Cape Peninsula University of Technology

A MOBILE-BASED SERVICE TO PROMOTE REPRODUCTIVE HEALTH FOR YOUTH-AT-RISK: THE CASE OF GRABOUW, WESTERN CAPE, SOUTH AFRICA

by

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DECLARATION

I, Hedvig Nyanyukweni Kakoko Iipito (Mendonca), declare that the content of this dissertation/thesis represents my own unaided work, and that the dissertation/thesis has not previously been submitted for academic examination towards any qualification. Furthermore, it represents my own opinions and not necessarily those of the Cape Peninsula University of Technology.

Signed **Date**

ABSTRACT

Transitioning from childhood to adulthood is typically coupled with many puberty related challenges, and such challenges are heightened by access deficiency to reproductive health information. The situation is worsened in under-resourced communities in Southern Africa as the youth's socio-economic status is hampered by a lack of timely informed education. Such youth groups are referred to as youth-at-risk. The youth are the most affected in recent days as they are exposed to various health disturbances. The youth need to be aware of critical life information, particularly reproductive health information, in order to make better choices. With mobile technology being an integral part of everyday life and more appealing to the youth, opportunities are opened up for the use of mobile functionalities or an extension thereof to provide relevant mobile-based services for information access. Recently, health information is shared and is accessible on different mobile platforms. This research project focuses on mobile-based services to promote reproductive health information for youth-at-risk groups, aged 18 to 24 from the Grabouw community in the Western Cape of South Africa.

Most of mobile technology's solutions and proposed mobile-based services come from elsewhere with little or no consideration of the communities and people who will use these services. The youth was engaged in different activities as participants to design a mobile-based service to promote reproductive health information, putting them at the center of the design process as design partners. Service design methods and tools were used as the methodology in a systematic manner. A Double Diamond framework consisting of four phases (Discover, Define, Develop and Deliver) was followed in order to collect the data. The phases guided the design process from ideation to co-designing of the service prototyped herein. Different ways of accessing information especially reproductive health information by youth-at-risk were identified. The available technology and existing practices to access reproductive health information were also identified.

Results clearly indicate that the youth are motivated to use mobile phones to share and receive health information. The youth currently have access to reproductive health information and services, however some services require the youth to travel long distances by vehicle or by walking. The youth walk as a result of lack of transport in some locations because there is no infrastructure in place to support vehicles. Furthermore, the information available to the youth currently is not contextualised, therefore making it irrelevant with consideration to resources available in this particular community.

The research project recommends that when a solution is being designed for any community, all the relevant stakeholders have to be involved in the design and development process to allow for a co-design interaction that allows for a usable and relevant solution design with and for the intended users. Involving the user in the design process accelerates adoption if an innovation and easy technology appropriation in the user's environment. The users add the value needed as they are sharing knowledge, experiences and way of doing things which have a positive effect on the solution. The study recommends service to be developed in the future according to the findings herein. The implementation, testing and use of the mobile-based service (RHIAY) prototyped in this thesis are for future work.

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DEDICATION

For my husband Julio M.C. Mendonca and my daughter Nadia N. Mendonca

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List of Acronyms

ABET	: Adult Basic Education and Training
AIDS	: Acquired Immune Deficiency Syndrome
AYC	: African Youth Charter
CA	: Content Analysis
CDs	: Compact Disks
ELF	: Elgin Learning Foundation
GPS	: Global Positioning System
GUI	: Graphical User Interface
HCD	: Human Centred Design
HIV	: Human Immunodeficiency Virus
ICT	: Information Communication Technology
ICT4D	: Information Communication Technology for Development
IDEO	: Innovation, Design Engineering Organisation
IT	: Information Technology
MBS	: Mobile Based Service
NGO	: Non-Governmental Organisation
NYDA	: National Youth Development Agency
NYP	: National Youth Policy
PDAs	: Personal Digital Assistants
SA	: South Africa
SD	: Service Design
SEXINFO	: Sexual Health Information
SMS	: Short Message Service
STIs	: Sexually Transmitted Infections
TV	: Television
UFISA	: User-Centred Design for Innovative Services and Applications
UK	: United Kingdom
UNESCO	: United Nations Educational, Scientific, and Cultural Organisation
UNFPA	: United Nations Population Fund
USA	: United States of America
USAID	: United States Agency for International Development
WHO	: World Health Organisation

Chapter 1. Introduction

Access to healthcare information, especially concerning reproductive health, is a global concern, particularly among underserved and marginalised communities (WHO, 2004; UNFPA, 2013). The youth are the most affected as they are exposed to various health troubles (Seutlwadi et al, 2012). Recently, health information is shared and is accessible via different information communication technology (ICT) platforms and devices (McNamara, 2007; USAID, 2011). This is due to the high growth of information communication technologies such as mobile technology, specifically the mobile phone (Levine et al., 2008*)*.

The research came about when the researcher was part of a visit to the community of Grabouw to engage in a context/status mapping workshop, which was facilitated by Terhi Pennanen (exchange student from Finland) on the 3rd of April 2013. The participants were from Cape Peninsula University of Technology (CPUT), Community Education, National Collaboration Enablement (CENCE) ("Cence is an implementation agency and through collaboration, enables sustainable development solutions in Education, Agriculture and Entrepreneurship – creating opportunities for employment and social enterprise in the communities of Southern Africa" (CENCE, 2015:1)), the priest from the local church, some local entrepreneurs, as well as people from the Grabouw Business Junction. The workshop was engaged in a context mapping exercise to gain a better understanding of Grabouw as a community and to answer the question; how do participants/different stakeholders see the current situation of Grabouw? Service design (SD) techniques and tools were used to achieve this in a group.

The main aim of this research project was to engage with the youth between the ages of 18 – 24 from the community of Grabouw in different activities. These activities allowed the youth to engage and to design a mobile-based service to promote reproductive health information. The need for an intervention that provokes creativity to allow for the development of solutions that work was highly illuminated in this research project. The double diamond framework was followed in order to collect qualitative data for the purpose of proper user needs analysis, context study and better understanding and positioning of the research project within the community.

1.1 Background to the research problem

One of the biggest concerns that face the youth in sub Saharan Africa is the issue of sexual and reproductive health (Moya, 2002; Ringheim & Gribble, 2010). In addition, the youth encounter difficulties in receiving relevant sexual and reproductive health services. These services enable the youth to obtain the necessary tools, medication, and education to protect themselves from infections, diseases, and ill health associated with reproductive health. There is therefore a need to promote disease prevention and making a choice to live healthy, as it yields positive results for a greater and healthy community (NYDA, 2011). Creative initiatives for the youth need to be the focus in order to deal with this sexual and reproductive health issue. This issue is regarded as a sensitive topic of discussion; consequently, there is a need for creative ways and means to access reproductive health information easily and privately for the purpose of informing and educating the youth on this. The youth especially need to be aware of all the critical health information, and reproduction is no exception.

There is a need for accessibility to youth friendly health services to avoid poor health outcomes in South Africa, particularly in rural areas (Geary, 2014). These poor health outcomes could lead to infant mortality, maternal deaths, and the high fertility rates may consequently lead to unwanted pregnancies which often result in unsafe abortion practices. The challenges often faced by youth-at-risk include unemployment, ill health, drug abuse, alcohol abuse, and crime. In the Overberg region, where Grabouw is located, there are high numbers of HIV/AIDS cases, and hence there is a need for a “comprehensive primary health care approach which emphasises promotive and preventative strategies” (Götte-Meyer, 2010:23) and the need to ensure that this promotional and preventive information get across to the vulnerable.

This research project focuses on how mobile-based services can bolster reproductive health information in the Grabouw area for youth-at-risk groups, aged 18 to 24. Youth-at-risk is defined by Whiteley (2001) as the young people who, after completing school, are neither employed nor engaged in further studies and they have difficulties choosing a life option. However, at-risk is vague and difficult to define and therefore further definitions may be explored. For the purpose of this dissemination, youth-at-risk will be referred to as youth.

The availability and easy access of reproductive health information for the general youth, particularly the youth-at-risk may be a creative initiative. However, the manner in which this information is disseminated and accessed is equally important. Today mobile technologies have become part of our daily lives and it is in demand due to their affordability and availability (Thomas, 2012). A lot of young people use mobile-based services to gather and

share information and also to keep in touch with their peers and people all over the world (Levine, 2011). Mobile based services depend entirely on any kind of mobile technologies and infrastructures that are already available.

Mobile technology comprises devices such as cellular or mobile phones, laptops, palmtops or personal digital assistants (PDAs), global positioning systems (GPS), wireless card payment terminals, etc. (Sheng et al,. 2005). The many benefits of these technologies which include portability, personalisation, wireless, easy to use, real time access to information, and other supported services, speed and most likely the size; may be the reason why people prefer mobile technology usage to gather and access information as opposed to other technologies. The benefits, to mention but a few are portability, wireless, ease of use, real time, and others. According to Levine et al., (2008*)* mobile services, such as text messaging, are feasible and accepted culturally for the youth to receive health information. As a result, mobile technology could be regarded as a potential means to accelerated health information provision for young people.

The available mobile-based services and other ICT solutions only serve and benefit a few from rural and low-income communities as they are introduced in the communities after they were developed from elsewhere (Stoecker, 2008). Often, when these mobile-based services are designed, there is no consideration of the cultural heritage and traditional values of the end-user communities (Stam, 2013). Users are often not involved in the process of the service or solution design and consequently the needs of the users are not met completely. On the contrary, service design as an approach incorporates the user as the centre of the design process and considers all the factors surrounding the user. According to Stickdorn and Schneider (2011:31), “service design is all about making the service you deliver successful, usable, efficient, effective, and desirable”. Service design goes hand in hand with innovation. Many of service design projects aim to improve existing services, accomplished when the designing of the service is done with the people and not for them (Polaine et al., 2013).

The service design tools and methods involve the users, and they should make the solution or service development user-centred, and allow the users to participate from the very beginning of the development process. Moreover, service design also allows all the stakeholders to participate and be co-designers so that all can contribute in the design process of the service or solution. Furthermore, service design allows iteration to allow for missed opportunities and refinement and the further development of the service or solution. Therefore, a combination of service design tools and methods plus mobile technology for a mobile-based service is one of the recommended solutions to develop a service that the

youth can leverage on to empower themselves with information that will enrich their lives and those of their peers and families.

1.2 Statement of research problem

The youth in the Grabouw community, that is located in the Overberg region, is a group of young people faced with many challenges. Due to the seasonal nature of farming activities, most of the youth are often employed as farm workers. In the off-season they become vulnerable to engage in crime, drug abuse, and alcohol abuse when their services are in less demand. As a result, health conditions of most youth in the community are not only compromised, but also relevant health related information and services are not readily available and sometimes difficult to access.

There are many proposed solutions and initiatives by the government and other non-governmental organisations to mitigate or solve all or some of these challenges, particularly the issue of access to relevant health information and services. However, a number of home based care and health promoters' solutions and or initiatives are inadequate to meet the heterogeneous and complexity of providing health support to youth at every location and when needed. The ineffectiveness of these initiatives is evident because of the increase of unwanted pregnancies, low birth weights, postnatal stress, infertility, HIV/AIDS, and natal fatality issues. There is, therefore, the need to investigate the effectiveness of existing methods/techniques of communicating health related information and services amongst this group of youth. Currently health related information and services are being communicated using face-to-face, print media, community radio and television; which are considered to be unsuitable, particularly taking into account the sensitive connotation of many to reproductive health in the community.

Many technological methods, particularly in mobile technology, have been designed and developed to ease communication for the purpose of promoting and educating people on reproductive health. However, these designs do not completely meet the need, as they do not consider the resources and environment unto where they are intended. Employing service design methods and tools to design a mobile-based service could be one of the solutions to help empower the youth in this regard. As supported by Götte-Meyer, (2010) youth programmes and projects need to be the focus in order to address these challenges for better youth development in a creative manner.

1.3 Research questions, aim, objectives and rationale

The main research question for this study is derived as follows:

> What are the design considerations for a mobile-based service to promote reproductive health for youth-at-risk?

1.3.1 Sub-questions

The following investigative questions need to be addressed in order to address the main question.

1. How do youth-at-risk groups in Grabouw currently access reproductive health information?
2. What reproductive health information is of need to the youth-at-risk?
3. What mobile technology is currently available for the youth-at-risk?
4. How can a mobile-based service be used to promote reproductive health for youth-at-risk?

1.3.2 Aim

This research project aims to explore the current ways of accessing reproductive health information in the community of Grabouw. It also aims to understand the means to access this information. Thereafter, the challenges that are currently being faced by the youth-at-risk related to reproductive health information access were closely studied. A preliminary mobile-based service prototype was co-created with the youth-at-risk of Grabouw with regards to design considerations, making use of service design methods and tools in order to improve or support access to reproductive health information for the youth-at-risk of Grabouw.

1.3.3 Objectives

The objectives of this research are to identify the current ways in which the youth-at-risk access reproductive health information in Grabouw, and identify the challenges being faced with the ways and means of accessing reproductive health information in the community of Grabouw. Additionally, to identify the available technology as well as the reproductive health information needs of the youth-at-risk of Grabouw. Moreover, the other objective is also to co-design with youth-at-risk, a prototype of a mobile-based service to access reproductive

health information in Grabouw with the use of service design tools and methods, and identify design considerations.

1.3.4 Rationale

Given the rapid increase in the use of mobile technology, it is important to explore all the possible ways to improve the living and livelihoods of the many that make use of these technologies, especially in low-income communities such as Grabouw. The increase in the use of mobile technology for health services and health information sharing and gathering in low-income and rural communities is evident. There is also a need to maximise the potential of mobile technology to ensure that health services and information is accessible by everyone regardless of whom they are and where they are from. Thus far there have been many initiatives to use these technologies for health services and it is reported by OAfrica (2012) that formidable challenges exist. The challenges include the lack of infrastructures in some communities to support the services, low literacy rates and sharing of mobile phones. These challenges limit the potential of the initiatives to provide relevant services.

There is, therefore, a need to come up with creative interventions towards services and solutions that are successful, useful, and serve the users. In the same vein, there is a need for solutions and services to be designed and developed in a user-centric manner to enable user participation and co-design. This research explores how a mobile-based service can be developed with the users it is intended for by engaging in different co-design activities for reproductive health information access. The design considerations that are resultant of this research project will be used to inform new and existing designers and developers intending to design and develop services and solutions for health information access and use in low-income communities. In addition, the research project arrives at recommendations for further research.

1.4 Significance of the research

There is a need to provide the youth with access to relevant reproductive health information via the easiest means. This research project will inform the body of knowledge that service design methods and tools combined with mobile technology can help design appropriate mobile-based services to meet that need. The envisioned service prototype design, when developed even with some minor changes, can be used to disseminate any other information relevant to the youth of Grabouw, and perhaps other communities that share the same profile, as they can utilise the service for their own benefit.

The envisioned service will empower the youth, and many other community members who wish to access this information privately. It will also help make the work of the health promoters easier and extend the access to the relevant personnel via online facilities. The research project will give insight into the process of user-centric design with the use of service design especially in low-income communities. This information will inform scholars and researchers of the factors to take into consideration when designing with the users. In addition, some insights and recommendations for further and future work will be herein included.

1.5 Delineation

This research project is limited to the youth of the Grabouw area only, and findings of this research cannot necessarily be generalised. Every community is dynamic and has its own cultural values and many different ways of doing things. Transferability can however be explored especially for communities that are somewhat similar to Grabouw. For transferability, further investigation and research should be done to ensure that the solutions best fit the community perhaps with a few changes and user involvement. The outcome of this research project was limited to a prototype only due to the time constraints. In addition, the project was also limited to the use of mobile technology for information dissemination, sharing, gathering, and use, but other technologies can be explored in further and future work.

1.6 Ethical considerations

This research project dealt directly with people, especially in the process of collecting data. All dealings that involve people directly tend to raise ethical issues, unless the researcher is collecting data about people from secondary data (Bouma & Ling, 2004:188). The nature of the research project, context, and what the researcher hoped to find guided the researcher. There were also many ethical issues to consider pertaining to the research project. This study considered the ethical issues as elaborated in chapter 3 in order to deal with the sensitive topic of reproductive health.

1.7 Roadmap

All the relevant additional documents will be attached to this thesis for further scrutiny and reference.

This thesis consists of six chapters:

- **Chapter 1** is the introduction that contains the background of the study, which leads to the problem statement of the research project. In addition, the research question, sub-questions, and the objectives are included in this chapter. The research delineation and significance are also stated, followed by the roadmap of the thesis to guide the reader.

- **Chapter 2** contains the review of literature that is pertinent to this research project and all the key areas are explored and explained in the scope and context of the research project. An overview of Mobile technology, Reproductive health, and service design are discussed in this chapter. This chapter also defines and aligns the service design to this project. The theoretical framework is highlighted in this chapter as well as the contextual framework.

- **Chapter 3** contains the research design and methodologies used to conduct the research with emphasis on the data collection. All the steps taken in this research project are explained in detail in this chapter in order to help the reader understand how the research project is structured and how the project arrives at certain conclusions. The steps taken in collecting data, the design process followed as well as the data analysis technique that was followed are well explained in this chapter.

- **Chapter 4** contains the findings as analysed and reported accordingly with consideration to the research questions and objectives. The findings are reported in a comprehensible manner and following the same structure as it was collected. This chapter also summarises the findings at the end.

- **Chapter 5** contains a discussion based upon the findings from the previous chapter. This chapter contains all the information regarding challenges faced when co-designing with a community as well as the benefits thereof. It also addresses the research questions from the sub questions to the main question.

- **Chapter 6.** Recommendations and suggestions are presented in this chapter as well as what to consider when one is designing with users. This chapter gives guidelines that can be followed and considerable recommendations when one is conducting a design research approach within a community.

- The Appendices include the CPUT approval of the research proposal, Data collection approval from the Elgin Learning Foundation, as well as the data collection Plan. It also includes the informed consent form translated into Afrikaans, English and Xhosa.

1.8 Summary

Chapter 1 introduced the research problem under the background to the research problem and the statement of the research problem. This was followed by the research questions and the research sub-questions. The aim of the research project, objectives and the rationale were highlighted in this chapter. The significance of the research project was explained in this chapter followed by the delineation and a brief description of the ethical considerations. To end the chapter, the reader is given a chance to find out what the thesis contains in the roadmap of the document. Following to this chapter is chapter 2 with the literature review.

Chapter 2. Literature Review

2.1 Introduction

This chapter focuses on identifying relevant literature that is pertinent to this research project. The aim is to provide a contextual understanding of information access through mobile technology by the youth, particularly reproductive health information. The focus of the literature review is central to the interests of the researcher and in accordance with Cooper's views (1988); the areas of interest are also highlighted. The focused interests of this review are concentrated on the methods, practices, and outcomes of similar projects in different settings. These interests assist with the integration of past literature that relates to the same issue of relevant reproductive health information access for the youth. This project is one of the outputs of the UFISA project, which stands for user-centred design for innovative services and applications. This project drives towards user-centred design of information and communication services for communities (UFISA, 2013).

Given the topic of this research project, areas such as reproductive health and information communication technology for development with emphasis on mobile technology are essential to the topic at hand and are hereby explored. Furthermore, areas such as human centred design with particular focus on co-design is also explored and aligned in the information communication technology for development (ICT4D) domain. This is done together with the methodology that guides the research into user-centredness and co-design called service design, which are all integrated with the areas earlier mentioned to be central to the topic under review. A conceptual framework is derived from the concepts explored and is presented and explained in this chapter. Some background theory is presented here as well, by means of which data is studied.

2.2 Reproductive health in South Africa

The framework of WHO (2013:1), defines health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity". This definition has not yet been amended since the year 1948. On the other hand, Godlee (2011) proposes a new definition of health as "the ability to adapt and self-manage in the face of social, physical, and emotional challenges". However, health can have different connotations in different situations. Often it is divided into two meanings namely, physical health, and mental health. For human beings, physical health can mean that one has good body health due to a number of factors such as physical activities (exercises), good healthy food, and proper rest. Whilst

for mental health, one should not have a mental disorder, which means that they can cope in a natural setting and also meaning that one is able to cope with normal life stresses and contribute to his or her community fruitfully and productively (Nordqvist, 2014).

South Africa is a country with a total population of 52 386 000 people (WHO, 2013). The population is extremely diverse with different levels of education in different areas, different living conditions, ranging from desirable to non-desirable and with a range of cultures (Mbananga & Beeker, 2002). There is a rapid spread of the HIV/AIDS epidemic (AIDS Foundation SA, 2013) as well as a high rate of unwanted pregnancies in South Africa particularly among the youth (Seutlwadi et al, 2012). This is a public health concern and it indicates that a lot of young people as well as other individuals are still engaging in unprotected sex (Ibid.). It is critical that the people of South Africa, particularly in low-income communities, change their sexual behaviours and hence there is a need for an effective way to disseminate and promote reproductive health information.

Reproductive health is a crucial part of general health (UNFPA, 2013). Reproductive health addresses the reproductive processes, functions and systems at all stages of life. It therefore implies that, individuals have the right to choose when to reproduce and how often to do so, as well as have responsible and satisfying safe sex lives. It is rather important to prioritise the dissemination of reproductive health information to the men and women of society so that they can have the right to choose and have access to safe and effective methods that enable them to have healthy reproductive lifestyles, and also have access to appropriate health services that are relevant to them (WHO, 2013).

Reproductive health sets the stage for health for the generations to come. A healthy child is a result of a healthy mother who has access to healthcare services as well as the right information to enable her to make the right health decisions. This is reflected not only in children, but also beyond reproductive years for both men and women in adulthood (UNFPA, 2013). To be healthy during reproductive years is particularly important for women, because in their old age, general health continues to reflect events from their earlier reproductive years. Men are affected at a lesser extent as opposed to women. However, they have a great deal of authority when it comes to decision making regarding reproductive matters. “Failure to deal with reproductive health problems at any stage in life sets the scene for later health and developmental problems” (Ibid. 1). It is therefore important to take care of our reproductive health during our youth to avoid future problems as confirmed by the UNFPA (2014).

Reproductive health services that are youth friendly must be accessible and acceptable in any community. These services should also cater for the youth's needs and interests so that the youth can be effectively attracted and respond with comfort in order to retain them for continued care. The reproductive health services should also include counselling in addition to family planning, sexual information and education, pregnancy services, treatment of sexually transmitted infections and medical male circumcision as well as pap smears (IPPF, 2007; Warenius et al., 2007).

Around the globe there are many barriers to access and implement youth friendly reproductive health services. These barriers can be poor access, availability, as well as acceptability of these services (WHO, 2004). To mention a few more, there is a lack of clear directions on services that are on offer, too few service points for too many people, lack of privacy or consideration thereof, appointments that are not flexible and not accommodating other schedules and activities, no consideration for walk in patients, and more often the limited services on offer (Ibid.).

Factors affecting reproductive health depend on how people live as well as their cultural, economic, and social status. Most of the reproductive health problems cannot be addressed with the absence of health information, services, and skills. It is therefore important to provide men and women with the right information and the necessary health services that will enable them to maintain healthy living regardless of where and how they live (UNFPA, 2013). Giving an individual a choice on when to use the information, when to use the available services and how to access them helps in making the right choices. This helps prevent diseases as well as act on a situation before it is too late for the individuals, their partners and their children.

Challenges such as lack of reproductive health information or access to the right services in low-income communities need to be dealt with in a creative and innovative manner. With ICT4D, the aim is to integrate information communication technologies (ICTs) into the old and existing practices and way of doing things within the community. This may include improving communication, information exchange between and within communities as well as between communities and other inter-connected stakeholders. These improvements will bring about benefits to the community members in many ways that can improve the communities' social and economic status. In South Africa, it was found that, inconvenient hours and how or where services are located also contribute to the lack of use of the youth friendly reproductive health services. In addition, unfriendly staff and the lack of privacy have been indicated as the main reasons for the lack of use of these services, according to a study by Barnett and Schueller (2000).

2.3 Youth

Youth is best defined as the period of transition from childhood to adulthood, when one becomes independent and is aware of his/her interdependence as a member of his/her community. Youth should not be defined as a fixed age group as it is rather fluid. However, for statistical purposes, age is the easiest way to define this group. For statistical consistency, the UN defines youth as persons between the ages of 15 to 24 across regions. UNESCO (2013) on the other hand, defines the youth according to their context when carrying out its youth strategy (Ibid.). The African Youth Charter on the other hand, defines youth as those persons between the ages of 15 to 35 (AYC, 2006). According to the National Youth Policy, the youth in South Africa is defined as any female or male who is between the ages of 14 to 35 (NYP, 2013). In this project, with consideration to the context of the study, youth is defined as those between the ages of 18 to 24 for sampling purposes and ethical considerations given the topic of reproductive health. The population of South Africa is estimated at 52 million and of that number, 42% comprises of people between the ages of 14 to 35 (NYDA, 2013). This means that the South African population is predominantly youthful. Investing in young people by way of creating pathways for accelerated development will greatly benefit South Africa. Once young people are empowered in terms of education, health, and better working conditions, they largely contribute to economic development and a positive change for the whole country (UNFPA, 2014).

2.3.1 "Youth-at-risk"

At-risk is an ambiguous concept and there are many definitions according to literature. Generally, individuals are considered to be at risk when they do not have some form of income, they abuse alcohol and drugs, and they are also exposed to illnesses such as HIV/AIDS and other sexually transmitted diseases. At risk individuals could also be regarded as those that are facing a future that is uncertain because of the many occurrences happening today like poverty, global warming and the many other issues around the world. However, it could also mean that everyone in this world faces a risk of some sort, especially the young people, for they still have a long future ahead. If the many challenges being faced today are not dealt with in a creative and sustainable way, the future remains bleak for everyone, which could increase the risk factor.

There are many definitions of youth-at-risk but any youth growing up in this world is at risk in one way or the other. The young people are exposed to a lot of negative influences at such a young age, thus they are at risk regardless of their backgrounds (Youthreach, 2013). The

definition of youth-at-risk cannot be limited to one definition such as the youth that are not performing well in school, not engaging themselves in further study, being unemployed and cannot make up their mind as to what to do with their lives (Whiteley, 2001) or those that are engaging in risky behaviours. The definition of youth-at-risk should be in relation to a community and its context, as well as the environment of the youth, and how life tends to turn out in adulthood.

The wicked problems concept describes “complex, interdependent problems that require non-linear methodological approaches or solutions” (Van Zyl & Du Preez, 2013:722). The youth of South Africa is currently exposed to wicked problems such as poverty, unemployment, crime, violence, and ill health. These wicked problems affect the youth’s personal development and prosperity as well as the development of the whole country, and they are a huge concern especially amongst certain communities. Due to the dynamics of every community, there is a need to address these wicked problems differently. Each community needs to have its own approach towards the development of a solution or intervention, allowing different stakeholders to co-design services and solutions to avoid misleading solutions that are decided upon without the involvement of the intended users (Chidubem, 2012). In order to help change the status of youth-at-risk in having better livelihoods and to break the cycle of poverty, co-design is highly recommended in this setup.

