordings will be visible to anybody and can also be shared with others.

Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>

Audio Recordings: Recorded talking from discussions and interviews.

Video Recordings: *Remember, a video can also have your voice in it. Video recordings may be uploaded in an unedited form.

Photography: Photographs of you taking part in the session.

C) Permission to publish all created workshop materials (for example drawings, posters, diagrams, audio, video, photographs etc.) on the internet/social media, in academic journals and physical exhibitions.

Please can you tick yes (agree), or no (disagree) to show which materials that we are going to produce in this workshop you are willing to be uploaded to social media. The uploaded media will be visible to anybody and can also be shared with others.

Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>

Audio Recordings: Recorded talking from discussions and interviews.

Video Recordings: *Remember, a video can also have your voice in it. Video recordings may be uploaded in an unedited form.

Photography: Photographs of you taking part in the session.

Other workshop materials: drawings, posters, diagrams etc.

VOLUNTARY PARTICIPATION

Feel free to ask the facilitators as many questions as you like. Once you are happy to take part please tick yes to indicate that you agree to being part of this session.

- | | |
|---|--|
| Yes <input checked="" type="checkbox"/> | I know that I may withdraw from the study at any time and will not be advantaged or disadvantaged in any way. |
| Yes <input checked="" type="checkbox"/> | I know that I can stop the audio/ video/ photographic record of the interview at any time without consequence. |

Participant Signature:  Date and Place: 09 May 2018

Research Leader Signature: _____ Date and Place: _____

If you have any queries about this form or encounter problems, please contact:

Principal Investigator (South Africa):

Prof Retha de la Harpe
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APPENDIX 4: DEMOGRAPHICS QUESTIONNAIRE



Demographic questions

1. Wat is jou nasionaliteit en in watter land is jy gebore? // What is your nationality and in which country were you born?

Swid-Afrikaner, Swid-Afrika

2. Waar woon jy tans? Is dit jou permanente woning of bly jy êrens anders? // Where do you currently live? Is this your permanent residence or do you live somewhere else?

Gerabouw, Hillside

Ja, dit my permanente woning

3. Woon jy alleen of saam met iemand? (indien saam met iemand – met wie?) // Do you live alone or with anyone? (if with someone, then with whom?)

Ma, pa en suster

4. Met watter geslag identifiseer jy? // What gender do you identify with?

Manlike

5. Hoe oud is jy? // How old are you?

20

6. Wat is jou eerste-/huistaal? // What is your first/home language?

Afrikaans

7. How verdien jy geld om jousef en ander te ondersteun? // How do you earn money to support yourself and others?

Ek werk parttime by 'n sekuriteitsplek om geld te verdien

8. Wat is jou hoogste vlak van onderrig? // What is your highest level of education?

(to) graad 10

9. Het enige iemand in jou familie by 'n universiteit of kollege studeer? Brei asseblief uit. // Has anyone in your family studied at a university or college? Please elaborate.

My oudste suster het by boland
Kollege gestudeer

10. Besit jy enige tegnologie, bv. 'n selfoon? Beskryf asb. al die tegnologie toestelle wat jy besit. // Do you own any technology, e.g. cell phone? Describe all the technology devices you have.

Computer, Wifi, T.V.

APPENDIX 5: SAMPLE OF WELLBEING QUESTIONNAIRE



Werkswinkel Terugvoer / Workshop Feedback

Wellbeing & Reflection / Welstand & Refleksie

Ons wil graag uitvind hoe dit wat jy geleer het by die werkswinkel jou gevoel oor jou welstand beïnvloed
We would like to find out how your feelings about your wellbeing are influenced by what you have learnt at the workshop

Welstand kan beskou word as hoe mense voel en funksioneer en hoe hulle hul lewe in geheel evalueer
Wellbeing can be understood as how people feel and function and how they evaluate their lives as a whole

#	Wellbeing Statement	Welstand Stelling	Your opinion / Jou opinie
1	I feel I am free to move where I want to go, vote for my political party and I have the freedom to speak my mind	Ek voel vry om te beweeg waar ek wil gaan, om te stem vir my politieke party en het die vryheid om my opinie te gee	Ja ek het n Reep
2	I can make a living, manage my own finances and have the skills to get a job	Ek kan 'n bestaan maak, my eie finansies hanteer en het die vaardighede om 'n werk te kry	Ja oud Genoeg
3	I am worried about the unemployment and poverty in my community	Ek is bekommerd oor die werkloosheid en armoede in my gemeenskap	Ja nogal
4	I have the chance to develop my knowledge, strengths and skills through education	Ek het die geleentheid om my kennis, sterkpunte en vaardighede te ontwikkel deur middel van opvoeding	Ja Reegtag
5	I have sufficient access to water, sanitation and electricity	Ek het voldoende toegang tot water, sanitasie en elektrisiteit	Ja ek het dit Nodig
6	I consider my actions so that I can live in harmony with my natural environment without wasting its resources, e.g. water	Ek neem my aksies in ag sodat ek in harmonie met die natuurlike omgewing kan leef sonder om natuurlike bronne soos byvoorbeeld water te mors	Waar
7	It is important to me to be healthy and have healthy habits	Dit is belangrik vir my om gesond te wees en om gesonde gewoontes te hê	Waar
8	I am concerned about addition to drugs, unplanned pregnancies and HIV/AIDS in my community	Ek is bekommerd oor dwelmverslawing, onbeplande swangerskappe en HIV/AIDS in my gemeenskap	Waar
9	I think it is important to have access to the Internet and technology to be able to connect to other people in the world	Ek dink dit is belangrik om toegang tot die Internet en tegnologie te hê om te kan verbind met ander mense in die wêreld	Ja nogal in verduing se. kerke
10	My image and appearance are important to me to reach my full potential	My selfbeeld en voorkoms is belangrik vir my om my volle potensiaal te kan bereik	Ja vir n konverdens lewe
11	My identity is important and I have meaning and purpose in my life	My identiteit is belangrik en ek het betekenis en doelwitte vir my lewe	My self beeld en My self het hê

Werkswinkel Terugvoer / Workshop Feedback

#	Wellbeing Question	Welstand Vrae	Your opinion / Jou opinie
12	I have opportunities to participate in cultural, creative and sport activities	<i>Ek kry geleentheid om aan kulturele, kreatiewe en sport aktiwiteite deel te neem</i>	<i>Jou ee speel leeds Rugby</i>
13	I am affected by the violence in my community and often feel unsafe	<i>Ek word beïnvloed deur die geweld in my gemeenskap en voel dikwels onveilig</i>	<i>Nodig ee fan n verskill Mqak</i>
14	It is important to me to have meaningful relationships with my family and friends	<i>Dit is belangrik vir my om betekenisvolle verhoudings met my familie en vriende te hê</i>	<i>Jy Net lietde gee</i>
15	I am hopeful about my situation and the future based on my faith	<i>Ek is hoopvol oor my situasie en die toekoms gebaseer op my geloof</i>	<i>Jy sterk ... sterk!</i>

BAIE DANKIE VIR JOU DEELNAME! / THANK YOU VERY MUCH FOR YOUR PARTICIPATION!

APPENDIX 6: SAMPLE OF SORTER

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APPENDIX 7: SAMPLE OF COLOUR CODES AND PRIORITIES



APPENDIX 8: CO-DESIGN DATA CATEGORISATION

