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Shaping meaningful ICT4D solutions using design science research: a social shaping of technology framework based on the capability approach

by

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Abstract

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Keywords: ICT for development, ICT4D, design science research, DSR, capability approach, social shaping of technology, self-documentation, design thinking, community informatics, ICT4D and women

ICT4D research is criticised on the one hand for being technology driven and on the other hand for becoming a social science concerned with creating theories of explanation without engaging with technology. Both criticisms have disengagement with the beneficiary community and a lack of understanding of their worldview in common.

It is estimated that almost eight million people live in urban slums in South Africa and that 39.2 per cent of urban residents are poor. Poverty is multidimensional with people experiencing economic poverty, time poverty and information poverty. Development requires some kind of action and needs information to set the development process in motion. An expansion of choice and the ability to enact choice are the outcomes of development. In order to become aware of choices and support the ability to enact choices that can lead to development outcomes and an experience of the good life, access to information is required.

The problem that the study addresses is how should the information needs that are meaningful to women working as domestic workers, be effectively translated through the use of ICT in order to enhance their experience of the good life as defined by Sen's capability approach and to contribute to the success and social value of ICT4D projects. The objective of this study is to create a framework to surface information needs of people in developing communities in a more effective way. Women working as domestic workers in an urban environment represent a developing community.

The study participants are a group of women working as domestic workers and a selected group of organisations in South Africa. The organisations are included to evaluate the study's framework and to provide a perspective on information inclusivity. The organisations were selected using purposive sampling based on their projects that effect people as represented by the group of women participating in the study.

The study is a mixed method ICT4D study that uses design science research (DSR) and case study research in the pragmatic tradition and applies the capability approach and social shaping of technology theories. The artefact is the Community Shaping Solutions Framework (CSSF) as a contribution towards increasing the success of ICT4D projects. The CSSF's contribution is a response to the criticisms against ICT4D by applying the social shaping of technology and the capability approach theories and suggesting a human-centered approach. The CSSF draws on the capability approach as a way to measure development and the social shaping of technology theory for the positive role in integrating people and technology concerns by offering a greater understanding of the relationship between scientific excellence, technology innovation and social well-being.

The CSSF contributes to knowledge as a theory of design and action. The novelty of the CSSF is the combination of DSR with ICT4D, the use of journals as a self-documentation technique to collect data, followed by a design thinking workshop and interviews. The effectiveness of the CSSF and utility to the community of users are demonstrated through the participatory approach to facilitate the community to shape solutions that they value and the empowerment experienced through both the activities as well as the impact of the solution as an expansion of choice.

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A doctoral journey is both a lonely experience and a group excursion. On my journey I am fortunate to have the support of the most proficient tour leader in the form of prof Carina de Villiers as my supervisor. I am grateful for her guidance and clarity that settled a few storms in my travels. I appreciate her involvement with my study for example when she facilitated one of the groups in the design thinking workshop.

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I see my parents, parents-in-law and close friends as part of my tour group on this journey. I cannot ask for more loyal supporters and reminders that I can complete this journey.

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I am grateful for the lonely experience too and for the many lessons and empowerment that it gave. The doctoral journey is not only in pursuit of academic knowledge and contribution, but also to personal development and my own expansion of choice. It gave me hope.

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List of Abbreviations

4D	For development
ANT	Actor-network theory
CAS	Complex adaptive systems
CI	Community informatics
CPA	Consumer Protection Act
CSSF	Community Shaping Solutions Framework
DDI	Digital Doorway Initiative
DE	Design ethnography
DSR	Design science research
DSRIS	Design science research in information systems
DSRIS4D	Design science research in information systems for development
DT	Design theory
FLO	Fairtrade Labelling Organizations International
HCD	Human centered design
HDI	Human development index
I4D	Informatics for development
ICT	Information and communication technology
ICT4D	Information and communication technology for development
ICT4G	Information and communication technology for good
ICT4RD	Information and communication technology for rural development
ICT4RED	Information and communication technology for rural education development
ID	Identity
IDI	ICT development index
ILO	International Labour Organisation
IP	Intellectual property
IS	Information systems
IT	Information technology
MDG	Millennium development goals
PC	Personal computer
POPI	Protection of Personal Information Act
PPP	Purchasing power parity
RUMEP	Rhodes University Mathematics Education Project
SCOT	Social construction of technology
SDG	Sustainable development goals
SMS	Short message service
SRQ	Secondary research question
SST	Social shaping of technology
UTAUT	Unified theory of acceptance and use of technology

Chapter 1 – Introduction

1.1 Background information

Poverty is the deprivation of basic capabilities rather than merely the lowness of incomes (Sen, 1999). In South Africa, 16.5 million people are living below the poverty line including 39.2 per cent of urban residents (Statistics South Africa, 2010; UN-Habitat, 2016). The proportion of the population with an income below ZAR269 per month indicates the poverty line (Statistics South Africa, 2010). Poverty is multidimensional with people experiencing economic poverty, time poverty and information poverty (Britz, 2004; Chopra, 2015).

It is a basic human trait to desire to help less fortunate people (Shermer, 2005; Weber, 2009). This is a visible theme in research and described as "development", and more specifically the use of technology to enable development, referred in research and in practice as information and communication technology for development, with the acronym as ICT4D or ICT4RD for rural development. ICT4D research draws on the domains of information systems (IS), computer science and development studies (Heeks, 2008).

The eight Millennium Development Goals (MDGs) is a key driver of international development since the early 2000s ending in 2015 and was the world's first global agenda designed to propel human development forward on multiple fronts (United Nations Development Programme, 2016a). South Africa also embraced the MDGs into a national set of ten priorities (Statistics South Africa, 2010). The MDGs are replaced by the Sustainable Development Goals (SDG) in 2016 to be achieved by all countries and stakeholders by 2030 (United Nations Development Programme, 2016a).