Young people are the future and it is unfortunate that they are faced with all these wicked problems. It is therefore important that the designed and developed services and solutions are sustainable, for the greater good and benefit of the youth. South Africa has a long history of poverty and oppression, whereby many people have been excluded from privileges of acquiring land and other assets (Van Zyl & Du Preez, 2013), contributing to a high increase in the numbers of youth-at-risk. It is therefore up to the youth to act upon self-improvement and become active participants in innovation systems and programmes to contribute to a better national development and to improve the socio-economic status of the country as a whole.

2.3.2 Youth development

Youth development goes back to as early as the 20th century (Walker & Walker, 2011). There were activities where the youth was actively involved. These included athletic sports, Sunday school, study groups, and public events sponsored by various clubs and religious communities. The first 20 years of the 20th century saw the youth activities receiving great support from organisations. These were “adult-led organizations with agendas driven by

adult concepts of what young people needed and should be doing" (Ibid. 10). These organisations used the benefit of the youth spirit and energy to improve their communities, neighbourhoods, and families as driven by the interests and all activities of their days. These organisations promoted personal development and leadership in respect of their faith, culture and community values in order to improve their way of living (Walker & Walker, 2011). Communities need to have equitable access to resources and be able to function in different ways (Haysom, 2007).

> *"*Between 1960 and 1980, in response to a moral panic around young people and their perceived potential for troublesome, criminal, self-destructive and generally bad behavior, new youth programs were organized and the older organizations adopted programs around drug prevention, anti-drunk driving campaigns (reminiscent of the temperance movement), pregnancy prevention, and productive alternatives for troubled, vulnerable, at-risk- youth. By the 1980s one begins to see the growing enthusiasm for programs that build or develop young people in positive, normative ways. Thus enters the concept of youth development*"* (Walker & Walker, 2011:10).

The South African youth are faced with many challenges such as being alienated from sources of support and information, lack of supportive environments, and lack of basic services (access to education and skills training, employment opportunities and proper healthcare). The youth are also not respected regardless of their age and have no proper access to shelter and food or even protection from abuse, which puts their health at risk and they therefore remain vulnerable and easy targets of ill health (Makhanya, 2014).

The South African Act number 54 of 2008 instructs the National Youth Development Agency (NYDA) to develop an Integrated Youth Development Strategy (IYDS) and plan for the country. The IYDS's purpose is to implement youth development programmes that would help with the complete integration of the South African youth into the country's economy and society. The main aim for the NYDA is to monitor and evaluate the progress on the implementation of those development programmes (NYDA, 2012). NYDA reports that the youth's economic participation is poor due to certain factors such as unemployment and poor entrepreneurial levels. The unemployment rate is especially popular between the 15 – 24 age groups and it has been consistent for the past years. Unemployment can be a result of the levels of education and work experience among the youth. This is not only evident in South Africa but is rather a global trend (Ibid.).

Entrepreneurship could be one of the answers to unemployment among the youth so as to improve their livelihoods. However, the South African youth's ownership of businesses has also not grown and one of the evident obstacles is the lack of start-up capital. Savings or the selling of assets can be used for start-up capital but unfortunately, the youth has no access to such resources. Youth development is also obstructed by the lack of skills training and quality education. The NYDA continues to report that quality of education is still not adequate, especially amongst schools that serve the poor and the historically disadvantaged communities. This negatively contributes to development and the youth remain in the poverty trap (Ibid.). Poverty is a vicious circle in which the youth continue to practise risky health behaviours which hinder their personal development and that of their communities.

2.4 Information and Communication Technology for Development (ICT4D)

The use of mobile phones in Africa keeps rising, and in South Africa about 29 million people are reported to use mobile phones (Hutton, 2011). This is the highest number of use as opposed to any other technology available to them. Mobile phones are used for various reasons such as sharing information, gathering information, entertainment and communication. South Africa is ranked fifth in the world for mobile data usage (Ibid.) as many South Africans use their phones to connect to data services, especially the internet and WhatsApp. It is therefore common for ICT4D research and innovation development projects to use mobile phones for their projects in South Africa because of their popularity among communities. Many of the ICT4D projects and e-services developed are disengaged because each service is developed individually without considering other projects towards a similar goal. These services are in the e-health, e-government and e-commerce (Gumbo et al., 2012). ICT4D projects in South Africa are community based and those facilitating the projects need to find ways to ensure community engagement.

The ICT4D researchers (Cole & Roman, 2003; Heeks, 2008; Maail, 2011; Gumbo et al., 2012) agree that each project of this nature requires user participation from all affected within a particular community. This helps and contributes to a technological innovation or innovations that can benefit all participants and all intended users. ICT4D is articulated by Toyama (2010:6) who explains that it "considers how technologies such as the personal computer, mobile phone and the internet can contribute to global socio-economic development of economically impoverished communities". Almost every development initiative has some level of information technology whether it is the mobile phone or the internet in order to make life easier for people or for economic advancement.

Global development initiatives involve projects where deliberate attempts are made in order to alleviate poverty and to improve other situations including poor health and lack of education in communities around the world (Hamel, 2010). However, some failures of such initiatives are a result of lack of user participation. Benefits of user participation in ICT4D projects include (Maail, 2011):

- Better understanding of the community context
- Better understanding of community needs and requirements
- Knowledge sharing
- Faster adoption of technology
- Increase in the likelihood of project sustainability
- Sense of ownership of the solution/project

A number of successful ICT4D projects are measured according to their sustainability. The ability of the project innovation or intervention to survive beyond the initial phase and continue to have an impact in the community is the main goal (Heeks, 2008; Ismael, 2010).

Despite the successes, there are also challenges that are faced by the ICT4D projects in different communities. These challenges include poor infrastructure as well as the inability to afford hardware (Ismael, 2010; Hamel, 2010). These physical constraints are obstacles for some ICT4D projects to begin. It is therefore advisable for the ICT4D projects to make use of already existing infrastructure and networks for better project success. It is also without a doubt that the mobile phone is the most visible ICT4D technology (Heeks, 2008). Perhaps it is because of the many benefits attached to it such as availability, portability, mobility, accessibility, and affordability (Wells, 2003; October, 2008).

The many benefits of mobile phones are also recognised in the field of health with regards to them being used as tools to ensure effective healthcare and service delivery. The use of ICTs for health is therefore referred to as eHealth (Mea, 2001; WHO, 2015). Web-based health interventions are also referred to as eHealth. These kinds of interventions allow for healthcare and service delivery to be given via the internet or via the networked electronic intervention. It is noted that mobile platforms are enabling easy access to the internet, which therefore leads to a conclusion that all health related services provided via the mobile platforms are included in the definition of web-based health interventions, which can also be referred to as mHealth (Eysenbach, 2011). mHealth can therefore be looked at as mobile health interventions or the rather provision of health via mobile interventions or platforms especially the mobile phone. Web-based and mobile health interventions make it easy to track large numbers of participants/patients, especially in behavioural change interventions

for quitting bad habits such as smoking or losing weight. These interventions are also used to track the patient's follow-ups and send reminders for follow-ups and for taking medicine (Eysenbach, 2001; Eysenbach, 2011).

2.4.1 ICTs for health information

In this thesis, the definition of ICTs by McNamara (2007:1) and USAID (2011:1) will be used, where it is defined as "tools that facilitate communication and the processing and transmission of information and the sharing of knowledge by electronic means". This definition includes a wide range of technologies such as radios, televisions, telephones (mobile or fixed), computers, and the internet. ICTs are viewed as having a great deal of potential to address many of Africa's challenges including the health sector. For sub-Saharan Africa, healthcare is one of the fundamental needs and ICTs can offer many benefits towards health. ICTs are not only important for the health providers but for the patients as well (Litho, 2007). Although the ICTs have the potential of greatly benefiting the health practitioners, it is evident that the patients and other users benefit from accessing the right health information in order to make informed decisions.

McNamara (2007) gives examples that show how ICTs have clearly made an impact on healthcare. These examples include that they have:

- Improved the dissemination of public health information and facilitated public discourse and dialogue around major public health threats
- Enabled remote consultation, diagnosis and treatment through telemedicine
- Facilitated collaboration and cooperation among health workers, including the sharing of learning and training approaches
- Supported more effective health research and the dissemination and access to research findings
- Strengthened the ability to monitor the incidence of public health threats and respond in a more timely and effective manner
- Improved the efficiency of administrative systems in healthcare facilities

On the other hand, USAID (2011) reports that the use of ICTs in health is not just about technology but rather to achieve a series of desired outcomes, such as:

- Health workers making better treatment decisions
- Hospitals providing higher quality and safer care

- Governments becoming more responsive to health needs
- National and local information systems supporting the development of effective, efficient, and equitable health systems
- Policymakers and the public becoming more aware of health risks
- People having better access to the information and knowledge they need to make informed choices for their own better health

With ICTs in health, better and more efficient health services can be provided for all. The ICTs empower patients to lead and be more responsible for their own health and to realise quality of life for themselves. The use of ICTs in health promotes better involvement and collaboration that is beneficial for both patients and health workers (ICT for Health, 2010). ICTs can be regarded as powerful tools when being used by those working towards improving health. Reliable information, coupled with effective communication is an important element in health practices. With proper information, knowledge is created, which empowers people to produce their own health (Ibid.).

Health is central to the global agenda and this is highlighted by three millennium development goals. These are namely to; reduce child mortality (goal 4); improve maternal health (goal 5); combat HIV and AIDS, malaria and other diseases (goal 6). Achieving these goals will greatly contribute to the improvement of the health status of many millions of people around the world. The role of ICTs in meeting the millennium development goals can be effective and useful tools in efforts to reach these goals. Despite some failures associated with ICT project implementation and deployment, it is evident that ICTs can be a critical component required in the success of millennium development goals. Before the implementation of ICTs in the projects towards meeting the millennium development goals, a well thought out plan and strategy as to how ICTs will be used needs to be in place. This is to avoid project failures and a lack of sustainability thereafter (Dubow, 2006).

2.5 Community-based research

Community-based research (CBR) is defined by Israel et al. (1998) as a collaborative approach to doing research by involving community members, organisations' representatives, researchers and all stakeholders involved in the research process. These participants contribute towards "unique strengths and shared responsibility" (Ibid. 177) for a better understanding of the phenomena being researched. CBR is also referred to as community-based participatory research (CBPR). This is defined by Minkler (2005) as a research process that is collaborative in nature, designed to establish structures and ensure

the participation of communities that are affected by the phenomena being studied. It also includes all the stakeholders affected by the phenomena in the research process. According to Roche (2008:2), CBR or CBPR is “guided by the core principles of collaboration and partnership where research brings together community and academic expertise to explore and create opportunities for social action and social change”.

CBPR is traced back to the 1940s and it was designed in order to find facts, through a cyclical process of action and reflection (Minkler, 2005). The focus was to involve those that are affected by the problem being studied. Minkler (2005) further argues that CBPR is not necessarily a research method but rather an orientation whereby any number of methodologies, whether qualitative or quantitative in nature, can be used. This research process involves all the stakeholders and recognises their unique strength that they each bring. Those that invest their time and effort to act as designers and developers and become knowledgeable enough to contribute collaboratively should be motivated and rewarded (Arias et al., 2000). The rewards include a feeling of being in control, being able to solve or contribute to the solution, and the fulfilment of a passion to master a tool in greater depth. In addition, making an ego-satisfying contribution to a group and contributing to good citizenship to a community is regarded as good rewards to collaboration.

Developers and designers cannot anticipate and design or develop solutions for all possible situations. The owners of the problems must be given the ability to contribute to the design and development of solutions. Those affected by the problem are of special importance when framing problems through collaborative design activities. This allows them to explore and contribute positively towards a solution to the problem that uniquely belongs to them and a chance to “contribute in a manner appropriate to their ability” (Arias et al., 2000:8). Any complex design problem requires relevant knowledge. That knowledge is usually distributed among stakeholders or participants.

A stakeholder is defined by David et al. (2013:158) “as an organization, a social group, a community, or an individual who can affect or is affected by the achievement of the objectives set by an organization or initiative”. As project stakeholders, communities contribute to the success of initiatives by investing their own knowledge and resources in the design and development process. Once the stakeholders are put together, a shared understanding is created. This leads to new solutions, ideas, artefacts and therefore this is called participatory, collaborative design or co-design (David et al., 2013). “Having different viewpoints helps one discover alternatives and can help uncover tacit aspects of problems” (Arias et al., 2000:5).

Co-design gives communities opportunities to contribute to the design process using their social and cultural knowledge by providing information to designers about their context as well as cultural habits (David et al., 2013). Co-design with the community allows users to be given a prominent place in the process, which results in the emergence of more useful and relevant design ideas. All the participants involved in the community co-design process have different views, perspectives as well as expectations and all these need to be adequately considered for higher innovation quality and better user satisfaction (Ibid.). This level of participation does not require the application of the right methods but rather the method, tools and process to be emergent around the needs of the community and these should be informed by the contextual definition of local forms of participation (Rey-Moreno et al., 2014; Winschiers-Theophilus et al., 2010).

CBR is a collaborative approach in conducting research whereby a phenomenon is studied (Berkes, 2004). The phenomenon being studied affects a specific community directly or indirectly, therefore the community and other stakeholders are involved in all the phases of the research process. Their involvement as participants is to share knowledge and insights as well as give support and contribute to the research project at hand. Many benefits attached to CBR are shared amongst the participants involved in the research process. These benefits include shared strength, and the uses of the resources that are available in the community contribute positively to CBR. A good understanding of the phenomenon from different perspectives, shared knowledge, and community centred rather than problem centred approaches all ensure that the solution is usable, useful, and successful for the community.

CBR is most preferred when the aim of the research being conducted is to develop a solution for the community. This process allows the researcher to work in collaboration with all the stakeholders (e.g. community, organisations) from the beginning until the end of the research process. The benefit of this is that all the stakeholders contribute to the process by sharing their knowledge and their customs, to highlight what is culturally fit for their community.

2.5.1 Defining a community

A community can be defined differently depending on the context (Hughey et al., 1999). A community has many definitions that allude to “aggregations of people who have something in common, such as a common residence, geographic region, and shared beliefs; or who claim membership in a common lineage structure, or who are distinguished by similarities of

economic activity or class position" (Eksteen et al., 2012). Due to the diversity of communities, people may belong to multiple communities; differing opinions, values and knowledge are to be expected in these diversified communities. When communities are provided with information with the request for feedback, the communities are involved in the consultation process. Community engagement is the umbrella tem over community consultation and involvement. It supports collaboration with community partners who share common goals and interests. It involves partnership building with an emphasis on mutual respect, inclusive participation, equitable power, and mutual benefits. Fairbrother et al. (2003) suggests three ways in which a community can be defined. These are namely:

Community as a locality: This simply refers to a collective of people that are staying in a certain geographical area. This could be a region, town, city, or village. This definition overlooks other definitions that are interchangeably referring to a community unlimited to a location.

Community as a shared sense of belonging: This refers to "aggregates of people who share common activities and/or beliefs and who are bound together principally by relations of affect, loyalty, common values, and/or personal concern". Geography therefore cannot be used to define community when it comes to the context of people who share the same vision and have the same aspirations in life. An example would be a community of travellers. These travellers could be people who hail from different geographical areas.

Community as a social network: This refers to the links and communication between individuals as well as the connection between individuals and social institutions. These connections are important as they are significant in coordinating everyday interactions of people and organisations and mostly decision-making. This is of critical importance especially to policy makers, as the government needs these networks to help create strong communities.

According to McQueen et al. (2001:1929), a community is "a group of people with diverse characteristics who are linked by social ties, share common perspectives, and engage in joint action in geographical locations or settings".

A community is not bound by geography; however it is easier to use this definition as people from the same area share common values and activities. A community can be a group of people who share the same vision and have the same goals. A sense of community for many can mean trust, security, belonging, and connection to others whether they come from different geographical areas such as a community of travellers in the SADC or, a community

of footballers in Namibia. Although the researcher follows the principles of CBPR, they are faced with various challenges. Following below are a few of the challenges as noted by Israel et al. (1998).

Lack of trust and respect: This occurs between the researcher and the community members. This is because of historic events whereby research was conducted in communities and there were no direct benefits for the community members or for the community as a whole. Furthermore, communities were left behind after the research was done and no feedback of results was given to the community. This left community members hesitant to participate in new research projects as they had lost trust for the process. Once the researchers show respect to the community and gain community trust, they have to prove their trustworthiness continually just so the community members are fully involved in the research process.

Inequitable distribution of power and control: the presence of power differentials is another challenge among researchers and community members. Community members find it hard to believe that 'equal partners' really means shared ownership and control. The distribution of resources among the CBR partnership is unequal as it is most often structured around race/ethnicity, class, and gender. The inequalities affect the research process in ways such as, whose opinions are considered valid, who has influence over decisions, who participates, and who attends.

Conflict associated with differences in perspective, priorities, assumptions, values, beliefs, and language: Conflicts within CBR partnerships occur between members. They may differ in many ways such as "decision-making styles, values, priorities, assumptions, beliefs, and use of language". For instance, certain words may have different meanings for different members, and these meanings create different understandings. The different understandings may create conflicts among members. These differences between members can be associated with diversity in gender, race, ethnicity, class, age, and sexual orientation.

Conflict over funding: Often conflicts arise over funds. These conflicts may be associated with the way funds are distributed and how the budget decisions are made. In most cases, "structured financial systems can make the transfer and reimbursement of funds to community partners into a cumbersome, time-consuming, and seemingly disrespectful process".

Conflict associated with different emphases on task and process: The different emphases placed on process versus task poses as another potential source of conflict. At times, partnership members differ when it comes to prioritising. Others are more interested in

accomplishing the project tasks whereas others are more concerned with the process of how decisions are made and how relationships were established.

Time-consuming process: Some activities in the research process take up more time than planned. For instance, the time required to establish and maintain trusting relationships was longer than anticipated.

Who is the representative of the community? This will be determined by how the community is defined: The way that the community is defined can arise as a conflict.

> Issues may include: “the extent to which a sense of community exists; who represents the community; the extent to which community participants are members of community-based organizations and/or more grass-root groups and how they relate back to those organizations; who in the community is excluded; the extent to which participants from community-based organizations represent and reflect community members; and competition or turf issues between community-based organizations and community groups” (Israel et al. 1998:185).

2.5.2 Community engagement

Community engagement is embedded within participatory approaches. Therefore it cultivates ongoing relationships between researchers and community representatives. Community engagement is underpinned by a number of concepts such as community consultation, involvement, and engagement. A number of methods used to ensure the quality of community engagement include the involvement of community members in research activities. Community members conduct the assessment/diagnosis and development of jointly agreed upon research principles. It also involves conducting an educational forum to provide training opportunities, the creation of interdisciplinary research forums and to involve partners in the publishing process (Ibid.). Community engagement may be achieved during the process of a one time-limited project. However, community engagement can evolve into a long-term relationship that moves from one single project to a number of projects to address other factors affecting the community as depicted in figure 1. (McCloskey et al., 2013).

The figure below is a suggestion of how community engagement can be achieved:

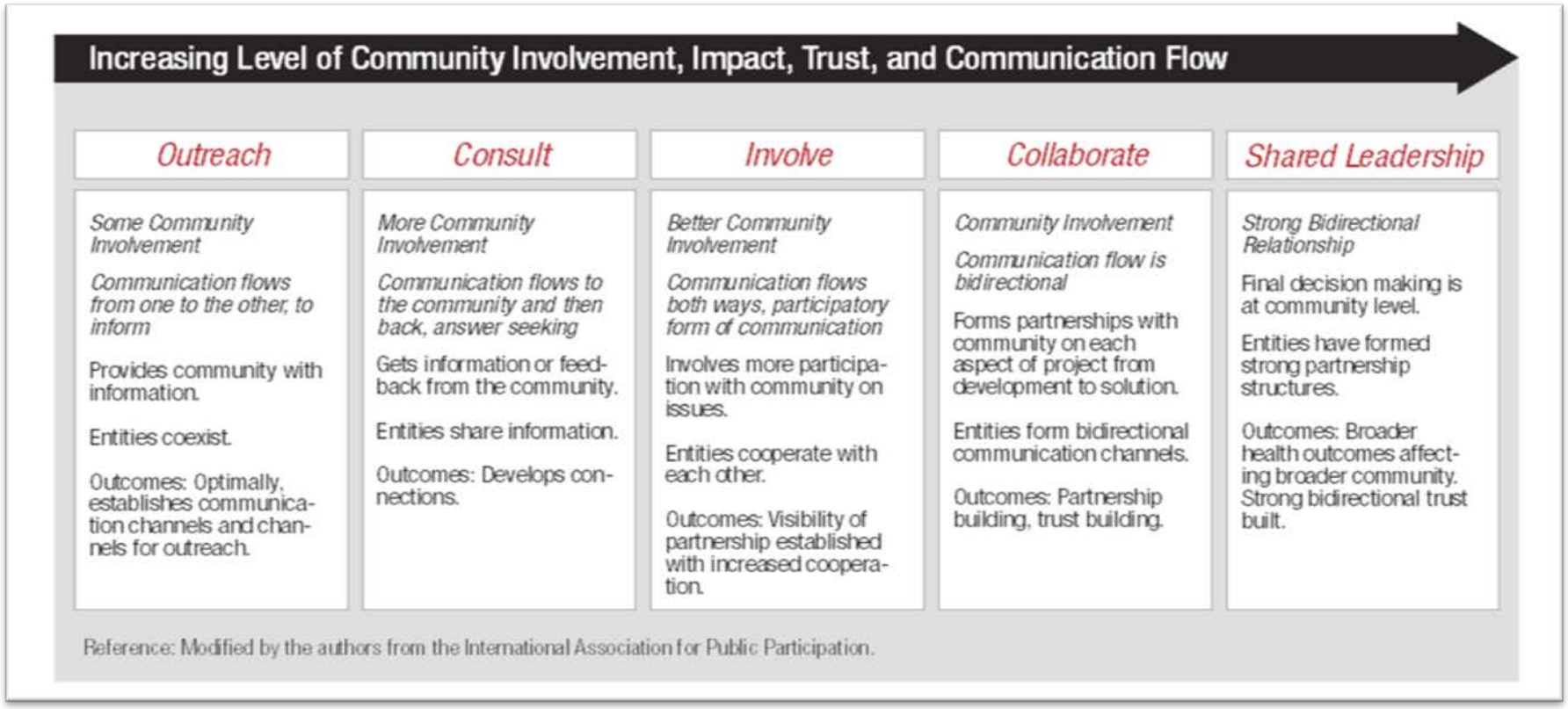


Figure 1: Community Engagement Continuum

Source: McCloskey et al. (2013:8)

2.5.3 Human and User-Centred design

User-centred design is also referred to as human centred design, which is a multi-disciplinary activity in which end users have an influence on how the design takes shape with the use of a variety of tools and methods (Kramer et al., 2000). It is defined as a "design approach that puts the user centre stage during the entire design process" (Wever et al., 2008:5). Users have a great impact on the design when they are involved in all the stages of the design process as design partners (Koh & Heng, 1996; Druin, 1999; Garzotto, 2008). Users are defined as the people who are going to use the final product, system, and or service to accomplish a task or a goal. In all the UCD development processes, the user is the centre of focus specific to making the system being designed and developed usable and especially to bring value to the user (Kramer et al., 2000; Abras et al., 2004).

When users are involved in the design process, it leads to more efficient, effective, and safe products and systems. This therefore contributes towards the acceptance and success of systems and products (David et al., 2013). Systems and or services designed using the UCD design processes are designed from the perspective of how it will be understood and used by the user. Instead of the users changing their attitude and behaviour to adapt to the use of a new system, the system can be designed in a such a way that it supports the users' existing attitudes, behaviour, and beliefs as they relate to what the system is being designed to do for them (Foraker, 2014; Abras et al., 2004). UCD is also an iterative process which therefore allows certain steps to be built into the process from the first stage through out to the implementation of the project. These steps are called design evaluation steps that enable the participants to re-evaluate and relook the design before it is implemented (Henry & Thorp, 2008).

According to Greenhouse (2013:1), human centred design (HCD) "is a process that is surrounded by people of any age and any ability for the design and development of products and solutions that enables users to maximise their potential and function at their highest capacity". In the past, designers developed solutions that are technologically driven with the belief that the users can adapt. However, HCD advocates that the designs and development initiatives have to be more user-driven and informed by the user's natural behaviours so that the interfaces designed are easy for the users to use and have fewer errors to a certain extent (Oviatt, 2006). Incorporating HCD in any solution design and development of IT systems increases the chances of success of these systems. As for the IT medical systems, HCD increases the user's ease of use, adaptability, satisfaction, productivity and many positive attributes that contribute to the reduction of medical errors (Greenhouse, 2013).

2.6 Mobile technology for development

Mobile technology is of great use today due to its affordability and availability. This technology comprises different forms of movable technology, and to mention a few this includes: mobile phones, palmtops or personal digital assistants (PDAs), laptop computers, global positioning systems (GPS) and wireless card payment terminals (Sheng et al., 2005). The benefits of mobile technology are the reasons why people prefer it as opposed to other technologies that can offer the same services. The benefits, to mention a few, are portability, wireless, easy to use, real time access to information, and other supported services, speed and most likely the size. Other benefits include "a sense of well-being, improved income, and reduced risk (e.g., call for assistance), but mostly keeping in touch with family and friends" (Hamade, 2012:25).

The use of mobile technology has a great impact on the youth's everyday life. However, according to where you live and what is available to you, services may be limited. Low income communities are faced with a number of challenges concerning mobile technology, these being cost and accessibility as well as network coverage (Hamade, 2012). Hamade (2012) further recommends that mobile service providers should also provide better services to low cost communities to mitigate these challenges and to provide opportunities. "Mobile technology allows users to have anytime, anywhere access to information" (Sheng et al., 2005:270). Mobile technology is not limited to the access of information, but is also used for entertainment (Aarnio et al., 2002; Carlsson et al., 2006), communication (Sheng et al., 2005) and interaction, in order to make the lives of those who use it easier. In some instances, mobile technology improves the living standards of many who use it for entrepreneurial initiatives and other activities that contribute to the improvement of their livelihoods.

In recent years, the short message service (SMS) has been very popular as a form of mobile-based service to disseminate information, communication, and interaction. It is also becoming popular "to successfully deliver clinical care and preventative health interventions related to disease self-management, smoking cessation, diet, and physical activity" (Gold et al., 2011:247). Heeks (2008) emphasizes on determining what development can be achieved using calls and SMS and, possibly older technologies. However, mobile phone users prefer the SMS service because of its affordability (Leon & Schneider, 2012). However, other services that perform the same functions as SMS and additional functions such as sharing video, audio, images as well as live chat between individuals and in groups are on the rise, especially the WhatsApp mobile-based service. In order to manage

information and its dissemination through technology for development, equipment such as handsets, computers, servers, software and network connectivity should be in place (Ibid.). It is with this background that the youth in the community of Grabouw have to be co-designers of the mobile-based service prototype to promote reproductive health information for themselves and others in their community.