The SDGs are seventeen interconnected goals building on the successes of the MDGs, while including new areas such as climate change, economic inequality, innovation, sustainable consumption and peace and justice. They are unique in that they cover issues that affects all people and ambitious in making sure no one is left behind (United Nations Development Programme, 2016a). The SDGs state that to realise sustainable development, countries need technologies and innovations that reconcile growth with environmental and social objectives that is possible only if essential technologies are made affordable and accessible to all (United Nations Development Programme, 2016a). The 17th SDG is partnerships for the goals that can be the motivation for countries to share essential innovations and improve access to technology and knowledge (United Nations Development Programme, 2016a).

The reduction of poverty is one of the MDGs and the first SDG. Throughout the MDGs and the SDGs, the role of women are intertwined, such as in the eradication of extreme poverty and hunger,

promoting gender equality, and the various health related goals. Specifically, "Gender equality" is the third MDG and the fifth SDG (Sachs & McArthur, 2005; Statistics South Africa, 2010; United Nations Development Programme, 2016b). The Heads of States of the African Union have announced 2010-2020 as the decade for the African Woman in recognition of her role in combating poverty and stimulating sustainable development (Government Communications, 2010). Women still face discrimination in labour markets, accessing productive assets, and private and public decision-making. While three quarters of working-age men worldwide participate in the labour force, only half of working-age women do. Women are also more likely to be poor in many developing countries (United Nations Development Programme, 2016a; 2016b). The importance for research on the role of women in connection with information and communication technology (ICT) in developing countries has been identified as crucial to accelerate sustainable development (United Nations Development Programme, 2016b; Walsham, Robey, & Sahay, 2007). Empowering women and girls have a multiplier effect, and helps drive economic growth and development forward (United Nations Development Programme, 2016b). Women are the catalyst for social change.

Access to information is crucial to reach the development goals with ICT as the delivery vehicle. The need exists for the effective application of ICT to positively influence the lives and livelihoods of poor people and marginalised communities (Unwin, 2009). In addition, the World Bank stated that ICT has an essential role to play in poverty alleviation and achieving development goals. To quote from the World Bank Working Paper: "No longer are information and communication networks and services luxuries for developing countries – they are now a necessity" (Guislain, Ampah, Besancon, Niang, & Serot, 2005).

The United Nations Human Rights Council (2011) opened a discussion if access to the Internet should be a human right, similar to freedom of expression and access to information. It can be argued that access to the Internet is a way to a means and the focus should not be on the technology; it should be on the information accessed and created. Access to information is protected in South Africa through the Constitution, the Promotion of Access to Information Act and the Protection of Personal Information Act (The Presidency, 1996; 2000; 2013).

However, care should be taken not to pursue ICT for the sake of ICT. Many failed ICT initiatives bears witness to the misalignment between the research goals and the community's requirements (Avgerou, 2008). The only way these ICT initiatives can be sustainable is if the needs of the users are understood and the embedded technologies deliver on the needs in appropriate ways (Unwin, 2009).

The success of a society can be measured by the substantive individual freedoms that the members of that society enjoy, as opposed to traditional normative approaches that focus on other variables such

as utility, procedural liberty or real income. Greater freedom enhances the ability of people to help themselves and also to influence the world – central to the process of development (Sen, 1999). Development is therefore the expansion of the capabilities of persons to lead the kind of lives they value, and have reason to value. Sen (1999) defines capability as "*A person's capability refers to the alternative combinations of functionings that are feasible for her to achieve. Capability is thus a kind of freedom: the substantive freedom to achieve alternative functioning combinations*." This approach to development as freedom is referred to as Sen's capability approach with ICTs as a commodity to achieve alternative combinations of functionings.

1.2 Problem statement

According to Statistics South Africa, South Africa has an estimated population of 55.91 million with 46.3 per cent of the population living in rural areas with an increasing rate of urbanisation and urban poverty (Statistics South Africa, 2016). It is estimated that almost eight million people live in urban slums in South Africa and that 39.2 per cent of urban residents are poor (UN-Habitat, 2016). Findings from analysing data from the South African labour market for the period 2001 to 2012, show that income inequality has risen, unemployment remains high, and employment for low and unskilled workers has declined (Bhorat, Goga, & Stanwix, 2014). There is an estimated number of 67 million people working as domestic workers worldwide of which 80 per cent are female (International Labour Organisation, n.d.). In South Africa about a million people, mainly black women, are employed as domestic workers and earn minimum wages (Budlender, 2010).

As indicated by South Africa's human development index (HDI) of 0.629 (rank 121), South Africa has a medium level of human development, varying between the nine provinces from a high level of human development (Gauteng and Western Cape) to a low level of human development (Limpopo). In addition, South African cities are recognised as the most unequal cities in Africa with a significant gap between rich and poor residents (UN-Habitat, 2016). The HDI is a summary composite index that measures a country's average achievements in three basic aspects of human development: health, education, and income. South Africans have a life expectancy of 53.4 years, an average of 8.5 years of schooling and a gross national income per capita, expressed in purchasing power parity US$ (PPP US$), of PPP US$9 594 (United Nations Development Programme, 2013). An application of the HDI is to indicate specific areas in South Africa where human development programs and policies should be prioritised.

The government of South Africa recognises the importance of human development and uses a collection of indicators to measure the impact of human development programs. The human development programs are based on three pillars namely strengthening the skills and human resource base, improving the health profile of all South Africans and build cohesive, caring and sustainable

communities (Republic of South Africa, n.d.). In addition, the Department of Public Service and Administration of South Africa published a guideline to improve geographic access to government service points (DPSA, 2012). The long distances required to travel to obtain services and information needed from government and the multiple service points that must be visited to access related government services are some of the challenges listed in the guideline. It remains a government priority to improve service delivery, especially services that improve the lives of poor and marginalised people (DPSA, 2012).