An SMS service to disseminate sexual health information called SEXINFO is a success in San Francisco, California, USA. SEXINFO is an SMS service that provides information and referrals about sexual health to at-risk adolescents (Levine et al., 2008). Gold et al. (2011) further argue that, SMS technology has been in practice between health practitioners and patients as a reminder to take medication or for follow-ups, especially for contraceptive users. Also, those that have received the facts and information on sexuality and relationships have better knowledge and seek further treatment or go for tests like HIV and other STIs (Gold et al., 2011). SMS can feasibly deliver quality healthcare at low cost and provide improved service delivery (Mukund & Murray, 2010).

Marie Stopes is a non-profit provider of sexual and reproductive health services in South Africa, established in 1993. This establishment offers services such as family planning, maternal health, safe abortions, HIV/STIs, gynaecological check-ups, pap-smears, and contraceptives. In 2011, they “launched an SMS platform to increase access to sexual and reproductive health information and services” (mariestopes.org, 2013:1).

2.6.1 Co-design of m-health interventions

There is an increase in the growth of access to mobile phone technology in the delivery of health services. Martindale (2013: VI) explains about mobile health or m-health that “it is the provision of health services and information via mobile technologies”. Furthermore, the features of m-health contribute towards the fast increase in wellness promotions and management of diseases. This therefore indicates that the provision of health services via mobile technology would be an ideal solution, especially for the service providers and the consumers. A number of services implemented in the m-health sector include, treat and follow-up on patient care, health promotion interventions, health worker education, and data collection. Among the many information communication technologies, the mobile phone technology has become most preferred (Leon & Schneider, 2012).

The use of mobile phones in the health sector strengthens the delivery of healthcare and increases the access of health services to all. The use of mobile phones helps users to deal

with the challenge of vast distances to and from health facilities and allows for immediate communication and hence improving the quality of life (Martindale, 2013).

In South Africa, many initiatives such as improved working conditions, training and developing the role of NGO as intermediaries for support (Schneider et al., 2008) are underway especially for community health workers, as they perform a number of roles. These roles include health promotion, prevention services, home based care, and treatment adherence support (Leon & Schneider, 2012). The use of mobile technology integrated into these roles therefore enables them to be categorised as m-health interventions (Tomlinson et al., 2013). These roles are a success in one way but face challenges, as the users did not co-design the intervention for positive user experience (Ouma et al., 2010). It is therefore important that these initiatives be user-centric and that they allow co-creation in order to prevent failures of the m-health project. There are metrics and factors to consider when developing in order to reach positive user experience. “Products should be able to include all the functionalities that the users intend them to have” (Ouma et al., 2010:272).

2.7 Conceptual framework

Derived from the literature, a conceptual framework is found, that guides the research process throughout the collection, analysis and presentation of data as well as pointing out the main concepts being studied and their relationships. A conceptual framework is defined by Vaughan, (2008:4) as “a written or visual presentation that explains either graphically or in narrative form, the main things to be studied – the key factors, concepts or variables and the presumed relationship among them”. The framework contributes to the thesis in two ways. It helps with the identification of variables and clarifies the relationships among them (Lewis, 2001). A conceptual framework also provides the structure or content for the study as a whole, which is based upon or is according to the literature as well as personal experiences (Vaughan, 2008). It is also usually clearer and elaborate as opposed to the long scholarly histories of the topics being studied (Lewis, 2001).The framework as presented in figure 2 feeds into the ICT4D domain.

Figure 2 below illustrates the relationships between the different variables derived from the literature review. Each variable is represented with its characteristics as described in the literature. It points out which variable informs what and how they relate to each other in order for mobile-based service to be designed for the purpose of promoting reproductive health information for youth-at-risk in Grabouw.

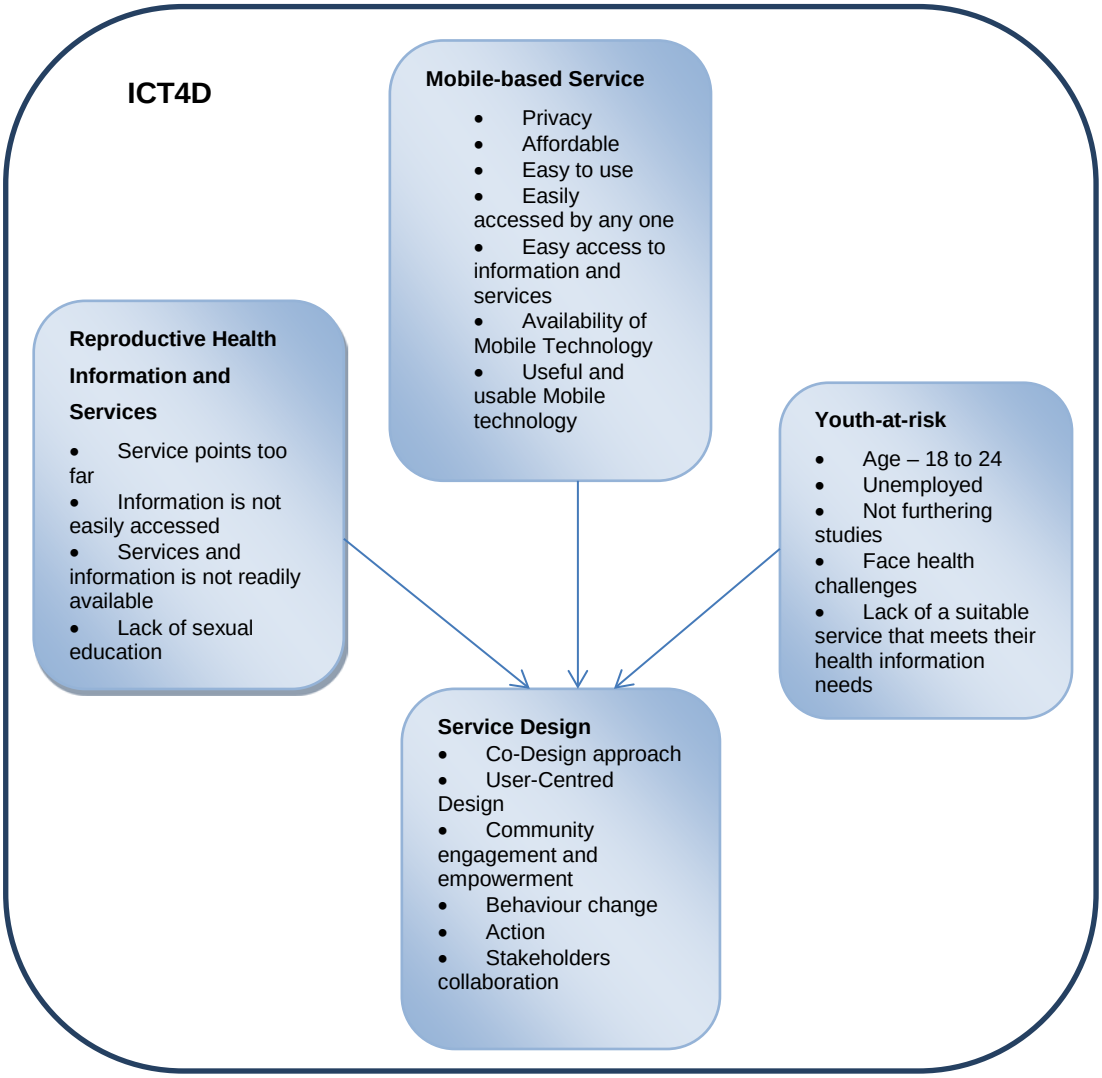


Figure 2 : Conceptual Framework

The relations are outlined as follows:

1. Reproductive health information and services inform service design process about all the necessary information needs and the availability of services that are pertinent to the youth-at-risk in the community of interest.

2. Youth-at-risk and service designs have a relationship whereby the youth-at-risk is part of the co-designing process of the suitable solution using service design methods and tools to access reproductive health information via mobile technology.
3. The relationship between service design and mobile-based service is the outcome of this whole project. Service design sessions will be carried out to develop a mobile-based service, and that outcome will be a result of the utilisation of service design methods and tools.

The need for a suitable mobile-based service for access to reproductive health information and services is illuminated by the literature for the community of Grabouw (Götte-Meyer, 2010; Seutlwadi et al, 2012; AIDS Foundation SA, 2013). Due to the low socio-economic status of the community, a large number of the youth in the community is confronted by a lot of challenges or rather wicked problems of which reproductive health is one of the major concerns (WHO, 2013; UNFPA, 2013; Seutlwadi et al, 2012), and thereby placing the youth at risk with a bleak future. It is in this vein that innovations and interventions need to be the focus in order to tackle these challenges. Of the population in the community, the youth forms the largest portion and if the problems are not dealt with, they affect the personal development and prosperity of the youth (Van Zyl & Du Preez, 2013).

Due to the sensitivity of the subject, reproductive health challenges need to be tackled innovatively in order for the proposed solution to be private, useful, and usable by those that it is intended for. Therefore, it is befitting to use service design methods and tools to come up with a solution that will best meet the need to promote reproductive health information. Service design enables the members of the community to participate and co-design the solution so as to ensure that the solution is local and relevant to the intended users, as well as being useful, desirable and effective (Stickdorn & Schneider 2011).

In the service design landscape, users or people who benefit from the design are invited into the design process as partners. During the service design process, methods that enable and give the user power to have influence on the service design process are used. Service design ensures the inclusion of citizens by using co-design tools. Another positive contribution that service design brings forth is the iterative design process, which allows for feedback, reflection, and redesign. This iterative process enables refined designs to ensure a proper design of context appropriate interventions and services (Van Zyl & Du Preez, 2013).

Mobile technology is popular and is essential for everyday living especially for the youth. Mobile technology is available and is becoming more affordable for everyone, on a daily basis (Bhavnani et al., 2008). Many mobile-based services are existent but most of them, however, are not designed to be context based. There is a need to leverage on the existing networks and infrastructures in order to design and develop services that are suitable and usable by low-income and rural communities to help improve the living standards of these community members.

2.8 Theoretical framework

According to Koranteng (2012), “a theory is an organised set of principles that explain real world occurrences (i.e. facts or events)”. The theories explained below are closely related and were seen fit for this study to explain the real world occurrences of the phenomenon under study. Similarities from diffusion of innovation theory and domestication of technology theory were used in order to argue certain occurrences. It is clear that once an innovation is introduced in a community, there are certain things that need to be considered. These things include the adoption of the innovation and or technology, the different types of adopters and how fast or slow they adopt it is clearly explained by the diffusion of innovation theory. This study thus contributes to the diffusion of innovation theory. Other things to be considered are how the innovation is appropriated in our environment and how it becomes part of our daily lives and practices, this is detailed by the domestication of technology theory below. Domestication of technology is mostly used to explain the innovation, which is an outcome of this study.

2.8.1 Diffusion of innovation

With mobile technology in mind, diffusion of innovation can mean a lot of things. It could either mean the adoption and use of technology in a certain community or the acceptance of using technology for a mobile-based service. Roger (1995) proposes that there are categories of adopters of a new innovation, technology or a new idea. These categories are regarded as follows: innovators, early adopters, early majority, late majority, and laggards. These categories are represented by a model or rather an S-shaped curve, which then shows percentages of each category of adopters over time (Roger, 2003; Robinson, 2009).

Innovators

According to Roger (2003), innovators are those that are willing to experience new ideas. He also added that innovators are the gatekeepers who are bringing in the innovations from the outside. They are sometimes not the favourites of other community members and may even be disliked because of their adventurousness. However, it is their adventurousness that brings in innovations and they tend to be faced with uncertainty, as well as unsuccessful and unprofitable innovations.

Early adopters

Roger (2003) argues that early adopters are those who are likely to hold leadership roles in the community. As leaders, they are more like role models and other community members come to them to seek for advice on the innovations. Their attitudes towards the innovations are important as their leadership in adopting the innovations decreases uncertainty for other community members. Once the early adopters adopt an innovation or a new idea, they somewhat give a sense of approval to the rest of the community members.

Early Majority

The early majority are the ones with good interaction with others in a community but they do not hold any leadership roles. They are claimed to adopt the innovation before the other half of other community members. Their decision to adopt an innovation is after some time unlike for innovators and early adopters. They are not the first to adopt and therefore not the last to adopt either.

Late Majority

Somewhat similarly to the early majority, the late majority wait for most of the other community members to adopt the innovation for them to adopt it too. They are usually sceptical about the outcomes of the innovation, but because of certain factors such as economic necessity or even peer pressure, they often feel obliged to adopt the innovation.

Laggards

The laggards are more sceptical about innovations and their outcomes more than the late majority. They do not hold leadership roles either and they always want to make sure that the innovation works well before they can adopt it. Their decision to adopt is rather long, as they want to make sure that the innovation has been successfully adopted by others in the community.

Innovations introduced to different communities are designed and developed from outside these communities. This leaves the community members with difficulty in deciding whether to adopt the innovation, or not. Often, once the innovation is adopted, it is possible that the outcomes do not necessarily meet the needs of the community members who adopted the innovation with certain expectations. It is imperative that the design and development of any innovation should be designed with the intended users in order to rid them of any sceptical thoughts, or adopting because of peer pressure and economic necessity.

This study focuses mainly on making sure that the users' input is considered from the beginning to the end of the design and development process to ensure that the users have some sense of ownership of the innovation and will find it easy to adopt the innovation as they know the exact outcomes and benefits of the innovation. This study also informs the diffusion of innovation theory, that for every innovation introduced in any community, a proper study of who the stakeholders are needs to be done. This is to ensure that the community is part of the design process, also to avoid late majority and laggards, and to ensure that the adoption process runs smoothly.

2.8.2 Domestication of technology

Traditionally, the word domestication refers to taming a wild animal to be more domestic to the one taming. However, in the use of the same metaphor, "the domestication of technology refers to the process where users bring an artifact from the public realm to the private and tame, gain control, shape or ascribe meaning to the artifact in users' lives" (Lee et al, 2009:2). The domestication of technology theory provides a theoretical lens that is useful to address the issue of user participation in design and the development of services, solutions, and innovations. The domestication of technology theory highlights the role of the user in innovation, most especially the work done by the individuals of a community towards a technology or innovation. This process involves the users as participants to manipulate technology from outside of their community to do practical and meaningful work that makes sense in the community (Williams et al., 2004). This will range from the adoption, use, functionality and even detailed user interface design (Lee et al., 2009) to address positive user experience, ensure that user needs are met and for the proper understanding of user context.

Domestication is the process by which a technology or innovation adapts to a household or community and its social settings. The users also adapt as the environment in which they are, and where the technology was introduced, changes with the technology or innovation. In

this way, one is able to understand the relationships between technology and culture as they emerge. Domestication deals with culture, social and technological networks of the everyday life of households. The participation of the user is what defines the meanings and significance of all the media and information products (UTwente, 2014). There are 4 segments that describe domestication; these are appropriation, objectification, incorporation, and conversion.

Appropriation

A technology or innovation is first introduced into a setting. It is as if the technology is removed from the public setting to the private setting where it acquires meaning. Meanings in these two settings are not the same. Private settings could be a home or a household. Appropriation in other words could also be described as a process of bringing a technology in another local cultural context.

Objectification

The technology is then displayed or arranged in a private setting. In this setting, the user then identifies him/herself with the technology and starts to feel comfortable with the technology. However, it is important to remember that the environment or household already had meaning for the existing objects before the technology was introduced.

Incorporation

This is the phase which describes how the technology is used in the household and how contextual factors influence this use. The contextual factors could be culture, gender, and status.

Conversion

In this phase, new meanings are created, as well as norms and values associated with the technology. Thereafter, the new meanings are transferred back to the outside world.

This theory feeds well into the double diamond design process, which was used and followed as a methodology technique for this research. The four phases of the double diamond will be explained in detail in the methodology chapter, but table 1 shows the relationships between the phases of the double diamond design process and the domestication of technology theory.

Phases	Domestication of technology theory	Double diamond design process
Phase 1	Appropriation	Discover
Phase 2	Objectification	Define
Phase 3	Incorporation	Develop
Phase 4	Conversion	Deliver

Table 1: Theory against methodology

2.9 Summary

Chapter 2 contains the literature review on topics such as reproductive health, youth, ICT4D, community-based research and mobile technology. These topics highlight the important literature that is pertinent to this research project. Conceptual and theoretical frameworks are herein presented. The next chapter talks about the research design and methodology.

Chapter 3. Research Design and Methodology

3.1 Introduction

This chapter covers the research design and explanation of the methodology. Research methodology comprises of different methods that allow problem solving in a systematic way as well as the process followed to conduct the research. The aim of the research methodology is to give a work plan of the research whereby procedures and processes by which researchers go about are explained. The study of the different research methods allow for knowledge gain, allowing for further description and explanation of the phenomenon (Rajasekar et al., 2013). In research methodology, general steps are adopted by the researcher on how to study his/her research problem and the logic behind them when using different methods. The different methods and tools used for this research project are hereby explained in detail, their benefits, and how they were used to collect, analyse and present data for this study. This chapter highlights the use of service design methods and tools, as well as the process followed. In addition, the case selection is well explained as well as the sampling process.

3.2 Research design

This study is exploratory in nature, in an empirical setting, and uses primary data collected during a field interaction. Exploratory studies are explained by Sekaran and Bougie (2010:103) as necessary when not much is known or when only some facts are known. There is therefore, a need to gather enough information in order to gain familiarity of the phenomena in the situation. This study uses an interpretive approach within the qualitative research paradigm. Sharan (2009) argues that qualitative researchers are interested in understanding how people interact with their world. In addition, researchers also want to understand individual interpretations of their realities at a certain time and in a certain context.

Information access via mobile technology is not clearly documented for the community of Grabouw. Another challenge is that the type of information that is accessible is not necessarily relevant to the community members. The qualitative approach is appropriate for this kind of study as supported by Sharan that “Qualitative research attempts to understand and make sense of the phenomena from the participant’s perspective”. Considering the user’s perspective, there are methods and tools that are designed and developed to ensure

that the user is a participant in the research process. The methods and tools used in this research are those of service design and they were carried out in empirical settings.

There is quite a need for better information dissemination and access by the community members. Much information particularly about the youth in the community of Grabouw is not available. It is therefore a concern for some community members that there is no information online about important aspects of the community. In addition, there is no information where to get important services for the community members. However, there is some presence on some websites about the community and tourist attractions. This has no direct benefit for the community members at all. Perhaps the use of service design methods and tools can help the community with a service that is highly influential and has high participation by the community members.

One of the five principles of service design, which is the highlight of this research, is user-centredness. User-centred is further explained by Stickdorn and Schneider (2011:34) as that "service should be experienced through the customer's eyes". Thus having the user being part of the design process and contribute to the development of the service or solution from the formulation of ideas to prototype, to ensure the success of the new service or solution by combining these tools and methods (Ibid. 148).

3.2.1 Selection of case

Grabouw is an agricultural community where many of the communal activities revolve around commercial farming. This results in many issues regarding the community. The commercial farms are labour intensive and require many farm workers. However, the region cannot accommodate the huge numbers of migrant workers who come to work on the farms. The population in Grabouw is thus largely made up of farm workers and their families. Of this big population, the largest portion is made up of the youth (Götte-Meyer, 2010). As a result, people end up living in informal settlements as they do not earn enough money to afford better living standards. The community also faces challenges such as poverty, poor sanitation, and mostly ill health. This community in itself is an area inviting research and there is a need for creative interventions for the development and improvement of living conditions.

In addition, this research project is part of the UFISA project. UFISA is a collaboration initiative among universities in Southern Africa and Finland. UFISA stands for "User-centred design of information and communication services for communities" (Kujanpää, 2012) and is

a multi-disciplinary area of education and development. The UFISA project focusses on the youth-at-risk as the unit of analysis and the following theme areas in South Africa.

- Health
- Education & Training
- Business & Entrepreneurship, and
- Talent Management & Discovery

The UFISA project chose the Grabouw community as their area of study in South Africa. Thus, Grabouw is automatically the area of study of this project, as this project is one of the outputs of the UFISA project. There is less known about Grabouw and possible improvements can be done towards health, social and economic development.

3.2.2 Sampling

This study is limited to the Grabouw community in the Western Cape, which coincides with the area sampling design. "Area sampling is best suited when the goal of the research is confined to a particular area" (Sekaran & Bougie, 2009:284). Furthermore, the study makes use of the non-probability sampling technique. This technique is characterised by population elements that have no probability of becoming sample objects (Blaxter et al., 2001:163). As the data collection process continued, more information was gathered from knowledgeable workers like the health promoters in the community as a result of referrals from existing participants.

Within the non-probability sampling technique, the following sampling designs were utilised. Firstly, convenience sampling was employed to choose enough youth participants to participate in the interviews, focus groups, and observations. Secondly, purposive sampling technique was utilised for the interviews and data needs as they arose in the study and the referrals, especially the focus group dealing with ideation and creation (Sekaran & Bougie, 2009:276; Blaxter et al., 2011:163).

According to Barbour (2007), the number of focus groups and the number of participants depend entirely on the researcher, the type of data generated and collected as well as how the researcher plans to analyse the data. Ten participants were chosen for the focus group sessions as well as for the group interviews. As for the individual interviews, four youths were interviewed to understand information access and use and two health promoters were

interviewed to understand information dissemination, access, and use. It is with this background that the individuals comprised the youth-at-risk community of Grabouw, were the unit of analysis and would jointly design a mobile-based service prototype.

3.2.3 Unit of analysis

The unit of analysis depends on the collected data aggregation. If the phenomenon being studied at hand is related to the effectiveness of a group, then the unit of analysis is at group level, otherwise it is at individual level (Sekaran & Bougie, 2009). It is with this background that the individuals comprised the youth-at-risk community of Grabouw, and these were the unit of analysis and would jointly design a mobile-based service prototype for the purpose of this research.

3.3 Methodology

3.3.1 Introduction and definition of Service Design

The methodology used in this study to collect, analyse and present data is service design. This approach considers the user from the very beginning to the end of service or solution development. There are many definitions that are all directing service design to user-centric and user participation in service development and design. Leinonkoski (2012) defines service design as an approach that addresses the functionality of a service from a user's point of view. Leinonkoski (2012) further argues that service design "aims to ensure that service interfaces are useful, usable, and desirable from the client's point of view and effective, efficient and distinctive from the supplier's point of view." To different people, service design means different things. According to Moritz (2005), "Service design helps to innovate or improve services to make them more useful, usable, desirable for clients, and efficient as well as effective for organisations." Service design is therefore, a field that is holistic, integrative and most of all, it is multi-disciplinary (Ibid.).

Service design is about trying to understand the user or client's context, resources available and needs, and allows the user to participate in the whole process. Service design tries to translate all the ideas into solutions that are feasible and sustainable for implementation. Service design helps to uncover the many opportunities from the users, produce viable ideas that solve problems and create solutions that can be implemented (Ibid). Service design allows for the iterative process to test ideas so as to improve them for the entire development process (Davies & Wilson, 2013). "It uses prototyping to test results, plans, and

process maps to implement the solutions". Tools and methods used in service design ensure that the user experience created is consistent and guarantees a positive user experience. This helps to improve the everyday life of the users (Moritz, 2005). Service design can be deducted as a suitable approach to ensure that the youth of Grabouw can easily and privately access reproductive health information wherever and whenever they feel necessary.

3.3.2 Double Diamond approach

This study uses the double diamond design process, which is based on the work by the UK design council. The double diamond design process is divided into four distinct phases: Discover, Define, Develop and Deliver. The phases map out the design process from a point where thinking and possibilities are so broad to a situation where possibilities are deliberately narrowed down and focused on distinct objectives (Davies & Wilson, 2013; Design Council UK, 2014).

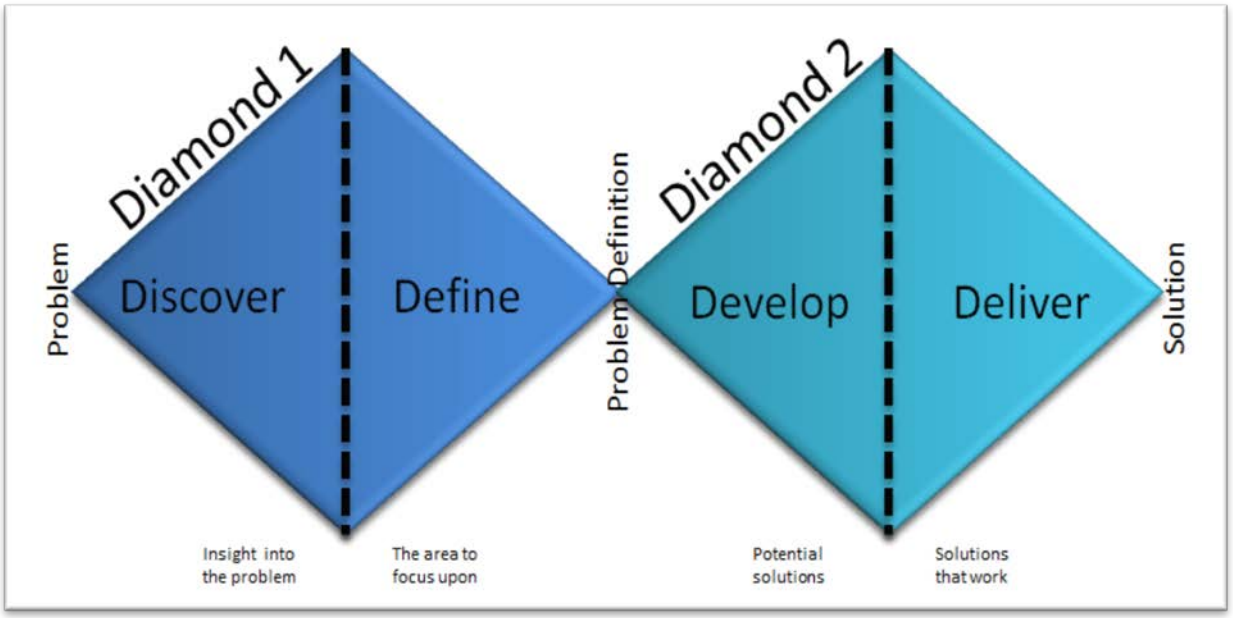


Figure 3: Double Diamond Design Model from the Design Council UK

Source: Adapted and produced by author, 2015

Overview of the phases found in the double diamond.

- The Discover design phase is the first quarter of the double diamond design process. The goal of this phase is to collect relevant information about the service, the service users, interaction, and communication between all parts. The various service stakeholders engaged are also identified during this phase.

- The Define design phase is the second quarter of the double diamond design process. This phase should be assumed as a filter where the review, selection and discarding of ideas takes place.
- The Develop design phase is the third quarter of the double diamond design process. It marks a period of development where solutions are developed, iterated, and tested in order to improve the service blueprint.
- The Deliver design phase is the fourth quarter of the Double Diamond design process. This is the phase where the final concept is tested, signed-off, produced, and launched. During this phase, designers create a storyboard to show how their service will work for a user.

(Mawson, 2012; Davies & Wilson, 2013; Design Council UK, 2014)

Each phase has a set of design tools and methods that allows for data collection as well as for the design process to take place according to the double diamond design process as explained below.

Phase 1: Discover

In this phase, the following activities were organised in order to understand the community of youth in Grabouw. This was the point of departure for the co-design and user-centred process of the research project.