As stated by the DPSA guideline, the information is located in Government offices and on Government websites. Both of these locations are difficult for women in developing communities to reach. The women's mode of transport is mostly public transport that has a significant cost implication and is often not affordable for people who live near the poverty line. Internet access is not common for the women, stunted by the high costs of telecommunications, broadband and home computers (Calandro, Gillwald, & Rademan, 2014; Calandro, Gillwald, Moyo, & Stork, 2010; RIA, 2016; Tariffic, 2016). In contrast to fixed line telecommunication access, South Africa experiences a growth in the use of cell phones that are becoming ubiquitous in households. The share of households with a cellular telephone rose by 7.3 percentage points between 2010 and 2014 reaching 95.7 per cent in 2014 with 43.5 per cent of South African adults (age 18+) using the Internet in the last year (ICASA, 2016).

In addition to the demographics of South Africa, access to cell phones and the need to improve the access to Government services and information, many failed ICT4D projects indicate that there is a problem with how ICT4D projects are implemented (Avgerou, 2008; Unwin, 2009; Weber, 2009).

The objective of this study is to create a framework to surface information needs of people in developing communities in a more effective way. Women working as domestic workers in an urban environment represent a developing community. In order to achieve this objective, the following need to be considered:

- Understand what is meaningful information;
- Determine if change is needed from the current practice of fulfilling information needs;
- Understand if information inclusivity is important to organisations that are primary information providers; and
- Confirm the relevance of this study to the development agenda through the lens of Sen's (1999) capability approach.

Given this background, the problem addressed in this research is how should the information needs that are meaningful to women working as domestic workers, be effectively translated through the use of ICT in order to enhance their experience of the good life as defined by Sen's capability approach (1999) and contribute to the success and social value of ICT4D projects.

1.3 Research questions

1.3.1 Primary research question

The study seeks to examine the primary research question: How should the information needs that are meaningful to women working as domestic workers, be effectively translated through the use of ICT?

1.3.2 Secondary research questions

The secondary questions that support the primary research question are:

1. What is meaningful information for the group of women?
2. How are the information needs of the group of women currently fulfilled?
3. What are the existing organisational views on information inclusivity with reference to developing communities?
4. How can access to information through the use of ICT contribute to the experience of the good life as defined by Sen's capability approach?

1.3.3 Clarification of concepts used in the research questions

The research questions use these concepts within the following context:

- **Information needs**: Information is a development resource (as explored in Chapter 2). People have different needs or requirements for information to enable choice. Roman and Colle (2003) suggest that continual research on community information needs must be conducted so that appropriate information resources can be developed.
- **Meaningful information**: One of the criticisms against ICT4D projects is the technology determinism. Often information services are not use by the targeted local population due to the lack of understandable and relevant content (Roman & Colle, 2003). Meaningful information is a collective term for information that is useful or valuable to a person.
- **Effectively translated through the use of ICT**: Information surfaced through ICT must be relevant and consumable (language, useful and affordable) in order for people to find it meaningful and the ICT delivery to be effective. The social shaping of technology theory is applied to guide the study and enhance the effectiveness of the study's framework.
- **Sen's capability approach**: The capability approach is a broad normative framework for the evaluation and assessment of individual well-being and social arrangement. The focus is on what people are effectively able to do and to be – their capabilities. Development is

therefore the expansion of the capabilities of persons to lead the kind of lives they value, and have reason to value. Development requires some kind of action and needs information to set the development process in motion. An expansion of choice and the ability to enact choice are the outcomes of development. The capability approach is relevant to the study because in order to become aware of choices and support the ability to enact choices that can lead to development outcomes and an experience of the good life, access to information is required. The capability approach and applications of the capability approach are explored in Chapter 2.

- **Information inclusivity**: There is a relationship between organisations as custodians of information and people as consumers and producers of information. The information can be public information about products and services or private information about customers and transactions. The policies of the organisations to allow interaction with information are described as information inclusivity.
- **Domestic workers**: People who are employed to work in homes providing services such as cleaning, cooking and caring. There is an estimated number of 67 million people working as domestic workers worldwide of which 80 per cent are female (International Labour Organisation, n.d.). A domestic worker may work on full-time or part-time basis; may be employed by a single household or by multiple employers; may be residing in the household of the employer (live-in worker) or may be living in his or her own residence (live-out). Domestic workers may be working in a country of which they are not nationals, thus referred to as migrant domestic workers (International Labour Organisation, n.d.).

1.4 Research methodology

1.4.1 Research philosophy

The research is conducted in the pragmatic tradition. Pragmatism view the meaning of an idea or concept as the practical consequences of the idea or concept (Hookway, 2013). It denies such things as functions and intentions and rejects the rigid subject-object divide (Rammert, 1999). Pragmatism is associated with action, intervention and constructive knowledge that is appreciated for being useful in action with practical value (Goldkuhl, 2007; 2012). Goldkuhl (2012) describes constructive knowledge as a collection of knowledge forms that includes descriptive, explanatory, prescriptive, normative and prospective knowledge. A pragmatic study is concerned with how things work, what works and what does not work (Goldkuhl, 2007). Action is the way to change existence (Goldkuhl, 2004).

1.4.2 Research approach

The study follows an inductive research approach where the data are collected and a theory is created as a result of the data analysis. An induction approach emphasises that the researcher gains an

understanding of the meanings humans attach to events with the realisation that the researcher is part of the research processes and follows a more flexible structure to permit changes of research emphasis as the research progresses (Saunders, Lewis, & Thornhill, 2009).