1. Shadowing - this method was used in the initial stages of the project whereby the researcher was following the health workers to their points of interaction with the community members such as the taxi rank, the shopping places, clinic and, even at the local bars. This method allowed the researcher to observe closely how the health promoters were going about giving and spreading information with the aid of print media such as pamphlets and some pictures of people with STIs. The observations will be further discussed in the following chapter.

2. Stakeholder Mapping - this method allowed the researcher to understand who the stakeholders are involved with the service in question. A session on stakeholder mapping was held with the focus group whereby the participants came up with a list of all the stakeholders involved. Firstly, stakeholders that were the core target of the service were identified. Secondly, stakeholders that were directly affected by the service were identified and finally those that were indirectly affected were identified. This exercise enabled the co-designers to consider and bear in mind all the

stakeholders involved. The output was a list of the stakeholders placed into smaller groups. The stakeholders vary from users, service providers, service designer, and partner organisations.

3. Context mapping - this method was used to help the researcher fully understand the context of the study. Thereafter, contextual interviews followed. The method of contextual interviews allowed the researcher to conduct the interview in the context or the environment where the interviewee was familiar with. With reference to this study, it was in the community of Grabouw. People are very comfortable when they have to give information and their own thoughts when they are in familiar environments. The output of this exercise revealed much information about the youth in relation to information access and reproductive health.

   Using service design tools and techniques, the following images were used in the process in order to help with the exercise. The images were used to represent places, organisations, people, activities and services as a form of inquiry to provoke conversation among the participants about the images and how what they represent is located in the community.

   Important places (formal and informal): Places that were important to the youth in Grabouw, perhaps where they spend most of their time or where they like to hang out.


   Organisations/people: Organisations that are of help, support, some meaning or even people that play a role in the lives of the youth.

   Services: To enquire if the youth utilise different services (formal or informal), and are there any services available specifically for the youth in the community.

Youth: To find out about their feelings of being young in this community as well as their dreams and aspirations.

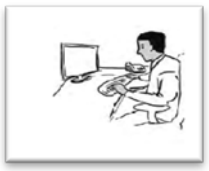
Agriculture: Their relation to agricultural activities in the community as this is mainly a farming area. Perhaps about jobs and anything that they feel is important to them regarding agriculture

Education and training: the places that offer training and how they access these services in the community

Health: To find out how readily available is the information regarding health and how they access these services when they need to.

Information and communication: To find out if they have access to important information and to determine the information that is important to them. Is the information readily available to them or do they have to go through some channels to get to the information?


Local economy and business: To determine how they are involved with the local economy and if they have any interest in the business ventures in the community.



4. Group Interviews - this method was used to interrogate the focus group participants in order to probe for further explanations on the phenomena from a general perspective from the group setting. This allows for further and deep discussions and answers that are more authentic.

5. Observations - this method allows the researcher to observe the movements and gestures of participants as they were busy with the activities as well as the environment in each activity done for further scrutiny. This method allows the researcher to notice some aspects that the participants did not mention or forgot to mention.

Phase 2: Define

In this step, a point of focus needed to be established due to the large amounts of data collected from the first step. So the following activities helped with narrowing down the data and trying to find what the focus should be in order to answer the research questions as well.

1. Individual interviews - this method was useful to help the researcher deal with group dynamics as opposed to group interviews. This method gives the researcher time to interview individuals and get deeper explanations on the phenomena as some participants are shy or intimidated by others. It is therefore to make the individual comfortable to be able to answer the questions accordingly.

2. Expectation mapping - this method allows the researcher to engage more with the users to find out what the users expect of the solution. In this activity, the participants came up with what is expected of the system and who are the consumers and the

type of content that the system will be using. This helps the participants understand the ideal solution as required by the users (and the participants) and helps guide the designers/developers and the service providers to identify the areas of focus from the perspectives of the users. Further observations of the focus group as they engage in the activities allowed for a better understanding of service design.

3. Storytelling - this method helps the participants tell stories that are directly related to the phenomena being studied as they share their own experiences and those of the people they know. It helps the researcher understand the extent to which the phenomena have affected the lives of the people in the community.

Phase 3: Develop

Once the focus was established in step 2, different ways of approaching and solving the issue emerged. Again, a few activities needed to be done in order to ensure that all the ideas were captured and the most preferred idea was therefore properly expanded and explained.

1. Idea Generation - this method allowed the participants to have a brainstorming session to come up with different ideas leading to the idea of the envisaged service. The researcher would be a participant as well as a facilitator and observed as the group ideated. Once a number of ideas were generated, they were rated and arranged according to preference and the idea that the group agreed was best suited as the solution was further discussed. The focus group used mind maps and drawings to visualise sequence processes of the solution as envisioned.

2. Co-creation - this method allowed the participants to work together collaboratively to examine and innovate the suitable solution as guided by the idea which was presented in the ideation process. The output of this focus group was a service prototype. This prototype is a paper-based prototype allowing further research into the actual development of the solution.

Phase 4: Deliver

1. A prototype will be presented and its description is included in this thesis.

All the methods as presented above were adapted from Stickdorn and Schneider (2011).

Secondary data was taken from books and existing literature and publications, as well as data from the internet pertaining to this study. "Secondary data may shed light on or compliment the primary data" (Blaxter et al., 2001:171). Literature review, therefore, informs this study from non-empirical settings, directs the study into a particular direction, and guides the researcher to give the necessary recommendations to help shape the output of this study.

3.4 Data analysis

A qualitative data collection approach produces large amounts of rich data. A data analysis process to make sense out of the data and to make the data more meaningful is required (Holliday, 2007). Service design methods used allow data to be readily grouped and coded, enabling the researcher to draw meaning from the data appropriately, especially the context mapping and the ideation, as well as the co-creation process. Further, the researcher used content analysis (CA) to analyse the large amounts of data that this study produced. Service design methods, as presented in the section above, produce a large amount of rich textual data and the researcher chose CA as the data analysis technique that is most suitable. CA as defined by Flick (2011:133) is "a classical procedure for analysing text material of whatever origin". Sekaran and Bougie (2009:386) further support this definition by explaining that a researcher is able to analyse textual information and establish its properties in a systematic manner.

In addition, CA is comprised of various steps (Flick, 2011:133) in order to code the data into categories, and this process is conceptual analysis as articulated by Sekaran and Bougie (2009:386). Conceptual analysis is an extension of CA that identifies the presence of and repeated occurrence of concepts. Relational analysis in support of conceptual analysis then identifies the relationships between these concepts (Ibid.). The domestication theory was also used as a lens to analyse the data through the double diamond design. The findings are represented according to the phases of the double diamond.

The data is also represented using service design tools to depict the findings. The dissemination of information in this thesis is arranged accordingly in order to guide the reader clearly in the understanding of the findings and outcomes of the project. The researcher also used tables, figures, and text to support and highlight important outcomes, concepts, issues, and other findings. Below is the template of codes that was used to analyse the data with the use of CA.

Coding and Analysis

The analysis of data in this research was done following the CA method that was explained by Sekaran and Bougie (2009), as a method to enable the researcher analyse large amounts of textual data and identify its properties systematically. The properties could be the presence of certain words, concepts, characters, themes and even sentences. CA is closely related to thematic analysis as a method used to identify, analyse, and report themes from within qualitative data (Braun & Clarke, 2006). Sekaran and Bougie, (2009) further explain that to analyse the text, codes and categories are derived from the text and further analysed using conceptual analysis supported by relational analysis. The aim for conceptual analysis is to establish the existence and frequency of certain concepts in the text while relational analysis examines the relationships among the concepts by building on conceptual analysis.

Table 2 outlines the refined codes as transferred from themes identified using conventional content analysis. After deliberating on the many initial codes as derived from the data, the main research question (What are the design considerations for a mobile-based service to promote reproductive health for youth-at-risk?) helped to narrow down to the codes that are most relevant to the research and to answering the research question.

The table below depicts the codes used to analyse the data collected.

Code 1	Label 1.1	ARH
	Definition	Access to reproductive health in the Grabouw community
	Description	Ways and means of how the youth of Grabouw are accessing information
Code 2	Label 1.2	RHN
	Definition	Reproductive health needs of the youth
	Description	The type of reproductive health information and services that are needed by the youth in the community
Code 3	Label 2.1	YARC
	Definition	Youth at risk context in the community
	Description	All the information and facts to help paint the youth at risk context in the community

Code 4	Label 2.2	YARH
	Definition	The challenges of the youth at risk
	Description	All the challenges that the youth are facing pertinent to reproductive health and mobile technology
Code 5	Label 2.3	YARA
	Definition	Youth at risk aspirations
	Description	All that the youth wish they had different, their dreams and desires
Code 6	Label 2.4	YARS
	Definition	Youth at risk spirit
	Description	The general feel of life of the youth in the community
Code 7	Label 3.1	MTA
	Definition	Mobile technology availability
	Description	The kind of mobile technology that is available for the youth at risk in the community and ways in which it is available
Code 8	Label 3.2	MTU
	Definition	Mobile technology use
	Description	The different ways mobile technology is used and intention of use by the youth at risk in the community
Code 9	Label 3.3	MBSU
	Definition	The use of Mobile-based service
	Description	The different mobile-based services that are used or desired
Code 10	Label 4.1	SDP
	Definition	Service Design - Participation
	Description	Willingness of youth to participate in the co-design workshops
Code 11	Label 4.2	SDC
	Definition	Service design considerations
	Description	Design considerations of the new proposed solution.

Table 2: Data Analysis

3.4.1 Data reliability and validity

Attention is applied to reliability and validity in all research methods to ensure that the research is not worthless, does not become fiction, and does not lose its utility (Morse et al., 2002). There are a number of methodological strategies to demonstrate qualitative rigor for validity and reliability. These strategies include audit trails, member checks when coding and categorising, confirming results with participants, and triangulation (Pierce, 2007). For the purpose of this research, member checks for confirming results with participants were used to validate the reliability of the data. Member checks are largely associated with qualitative research whereby the researcher validates findings with the people who are the source of the data (Morse et al., 2002). The researcher collected the contact details of the participants during the initial introduction of the research for further follow-ups. This was purposeful for member checks once the researcher was analysing the data.

The researcher used the contact details of the participants to do follow up interviews for validation to ensure that the findings and results were reliable. In addition, a health promoter, who was in the same age group as the participants, was also interviewed to validate the data from the perspective of a knowledgeable worker as well as from the same viewpoint as youth. This was all done to ensure that the findings are not only valid but also reliable. Nevertheless, because of the non-probability sampling technique that was used, the findings here cannot be generalised to include other communities but can rather be transferable with consideration to the differences of the community onto which transferability is considered.

3.4.2 Delineation and transferability

This research project is limited to the youth of the Grabouw area only, and findings of this research cannot necessarily be generalised. The expected outcome of this research project is limited to a prototype only due to the time constraints. The project is also limited to use of mobile technology for information dissemination, sharing, gathering, and use. Other technologies can be explored in further and future work. Every community is dynamic and has its own cultural values and many different ways of doing things. Transferability can, however, be explored especially for communities that are somewhat similar to Grabouw.

It is increasingly evident that situated design and contextual research clearly needs to be validated in order to be transferable. Although many communities face similar challenges, it is imperative that findings and prototypes from other communities be thoroughly validated for the successful transferability of those findings and prototypes to other communities

(Winchiers-Theophilus et al., 2013). Researchers have the responsibility to understand the contexts of the communities among which transferability is applicable. For transferability, further investigation and research should be done to ensure that the solution best fits the community, perhaps with a few changes and user involvement. There are many variables to consider such as culture, tradition, practices, and values. Winchiers-Theophilus et al., 2013:372 cautions that "premature conclusions on transferability without a more profound understanding of the depth of community engagement, transformation, contextual similarities and cross-contextual validation". As much as there are contextual similarities, there are also differences that need to be considered.

3.4.3 Ethical considerations

Ethical clearance was granted by the ethical committee of the informatics and design faculty during the proposal defence. All participants received a document that explained what the research project was about and they all signed on the space provided. By signing, they agreed that they understood the research project and its sensitive topic. Participants took part in the research process by their own will, and they had the freedom to withdraw should they have felt they did not want to continue participating. Data collected was deemed as important and confidential. In order to preserve the privacy of the participants, the protection of data was handled as of high priority.

Participants chose to be anonymous and if they had said something of high significance to the research that needed to appear in the thesis, permission was obtained from the participant concerned. (To avoid misinterpretation, the data was presented accordingly in order to clearly explain the study). Member checks were done. The researcher did not cause harm to participants. The researcher also maintained sensitivity. The researcher promised to refer anticipated risky situations to the relevant authority bodies (Hospitals, Church, Police, and Community Elders) and did not have to do that.

The participants did not receive any kind of monetary payment for their participation except some small gifts for their time. The participants received t-shirts that were donated by Elgin Learning Foundation to the researcher. The participants also received a small gift bag from the researcher as a token of appreciation. The gift bag contained the following items: A notebook, a pen, pencil, rubber, sharpener, and ruler.

3.5 Summary

Chapter 3 outlines the research design and methodology. Grabouw which is located in the western cape of South Africa was chosen as the case and the participants were aged between the ages of 18 to 24. A double diamond was used to guide the design process and for collecting data. Data analysis was done and a more detailed ethical consideration is herein presented. The next chapter reports on activities and the outcomes.

Chapter 4. Service Design Activities and Outcomes

4.1 Introduction

This chapter consists of the findings and the analysis of the data collected. The data in this chapter is presented with the use of the service design tools. Thereafter the research questions will be outlined and all the evidence that leads to the answering of the questions is clearly explained.

The arrangements that were made by the researcher are explained below.

The researcher corresponded with the Elgin Learning Foundation (ELF), a non-governmental organisation located in the community of Grabouw, in order to arrange for the participants that would take part in the workshop. The researcher interacted with the youth in a number of service design activities in a focus group setting. The NGO also helped with arranging for the venue, accommodation and catering services. ELF opened and started its operations in 1996 with only 8 staff members. This was an initiative to support and empower farm workers by giving them the necessary training and developing their skills for farming purposes (Kotu, 2013).

As the initiative gained momentum, other programmes were developed to help with community development and to provide interventions that would address the many challenges that the community faces. ELF is now a household name in the Elgin valley and elsewhere in the country. ELF works on 50 and more projects that run at any given time with 150 staff members. Apart from development initiatives, the NGO is proud to say that they now provide accredited training in areas such as health and social care, small business development and entrepreneurship, early childhood development, agriculture, ABET, and technical trades (Ibid.).

4.2 Phase 1: Discover

4.2.1 Shadowing

In the initial stages of the project, the researcher participated in the shadowing activity in order to investigate and understand the community as well as to observe with regards to the project. The researcher followed the health promoters to their points of contact with the community members to observe how the health promoters approached and spoke to the

community members. After greeting the community member, the health promoter identified himself and explained what his role was. Because of their uniform, it was very easy to have confidence in them. The community is reasonably familiar with the organisation that is running the program.

According to the gender of the community member, the health promoter then asks if he/she is aware of some reproductive health issues and the services available in the community. The health promoter has some pamphlets and some pictures of people infected with STIs that he/she shows to the community members to support his arguments. Due to the sensitivity of reproductive health information and conditions, some community members especially the women are shy and uncomfortable to do further discussion or to actively engage in that conversation or even to ask for the information they need. However, some male community members are free to discuss these issues and they even refer to the people they know like their friends and family. They ask questions and they make suggestions of how the health promoters should go about discussing these reproductive health issues.

4.2.2 Stakeholder mapping

The focus group was engaged in this exercise in order to identify all the stakeholders that would be directly affected and or indirectly affected by the envisioned solution, which would be a mobile-based service to promote reproductive health information. The core target stakeholders are the stakeholders who are targeted as the first hand users of the service and the ones who have taken part in the co-design process of the service. The directly affected stakeholders are the stakeholders who will interact with the service or its users. The indirectly affected stakeholders are those that will either benefit or not from the service without even knowing it.

Figure 4: Workshop Session on Stakeholder Mapping

This activity aids in the understanding of different communities that are intertwined within the community of interest. It also enables the design of the service to ensure that all the stakeholders are positively affected by the service being designed and developed. This exercise also informs the participants that the service they are co-designing is not only beneficial to them but to the community at large in one way or the other. Also, it informs the participants that some community members will be affected by the envisioned service be it directly or indirectly. The activity as depicted in figure 4 is interactive and allows everyone in the focus group to participate. The results of the stakeholder mapping is shown in figure 5.

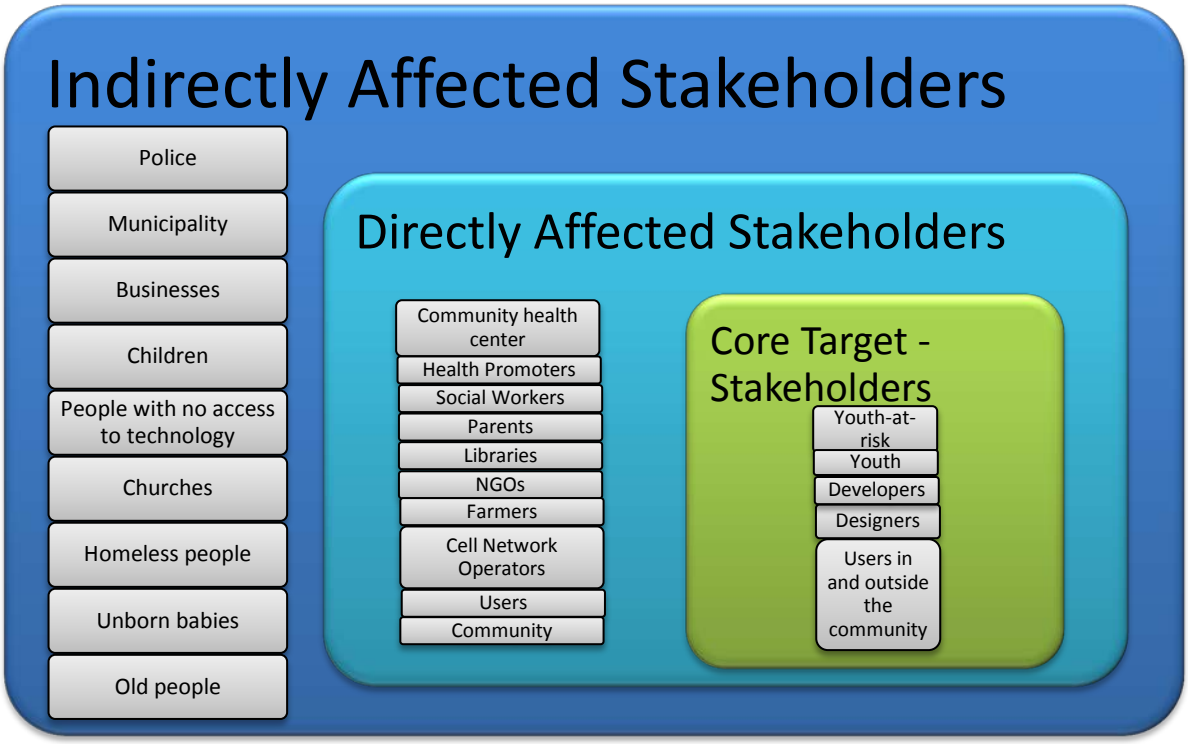


Figure 5: Stakeholders

4.2.3 Context mapping

The focus group was engaged in this exercise in order to paint the picture of the youth in the community of Grabouw. This exercise gives a deep insight of the youth and exposes most, if not all the underlying needs. It also identifies all the aspects that are important to the youth and information that is not currently documented or published. This is helpful because there is currently no website that supplies any information about the community of Grabouw, except some websites on tourist attractions. It is difficult to access useful information in the community, especially information about the community, important places and services that are available. The context mapping exercise also provokes the participants to think deeply as shown in figure 6 and not only discuss petty but rather very serious and important issues that face this group.

Figure 6: Context Mapping Activity

The results are colour coded as they appear in the table; those that are black appear only once in the whole table, green appears more than once and the red ones represent the places and activities that the youth wishes to visit or partake in. The participants were interested in taking part in the activity and they engaged vigorously to give all the information that they knew about the community, especially those that relate closely to their livelihoods. Figure 7 illustrates the outcome of the activity and a further analysis will be given.

4.2.3.1 The picture of Grabouw Youth

Figure 7: Youth Context

Currently the youth of Grabouw accesses reproductive health information from different sources. At times, one needs to travel long distances to go to the clinic to get the information. They need or even have to pay for transport in order to get to the clinic for specific information. This is discouraging as the youth might find it too far to walk, and therefore would prefer not to go to the clinic and miss important information that they might need. The Elgin Learning Foundation has some information available but the Foundation keeps it at their premises. For one to get this information one is required to go to the Foundation. At times, the Foundation hosts campaigns for the community and the youth can then receive the information. Nevertheless, the campaign not only gives information that is needed at the time. The only time that the information reaches the youth in their own environments is when the health promoters that are recruited by the foundations mingle with the community. The health promoters approach different age groups to inform them about health information. They also provide print media for further reading.

Schools also make an effort to give health information to their students and the same information can be found in the libraries around the community. The one challenge about the libraries is that there is no one to ask for further information and advice regarding the specific health information needed as the information is mostly provided in the form of print media. The church also provides some health information but at times not as often as needed. There is also another NGO in the community besides Elgin Learning Foundation called Temba Care that provides health information in the community. However, the community is so widely dispersed that most of the NGOs are found in the more formal settlements of the town and those that live in the informal settlements are left out as their settlements are a distance from town.

Elders such as some parents, community leaders, and even traditional healers in the community are willing to share health information. Due to the sensitivity of the topic, many youth are shy and embarrassed to ask for information from the elders, because culturally it is a taboo to ask and even talk about sex when you are young. When the youth cannot get the information they need, they turn to Google, social media and their friends. The information acquired this way is not always relevant to them in the environment in which they live. The youth feel that there is a great need for one to access relevant health information at any time without feeling shy or embarrassed and that the information should be specific to their community.

4.2.3.2 Triggers to seeking information

There are triggers that prompt the youth to look for reproductive health information in the community. “It could be either 3 things. Either in your peer group you heard about it, or either you feel that something is wrong with you, or it could either be in your family, there is something that is not in place” (Response from one of the interviewees). Simplified, the three triggers are self, peers and family. Once there is a need to look for information, the youth then seek for information from the sources that are known to them or that are easily accessible by them, depending on where they are located in the community.

They therefore, seek for information from the sources available in the community or alternatively from the internet. Once they fail to get the kind of information that they are looking for, they look for further information from the clinic or from the health promoters or health workers that they know. The challenge with this is that they are shy and are embarrassed by some of the conditions. Consequently, when they go to the clinic, the condition has deteriorated, has become very serious, and needs a lot of care which they

could have prevented by having access to the information that they can access privately. Once they get the right information, they then use the information for themselves or they inform their peers and family about it. The easier you have access to information the more proactive you can be and prevent conditions in the first place and this would mean a healthy and informed community.

The participants highlighted a number of information needs as explained here. The number one on the list is HIV/AIDS, which is a big concern, because there are still some people in the community who practice unsafe sex and have multiple sex partners. As highlighted by one of the interviewees, “Teenage Pregnancy and HIV/AIDS because they link in together. Why I say we focus on these is because we have our 13 year old children becoming pregnant and then ending up with HIV/AIDS”. Teenage pregnancy was highlighted as a pressing challenge as many of the young people are starting to engage themselves into sexual activities at a very young age. There is therefore, a need to educate young people on the issue of teenage pregnancy, and to educate them on how to prevent early and unwanted pregnancies. This education also needs to highlight the available options of family planning and safe abortion. There is a need for proper sex education in the community, as many people know the little they know from their peers and at times it is not all the information. There is a need in this community for proper awareness of sex and its consequences and people should be afforded the opportunity to make the right decision with the right information.

On the other hand, the government and other organisations have made great initiatives to provide health information to the youth and to the community at large. These initiatives give or provide the needed health information through posters at their locations coupled with a number of pamphlets, books, pictures, role plays, discussions and health workers or promoters who explain in detail what all this information means. However, the information is not provided as often as it needs to and is not readily available.

4.2.3.3 Limitations to information dissemination

There is, however, a limitation in the way the information is disseminated because it is not always that one visits these facilities unless there is a need to. Usually one goes to the clinic or perhaps is approached by the health promoters or attends a talk about sex where they find it difficult to interact with the people giving information due to the shame attached to the topic. The manner in which the information is provided proves to be difficult for some. The information is sometimes textual and requires one to read and some people cannot read or

write. The information that is provided includes sex education which educates people on HIV/AIDS, teenage pregnancy, condom use in addition to other family planning methods, as well as how and where to get a pap smear. There is also health information regarding cancer and substance abuse such as drug abuse and alcohol abuse.

4.2.3.4 Mobile technology for information access

Although not every youth owns one, they have one way or the other of accessing the mobile technologies through their friends and family. The participants also highlighted that they mostly preferred mobile technology and specifically the mobile phone because of its many benefits. The participants pointed out that a mobile phone is preferred because of its mobility. It is also flexible to move between different network providers, even across borders. In addition to mobility, communication is made easier for the owner to be able to communicate and keep in touch with friends and family. A mobile phone can also be used for learning as one can easily gather information, seek advice, and share information as well. On top of that, one can use it for entertainment.

The participants also highlighted that it is very easy to get access to mobile phones in the community, as there are many outlets that sell mobile phones. “The struggle is the money, not everyone can afford it” stated one of the participants. Otherwise, if one cannot afford to buy a mobile phone from the very common and popular outlets, one can easily buy it from the streets where some young people steal them to resell for a cheaper price. As much as it is easy for the youth to get and buy mobile phones, the challenge is keeping them in a functioning mode, whereby they are able to make calls, chats and browse the internet.

The mobile phones require the youth to load them with airtime in order for them to use all the services that they, like for instance, chatting, texting, and social networking as well as internet services. They consequently look for small jobs, weekend jobs and temporary jobs to earn the money they need. They wash cars, work in clothing shops, work at the farms, baby-sit, and work at the barbershops / hair salon or piracy. Others can get money from their parents whilst others from older man or multiple partners.

4.2.3.5 General Enquiry

After the first part of the context mapping activity was done, the second part was to find out general information about the community. The information was discussed, and as a result,

much information was accumulated during this exercise. There are four categories whereby each category is represented by a colour so that they can be easily differentiated. The categories were represented as follows:

Strengths of the community (yellow)

Problems and challenges (orange)

Youth spirit (green)

General community spirit (pink)

Here are the results of this exercise, colour coded as they are represented by their theme colours in figure 8 and 9.

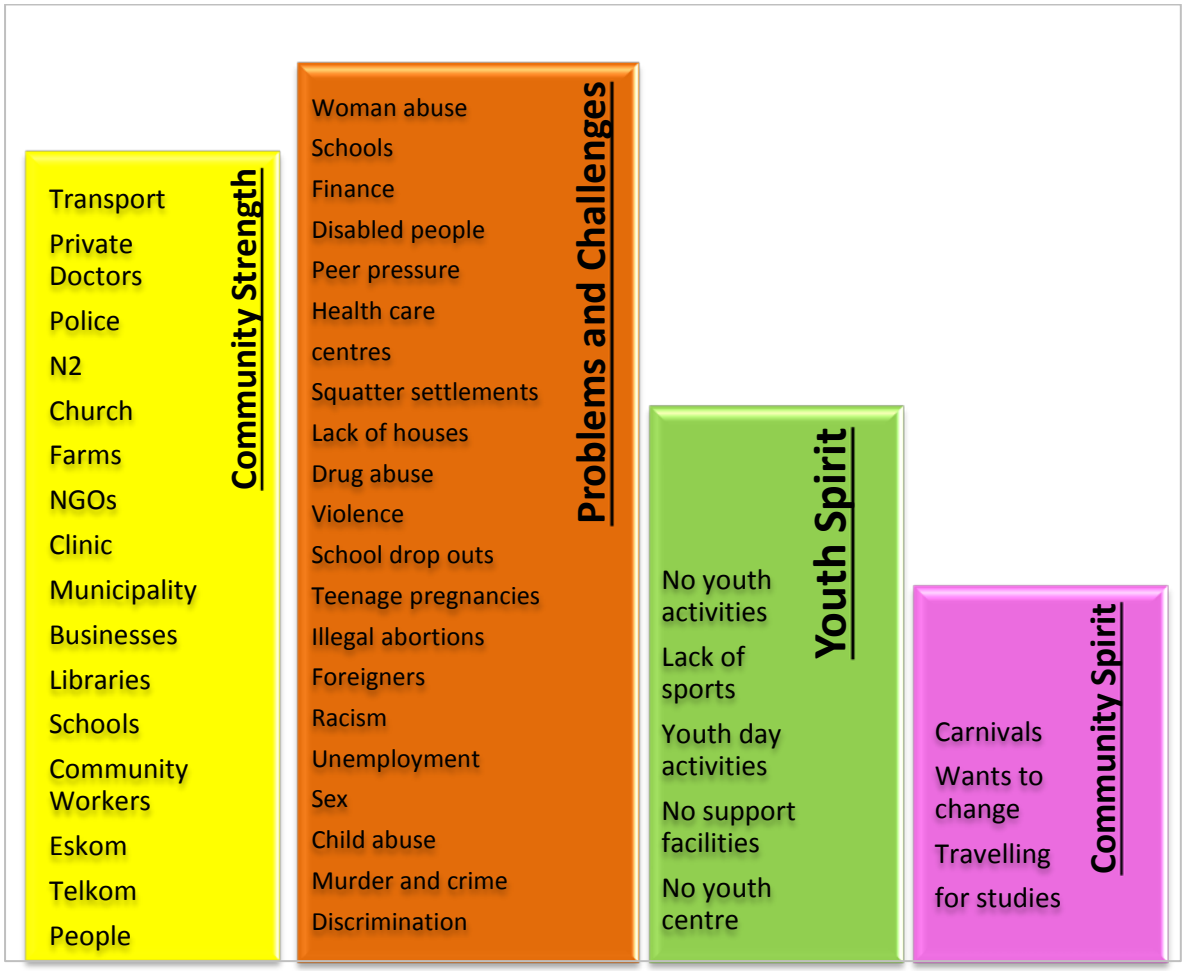


Figure 8: Youth Context General

Figure 8 highlights the outcomes of the general enquiry activity under the context mapping. There are problems and challenges that the youth are facing in Grabouw, and apart from these challenges; there are also some positive things about the community as well. The community has strengths that the youth and other community members benefit from. Overall, the youth feel that the community needs change especially for them as highlighted in figure 8 under the title, youth spirit.

Figure 9 below shows how the activities were arranged in their particular themes right after the activity was done.

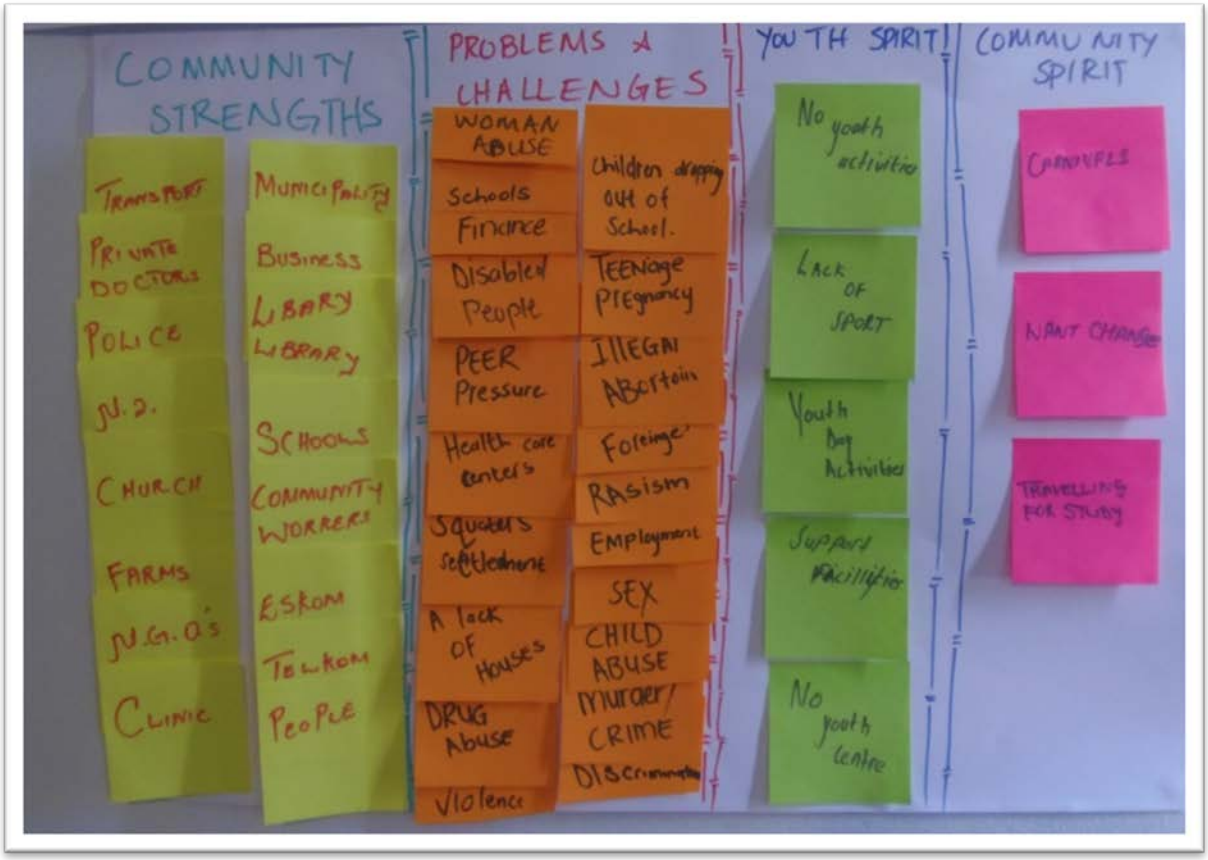


Figure 9: Youth Context Original

4.3 Phase 2: Define

4.3.1 Personas

The personas depicted on the following pages are derived from the focus group activities as well as the group interviews and the individual interviews. The observations contributed to the formulation of these personas. These personas are a representation of the variety among the youth and their needs as they were analysed according to the data. The names

used here are fictitious and are not in any way related to any youth member of the Grabouw community, merely a representation of many youth members. This representation was done as a service design representation of data after the data analysis as the service design methods and tools were used to collect the data. These are a few of the many personas that could be created from the data. However, some of the data will be represented using the many other service design tools in order to clearly explain and depict the data as analysed.

The personas are further analysed to identify common reproductive health information and service needs of the youth. This information will help the discussion on how a mobile-based service can be used to promote reproductive health and what the best suited design would be for this community.

Persona 1

Persona 1 - Male
David – 19 years old
Partially dependent as he asks for money sometimes from family and peers

David works at the carwash, which allowed him to buy a Samsung phone. He bought the phone from a friend who stole it somewhere. He uses the money earned from the carwash to get by and to load his phone with airtime so that he can use his phone. He uses his phone to make phone calls, text messages, and to browse the internet and he likes to go on social media, especially the common ones like Facebook and WhatsApp. He prefers WhatsApp to the other social media because it allows him to stay in touch with his friends and family mostly by using the chat function.

David needs to go for the medical male circumcision but he is not sure of how to take care of himself after the procedure. He understands what it means as it was explained by the health promoter who approached and told him about it, but David was shy or rather embarrassed to ask for further information especially for aftercare. Therefore, he then turned to his phone to Google this information and he got so many results and was not sure which one was correct. He is also concerned by the fact that some of the information is not relevant to him as it was written by people from urban areas and is not relevant to his circumstances.

Persona 2

Persona 2 - Female
Tandeka – 21 years old
Independent and earns own money but does not have a job

Maria has multiple sex partners because she needs them to give her money so she can sustain her life. She is aware of HIV/AIDS as well as how to protect herself from STIs. She, however, has no idea about pap smears. She heard her peers talk about it but was too embarrassed to ask for further information.

She owns a Blackberry phone, which she uses for many things including the internet. She wants to find out why it is important to have a pap smear done every now and then. She feels that she needs a service that will provide her with the relevant information that explains where to go for this test, as well as the right information pertinent to reproductive health that she can access privately.

Persona 3

Persona 3 - Female
Eva – 18 years old
Still dependent on her parents but gets small jobs here and there

Eva is pregnant but she is not aware of it. She thinks she is coming down with a cold and she is busy taking all kinds of medicine to feel better. Meanwhile she could be putting the unborn baby at risk. She has no phone, but she has access to the library where she often goes to check her mail and browse the internet.

She needs information that is indicative of pregnancy and she needs to go to the hospital for a pregnancy test. She also needs to know what choices are available to her so she can choose to have the baby or find out where she can go for a safe abortion to avoid infections or even death.

Persona 4 - Male
John – 23 years old
Independent, has a job as a driver from a local NGO

John has a job as a driver and earns enough money to buy his basic needs. He owns a smart phone which helps him with locations on the GPS application for his job. He has a girlfriend whom he loves and has been in a 3 years relationship. John plans to marry his girlfriend and until they are married he does not want to have any children. He would like to know how and where to get information regarding contraceptives that are safe both for him and his girlfriend to use before marriage. They would like to avoid unplanned and unwanted pregnancies.

He prefers to get information on this at his convenient time preferably on his mobile phone as he does not get time to go to the day hospital. Also, he is afraid that if he goes to the day hospital, he will have to sit in long queues which will delay him especially for his job.

4.3.2 Journey map

Below is a youth journey map of how the youth are currently accessing information in the community. This map highlights clearly how the youth access reproductive information in the community without a design intervention. Starting from home, the youth try to get information from their family members which they sometimes find very hard to do as the topic is very sensitive and culturally a taboo and difficult to discuss. So, once they cannot get what they are looking for from their family, they look for the information from their friends. At times, it is embarrassing for them to discuss with their friends, as they are afraid that their friends will tell other people about their condition.

Once they fail to get the right information from their friends, they try the clinic or other organisations. This is not always successful, as they have to walk long distances to get to these venues. At times, there are just too many people, especially at the clinic, since there is only one in the community, called the day hospital. It is also at times not private enough to ask the right and proper questions. The youth then turn to technology which gives them a lot of information. This information does not always directly address the issue as they are not relevant to the context of the environment in which they live and it is often hard for them to

filter the information. Once they get the right information, they share it with their friends and family or keep it to themselves as depicted in figure 10.

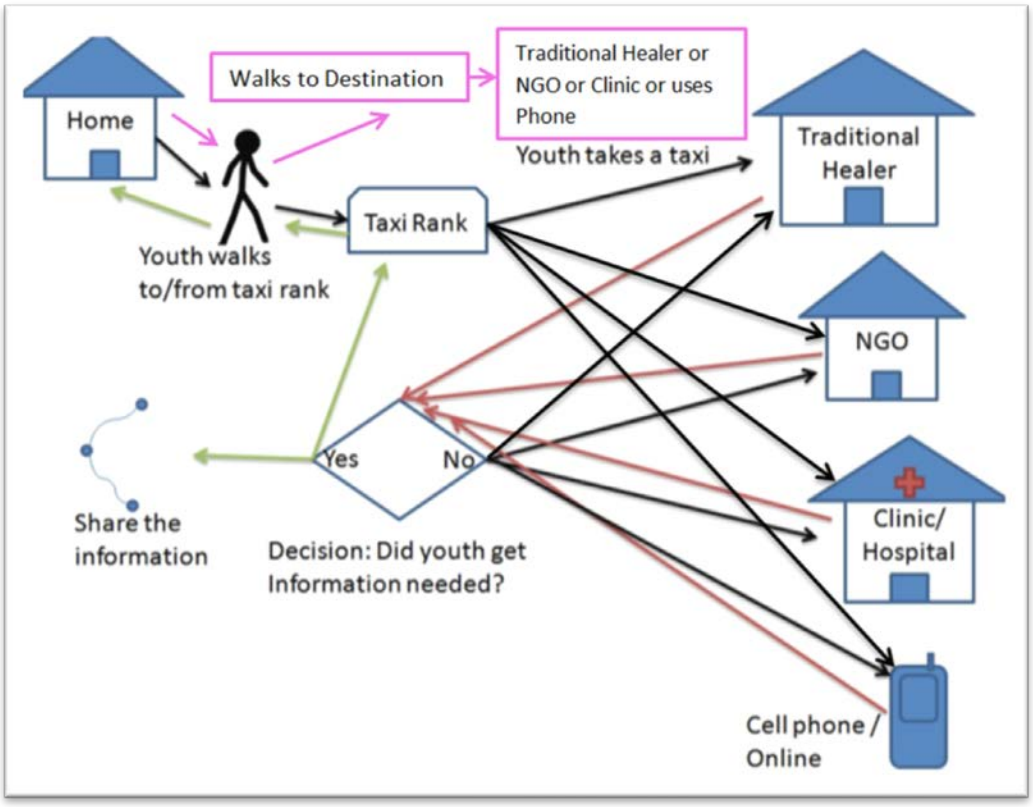


Figure 10: Health information access journey map

4.4 What have we learnt thus far?

The shadowing exercise allowed the researcher to observe and understand how the health promoters were promoting reproductive health information to the community members. The approach however puts some of the community members in an awkward situation as they find it embarrassing to discuss sexual issues face to face. In addition, the print materials used by the health promoters do not help much as it is mostly printed in black and white, which hinders the true representation of the picture. Furthermore, this approach is inefficient as it defeats the purpose of ease and private access to reproductive health information.

For a new service or solution to improve or compliment the health promoters, stakeholders were identified. The context in which the service or solution is designed in and for was closely studied. This study allowed the participants to paint the picture of the youth in the Grabouw community. It was highlighted that a new service to access reproductive health information is needed. The needed service needs to provide relevant content that the youth can relate to, and can be accessed easily and privately.

For further service understanding and design, personas were created to group and represent the different types of youths in the community as well as for clearer context. Three personas were created and they represent the youth of the community. The personas helped in the service design process as the participants felt that it was important to design with the end user in mind and it is a method that is used in user experience and user-centred design activities. In addition to the personas, a journey map was also created with information derived from the context study. The map depicted the journey that the youth followed in order to get the information they needed concerning reproductive health.

4.5 Phase 3: Develop

4.5.1 Ideation

The ideation activity was to engage the participants in a brain storming session where they, together with the researcher, were supposed to come up with a number of ideas. The ideas had to be suitable to disseminate reproductive health information in the community of Grabouw via the use of mobile technology. First, the participants with the researcher all generated possible ideas. Once the ideas were jotted down, they were arranged according to the order of importance and thereby choosing one idea, which was then exploited in more detail. Table 3 represents the ideas as they were brainstormed in the ideation session.

No.	Idea	Method
1	Cell phone	Internet – access for information from the internet via cell phones Mixit and other similar platforms such as WhatsApp– to be used as a platform to disseminate information to youth
2	Library	Internet - access for information from the internet via library computers Books – information to be accessed from library books CDs – information recorded as audio and video on CDs in the Library
3	Television	Role-plays – shows especially made for the youth with messages Adverts before news and after hours – adverts on where to access service and relevant information Program – talk shows (good morning show), movies and targeted TV programming
4	Radio	Adverts - adverts on where to access service and relevant information Programs - talk shows, movies and targeted TV programming Stations such as KFM (94.7), and Radio Helderberg
5	School	Teaching and learning – integration of sex education in the normal school programs, invite guest speakers as well to talk to youth

Table 3: Ideation Outcome

The overall solution is a system that is accessible via the cell phones and computers. This system should have an interface that is user friendly and is web based. The system should also contain local content. In addition, the system should be password enabled for the users and those that are maintaining it to ensure data integrity and reliability. Those that don't have access to the system would have to view all the information that is available and interact with the system and other users through the use of forums and chats that are enabled on the system. The registered users should be able to communicate to the health promoters that are registered on the system using emails, a function that is also enabled on the system. The users need to register so that the health professionals can follow up as well as to allow for trust between the youth and the professional. The users should have an option to remain anonymous should they choose to.

Other ways of getting information from this system is through the form of videos and pictures, apart from the real stories that are provided in the form of text. The social and health workers registered on this system should be able to give advice through posting articles on the system and by responding to queries directed to them via email. This system will provide a very interactive environment for the youth to communicate with other youth and other community members. This is possible because the content will be provided in the languages (Shona, Xhosa, Zulu and Afrikaans) that they understand apart from English. Many different pages will have different themes and will allow people to engage in debates on topics that are relevant and important to everyone in the community.

4.5.2 Service expectation

Firstly, service expectation mapping involves an investigation on what intended users expect to get out of the service during interaction with the service (McGrath, 2013). Figure 11 below explains in detail what is expected from the mobile-based service.

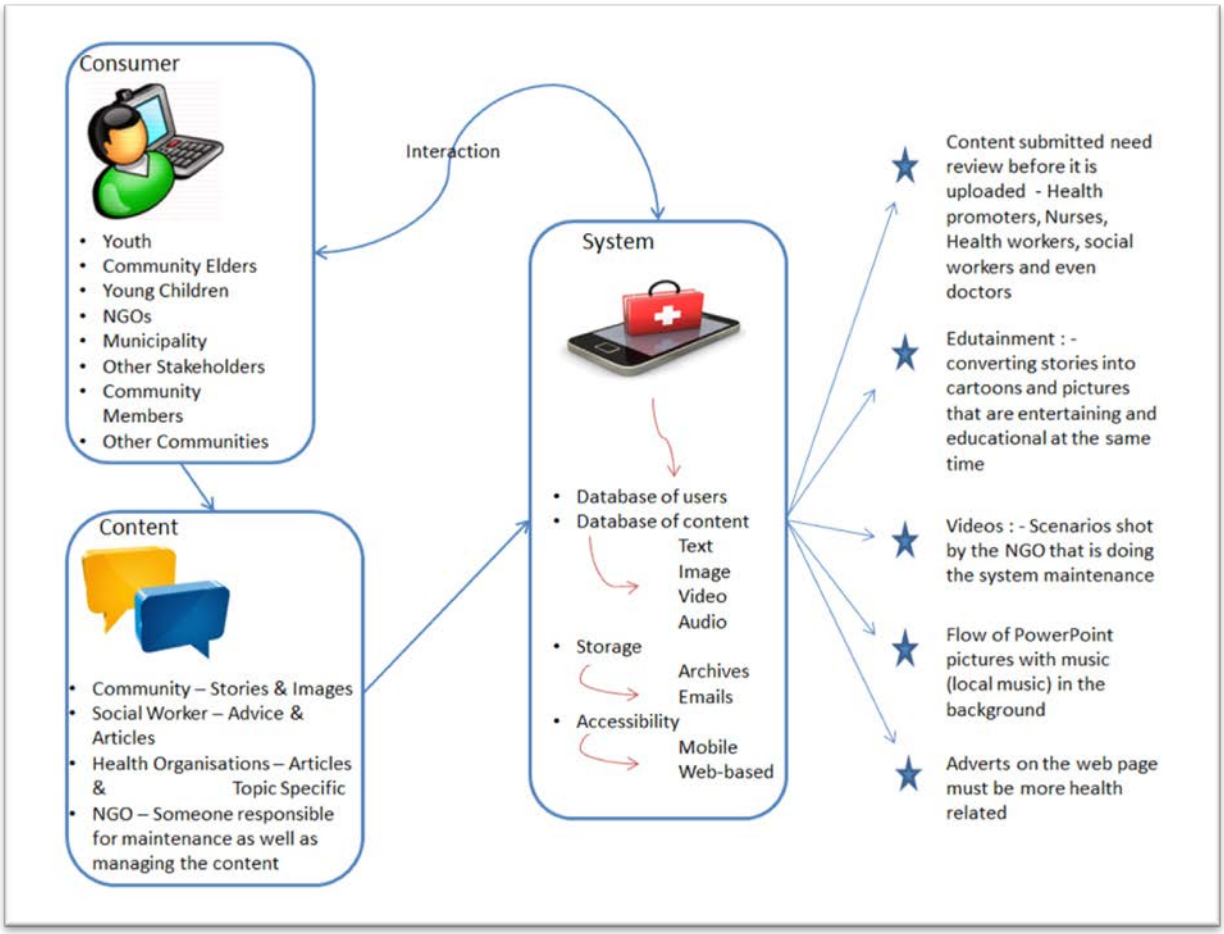


Figure 11: Expectation Mapping

Consumer – the consumers of the envisioned mobile-based service as depicted above are and could be the youth of the community of Grabouw and elsewhere, community elders, young children, NGOs, municipality, Grabouw community members, other communities, and many other stakeholders.

RHIAY Content – The content on this mobile-based service comes from the following:

- Community – in the form of stories and pictures
- Social workers / health workers – Advice and reproductive health articles
- Health organisations – Articles and topic specific information
- NGOs – they provide articles and a content uploader who is responsible for content management will be from the hosting NGO.

System – Functionalities of the service.

- Database of registered users, such as the health workers, social workers and youth for further interaction
- Database of content in the form of text, audio, video and images

- Storage – email facility to enable communication as well as archiving of old information for future reference
- Accessibility – available and accessible via a mobile application and provision on the web for those without mobiles and can also use desktops

Expected functionality and outcomes

Content submitted needs review before it is uploaded. The health promoters, nurses, health workers, social workers, and even doctors are responsible for the verification of content. It will not be published unless one of the knowledge workers has approved that the content submitted is indeed relevant. Edutainment, by converting stories into cartoons and pictures that are simultaneously entertaining and educational should attract the youth. Consequently they will be able to use the service to be informed for better decision making and obtaining information.

Videos of scenarios shot by the NGO, that is doing the system maintenance to represent reproductive health in information or services, will be provided as a functionality. Flow of Power Point pictures with music (local music) in the background to make the service local and interesting for the users, as well as adverts on the web page, must be more health related, particularly reproductive health.

4.5.3 Co-Creation and Co-design

The prototype that was co-designed and co-created is explained in detail below. The service is called RHIAY by the researcher, which stands for reproductive health information access for youth.

Service accessibility

The RHIAY service will be developed as a mobile web database system, which is accessible to the users over the internet via their mobile devices. Users will be able to interact with the system through a mobile application for mobile devices as well as via the web interface for computers. The mobile users will also be able to access the mobile application via the web.

System Architecture

This is a representation of the technical and user functionality of the proposed service.

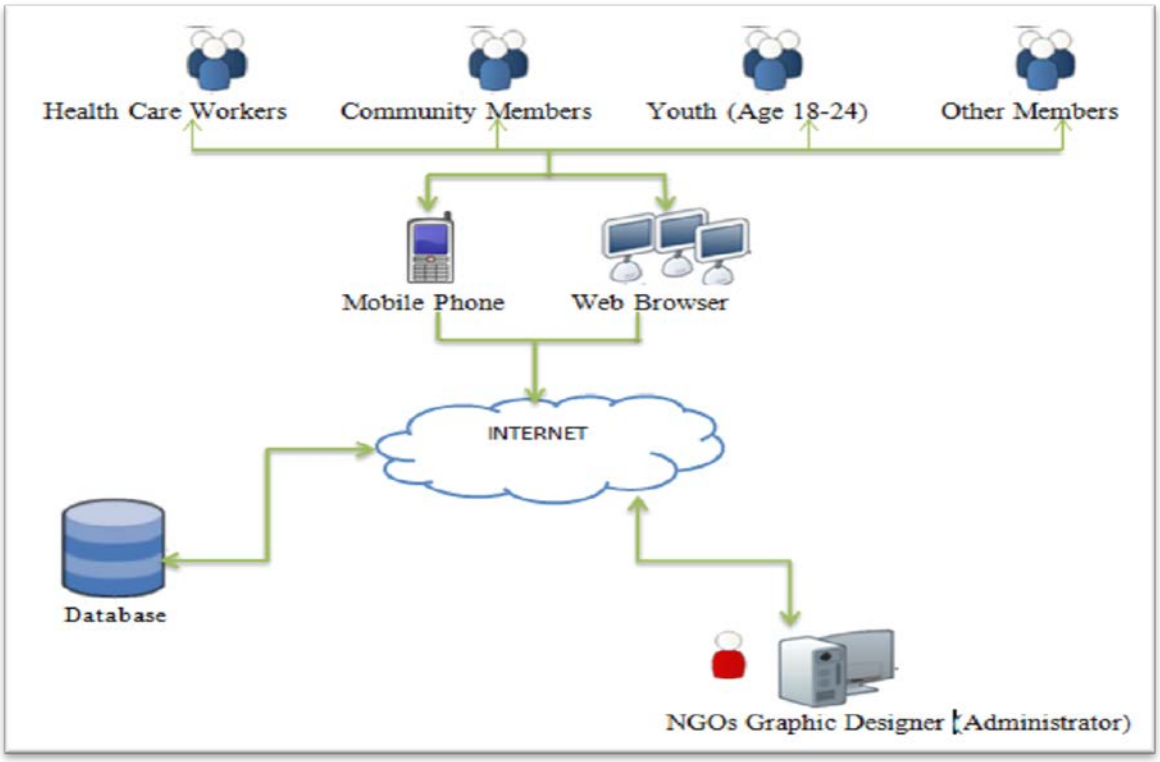


Figure 12: System Layout / Architecture

Interfaces

Graphical user interface design must be divided for two different domains, which are mobile phones and Web based interfaces. Users can register for an account through this interface by entering their personal profile information such as name, location, email, etc. Developers will take into account the usability of the user interfaces.

The architecture of the RHIAY is composed of three layers or tiers:

Presentation – this is the GUI of the application. In this layer, two graphical interfaces will be designed and developed according to the technology from which the users will access it. It will be designed for the mobile application, mobile web browsers, and normal pc web browsers.

Logic – this is the processing unit, which will be doing the processing. This is the layer that is responsible for managing the input/output requests and redirects data and information to its rightful place or user.

Back end – this is the database, which will be storing data. This is where all the data pertaining to the users, and the information found on this particular platform is stored.

The RHIAY service system will consist of two-user interface:

Mobile Application interface – mobile device (phone, tablet etc.) based interface with uploading and downloading capabilities.

Web based interface (figure 12) – which can be used to view or read stories or upload your idea or story to the web and a download option to download designs to complete the story.