1.4.3 Research strategy

The research strategy is a combination of design science research (DSR) and case study research strategies. Design science research, also referred to as design and creation research strategy (Oates, 2006), focuses on the construction of a wide range of socio-technical artefacts such as decision support systems, modelling tools, governance strategies, methods for IS evaluation, and IS change interventions (Gregor & Hevner, 2013). Design thinking methods are used with the research participants to define the information needs they find meaningful and design an artefact following the three design science research cycles namely the relevance cycle, the design cycle and the rigor cycle (Hevner, 2007).

The case study is a research strategy which focuses on understanding the dynamics present within single settings (Eisenhardt, 1989; Myers, 2009; Payne & Payne, 2004). Case study research can be used to describe, test or build theories (Eisenhardt, 1989). A characteristic of a case study is that the case is studied in depth, using a variety of data generation methods, to obtain a rich, detailed insight into the "life" of that case and its complex relationships and processes (Oates, 2006). The case study is within the relevance cycle and the design cycle of the design science research to understand the requirements and evaluate the artefact (Hevner, 2007).

1.4.4 Data collection methods

A group of women working as domestic workers and a selection of organisations participate in this study to provide different perspectives and facets to the study. The organisations are included to evaluate the study's framework and to provide a perspective on information inclusivity. The organisations were selected using purposive sampling based on their projects that effect people as represented by the group of women participating in the study. The data collection methods are predominately qualitative and described in detail in Chapter 3.

In summary, the data collection methods follow the design science cycles of relevance, design and rigor (Hevner, 2007) across the six steps in the design science research process (Peffers et al., 2006). Each cycle leans itself to relevant data collection methods such as interviews, participant observation, self-documentation and workshops using design thinking instruments as defined in the Human Centered Design toolkit (IDEO, 2012).

Hevner, March, Park and Ram (2004) define seven guidelines for design science research that highlight the importance of the artefact and the problem identification. Peffers et al. (2006; 2008)

define a design science research process based on the guidelines defined by Hevner et al. (2004) to provide a mental model as guidance for the application and evaluation of design science research projects with the first activity to identify the problem and justify the value of the solution. These guidelines and the process do not prescribe how to perform the activities and is complemented by the practical approach of design thinking.

Design thinking applies the way designers approach complex design problems to business problems and is a system of overlapping spaces of inspiration, ideation and implementation, rather than a sequence of orderly steps (Brown & Wyatt, 2010). It encourages an alternative way of thinking to consider "what might be?" and "how can we make it better?" (Beacham & Shambaugh, 2010) and complements design science research (Devitt & Robbins, 2013; Dolak, Uebernickel, & Brenner, 2013). Following the success of design thinking in solving complex business problems, IDEO (2012) codified the design thinking process resulting in the Human Centered Design toolkit methodology to assist non-governmental organisations in their work. The Human Centered Design methodology complements the activities of the design science research process and is used in this study to support the data collection activities.

Interviews are widely used in qualitative research to gather data. An interview is a guided conversation between the researcher and one or more people, referred to as interviewees or subjects with the purpose of gathering data. In a good interview, the researcher listens, prompts, encourages and direct interviewees to share rich insights into their worlds (Myers, 2009). Interviews are classified as structured interviews (adhering to a script), semi-structured interviews (guided by a script) and unstructured interviews (no script) (Myers, 2009; Myers & Newman, 2007). In this study, semi-structured interviews are used.

Participant observation is a data gathering technique where the researcher participates in and observes people in their natural setting; similar to fieldwork (Myers, 2009). Participant observation, also referred to as fieldwork, usually involves observing people who have a different culture or sub culture from the researcher and therefore involves a period of enculturation, a time where the researcher learns to become a member of another culture or sub culture (Myers, 2009).

1.4.5 Data analysis methods

Qualitative content analysis is used as a method to analyse the data collected during the various activities such as the self-documentation, interviews and workshops. Qualitative content analysis is a method for systematically describing the meaning of qualitative material (Schreier, 2012). The data analysis methods and process are described in Chapter 4.

1.5 Limitation and bias

The limitations observed in this study are linked to the nature of the study, the participants, the duration and the researcher. The study is a qualitative study that is limited to a small research population. The findings of the study cannot be generalised to a larger population due to the sampling size, however a qualitative study can contribute to theory (Myers, 2009). The research population is a group of women with 26 members working as domestic workers in Johannesburg and a selected group of six organisations in Pretoria and Johannesburg, South Africa. The selection is based on snowball sampling for the women and purposive typical case sampling for the organisations.

The data collection methods, self-documentation journals, interviews and workshops using the Human Centered Design methodology, are done in a combination of languages (English, isiZulu and Sesotho). As the researcher cannot converse in isiZulu and Sesotho, and relies on the cultural interpreter as the translator, some content and intent may be lost in translation.

Furthermore, time is recognised as a limitation as the study was conducted over a period of four months. The participants from the organisations expressed time constraints and their schedules, due to the nature of their roles at their organisations, made it difficult to secure appointments. The interviews at the organisations were limited by the length of time gifted by the interviewee with a minimum of one hour requested. To address this limitation, the researcher prepared the interviewees from the organisations using email correspondence and secured access to the interviewee for any clarification needed after the interview.

The researcher is also aware of her own limitations for academic research due to her limited experience and her own worldview, culture and interpretations that could influence the study. The research is viewed through the capability approach lens and may cause certain biases to emerge in the research findings.

1.6 The contribution to the field of Informatics

ICT for Sustainable Development is one of the four research focus areas of the Department of Informatics at the University of Pretoria (University of Pretoria, n.d.). The Department recognises the importance of ICT to bring sustainable socio-economic development to impoverished communities. This study contributes to the body of work on ICT for Sustainable Development as an African ICT4D study.

The field of ICT4D research is relatively young and are still evolving lacking rigorous research quality (Avgerou, 2009; Weber, 2009). The aim of this study is to contribute to the ICT4D field by creating a theory for design and action (Gregor, 2006). A theory for design and action says “how to do” something (Gregor, 2006).

The study is an ICT4D study that uses the design science research methodology and applies the capability approach and social shaping of technology theories. The artefact is the Community Shaping Solutions Framework (CSSF) as a contribution towards increasing the success of ICT4D projects. ICT4D projects are criticised for their technology deterministic approach and lack of understanding users' needs (Avgerou, 2008; 2009; Kleine & Unwin, 2009; Krauss, 2009a; 2013). The CSSF's contribution is a response to these criticisms by applying the social shaping of technology and the capability approach theories and suggesting a human-centered approach.

Design science research is a relatively new field in ICT research with Walsham (2012) and Österle et al. (2010) encouraging the application of design-orientated and mix-methods research. The CSSF artefact produced by this study is a contribution to and application of DSR.

This research will contribute to the ICT4D literature in a South African context as well as to the role of women in developing communities. It will also highlight the needs of affordable connectivity and access to meaningful information in an increasingly digital world that is causing further exclusivity.

Further contributions are summarised in Chapter 5 as a response to suggestions for future research in existing literature.

1.7 Map of the research

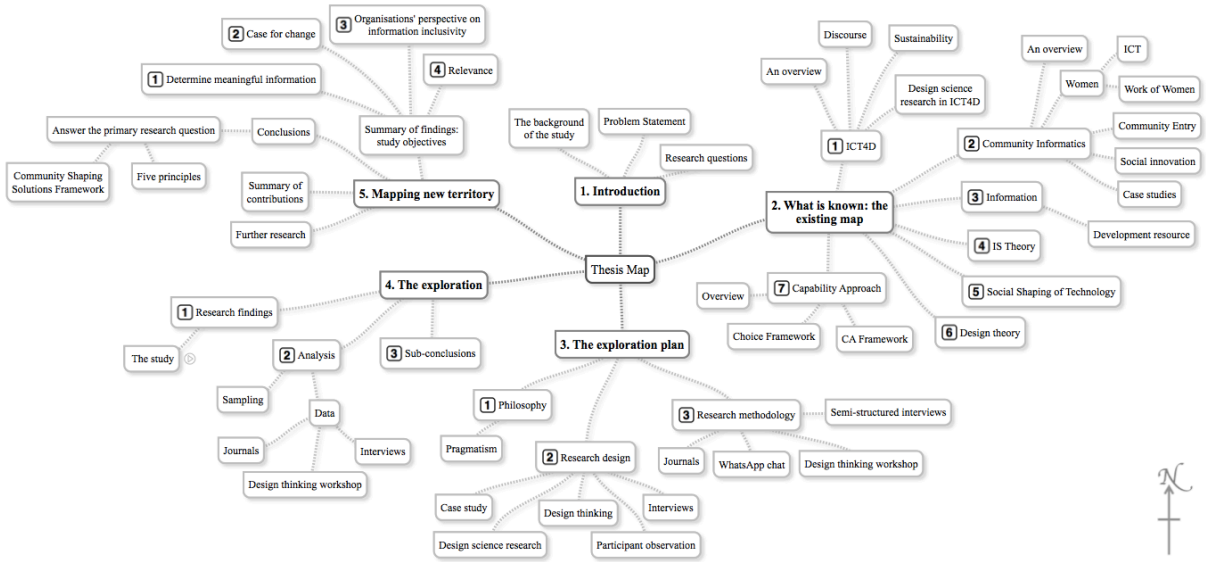

Figure 1.1. Map of the thesis structure

The study sets out to find an answer to the primary research question of how should the information needs that are meaningful to women working as domestic workers, be effectively translated through the use of ICT. The thesis is the result of this study and organised as mapped in Figure 1.1:

- Chapter 1 – Introduction

  Chapter 1 sets the scene for the study by way of exploring the background and problem statement that supports the primary and secondary research questions. It provides a brief overview of the research methodology, the limitations of the study and contributions.

- Chapter 2 – The existing map

  The existing map is explored through the reviewing existing literature. The method of finding the literature is explained, followed by a discussion of the literature organised in the relevant categories that support the research problem statement.

- Chapter 3 – The exploration plan

  This chapter explains the strategy that the researcher follows to explore the uncharted territory defined by the research problem statement. The exploration plan includes the research philosophy and methodology, the data sources, data collection procedures, collected data and data processing methods.

- Chapter 4 – The exploration

  The exploration preparation, activities, analysis and sub-conclusions are documented in this chapter. The exploration includes the submersion and surfacing interactions with the group of women and the interviews with the participating organisations as well as recording the organisations' reaction on the CSSF during the interviews.

- Chapter 5 – Mapping new territory

  The summary of the findings in response to the study objectives, the answer to the primary research question and the study's contribution to the body of work map the new territory discovered by the study. The thesis ends with suggestions for further research to continue the quest.

1.8 Conclusion

This chapter presents the problem statement, objective, research question, sub-questions and contributions. In the introduction, an overview of the reasoning behind the problem statement is positioned, to explain why women, information needs, access to information and ICT form the focus of the study, as well as the importance of Sen's capability approach as the lens through which this study is viewed. The next chapter describes the exploration of the existing map of knowledge following a collection of categories derived from the problem statement.