4.6 Phase 4: Deliver

4.6.1 Prototype

The prototype that resulted from this research is explained above in point 4.5.3. Figures 13, 14 and 15 form part of the prototype created during the co-creation sessions. This figure highlights the important variables that the youth desire and prefer to see on the system/service. They are also serving as a basic storyboard of what the user expects to see and the functionality of the service.

Figure 13 : Prototyping Screen 1

Figure 14 : Prototyping Screen 2

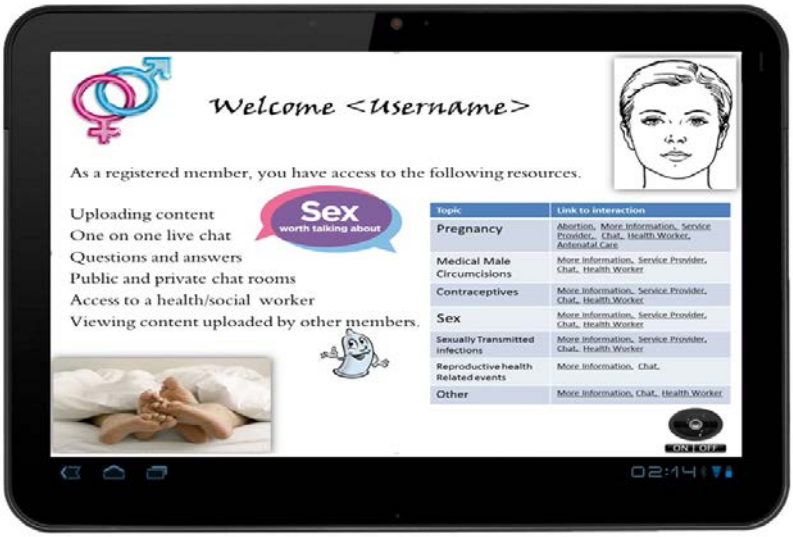


Figure 15 : Prototyping Screen 3

The youth highlighted the importance of the user interface to be user friendly and interactive as indicated in figure 15. The user, once logged on is able to choose a topic that redirects him to a feature that allows for interaction such as chat rooms. The youth also mentioned that there should be many graphics and videos to cater for those who can't read and the content should be localised so that it is relevant to the users. In figure 13, the user is able to translate the page into the languages that they understand and most of the content that the users are able to upload is content of relevance to the community and its members. The youth also mentioned that the interface should be fun and colourful to attract the youth as depicted in all the figures (13, 14 and 15).

The result of this research project is a paper-based prototype which highlights features and design considerations for future designers or developers, and proposed flow of data as well as system architecture. In the 3 figures above, the basic idea is represented that can and will guide future design. Figure 13 represents the home page or the first page that the user sees once connected to this service. If the user already has an account, they can log in and if they don't have an account, they have the option to register so that they can have access to more resources. The page is colourful and attractive and the pictures on it are relevant to the service and the topic of reproductive health. Figure 14 and 15 are follow up pages depending on what steps the user takes on figure 13.

Further research is needed in order for testing and service implementation, which will result in an actual service that will serve the purpose for reproductive health information access by the youth of Grabouw. A number of aspects should be taken into account such as cost, content, environment and time for the success of the service implementation. In addition to the paper-based prototype, a list of things to consider when designing and developing a mobile-based service to promote reproductive health information for youth in Grabouw is also an outcome of this research.

4.7 Summary of findings

4.7.1 Transportation

Nearly all the informal locations in the community of Grabouw, such as Iraq, are so isolated and located far away from town and available services. The residents of these locations have no access to transportation. The residents often have to walk long distances in order to get transport for them to reach their destinations.

4.7.2 Information

The participants highlighted that there is a need for access to clear and relevant information for the community, that is easily accessible and easily available. The important information that the community has access to is rarely relevant to their context. In many cases, it is presented to them in the form of print media such as pamphlets, booklets, and information sessions where information is presented face to face.

The information regarding reproductive health that the youth has access to in the way it is currently available, is the same information that they require but in much more easier means of access as well as access in a private manner. The concern that reproductive health is a very sensitive area of discussion, whether it is in times of need, is highly emphasised by the youth and they prefer to have a platform that allows them to access this information at their own time of convenience in private.

4.7.3 Services

There is a one-day hospital in the community to cater for the health needs of the community members. However, these services are minimal. Other organisations in the community also provide health services located in other different parts of the community. The participants highlighted the need of having access to a range of reproductive health services from one point. Some services require them to travel long distances to nearby towns such as Somerset West to get the help they need. They also feel that it would be great to have access to information that states clearly where you can get certain information and avoid travelling to a certain facility just to be told that you need to go to another facility.

4.7.4 Design considerations

For any solution that is designed for the community, the following should be considered to ensure that the service provided is not only effective but is easily adopted. The best approach to a service or solution design for the community would be co-design with the intended users of the service or design. There is a need for many developers and designers to involve the users in their development and design processes. Through participation and engagement of the intended users, the solution and service being designed will be informed, not only by designers but by the community that will benefit from the service or solution. Many insights will emerge from this process, which are of significant importance and contribute heavily on the success of the developed or designed service or solution.

4.7.5 Grabouw youth context

The youth-at-risk in Grabouw who participated in the workshop were briefed about the researcher and the university where the researcher comes from. Additional to the briefing, service design as a methodology was also introduced to them and all the activities as well as all that was expected from them was well explained. The ethical form was read to them in

English although there were other forms translated in their local languages, which are Afrikaans and Xhosa. The participants then agreed to the ethics and that they understood everything that was explained to them, they then signed the form and provided their contact numbers just so to be contacted for further research and involvement.

4.8 Summary

Chapter 4 reports on the activities that were performed during the 4 phases of the double diamond and the outcomes. Activities such as shadowing, stakeholder mapping, context mapping, ideation, and co-creation/co-design yielded outcomes. The outcomes are herein presented. The outcomes include personas, journey maps, service expectation and a prototype. There is also a section in this chapter on summary of findings in which the design considerations are presented. The next chapter is a discussion on the outcomes as presented in chapter 4.

Chapter 5. Discussion

5.1 Introduction

In this chapter, the research findings of the previous chapter will be discussed in detail. A detailed discussion on how the data was analysed will also be explained. In addition, Reproductive Health Information Access for Youth (RHIAY) mobile-based service will be explained in detail as well as its objectives, and relevance to the community of Grabouw.

5.2 Service design tools for data collection and analysis

Service design gives a platform for researchers to explore different ways of collecting data. It enhances the customer experience during the design and development process of a service as well as after the process is complete (Moritz, 2005). When designing a new service or even redesigning an already existing service, all participants need to be part of every decision taken, be it major or minor (Cook et al., 2002). With service design, a toolbox is provided by IDEO in which you find a range of tools and methods to use. The benefit of these tools and methods is that the data is already classified into themes and somewhat pre-analysed during the activities, especially in a focus group setting where a number of participants are involved. For further analysis, content analysis was used. In this research project, the four Ds of the double diamond design process or framework (discover, define, develop and deliver) (Moritz, 2005) were used to guide with the data collection in conjunction with the conceptual framework as deducted from the literature.

The double diamond framework consists of 4 Ds represented as phases which were followed according to the table below.

Double Diamond Framework		
Phases	***Tools***	***Objectives***
Phase 1 – Discover	Shadowing Stakeholder mapping Context mapping Group Interviews Observations	• To understand the community of Grabouw. • To understand the context of the youth • To identify the stake holders directly and

		indirectly affected • To gather all the information pertaining to the phenomenon being studied
Phase 2 – Define	Individual Interviews Expectation Mapping Story Telling	• To define the area of focus that is being studied • To identify the real needs of the youth in regards to reproductive health information and service access • To identify what the expectations are of the envisioned service solution
Phase 3 – Develop	Ideation Co-creation	Brainstorm on different ideas with the participants on what the possible service should be. Co-create / co-design a more detailed service solution with the participants that is suitable and most desired for the phenomenon at hand
Phase 4 – Deliver	Mobile-based service prototyping	To have a prototype that is ready for anyone to take it for further development and implementation

Table 4: Double Diamond Framework

5.3 Discussion of phase 1 findings

In phase 1 (discover) much textual data was collected and the data was analysed with content analysis. Here is a summary of those findings.

5.3.1 Stakeholders

There are quite a number of stakeholders that are directly affected and indirectly affected (Sharp et al., 1999) by the envisioned service. Firstly, the core stakeholders are the ones who have influence on the operations and survival of the service. They are the ones who influence the decision making process (Brugha & Varvasovszky, 2000) or they are the targeted users. Without these stakeholders, the service would mean nothing to the rest of the other stakeholders. Secondary, the directly affected stakeholders are those that will directly benefit from the service. This can be because the service provides a better platform for them to share the information that they usually do with less effectiveness and or the information would also be relevant to them. Finally, the indirectly affected stakeholders are the ones who benefit without even knowing about the service, either by being exposed to the service and the information and they do not even know how or why.

5.3.2 Youth context

In short, the youth of Grabouw has access to many health service providers as mentioned in chapter 4. However, these service providers' services were designed to cater for the needs of everyone in the community and the setup therefore is not youth friendly. These services are not youth friendly due to social and cultural factors. The youth is not comfortable to queue up together with their elders, especially when it comes to issues related to sex. It is embarrassing for them because of the fact that the elders that share the services are from the same community and they know one another (Alford, 2009). There are other government initiatives to give or make information available to the community members, especially the youth. The aim of these initiatives is to ensure the decrease in the numbers of the present reproductive health related issues. The UNFPA advocates for and fully supports young people from marginalised communities and who are difficult to reach to also have health services and supportive programmes available to them, as well as a holistic youth friendly health care package of services to be delivered to them. The WHO advocates for the same thing because such services are efficient, especially if based on a successful collaboration between relevant stakeholders.

There are a number of NGOs running these government initiatives for information dissemination, particularly reproductive health information in the community of Grabouw. One of the initiatives is to employ a number of health promoters from the same community to enable the success of information dissemination and this is fulfilled by the Elgin Learning Foundation (ELF). The health promoters are managed by ELF that is responsible for the statistics of how many people are reached and report back to the government. However, it is still evident that the numbers of reproductive health related issues are still on the rise. Even with the high need of information, it is clear that there is a need for a new intervention that will effectively ensure that the information disseminated reaches the target audience. This is with respect to confidentiality, respectful treatment, culturally appropriate care and easy access to free if not low cost services (Alford, 2009).

Looking at interventions, technology has proven to be a successful aid in many initiatives of the same nature. Youth friendly services can employ modern technology as a means to specialised services and to be a central part of these services (WHO, 2013). Having studied the youth and the community of Grabouw in which they live, there are quite a high number of technology users, particularly mobile technologies. The mobile technology is readily available to anyone in the community as there are service providers of these technologies in and around the community. Having looked at the current information provided and the way in which it is provided, it is apparent that the technology is missing. In addition to the information currently disseminated, it is surprising that the youth highlighted the same information as needs. It is therefore clear that the technology that is available and the information currently being disseminated needs to be combined to ensure effective information dissemination and information access at all times privately by the youth and by everyone who needs it.

5.3.3 Appropriation

Concerning the theory, here is how the findings were looked at through the lens of domestication of technology. During the appropriation stage of domestication, a technology is introduced into the household/community from the outside world in order to create new meaning (Lee et al, 2009). With this study, a proper context study was done to understand the mobile technology that we are working with, how it was introduced in the community and what meanings it has for the community, particularly the youth. The youth can acquire mobile technology in 3 different ways.

The first way is from the mobile shops by buying it. The money they use to buy it is from parents/guardians, or money they earned from doing small jobs. The second way is when they get it as a gift from family or peers. At times, some youth exchange sex for gifts like these. The third way is by pick pocketing from people or stealing from the shops where it is sold or places where it is kept. The technology, especially the mobile phone, becomes part of their fashion. It is used for many purposes and that is how new meaning is created.

In terms of the design process, appropriation is achieved by doing the activities in the first phase, which is to discover. During this phase, context study activities are done and the participants get to understand the context and their own environment and try to find a design that will solve a problem in the community in order to create new meaning.

5.4 Discussion of phase 2 findings

In phase 2 (define), the information gathered in phase 1 was analysed and scrutinised to come up with a defined or focused area.

5.4.1 Personas

Persona 1 - needs analysis.

The prevailing need of reproductive health information for this persona is medical male circumcision. The male youth of the Grabouw community would like to have more information about the procedure, how it is done, and where it is done, and once done, how to take care of oneself to avoid infections. In addition, Persona 1 believes that, in order to get the correct and relevant information about an issue, there is a need for mobile-based services and technology to provide these kinds of information. In addition, the information provided should be relevant and local to the community where the youth live.

Persona 2 – needs analysis

Persona 2 highlighted that the need of reproductive health information is mostly about Pap smear testing. Persona 2 would like to know more about the testing especially the benefits of the test and also about how the test is done and where in the community it is safely done. Also, Persona 2 believes that information should be accessed anytime and it should be relevant. Not only that, but information should be accessible privately to afford an opportunity

to those who are shy and embarrassed to ask for the information to be able to get the right information. Persona 2 thinks that mobile-based services and technology can help in this regard.

Persona 3 – needs analysis

Persona 3 has a great need to access reproductive health information especially about pregnancy and how to practice safe sex. Persona 3 would like to know more about pregnancy symptoms and where to go for help if one is pregnant, and how one can take care of oneself once they find out they are pregnant to avoid giving birth to unhealthy babies. Also, Persona 3 can benefit from information at her fingertips on pregnancy signs, when and where to go for pregnancy testing, options she has as a young pregnant female and the whereabouts of safe abortion services. This can be achieved through mobile-based services and technology.

Persona 4 – needs analysis

Persona 4 is well aware of what information he needs to get, unfortunately he is unable to get the information due to the nature of his job. He would like information about contraceptives that are safe for both him and his girlfriend; however there is no easier way of getting this information. He needs to go to the day hospital and stand in long queues just to get to speak to health worker and this will take up his time of doing his job. He therefore requires a service that allows him to get relevant information regarding health specifically contraceptive use through his smart phone. This can be achieved by providing a mobile-based service that meets his needs.

5.4.2 Journey map

The journey map below is the envisioned map for youth to access reproductive health information once the service is implemented. All are accessible via an online platform.

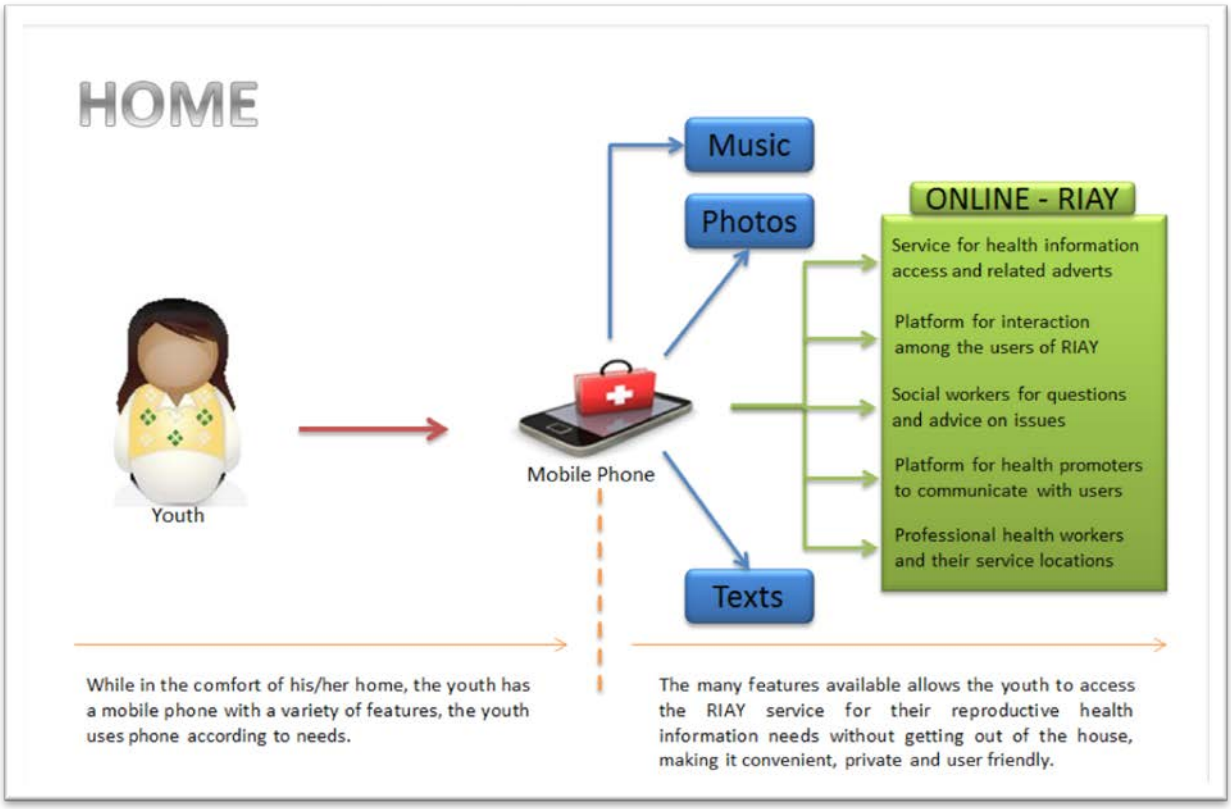


Figure 16: Envisioned Journey Map

5.4.3 Objectification

During the objectification phase of domestication, the technology is displayed or arranged within the household or community (Williams et al., 2004). Concerning this research, mobile technology was arranged in the community in different ways. The mobile phones became part of the peoples' identity. They could not go anywhere without it. Other types of mobile technology were placed in the homes for instance the computers, televisions, and radios. There was a routine in some houses for when to watch TV and how often to use the computer.

In terms of design, this phase is achieved through the define phase of the design process. Once the context was studied in phase one, certain aspects were discovered and perhaps too many of them. The participants needed to properly arrange their thoughts and define the problem at hand and how it would be solved using design and participation from the intended user and how further interaction would take place.

5.5 Discussion of phase 3 findings

In this phase (develop), ideas were conceived and the co-creation process continued with a more detailed service solution.

5.5.1 Ideas

A number of ideas were brainstormed in a focus group session as shown in figure 17. They were numbered according to preference and the idea that came out on top was therefore discussed further. The idea that came out on top was to use the already existing mobile technology (Levine et al., 2008) to promote reproductive health. This resulted because the youth already had access to this technology and had ways and means to get and to keep it functioning.

The participants also agreed that those without mobile technology still had access to it or they knew someone who had. In addition, if they did not really have access to it at all, provision should be made for these people. There are currently libraries and public and private places where one can have access to ICT platforms (McNamara, 2007; USAID, 2011), which is available to the community members for a fee or for free. Therefore, the service should also cater for those that can only access technology in that way.

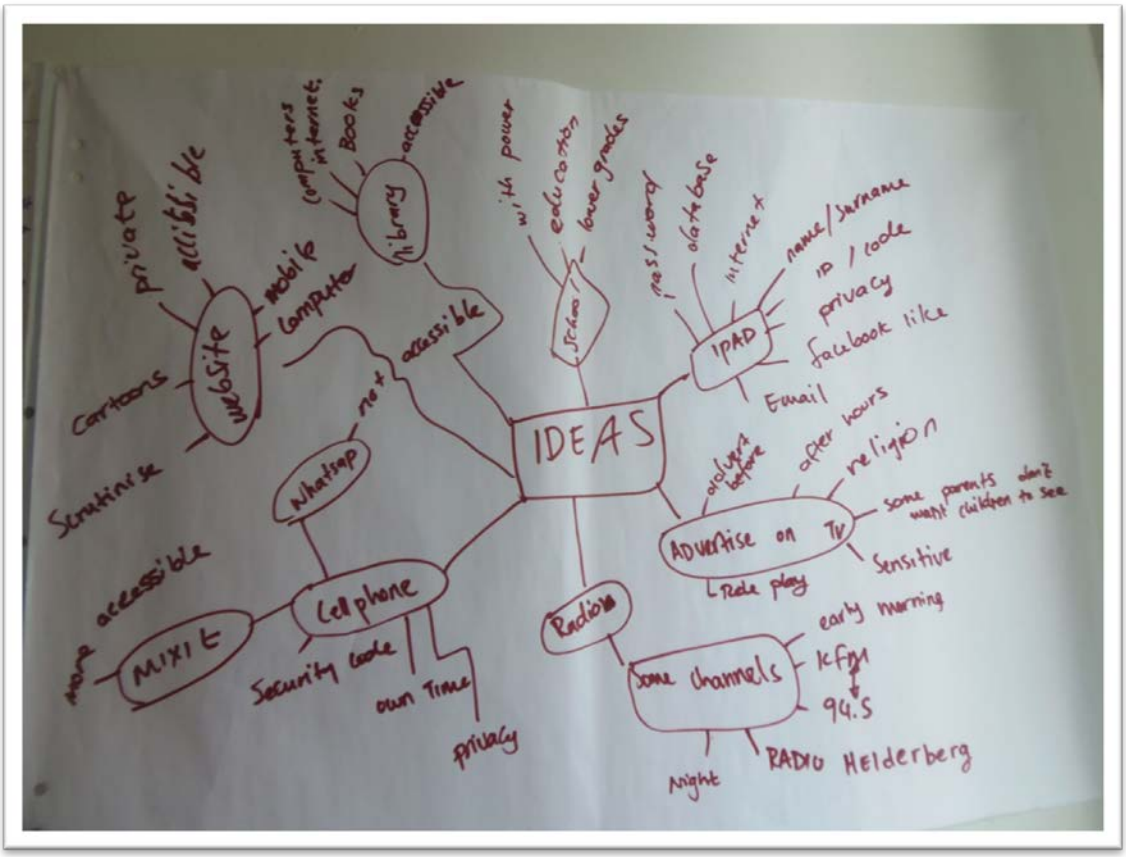


Figure 17: Ideation Activity

5.5.2 Expectation mapping

The findings and the decision by the focus group participants shows that technology is needed to play an important role to disseminate reproductive health information to the youth for a number of reasons.

As expected, information should be accessed privately during any time of the day as needed and without the help of anyone. The technology is also expected to provide access to information that is relevant and is informative to its audience. The information should be displayed in different formats to assist the youth with proper understanding. All these should be achieved with the minimum distance being travelled.

It is therefore clear that a mobile-based service that meets all the requirements for reasons above would be ideal for the community of youth in Grabouw (Götte-Meyer, 2010). For an ideal mobile-based service to promote reproductive health for youth, it is expected that the users would be allowed to access the service on mobile devices as well as on desktops to cater for those who do not have access to mobile devices. The service should allow users to seek for information anonymously and at their own convenience without having to face

anyone. Users also expect to share their personal experiences and stories, share videos and images with regards to reproductive health. The users are also interested in a service that would allow for interaction as they want to chat, discuss issues and get quick response as well as request for feedback from those who are knowledgeable. Finally, the service should give information on where the service providers of reproductive health services are located in the community for ease of access.

5.5.3 Mobile-based service

A mobile-based service which the researcher decided to call RHIAY as an acronym, which stands for Reproductive Health Information Access for Youth, was co-designed. RHIAY will be accessible via mobile devices especially mobile phones. RHIAY will be designed and developed in a way that it is also accessible via the web to cater for the youth that does not have access to the type of mobile devices that support RHIAY mobile application. These youth can access the web interface using public computer resources available at the libraries and internet cafes available in the community. The mobility of the technology allows the youth to have access to information needed anywhere and anytime (Sheng et al., 2005; Gold et al., 2011; Martindale, 2013).

Once the youth has access to RHIAY, they will be exposed to so much useful information about their wellbeing in relation to reproductive health. The youth will also be informed about all the available service providers that offer reproductive health services and where exactly they are located in the community. In addition to that, the youth will also be informed about the different options available to them whether personally or for their peers and family in order to make informed decisions about reproductive health.

5.5.4 Design considerations

RHIAY will be fully accepted and useful in the community of Grabouw provided the design considerations below have been taken into account as stipulated by the participants. The stipulated design considerations are mentioned below and are explained briefly.

Clarity and readability – the content provided should be clear and understandable by the reader. This is to ensure that the same message is received by the different readers.

Colourful – the application should appear colourful to attract the youth.

Fun and entertaining – the service should maintain entertainment whilst educating at the same time.

Simple and Interesting– Information presented should be straight forward and simple yet interesting. The content should be relevant and other information related to reproductive health can be presented.

Language – the users should have an option to translate the languages they can speak and understand. The languages that are spoken in the community are: Afrikaans, Shona, Zulu and Xhosa.

Privacy and confidentiality – the service should be available privately to the users for them to access the information at their own time. Their personal information should remain confidential for their protection.

Cultural – the service should respect the cultural values and ways of doing things within the community.

5.5.5 Incorporation

During this phase, the technology is used with consideration to contextual factors (Williams et al., 2004; UTwente, 2014). This is achieved in the development phase of the design process. The new design has to incorporate the customs of the people and must consider their traditional and cultural values. All these are contextual factors (Ibid.). This is mainly done to ensure that the intended users as partners in design will have a sense of ownership of the new design intervention and to ensure easy adaptation. It is easy to incorporate the new design in their way of doing things, especially knowing that they are already using the mobile technology. Hence developing a system or service that will make use of the already existing technology makes it easy for adaptation (Heeks, 2008) and positive user experience (Ouma et al., 2010).

5.6 Discussion of phase 4 findings

In this phase, a high-level prototype was developed where a number of important points were discussed.

5.6.1 Mobile-based service prototype

The participants came up with the look and feel of the mobile application as shown in figure 18. The participants were also concerned about creating awareness of the service in the community. They came up with different ways to create this awareness. The most important was to advertise the service once it was implemented and functional by means of pamphlets, sms campaigns, social media, radio, and word of mouth. Figure 18 was a rough design of the prototype and the actual prototype is presented in figures 13, 14 and 15.

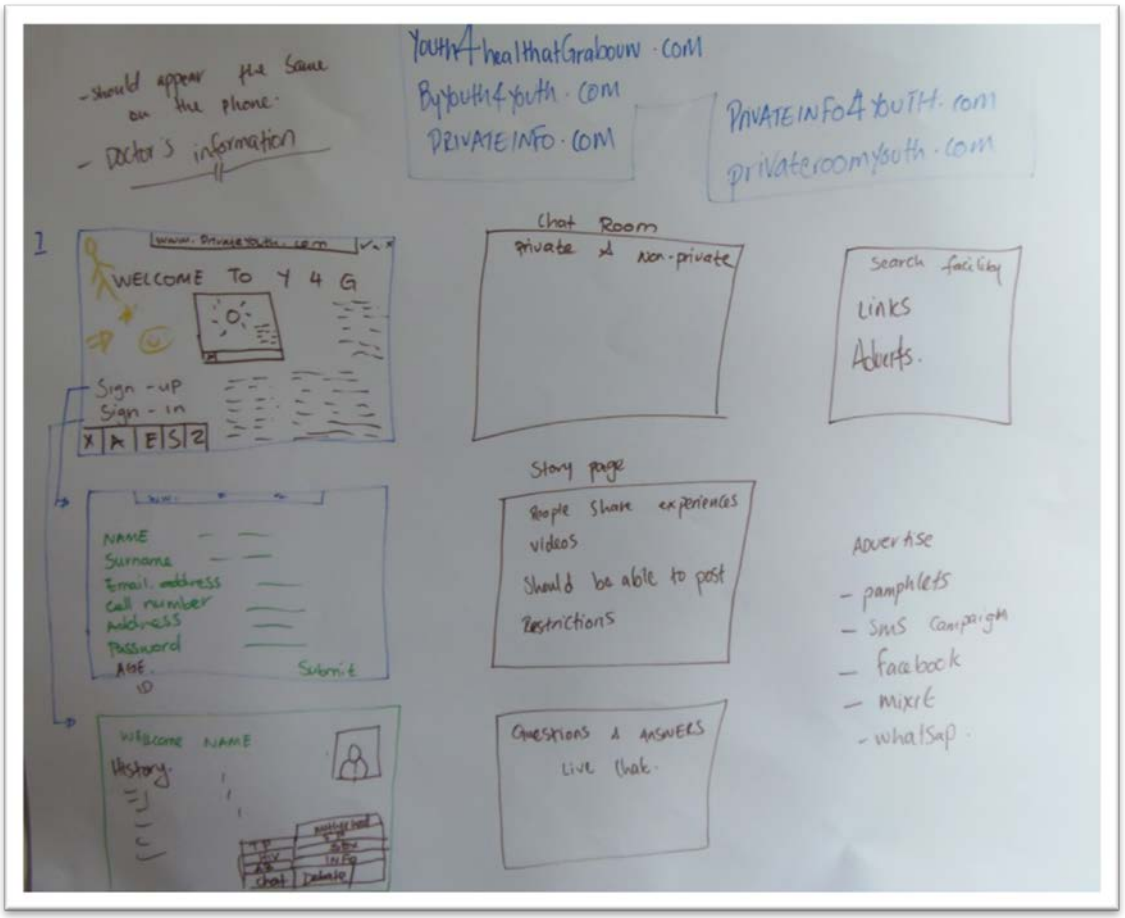


Figure 18 : Co-design

5.6.2 Conversion

During this phase, new meanings are created (UTwente, 2014; Lee et al., 2009; Williams et al., 2004). Moreover, this is achieved through the development phase of the design process through a number of activities. Iteration is performed to ensure that the new designed service or system performs exactly the way it is intended to (Stickdorn & Schneider, 2011). The participants also try to prove the concept by creating a prototype. Provision is also made for transferability (Winschiers-Theophilus et al., 2013) to the outside world.

5.7 Challenges of co-design

The challenges faced in this chapter are hereby highlighted. There were not so many challenges faced during this process as the youth that were involved in the process were very happy to be part of it. The only challenge at times was the language barrier whereby some participants were highly conversant in Afrikaans as opposed to English. However, there was the help of the others who could understand both languages.

Another challenge was the spelling of some of the words when the participants were engaged in an exercise that required people to write words down. Finally, the last challenge was to keep time. Some of the activities were time consuming and at times, some of the participants came late to the venue. Because all the participants were from the surroundings of the same community, the activities were always completed in one session.

5.8 Conceptual framework re-visited

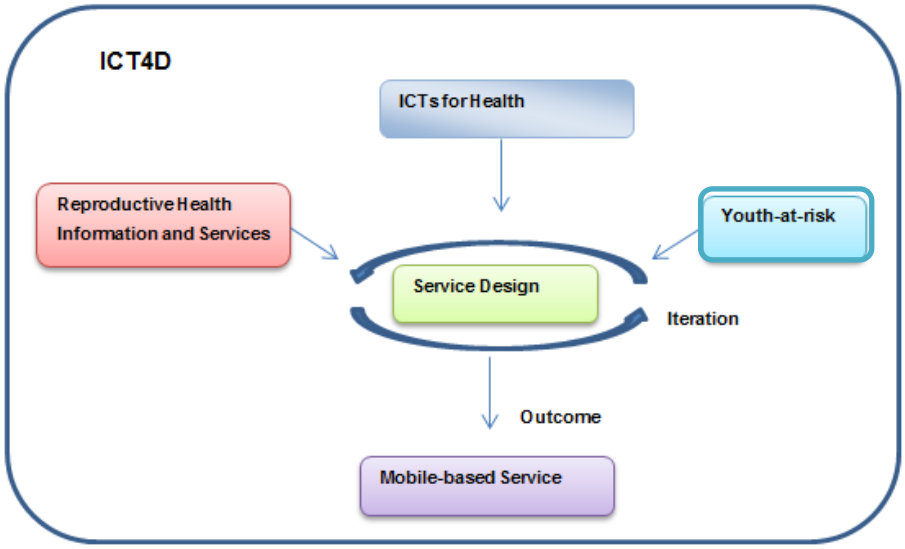


Figure 19: Revised Conceptual Framework

This new conceptual framework addresses the old conceptual framework that resulted from the literature review. After the study had been completed, it was clear that service design with its tools and methods needed to be the centre of the concepts into which all the other concepts fed to have a mobile-based service as an outcome. As indicated, it is very important for the iteration (Stickdorn & Schneider, 2011) to take place in order to ensure that the service being designed takes into considerations all the aspects and concerns of the users.

Mobile-based service is the innovation to promote reproductive health for youth-at-risk. For the innovation to be created there are a number of aspects that play major roles to realise this service/innovation. These aspects are the focal areas which are: reproductive health information and services, methodology which is service design, audience which is youth-at-risk and the technology which is ICTS for health.

The focal area informs the methodology or rather the design process of what the needs, the relevance and how the current situation is ineffective in providing the information needed, as well as the limited access to the services. The technology informs the design process about the available technology and infrastructures that support the technology in the community. The extent to which the technology is used, and how the existing technology can be utilised for better and improved access to reproductive health information and services is relevant information for the design process.

The audience otherwise known as the intended users inform the design process of their requirements of the service in conjunction with their contexts. In addition, the users are part

of the design process and have a stake in the decision making for the duration of the process. The design process indicated here is adapted from service design which emphasises involving the intended users and valuing their contributions and ideas. This also allows for iteration to cater for the refinement of the innovation and guarantees the intended users a positive user experience.

5.9 Summary

This chapter is a discussion of the outcomes with reference to literature. In this chapter, the discussions are structured according to the structure of the outcomes from the previous chapter. Service design tools were explained in this chapter for the purpose of collecting data as well as the challenges of co design. The conceptual framework was revisited in this chapter. Chapter 6 consists of the conclusions of the research project and the recommendations.

Chapter 6. Conclusions and Recommendations

6.1 Introduction

In this chapter, a review of the chapters are shortly summarised and discussed to round off the thesis document. Some conclusions are made and recommendations for future research and others are discussed in this chapter. This chapter is the last chapter of this thesis.

6.2 Research contribution

This research project informs the body of knowledge that if service design methods and tools are combined with mobile technology, a mobile-based service can be designed for information access for a particular community. A new design and development process needs to pay attention to the details of the context within a community which the service is meant for. This will ensure that the information disseminated or accessed through the service is relevant for the end user and makes sense to the community at large.

Much literature on service design addresses how organisational service design has to impact their customer experience positively (Zomerdijk & Voss, 2010; Cook et al., 2002; Goldstein et al., 2002; Herrmann et al., 2000). However, not much is written to address the issue of using service design tools and methods (IDEO, 2013) to design services that are not organisational related. Service design tools and methods are a good way of designing any type of service, especially when it is solving a problem for a certain community. Service design and design thinking methods deliver new and viable innovations by placing customer needs, practices and even culture (Choi et al., 2005) at the center of service development, which in return offers creative ideas that eventually develop into new innovations (Kronqvist & Korhonen, 2009).

It has been observed that culture plays an important role in design, especially in system design. Considering user interface, some elements, as a result of design, might work and be appropriate for one culture but may not be appropriate for another. Choi et al. (2005) confirms this by saying that “user interface elements require localized designs for cultural groups”. According to Lederach, (1995) culture is defined as follows: “Culture is the shared knowledge and schemes created by a set of people for perceiving, interpreting, expressing, and responding to the social realities around them”.

For the designers who intend to design for communities, there are many points to consider, not only the problem at hand. Culture is one of the major issues that need to be considered. In addition to culture, context needs to be fully understood for one to identify the relevant methods and tools that are at the appropriate level of interaction of the participants. Often, many designers have a rigid plan of what to do when consulting with the community for a certain service design and development and do not meet all the user needs, which consequently do not guarantee positive user experience. Once the designer is in the community, he/she needs not be the designer but rather a participant and create an environment everyone can equally contribute. In addition, the methods can also emerge from the participation of all involved. The iteration process, for missed opportunities and refinement of the service being developed, should be allowed to take place.

The prototype that was designed can be used, not only for reproductive health information access, but also for any kind of information access according to the need. The prototype highlights design considerations that need to be understood by developers when designing for low-income communities. These considerations come about as a result of proper investigation and interaction among the participants including the researcher. For any health related services that are to be designed and developed, it is best to involve the users through the whole process as active participants and to value their contributions.

The prototype can be used not only by the Grabouw community, but also by any community that shares the same profile. Transferability needs to be considered after proper investigation and context study of the community where the service is to be transferred to. This research also informs scholars and other researchers of what to consider when designing with the youth, for the youth, using service design. The research also highlighted the similarities between user-centred design process and service design process.

6.3 Addressing the research questions

Below is a discussion of how the research questions were answered starting with the main research question and finally the sub research questions.

6.3.1 Main question - What are the design considerations for a mobile-based service to promote reproductive health for youth-at-risk?

In order for RHIAY to be fully accepted and useful in the community of Grabouw, the participants identified useful design considerations for RHIAY. The identified design considerations are mentioned below and are explained in detail.

Clarity and readability – the content should be clear and easily understood by the reader. This is to ensure that the different readers get the same message. The content in text should be in a font that is readable by all and allows users to zoom in.

Colourful – the application should display colours since most of the targeted users are youth. The participants emphasised that the colours also help draw the attention of the readers or users.

Fun and entertaining – it should be fun to read about some of the issues of reproductive health if the application/service caters for that. For instance, there must be local music playing in the background and some moving items as well. In addition, it is important that it maintain entertainment whilst educating at the same time. This will attract more users and that means that many users will be educated in one way or the other.

Simple and Interesting– Information should be straight forward and to the point. Simplicity is always better than complexity. The content should appear and be interesting enough to keep the users returning for more. The content should be relevant and other information related but not entirely on reproductive health can be interesting.

Language – it would also be great if the users could read the content in their vernacular language to allow for those that are not English proficient to participate in the use of this service.

Privacy and confidentiality – the service should be available privately to allow the users to access the information at their own convenience without having to confront anyone face to face. The personal information should be kept confidential for the protection of the service users.

Cultural – the service should consider the cultural values and customs, as much as information is very important to be heard, the content editor must make sure that it is not offending in any way. Perhaps the service should provide the user an option to choose the censored or not censored option.

Once all these considerations are met, it means that the service developed will give the youth a positive user experience (Ouma et al., 2010). It will also touch on prevention (Leon & Schneider, 2012) which is always better than cure. The mobile-based service would be able to deliver quality healthcare at low cost as well as provide improved service delivery (Mukund & Murray, 2010).

6.3.2 Sub question 1: How do youth-at-risk groups in Grabouw currently access reproductive health information?

The youth of Grabouw currently accesses reproductive health information differently. They need to travel and walk in order to get to the clinic/day hospital for the information needed. At times, they need to pay for transport as the clinic is located near town and some of them live at the outskirts of the town in informal settlement. This is rather a discouraging situation and as result, many opt not to go through the trouble and miss on important information that they need. The Elgin Learning Foundation located within the community provides and makes information available, however the information is kept at their premises and one still need to walk or find a way to get there. The Foundation hosts campaigns on different issues for the community and the youth can get information this way. Nevertheless, the campaigns do not always give information that is needed at that particular time. The only time that the information reaches the youth at their convenient time is when the health promoters recruited by the foundations go around the community. The health promoters walk around the community approaching people from different age groups to tell them about health information supported by print media for further reading.

Schools also provide health information to their students and the same information is found in the libraries around the community. Unfortunately, there is no one to ask for further information and advice regarding any specific health information needed as the information is mostly provided in the form of print media. The church also provides health information but not as regularly as needed. Temba Care which is another NGO in the community also provides health information. However, the community is so widely dispersed that most of the NGOs are found in the more formal settlements of the town and those that live in the informal settlements are left out.

Some elders in the community are willing to share health information such as parents, community leaders, and even traditional healers. The sensitivity of the topic limits many youth to ask for information from the elders, because culturally it is a taboo to ask and talk about sex when you are young. As a consequence of not getting information the youth turn

to Google, social media and their friends. The information acquired this way is not always correct and not relevant to them in the environment in which they live. The youth therefore feel that there is a great need for one to access specific relevant health information at any time without feeling shy or embarrassed.

6.3.3 Sub question 2: What reproductive health information is of need to the youth-at-risk?

The following are the needs as highlighted by the participants:

> HIV/AIDS, Teenage Pregnancy, Sex Education, Safe Abortion, Awareness and
> "Teenage Pregnancy and HIV/AID because they link in together. Why I say we focus on these is because we have our 13 year old children becoming pregnant and then ending up with HIV/AIDS." Said by one of the knowledge workers from the day hospital. This was the same needs highlighted in the sessions by other participants.

Currently, the information that is available to them on reproductive health is:

> Information on different types of Cancers, Information on HIV/AIDS, information about Teen Pregnancy and sex, information on Drugs Abuse and Alcohol Abuse, and finally information on Condom Use, Pap Smears, Family Planning. This would be needed on a larger scale and relevant to the users in their community.

6.3.4 Sub question 3: What mobile technology is currently available for the youth-at-risk?

The mobile technology that is available in the community of Grabouw especially to the youth comprises of Mobile Phones, Tablets, Computers / Laptops, TV and Radio.

The participants also highlighted that the most preferred mobile technology in the community is a mobile phone because of the following benefits:

> Mobile phones offer mobility as a benefit for one to move between service providers depending on the specials. One only needs to buy a new simcard, which is very affordable as well for one to move from one place to the other and can activate mobile network roaming and ease of movement. Privacy for one to keep all the information they deem private in their mobile phone and can activate passwords and no one can access their information. Communication at all times to allow one to be in touch with loved ones

when there is a need to. Learning can be achieved through the many platforms like social media, internet, and other mobile applications. Gather information when required, and or gather it when there is a need. Share information with peers and family and with those who need and request it. Seek for advice from experts through the many mobile platforms. Entertainment can be achieved through games, and music.

They also highlighted that it is very easy to get access to mobile phones in the community, as there are many outlets that sell mobile phones. “The struggle is the money, not everyone can afford it” stated by one of the participants. Otherwise, if one cannot afford to buy a mobile phone from the very common and popular outlets, one can easily buy it from the streets where some young people steal them to resell for a cheaper price. As much as it is easy for the YAR to get and buy mobile phones, the challenge is keeping them in a functioning mode, whereby they are able to make calls, chat and browse the internet.

The mobile phones require the youth to load them with airtime in order for them to use all the services that they like for instance, chatting, texting, and social networking as well as internet services. They therefore look for small jobs, weekend jobs and temporary jobs to earn the money they need. They wash cars, work in clothing shops, work at the farms, baby-sit, and work at the barbershops / hair salon or piracy. Others can get money from their parents whilst others get it from older man or multiple partners.

As depicted in figure 20, the youth have access to different types of mobile phones. Some are smartphones and some are not. The brands range from Samsung, Nokia, Blackberry, Sony and some have no names whilst others are from network service providers such as MTN. The most needed feature on the mobile phones is the internet explorer as it allows the youth to browse and have access to vast information. The youth also highlighted the need for better access to other mobile devices for better access to relevant information.

Figure 20: Mobile Technology

6.3.5 Sub question 4: How can a mobile-based service be used to promote reproductive health for youth-at-risk?

A mobile-based service is suitable and can be used for reproductive health information for any group of youth and especially for the youth-at-risk. The mobile technology provides a range of benefits that were highlighted in the previous question, such as mobility and privacy. The service, once mobile-based, can easily be accessed by everyone, anytime, anywhere in and out of the community. The youth already have access to mobile technology, which makes it easy to use for promoting reproductive health. It is also clear that the youth have the same need of information as the information that is already being provided for. However, the manner in which the information is currently being given or disseminated is visibly not effective. Therefore a mobile-service would be ideal to promote reproductive health for youth-at-risk in the community of Grabouw with the participation of the stakeholders and the intended users in the design and development of the service.

6.4 Reflection

This section is about the researcher's reflection on the research process as well as different concepts used at different stages of the project.

Design has many different definitions but overall, it is about translating ideas into reality (Moritz, 2005). Whether it is for an innovative artefact or a service, there are a number of key ingredients that result into a successful design-led project. These key ingredients ensure that the design-led solutions enhance the quality of life of those designed for.

An initial ingredient is to understand the users and their context (Ibid.). This is possible with the use of service design tools such as those by IDEO, and by following a design process. In this research, the double diamond design process (Design Council UK, 2014) made up of four phases (Discover, Define, Develop and Deliver) was implemented. Designers go through a process from "where thinking and possibilities are as broad as possible to situations where they are deliberately narrowed down and focused on district objectives" (Moritz, 2005:6). In other words, the process goes from divergent thinking of creating a number of possible ideas to convergent thinking of narrowing down to the best idea. This process is represented by a diamond shape. There are two diamonds of which the first diamond represents the problem definition and the second represents the creation of the solution. This is where the name double diamond originated from and the reason why there are two diamonds is to avoid solving the wrong problem should the first diamond be omitted (Design Council UK, 2014).

Other ingredients include identifying the user needs and developing the initial ideas. This is followed by creating a clear brief that frames the design challenge followed by prototyping. Once the prototype is done, testing, iteration and launching then follows. All these are part and parcel of the design process and service design provides methods and tools to achieve these.

The youth in the community of Grabouw were interested to participate and engage in the activities as explained in chapter one, which shows their hunger for improved services and better quality of life. This experience provoked the participants with the desire to get the best out of what they already had in the community and most importantly to get the right health information as they were informed by the discussions about the resources in the community that they were not aware about.

There is a range of mobile technology that is available to the youth in this community; there is also some form of access to different types of information. However, there is no strong connection between mobile technology and information access. In the different stages of the design process, it is highlighted that any information can be accessible via mobile technology. The information can be of any type such as audio, text, video and imagery. The information can also be about anything ranging from entertainment, educational, and informative. Also the information can be from any field such as health, sports, etc.

The findings clearly emphasise the fact that the youth in the community of Grabouw are more than willing to participate in processes that will contribute to the improvement of their lives and those of their community members (Götte-Meyer, 2010). It is clear that the community is exposed to a level of technology particularly mobile technology and is eager to make use of this technology in many ways that are beneficial. These benefits should not only benefit the community in some ways but the potential must be maximised in order to develop and empower the users (Heeks, 2008; Toyama, 2010).

The best way to empower the users of the new mobile services, in addition to the already existing services, is that the members of the community are part of the design and development process (Stickdorn & Schneider, 2011). This practice will help and inform the design and not only consider the output but rather to consider the cultural and traditional values of the community as well. A community like Grabouw is very diverse. Hence, for any technological innovation, ethnography and service design methods will go a long way in providing designs and the development of services that are useful, usable and desirable by the intended users (Ibid.).

6.5 Conclusions

It is strongly emphasised in this research that when one is developing a solution for a certain group or community of people as users, it is important to involve the intended users in the development process. The service design methods and tools allow one to do this and help the development process reach the co-design objectives. The intended users inform the design and development of the solution in order for it to be useful, usable, and desirable by them. This eliminates solutions that are imposed on users and do not really serve the purpose.

Solutions that are developed with the intended users consider many issues, which include traditional and cultural values and practices. Other points to consider are the economic

status of the community, already existing infrastructure and knowledge plus community customs. For a low-income community like Grabouw, it is very important to understand the context of the intended users. In this case, youth-at-risk, which is a prevalent group of young people in Grabouw community, are the intended users.

Youth-at-risk in Grabouw, although not motivated or involved in activities to improve their lives, have some good design ideas. In the meantime, they are doing odd jobs here and there to make ends meet. Their thinking is to live for the moment and not much about taking care of their present to have a better future. Their good design ideas are influenced by their current lifestyles and how they perceive challenges and needs currently being faced in the community, particularly for reproductive health information access, which is the focal area of this study.

Reproductive health information access is very important for everyone in any community as it contributes to the wellbeing of the community as well as their social and economic growth. Some of the challenges were highlighted in this study in order for easy reproductive health information access. These challenges need to be dealt with in a creative manner in order to meet the needs of the youth. In order to creatively deal with these challenges, some level of improvised technology is needed to ease the process of information access.

A technology that is used to ease the access of reproductive health information is and can be mobile technology. Fortunately this is already in reach of this community and almost everyone has access to this technology, or else they live with or they know someone who has access to the technology. Since the technology is accessible in the community, the infrastructure to support it is also in existence. It is therefore fit to make use of the already existing technology and infrastructure to ease the access of reproductive health information in a creative manner to meet the current challenges.

6.6 Way forward

Further research is needed to enhance the design experience, particularly when employing service design and when designing for communities in need. This research highlighted the importance for South African researchers in the field of service design to work closely with their communities for a positive user experience throughout the design process and perhaps after the implementation of a service or solution. Contextual aspects of a community are a significant factor that can drive the process towards positive change and improved quality of life.

The prototype herewith presented requires resources to see to it that it becomes a reality and it will benefit the community in many ways as indicated above. The resources required include skilled developers of mobile applications and web based applications to see to it that it was developed according to how the users want it. Money to fund the development and coding of the service was also a required resource as well as time to allow for testing, implementation and iteration. The success of this service will require the further participation of the users to ensure that all of the requirements are met to meet the initial goals of the participants.

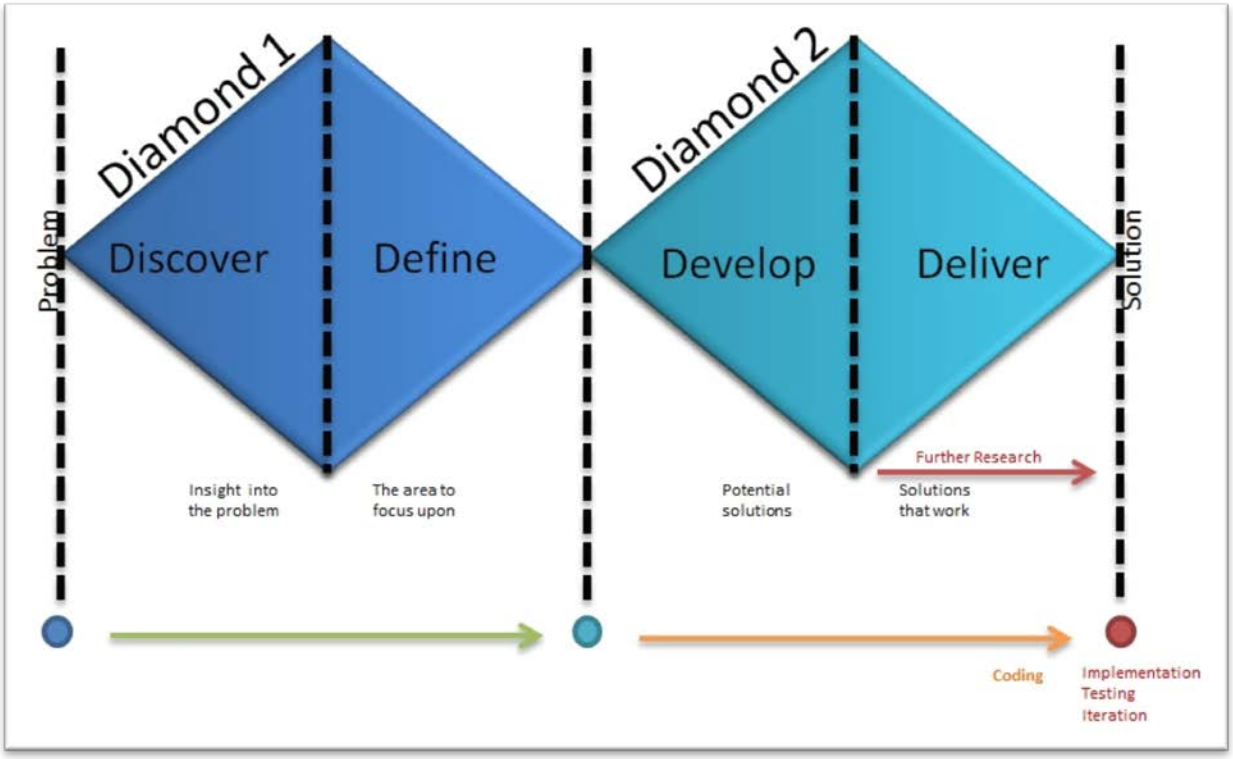


Figure 21 : Way forward

Source: Adapted (Du Preez, 2015) and produced by author, 2015

6.7 Recommendations

The research process of data collection and analysis allowed the researcher to arrive at some recommendations. The observations made also contributed to these recommendations as outlined below.

When a solution is being developed for a particular community, it is recommended that stakeholders affected from the community be part of the development process. This is

especially important for the intended users to be well represented as they have better views on how they want to use or how the solution should work. After the stakeholders and all the participants are identified, it is recommended that the participants study and understand the context of the community although most of the participants are part of the community. This exercise helps the participants realise some of the things that they take for granted and did not think were important in the community. This helps inform the development process of the already existing solutions, and how they can be complemented or improved. Once the solution is developed, it is recommended that there should be a reiteration process to allow for missed opportunities and to refine the solution to function as expected.

6.8 Summary

This chapter concludes the thesis with a topic on addressing the research question and its sub questions, reflections and some conclusions made. It also includes the way forward as well as recommendations. Following this chapter is the references and the appendices.

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Appendices

Appendix 1: CPUT approval

Cape Peninsula
University of Technology

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31 July 2013

TO WHOM IT MAY CONCERN

This is to confirm that Ms Hedvig Iipito, student number 213101181, is registered for the MTech degree in Information Technology at the above institution. Her proposal was approved by the University's Higher Degrees Committee on 23 July 2013 and the title of her research project is:

A mobile-based service to promote reproductive health for youth-at-risk: the case of Grabouw, South Africa

Ms Hedvig is preparing to embark upon the data collection and analysis exercise for her research and any assistance you are able to render to her in this regard would be appreciated.

Do not hesitate to contact me should you have any questions.

Yours sincerely

Veda Naidoo (Ms)
Postgraduate Office

Appendix 2: Data collection approval

ELGIN
Learning Foundation

DATE: 12th July 2013

To whom it may concern

Hereby Elgin Learning Foundation; HTA Project gives Hedvig Iipito-Mendonca permission to conduct her research study (Mobile Based Service to Promote Reproductive Health for Youth-at -risk), operating from within our community health project based in the community of Grabouw, TWK district.

The proposed dates for the above mentioned research to take place is the 31st July 2013 to the 2nd of August 2013.

If any queries, please contact Gideon Coetzee; HTA Project Manager.