Chapter 2 – The existing map

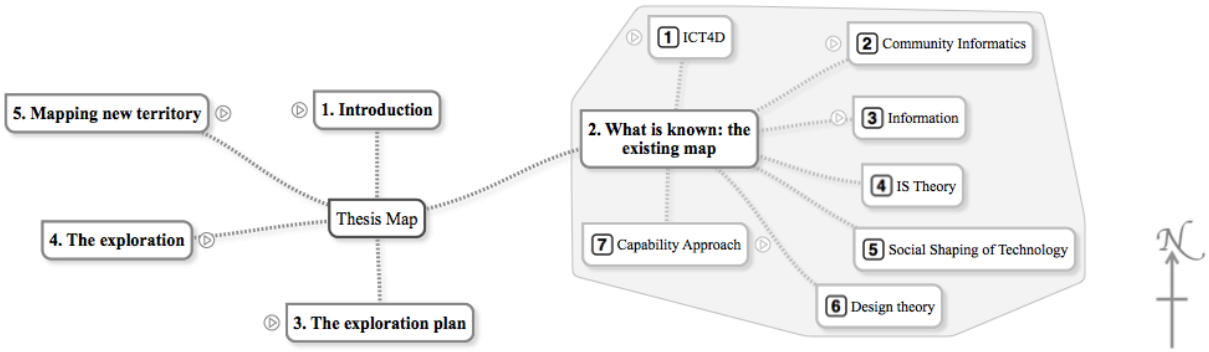

Figure 2.1. The focus of this chapter on the thesis map is what is known: the existing map

2.1 Introduction

Chapter 1 is the introduction to this study where the researcher discusses the background to the study, the problem statement that this study explores, the research questions, the research methodology, the limitations, the contributions to the field of Informatics and a general outline of the thesis as a map. This chapter continues the thesis journey by describing what is known through reviewing existing literature and supporting information. The method of finding the literature is explained, followed by a discussion of the literature, and is organised in the relevant categories that support the research problem statement as illustrated in Figure 2.1.

The literature that is included in this study is by no means an exhausted list of available literature on the subject. The researcher limits the search to the categories derived from the research question and sub-questions with anchor authors such as Sen for the capability approach, as discussed in the literature review strategy.

2.2 Literature review strategy

The researcher's journey on the subject matter of ICT4D, women development and ICT, Sen's capability approach and community entry started as part of her Masters in Information Technology dissertation with the University of Pretoria. The research study was presented at the Eighth International Development Informatics Association Conference and published in the conference proceedings (Grobler & De Villiers, 2014). This study expands on the collection of literature from the earlier dissertation by updating existing categories and adding categories for example DSR, community informatics (CI) and IS theories.

The problem addressed in this research is how should the information needs that are meaningful to women working as domestic workers, be effectively translated through the use of ICT in order to enhance their experience of the good life as defined by Sen's capability approach (1999) and

contribute to the success and social value of ICT4D projects. The categories selected for exploring the existing landscape on the subject, are: ICT4D, community informatics, information as a development resource, information systems theory, social shaping of technology, design theory and the capability approach. Within the broader ICT4D category, sub-categories for an overview, research discourse, sustainability, and DSR are explored. The concept of community and ICT4D are unpacked with an overview of CI, women and ICT in a developing context, the work of women, community entry, social innovation and a selection of case studies. The University of Pretoria's library online search facility is the starting point for all the searches using the categories as key words. Further, the articles' reference lists provided specific articles, conference proceedings and books that are included in this review. The number of resources per category with mention of the journal names and sub-categories are summarised in Table 2.1. The categories and sub-categories are used to structure the literature review as the sections and sub-sections and reflected in the headings.

Table 2.1. Summary of categories that guided the literature review

Category	Sub-category
ICT4D 88 resources from books, conference proceedings, and journals such as Computer; Development Informatics Working Paper Series; Geoforum; Information Technology for Development; Journal for Information Technology; Journal for International Development; MIS Quarterly; The Electronic Journal of Information Systems in Developing Countries; The Electronic Library; The Journal for Community Informatics; World Bank Publications.	Overview Discourses on research Sustainability DSR and ICT4D Towards I4D
Community informatics 65 resources from books, conference proceedings and journals such as Computer; Design Studies; Development; Development Southern Africa; Feminist Africa; Information Technology & People; Information Technology for Development; innovations; International Journal of Human Resource Management; International Journal of Tourism Research; Journal for Information Policy; Journal of Information Technology Case and Application Research; Stanford Social Innovation Review; Technology in society; The Electronic Journal on Information Systems in Developing Countries; The Information Society; The Innovation Journal: The Public Sector Innovation Journal; The Journal of Community Informatics.	Overview Women and ICT Work of women Community entry Social innovation Case studies

Category	Sub-category
Information 16 resources from books, conference proceedings and journals such as Information Technology for Development; International Journal of Education and Development using Information and Communication Technology; International Journal of Information Management; Journal of Information Science.	Resource for development
IS theories 11 resources from books, conference proceedings and journals such as Journal of the Association for Information Systems; MIS Quarterly; Journal of Information Technology Theory and Application; Educar.	Overview
Social shaping of technology 15 resources from books, conference proceedings and journals such as Academy of Management Journal; Current Sociology; Government Information Quarterly; Information Technology & People; International Journal of Social Research Methodology; Journal of Computer-Mediated Communication; Social Studies of Science; Society for Philosophy and Technology.	Overview, benefits, limitations Application
Design theory 14 resources from books and journals such as European Journal of Information Systems; Information Systems and e-Business Management; International Journal of Public Information Systems; Journal of Information Technology Theory and Application; Journal of Information Technology; Journal of the Association for Information Systems; MIS Quarterly.	Overview, benefits, limitations Application
Capability approach 23 resources from books, conference proceedings and journals such as Ethics and Information Technology; Information Technology & People; Information Technology for Development; International Journal of Education and Development using Information and Communication Technology; Journal of Human Development; Journal of International Development; Journal of Political Philosophy; MIS Quarterly.	Overview Application

Following, is a discussion on the articles, conference proceedings, books and statistical reports used as reference for this study.