Gideon Coetzee
HTA Project Manager
Registered Clinical Nurse Practitioner
Tel: (021) 848 9413
Fax: (021) 848 9414
Email: gideon@elginlearning.org.za

Appendix 3: Data collection plan

Date: sometime in August 2013

Duration: 3 days

Focus group (8-10 Members, 18 -24 of age, gender balanced)

1. Organise with ELF (Gideon) who to work with in identifying the focus group members
2. Make contact with Bevril to assist with the identification process
3. Organise accommodation and snacks to be eaten during session for 2 days + Incentive
4. Prepare the tools and the interview questions for the session as well as the letter of consent
5. Look for assistant to assist with the equipment

Day 1	Day 2	Day 3
Arrival and preparation of venue	Focus group first session to last about 2 to 3 hours	Focus group second session to last about 2 to 3 hours
Shadow health worker and take notes	Workshop and Activities	Workshop and activities
Familiarise self with the community plus site seeing	Snacking	Snacking, Incentives & departure
Meet with Gideon for brief discussion about the activities to take place in the next 2 days		

Focus Group First Session Agenda

1. Introduction of project and brief description of what it is about - ->Hedvig/ Assistant
2. Consent forms distribution and filling/signing
3. Introduction of members (self)
4. Ice breaker (Game)
5. Activity 1: Identify Reproductive health needs for youth (everyone)
6. Activity 2: Identify Mobile use by youth (everyone)
7. Activity 3: General discussion on context, challenges and other issues
8. Snacks
9. Departure

Focus Group Second Session Agenda

1. Ice breaker (Game)
2. Activity 1: Ideation
3. Activity2: Co-Creation
4. Activity3: General discussion on how everyone feels about the solution (concerns & benefits)
5. Feedback about the two days activities
6. Snacks and gift distribution
7. Thank you session
8. Departure

Appendix 4: Interview transcripts

Name: Sonia Age:22 Gender: Female

Reproductive Health

How do you access reproductive health information?

Here, explain step by step what happens in order for one to get the information? Map out the process. What triggers you or anyone to get RH information?

"It could be either 3 things. Either in your peer group you heard about it, or either you feel that something is wrong with you, or it could either be in your family, there is something that is not in place."

How would you prefer to access reproductive health information?

Here the user must explain what they would change in the current process.

Through the phone or the internet, however "some of the people don't have access to the internet, or they don't have iPhones, blackberries or iPads and all that, the only way they can get this information is from the clinic."

The clinic, because some people are illiterate and don't know how to use the computers or even their phones to access information. Some people use the phone to text friend to find out information that they don't know and in this way they access the information through the phone although it was not through the internet.

Why do you need reproductive health information?

Here the user must explain why they need the information or why they think it is needed by everyone

"Because if you don't know anything about health and all of a sudden something very bad happens to you, how are you going to know what it is, what to do, where to go?

Why is the information about reproductive health important to anyone and especially to you? User must give reasons why they would like to hear about the information

To keep them informed and be able to know what to do should they find themselves in situations and conditions that are health related and need attention.

Who provides reproductive health information in Grabouw and would you prefer otherwise?

- The Clinic
- Elgin Learning foundation
- Schools
- Peer educators, tutu buses

How do they provide reproductive health information and do they have supporting material and do you think it is effective?

- Pictures
- Pamphlets
- Divide into groups

Do they only provide reproductive health information or other information as well?

- Drugs Abuse, because this is a major problem in the community especially amongst the youngster.

How do youth in the community of Grabouw currently access reproductive health information in general apart from how you do it?

- Clinic

What reproductive health information is really important and is needed by the youth in Grabouw?

- Teenage pregnancy and HIV & AIDS because they link in together. “Why I say we focus on these is because we have our own 13 year old children becoming pregnant and then ending up with HIV/AIDS.”

Mobile Technology

Do you have access to mobile technology and what are the benefits to you?

- Mobility and privacy
- Use of phone to access the person who is knowledgeable by texting or calling and avoid physical contact especially when the subject is sensitive.

What are the different kinds of mobile technology do you have access to?

- Computers
- TV
- Radio
- Cell Phones

Do you have a cell phone and what kind of phone do you have?

- YES - Blackberry

What do you use your phone for?

- Calling
- Chatting
- Texting
- Time, calendar, alarm
- Entertainment – pictures, music, videos

Is it easy to get a phone, where?

- Yes, available at mobile shops even clothing shops

Is it expensive to have a phone? Why?

- Yes. “Some of the people, most of my friends, we girls we would rather wash cars to get that airtime money, some of them do go get a weekend job in town to get airtime money, because airtime is very veryvery important.”

Do you wish you had a better phone? Why?

- Yes – I need to upgrade my phone so I can get better services.

Which mobile service provider do you prefer? Why?

- Vodacom is good now, but I would rather prefer MTN

Name: Elmedia Age:19 Gender: Female

Reproductive Health

How do you access reproductive health information?

Here, explain step by step what happens in order for one to get the information? Map out the process. What triggers you or anyone to get RH information?

- Go to the clinic when need more information

How would you prefer to access reproductive health information?

Here the user must explain what they would change in the current process.

- The clinic is fine but also need parental guidance

Why do you need reproductive health information?

Here the user must explain why they need the information or why they think it is needed by everyone

- Very important

Why is the information about reproductive health important to anyone and especially to you? User must give reasons why they would like to hear about the information

- Very important

Who provides reproductive health information in Grabouw and would you prefer otherwise?

- Schools
- Libraries

How do they provide reproductive health information and do they have supporting material and do you think it is effective?

- sometimes
- Pamphlets
- Role-plays

Do they only provide reproductive health information or other information as well?

- Condom Use

How do youth in the community of Grabouw currently access reproductive health information in general apart from how you do it?

- By Talking, some are shy

What reproductive health information is really important and is needed by the youth in Grabouw?

- HIV/AIDS
- Teenage pregnancy

Mobile Technology

Do you have access to mobile technology and what are the benefits to you?

- Yes, it can be boring

What are the different kinds of mobile technology do you have access to?

- Computers
- TV
- Cell Phones

Do you have a cell phone and what kind of phone do you have?

- Samsung Galaxy

What do you use your phone for?

- Find out information on sex
- Mixit
- Facebook
- Music
- Taking pictures
- Prefers a computer

Is it easy to get a phone, where?

- Yes, Mobile homes and clothing shops

Is it expensive to have a phone? Why?

- Yes

Do you wish you had a better phone? Why?

- Would prefer another phone

Which mobile service provider do you prefer? Why?

- Cell C
- MTN

Name: Dorothy Age:18 Gender: Female

Reproductive Health

How do you access reproductive health information?

Here, explain step by step what happens in order for one to get the information? Map out the process. What triggers you or anyone to get RH information?

- A link maybe, phone, clinic, TV, books, talking with friends

How would you prefer to access reproductive health information?

Here the user must explain what they would change in the current process.

- The current way is just fine

Why do you need reproductive health information?

Here the user must explain why they need the information or why they think it is needed by everyone

- To be safe

Why is the information about reproductive health important to anyone and especially to you? User must give reasons why they would like to hear about the information

- To be safe

Who provides reproductive health information in Grabouw and would you prefer otherwise?

- The Clinic
- Elgin Learning foundation
- Schools
- Libraries
- Parents
- Friends
- Social networking

How do they provide reproductive health information and do they have supporting material and do you think it is effective?

- Pictures
- Pamphlets
- Some people can't read

Do they only provide reproductive health information or other information as well?

- Everything really

How do youth in the community of Grabouw currently access reproductive health information in general apart from how you do it?

- I am not sure

What reproductive health information is really important and is needed by the youth in Grabouw?

- HIV/AIDS
- Teenage pregnancy
- Create awereness

Mobile Technology

Do you have access to mobile technology and what are the benefits to you?

- Learn about everything
- Get information
- Stay in-touch with family and friends
- Share information
- Seek for advice

What are the different kinds of mobile technology do you have access to?

- Computers
- TV
- Radio
- Cell Phones
- Tablet

Do you have a cell phone and what kind of phone do you have?

- YES - Blackberry

What do you use your phone for?

- Calling
- Chatting
- Texting
- Time, calendar, alarm
- Entertainment – pictures, music, videos
- Internet

Is it easy to get a phone, where?

- The struggle is the money, not everyone can afford it

Is it expensive to have a phone? Why?

- Yes. Airtime

Do you wish you had a better phone? Why?

- I like my phone but can get a better one

Which mobile service provider do you prefer? Why?

- Cell C
- MTN

Name: Aviwe Age: 21 Gender: Male

Reproductive Health

How do you access reproductive health information?

Here, explain step by step what happens in order for one to get the information? Map out the process. What triggers you or anyone to get RH information?

- Use phone, Check internet when hears about friends sickness

How would you prefer to access reproductive health information?

Here the user must explain what they would change in the current process.

- Clinic, better to be educated

Why do you need reproductive health information?

Here the user must explain why they need the information or why they think it is needed by everyone

- To know

Why is the information about reproductive health important to anyone and especially to you? User must give reasons why they would like to hear about the information

- Focus on what's around

Who provides reproductive health information in Grabouw and would you prefer otherwise?

- Church
- Elders

How do they provide reproductive health information and do they have supporting material and do you think it is effective?

- Just talk
- Sensitivity

Do they only provide reproductive health information or other information as well?

- Drugs and Alcohol Abuse, Teenage Pregnancy

How do youth in the community of Grabouw currently access reproductive health information in general apart from how you do it?

- Clinic

What reproductive health information is really important and is needed by the youth in Grabouw?

- Sex Education

Mobile Technology

Do you have access to mobile technology and what are the benefits to you?

- Yes
- Information gathering and sharing

What are the different kinds of mobile technology do you have access to?

- Cellphone
- TV
- Radio
- Computer

Do you have a cell phone and what kind of phone do you have?

- Huawei

What do you use your phone for?

- Calling
- Texting
- Internet
- Pictures

Is it easy to get a phone, where?

- Yes, spaza shops

Is it expensive to have a phone? Why?

- No, Working
- Ladies work in the china shops or farms

Do you wish you had a better phone? Why?

- Yes, the one I have is embarrassing

Which mobile service provider do you prefer? Why?

- MTN

Name: Barryline Age:20 Gender: Female

Reproductive Health

How do you access reproductive health information?

Here, explain step by step what happens in order for one to get the information? Map out the process. What triggers you or anyone to get RH information?

- Alone on the phone

How would you prefer to access reproductive health information?

Here the user must explain what they would change in the current process.

- Happy with the current ways

Why do you need reproductive health information?

Here the user must explain why they need the information or why they think it is needed by everyone

- To know for protection

Why is the information about reproductive health important to anyone and especially to you? User must give reasons why they would like to hear about the information

- Protection

Who provides reproductive health information in Grabouw and would you prefer otherwise?

- Schools
- Libraries
- Temba care
- ELF

How do they provide reproductive health information and do they have supporting material and do you think it is effective?

- Yes

Do they only provide reproductive health information or other information as well?

- Work opportunities

How do youth in the community of Grabouw currently access reproductive health information in general apart from how you do it?

- Clinic, Friends

What reproductive health information is really important and is needed by the youth in Grabouw?

- HIV/AIDS
- Teenage pregnancy

Mobile Technology

Do you have access to mobile technology and what are the benefits to you?

- Chatting
- Look for and sharing of information
- Keeping in touch

What are the different kinds of mobile technology do you have access to?

- Computers
- TV
- Cell Phones

Do you have a cell phone and what kind of phone do you have?

- Nokia H2-02

What do you use your phone for?

- Chatting
- Calling
- Smsing
- Music
- Pictures
- videos

Is it easy to get a phone, where?

- Yes, shops

Is it expensive to have a phone? Why?

- Not expensive

Do you wish you had a better phone? Why?

- Yes, so I can whatsap and mixit

Which mobile service provider do you prefer? Why?

- MTN

Group Interview

Reproductive health

Do you have access to reproductive health information?

- Yes, the information is very accessible.

How do you access the reproductive health information?

- By going to the clinic to get the information one needs
- Some information is brought to us by peers and health workers
- Some through talks at schools

Do you think you need this information?

- Yes, we need this information, if one is not informed it could be dangerous for their health.
- It always better to know.

How relevant is the information about reproductive health to you?

- Very important, it helps one improve their health status.

Who provides reproductive health information in Grabouw?

- The day Care Centre – sensitivity is considered
- Clinic
- ELF – Elgin Learning Foundation
- Some Parents – Parents need to talk to their children about reproductive health
- Friends – need evidence or supporting material

How do they provide reproductive health information?

- Books at school
- Pamphlets
- Love life books

How often do they provide reproductive health information?

- Not very often
- AIDS day
- Come to schools to give talks and books
- Walk around (health promoters)

What kind of information about reproductive health do they provide?

- Cancer, HIV, Teen Pregnancy, Drugs Abuse, Alcohol Abuse, Sex, Condoms Use, Pap smears, Family Planning

What other information do they provide?

- TB, BP, Abortions, Clinic. Abortion services not available in the community, clinic is only for observations and referrals.

In what way do they provide any information?

- Presentations
- Gatherings
- Projection on screen

Mobile Technology

Do you have access to mobile technology?

- Yes

What are the different kinds of mobile technology do you have access to?

- Mixit, Twitter, Facebook, Whatsap, BBM, 2go, Youtube, Google

Do you have a cell phone?

- Yes, not everyone has a cellphone

What kind of phone do you have?

- The kind that has access to the internet

Is it easy to get a phone?

- Very easy

For what do you use your phone?

- Chatting, time, calendar, music, radio, video, games, pictures, Bluetooth, Google

Is it expensive to have a phone? Why?

- Yes, buying credit, calling is expensive

Do you wish you had a better phone? Why?

- Love the phone

Where can you get a phone?

- Game, Pep Stores, Jet, MTN shop, fashion express

Which mobile service provider do you prefer? Why?

- MTN
- Cell C

Appendix 5: Informed consent form in English

Hedvig Iipito; hiibizz@gmail.com; 0604388447; Cape Peninsula University of Technology; MTech: IT

[Informed consent form for youth from Grabouw invited to participate in a focus group for a research project intended to collect qualitative data using service design methods and tools to design a mobile-based service to promote reproductive health for youth.]

Introduction

I am Hedvig Iipito, studying towards a Masters degree in information technology at the Cape Peninsula University of Technology. I am doing research to co-create a mobile-based service with the youth of Grabouw to promote reproductive health. Reproductive health addresses all the reproductive processes and system at all stages of life, it enables people to have responsible, satisfying and safe sex lives and the capability to reproduce.

Purpose of the Research

The biggest issue that faces the youth in sub Saharan Africa is the issue of sexual and reproductive health. There is a big need to promote disease prevention and a choice to live healthy lives. In order to do so, services that are useful and usable by the intended community need be collaboratively designed by the community to ensure the success of the designed service. That is exactly what this research project aims to achieve.

Type of Research Intervention

This research project will involve your participation in a focus group discussions, activities, and interviews. It will take place for 2 to 3 hours per day for 2 days.

Participant Selection

You are being invited to take part in this research, because of your experience in the community as youth. Your participation will immensely contribute to this research project.

Voluntary Participation

Your participation in this research is voluntary. It is your choice whether to participate or not and you are free to withdraw at any given point during the research process. In addition, take note that this research project will not negatively affect you in any way.

Confidentiality

Information about you will not be shared with anyone outside of the research team. The information that is collected from this research project will be kept private. If need be, you will be asked for permission.

Anonymity

Any information about you will have a number on it instead of your name. Only the researcher will know what your number is when represented in the report.

Certificate of Consent

I have read and understood the information about the project, as provided above. I have been given the opportunity to ask questions about the project and my participation. I voluntarily agree to participate in the project. I understand I can withdraw at any time without giving reasons. I give permission for picture taking as well as voice & video recording.

I, along with the Researcher, agree to sign and date this informed consent form, and I have received a copy of this for future reference.

Participant: _____

Name of Participant

_____ _____ _____

Contact Number Signature Date

Researcher: _____ _____ _____

Name of Researcher Signature Date

Adapted from WHO for qualitative studies. Source: http://www.who.int/rpc/research_ethics/informed_consent/en/

Appendix 6: Informed consent form in Afrikaans

Hedvig Iipito; hiibizz@gmail.com; 0604388447; Cape Peninsula University of Technology; MTech: IT

[Hierdie is ‘n ingeligte toestemming vorm vir die jeug van Grabouw wie genooi is om deel te neem aan 'n navorsings projek wat gebruik maak van diens ontwerp (“service design”) metodes en instrumente. Die doel van die navorsing is om a selfoon-gebaseerde diens te ontwerp om seksuele gesondheid (“reproductive health”) te bevorder onder die jeug.

Inleiding

My naam is Hedvig Iipito en ek studeer vir ‘n Meesters Graad in Inligtingstegnologie by die Kaapse Skiereiland Universiteit van Tegnologie (Cape Peninsula University of Technology). Ek doen my navorsing oor die mede-skepping van 'n selfoon-gebaseerde diens vir die jeug van Grabouw. Die doel van hierdie diens is om seksuele gesondheid te bevorder. Seksuele gesondheid bemagtig mense met betrekking tot 'n verantwoordelike, bevredigende en veilige seks lewe en die vermoë tot voorplanting.

Doel van die navorsing

Die grootste kwessie wat die jeug van in Sub-Sahara Afrika aanstaar is die kwessie van seksuele en reproduktiewe gesondheid. Daar is 'n groot nood aan die bevordering van siekte voorkomings kennis en metodes as ook bemagtiging van die keuse om 'n gesonde lewe te leef. Om dit te kan doen is dit nodig om dienste wat nuttig en bruikbaar is deur die bestemde gemeenskap saam te onwerp. Dit is presies wat hierdie navorsingsprojek beoog.

Tipe van navorsings ingryping

Hierdie navorsingsprojek behels jou deelname in 'n fokusgroep, besprekings, aktiwiteite en onderhoude. Dit sal plaasvind vir 2 tot 3 ure per dag oor 2 dae. U word uitgenooi om deel te neem in die navorsing, as gevolg van u ervaring in die gemeenskap as 'n jeugtige. U deelname sal geweldig bydra tot die projek.

Vrywillige Deelname

U deelname aan hierdie navorsing is vrywillig. Dit is u keuse as u will deelneem of nie en u is vry om te onttrek gedurende die navorsingsproses. Bykomend, neem asseblief kennis dat hierdie navorsingsprojek u geensins negatief sal beïnvloed nie.

Vertroulikheid en beskerming van identiteit

Inligting oor u sal nie gedeel word met individue buite die navorsingspan nie. Die inligting wat deur die navorsing ingesamel word sal privaat gehou word. As dit wel nodig is om inligting oor u te deel, sal u gevra word vir toestemming.

Enige inligting wat oor u versamal word sal 'n nommer in plaas van u naam hê om dit te identifiseer. Slegs die navorser sal weet wat u nommer is wanneer die inligting verteenwoordig word in die uiteindelike verslag.

Sertifikaat van Toestemming

Ek het die inligting hierbo gelees en ek verstaan dit. Ek is die geleentheid gegee om vrae te vra oor die projek en my deelname daarin. Ek het vrywillig ingestem om deel te neem aan die projek. Ek verstaan dat ek kan enige tyd onttrek sonder motivering. Ek gee toestemming dat fotos van myself geneem kan word sowel as stem en video-opname.

Ek, saam met die navorser, stem ooreen om die ingeligte toestemming vorm te onderteken en te dateer, en ek het 'n afskrif van die vorm ontvang vir toekomstige verwysings.

Deelnemer: _____

Naam van deelnemer

_____ _____ _____

Kontaknommer Handtekening Datum

Navorser: _____ _____ _____

Naam van navorser Handtekening Datum

Adapted from WHO for qualitative studies. Source: http://www.who.int/rpc/research_ethics/informed_consent/en/

Appendix 7: Informed Consent form in Xhosa

Hedvig Iipito; hiibizz@gmail.com; 0604388447; Cape Peninsula University of Technology; MTech: IT

[Isazisi sesivumelwano nolutsha lwase Grabouw oluthe lacelwa ukuba lithathe inxaxheba kwindibano. Oku kukuqokelela ulwazi malunganophando oluqhubayo kusentyenziswa izixhobo zoqulunqo nkonzo (service design) ukuqokelela ukwazi malunga nokuqulunqwa kwenkonzo ekwicala lemfono-mfono injongo ikukuphuhlisa impilo ephucukileyo]

Intshayelelo

Igama lam ndingu Hedvig Iipito, ndifundela imfundo enomsila kwicala lenzulu lwazi nobuchwepheshe kwidyunivesithi Cape Peninsula University of Technology. Ndenza uphando malunga nokwenziwa kwenkonzo ekwicala lemfono-mfono nolutsha lwase Grabouw ukuphuhlisa impilo ephucukileyo, iquka zonke inqubo zophuhliso lwempilo kuwo wonke amanqanaba okuphila. Yenza bakwazi abantu bakhathale kwaye bafunde ngesondo olukuselekileyo kwaye olonelisayo.

Injongo zophando

Ulutsha lubhekene nengxaki enkulu kwisithili sombindi iSaharan Africa, iingxaki zesondo, ukubeleka nokukhulisa umntwana ngokusempilweni. Ngoko ke kuyimfuneko ukukhusela ubomi bakho kwizifo nokukhetha ukuphila ubomi obusempilweni nobungenamakhwiniba. Ngokwenza njalo, kufuneka kuqulunqwe ngobanjiswano ekuhlaleni inkonzo ezisebenzayo nezifikelelekayo, ukwenzela eliphulo le service design libeyimpumelelo. Yiyo lonto kwenziwa oluphando, injongo kukuphumelela oluqulunqo lwenkonzo.

Intlobo yobandakanyo kuphando

Oluphando lufuna uluvo lwakho apho uzothatha inxaxheba kwingxoxo, kunye nemibuzo.Yonkelonto izothatha iiyure ezimbini ukuya kwezintathu, kwintsuku ezimbini.

Ukhetho lokuthath' inxaxheba

Umenyiwe ukuba uthathe inxaxheba koluphando ngokuba unolwazi namava njengolutsha lwalapha ekuhlaleni kwaye, ukuthatha inxaxheba kwakho koluphando kundadlala indima enkulu.

Ukuzigqatsa kwabathathi nxaxhe

Kukuthanda kuwe ukuba uthathe inxaxheba okanye ungayithathi kwaye unelungelo lokuyekaphakathi ukuba uyafuna okanye uyabona ukub' awuzivamnandi ngalento yoluphando. Kodwa funeke wazi ukuba lenquboyoluphando ayizubanomphulela ombi kuwe kokoke ungabinaxhala.

Incukacha ezibucala

Ulwazi nencukatha ozikhuphileyo zizohlala emfihlakalweni, azinokwaziwa ngumntu ongathathi nxaxheba kuphando. Lonke ulwazi oluthe lwafunywana koluphando lothi lugcinw' emfihlakalweni.

Imfihlelo

Zonke incukacha ozikhuphilelyo zothi zibese mfihlakalweni ngokuthi zibekwe inani ukufihla igamalakho. Ngumpandi yedwa oyobanelungelo lokwazi ukuba inani limele igama likabani.

Iphepha lesivumelwano

Ndiyendafunda konke endifuna ukukwazi malunga noluphando, kwaye ndiyendafumana ithuba lokubuza into endinga yicacelwanga. Ngokoke ndiyavuma ukuthatha inxaxheba kulenqubo yoluphando kwaye ndiyazi ukuba ndingabekaphantsi naninina, ndinika imvume yokuba ndithathwe imifanekiso kwayendishicilelwe.

Mna, nomphandi siyavumelana ngokuthi ndityikitye ndibeke nomhla kwesisi vumelwano, Kwaye ndinazo impepha ezichaza isivumelwano

Umthathi nxaxheba: _____

Igama lomthathi nxaxheba

_____ _____ _____

Inombolo zomnxeba Tyikitya Umhla

Umphandi: _____ _____ _____

Igama lomphandi Tyikitya Umhla

Adapted from WHO for qualitative studies. Source: http://www.who.int/rpc/research_ethics/informed_consent/en/

Appendix 8: Paper acceptance at PDC conference 2014 - Namibia

-----Original message-----

From: shortpaper@pdc2014.org

Sent: Fri 13-06-2014 08:23

Subject:PDC 2014 Short Papers notification - #114

To: iipitoh@polytechnic.edu.na;

CC: admin@pdc2014.org;

> Dear Hedvig Iipito -

> Please accept our apologies for the missing reviews in the previous e-mail. We hope to have fixed the problem by now.

> We received 54 submissions for the Short Paper track. All submissions had three anonymous reviews and a meta-review. At the Programme Committee meeting last week, 19 papers were accepted for PDC 2014.

> We are glad to confirm that your short paper 114 - Youth Empowerment: The Role of Service Design and Mobile Technology in Accessing Reproductive Health Information.

> has been accepted to PDC 2014 Short Papers. We remind you that the camera-ready version of the paper, modified according to the reviewer suggestions, is due by August 5th.

> We are happy that you considered PDC a venue for your research, and we are looking forward to attend you presentation and see you in Windhoek, Namibia in October 2014.

> We remind you that at least one author for each paper has to have registered for the conference by August 5th to have an accepted paper included in the Proceedings.

> Sincerely,

> Claus Bossen, Maurizo Teli, PDC 2014 Short Papers

> shortpaper@pdc2014.org

Appendix 9: Paper acceptance at AHILA conference 2014 – Tanzania

ASSOCIATION FOR HEALTH INFORMATION AND LIBRARIES IN AFRICA
TANZANIA CHAPTER (AHILA TZ)

Tel: +255 712 202320
+255 766 268 578
E-mail: ahilatzchapter@gmail.com
Website: www.ahila-tz.org
(All letters should be addressed to
The Secretary General)

P. O. BOX 650012,
DAR ES SALAAM,
TANZANIA.

Ref. No. AHILA/TZ/CONF/AB/ 20 **9th October, 2014**

Dear,
Hedving Mendonca

RE: INVITATION LETTER FOR 14TH CONGRESS OF THE ASSOCIATION FOR HEALTH INFORMATION AND LIBRARIES IN AFRICA (AHILA14TH)

Thank you for showing interest in participating at the AHILA-14th Congress which will be held from **20th -24th October 2014 in Dar es Salaam, Tanzania.**

We are pleased to inform you that your paper titled "**Reproductive Health Access for Youth at Risk the role of mobile based services.**" has been accepted for presentation. The date and time of your presentation will be communicated to you at a later date. The time allocated for presentation will be a maximum of 15 minutes to be followed by a panel discussion at the end of each session. Your presentation should be in power point format. The deadline for submitting your paper or poster is 30th September 2014. This will help us to produce the conference proceeding early before the conference.

Kindly use the following format for writing your paper:

- Background and rationale
- Research objectives
- Research methods
- Results/ preliminary results
- Relevance/impact on policy and practice
- Conclusion

Remember also to register for the conference and pay registration fee to bank name: National Microfinance Bank, Bank House Branch, and Account No. 20102300229 SWIFT CODE: **NMIBTZTZ**

Kindly confirm your participation and attendances by latest 20th September 2014 to enable us include your paper in the final programme.

Looking forward to meet you in Dar es Salaam.

Regards,

Haruna Hussein
Secretary General
AHILA TZ CHAPTER
+255753559063
ahilatz@gmail.com