2.3 Information and communication technology for development (ICT4D)

It is a basic human trait to desire to help less fortunate people (Shermer, 2005; Weber, 2009). The human trait to help others is a visible theme in the research and described as "development", and more specifically, the use of technology to enable development, referred in research and in practice as information and communication technology for development (ICT4D). Development is a multidimensional concept with economic growth, participation and empowerment some of its dimensions (Roode, Speight, Pollock, & Weber, 2004; Sen, 1999; Unwin, 2009). Human development can be seen as a process of expanding the real freedoms that people enjoy (Sen, 1999).

The need exists for the effective application of ICT to positively influence the lives and livelihoods of poor people and marginalised communities (Unwin, 2009). In addition, the World Bank states that ICT has an essential role to play in poverty alleviation and achieving the MDGs. To quote from the World Bank Working Paper: "*No longer are information and communication networks and services luxuries for developing countries – they are now a necessity*" (Guislain et al., 2005). However, care must be taken during ICT4D projects, not to complicate progressive development agendas or exaggerate the contribution of ICT to development (Rubinoff, 2005).

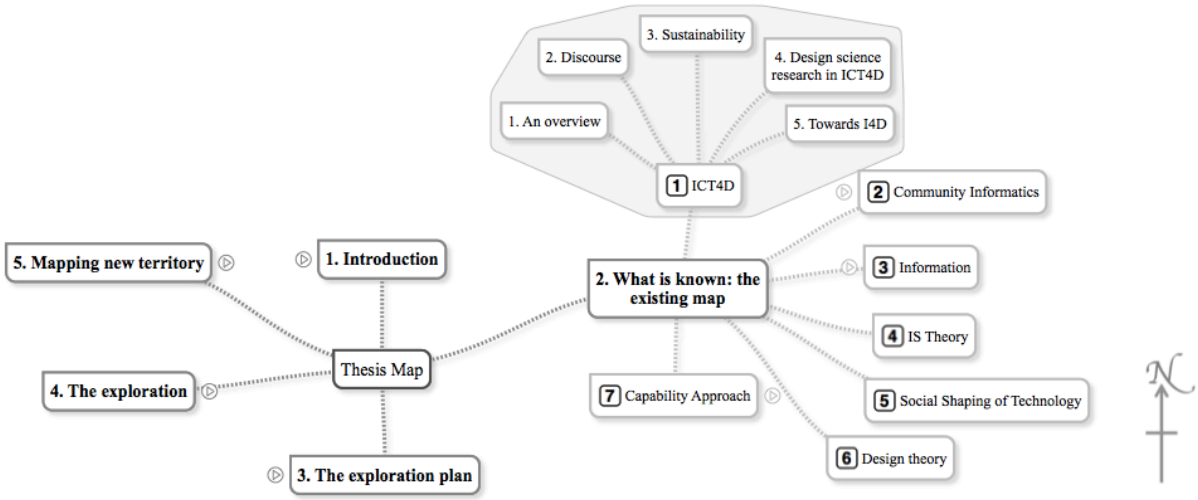

Figure 2.2. What is known about ICT4D map

The literature review on ICT4D is organised as shown in Figure 2.2. The first section offers a view on existing ICT4D literature. The nature of ICT4D projects leads itself to qualitative and interpretive research. The majority of early work was based on case studies and critiqued as opportunistic work, that raised questions regarding the research quality (Avgerou, 2009; Weber, 2009). The second section reviews discourses on ICT4D research. ICT4D projects must consider the local unique requirements (Avgerou, 2008; Thompson & Walsham, 2010), such as in Africa, for effective research and projects. The third section focuses on sustainability recognising that ICT4D research raises questions about the sustainability of the projects (Ali & Bailur, 2007; Madon,

Reinhard, Roode, & Walsham, 2009). In the fourth section, ICT4D case studies with a design science research (DSR) strategy are discussed as a counter balance to technology determinism and an over-focus on explanatory theories (Hevner et al., 2004; Islam & Grönlund, 2011; Walsham, 2012). The ICT4D review ends with a brief look at the impact of the post-2015 development agenda on ICT4D and the call towards informatics for development.

2.3.1 A view on ICT4D literature

At the World Summit on the Information Society in 2003, Kofi Annan, in his capacity as the United Nations Secretary-General, describes the digital divide as a collection of gaps. These gaps are the technological divide, the content divide, the gender divide and the commercial divide. He posits that information and communication technologies are not a panacea or magic formula, but they can improve the lives of everyone on this planet.

The term "digital divide" was introduced in the 1990s to refer to the growing differences in access communities had to computers and the Internet, signifying a new form of inequality and source of socio-economic disadvantage (Avgerou, 2009; Gilbert, Masucci, Homko, & Bove, 2008; Kvasny & Truex, 2001; Unwin, 2009; Van Rensburg, Veldsman, & Jenkins, 2008). Crampton (2004) defines the digital divide as the unequal access to knowledge in the information society, while Nederveen Pieterse (2010) argues that the divide is not digital, but socioeconomic. The digital divide is multi-dimensional as listed in Table 2.2 and should be seen as the result rather that the cause of poverty (Harris, 2004). Efforts to address the digital divide must be rooted in a broader strategy to alleviate poverty (Harris, 2004).

Access to on-line computers, the increase of levels of information, knowledge, communication and other types of socially valued benefits through the use of ICT and where the absence of access and resulting computer illiteracy will create a dichotomous society of haves and have-nots, are the core of the digital divide discourse (Carpentier, 2003; Harris, 2004; Kvasny & Truex, 2001; Madon et al., 2009). Besides categorising the digital divide as those who have access to ICT connectivity and computing mechanisms, those who create content in digital format and those reduced to consuming this content is a third category of the divide (Van Rensburg et al., 2008).

Digital divides can also exist within communities if ICT projects undertaken to promote digital inclusion missed the least-advantaged groups in the communities that they aim to serve. Missing some groups can produce a local form of digital divide within these communities. Often girls and women have less access to ICT than boys and men, causing the gendered digital divide (Huyer, 2005; Morrell & Sterling, 2006). Long-term value is only derived if the projects become institutionalised in a way that aids successive generations (Madon et al., 2009).

Table 2.2. Dimensions of the digital divide (Harris, 2004)

Dimension	Description
Service availability	The services made available through the use of ICTs should be freely available to all who might wish to make use of them.
Awareness	Everyone is aware of how they might be able to use ICTs for their own benefit.
Opportunity to learn and use new media	Everyone has the opportunity to attain computer literacy.
Mastery of technologies	Everyone understands which tools are best suited for which tasks.
Experience	Everyone is able to accumulate sufficient experience with the use of ICTs to enable them to fully exploit their potential.
Skills	Everyone has the right skills for performing ICT related tasks.
Support	Everyone has access to appropriate assistance when they need it to help them make good use of ICTs.
Attitudes (motivations)	Everyone is encouraged to participate in the sharing of benefits available from equal access to ICTs.
Content	Sufficient content is available to enable everyone to gain benefit from ICTs.
Cultural	The other dimensions are adapted as required to the cultures of all potential users.
Disability	The other dimensions are adapted as required so that disability is not a barrier to equal enjoyment of the benefits of ICTs.
Linguistic	The other dimensions are adapted as required so that language is not a barrier to equal enjoyment of the benefits of ICTs.
Gender	The other dimensions are adapted as required so that gender is not a barrier to equal enjoyment of the benefits of ICTs.
Empowerment of civil society	Structural, political, and governance factors do not impede equal enjoyment of the benefits of ICTs.

The evolution of the digital divide from 1999 to 2007 is mapped using a data set arranged into five groups namely digital development, economic, infrastructure, demographic and risk (Skaletsky, Soremekun, & Galliers, 2014). The indicators that measure the global digital divide in the digital development group are the number of Internet users, the number of PCs and the number of mobile subscribers per 100 people (Skaletsky et al., 2014). The results indicate that most African countries except Zambia and Morocco have made little or no improvement on closing the digital divide (Skaletsky et al., 2014).

Sub-Saharan Africa presents unique challenges that contribute to the existence of the digital divide for example multiple languages with none constituting the common language of the Internet and computing, inadequate infrastructure, high cost of access, inappropriate policy regimes and inefficient provisioning of telecommunication networks (Mutula, 2005). In addition to these challenges, countries in sub-Saharan Africa have to deal with multiple development issues such as access to clean water, health facilities, electricity, good roads, quality radio reception and newspapers in local languages that have higher priority than elaborate ICT infrastructure (Mutula, 2005). Commercial cyber cafés users in developing countries are not "ordinary" citizens and may contribute to increasing the digital divide (Mwesige, 2004). Mwesige (2004) describes the typical Internet user in Uganda as a young educated and computer literate male with disposable income. Affordability of cyber café services, cost of the ICT infrastructure, exorbitant Internet connection costs, language and computer literacy are factors that contribute to excluding people from crossing the digital divide (Mwesige, 2004).

In South Africa, Internet access is not common, stunted by the high costs of telecommunications, broadband and home computers (Calandro, Gillwald, & Rademan, 2014; Calandro, Gillwald, Moyo, & Stork, 2010; RIA, 2016; Tariffic, 2016). In contrast to fixed line telecommunication access, South Africa experiences a growth in the use of cell phones that are becoming ubiquitous in households. The share of households with a cellular telephone rose by 7.3 percentage points between 2010 and 2014 reaching 95.7 per cent in 2014 (ICASA, 2016). However, with the cost of rolling out networks and service prices likely to remain beyond the means of many people for some time, prioritising the roll out of public Wi-Fi at all public buildings as required by South Africa Connect, especially outside of the larger and wealthier metropolitans, is essential (RIA, 2016). South Africa Connect is South Africa's broadband policy gazetted in 2013 with the objective to deliver 100 per cent broadband connectivity for all schools, health and government facilities by 2020, deliver widespread broadband access to 90 per cent of the country's population by 2020, and expand to 100 per cent by 2030 (Department of Communications, 2013). The gap as reported by ICASA (2016) is still significant with less than 50 per cent of South African households with at least one member who used or had access to the Internet in 2014. However, Internet connections in households were only 10.9 per cent, without significant change since 2011, and can be interpreted that the vast majority of Internet users access the Internet either not at home or through a mobile device (ICASA, 2016). ICT4D research and projects are relevant, even crucial, for the digital and social inclusion of communities in South Africa.

It is clear that only focusing on access to computers will not address the digital divide (Crampton, 2004; Kvasny & Truex, 2001; Rubinoff, 2005). To cross the digital divide, three knowledge senses are required: to know with (access to the tools), to know what (access to information) and to know

how (how to use the tools) (Crampton, 2004). Kvasny and Truex (2001) refer to Van Dijk and Hacker's multifaceted framework for conceptualising access in terms of four hurdles as shown in Table 2.3 that are in the way of the information and network society.

Table 2.3. Defining access and hurdles (Kvasny & Truex, 2001)

Type of Access	Definition of the hurdle
Psychological	Lack of any digital experience caused by lack of interest, computer fear, and unattractiveness of the new technology
Material	Lack of possession of computers and network connections
Digital Skills	Lack of digital skills caused by insufficient user-friendliness and inadequate education or social support
Usage	Lack of significant usage opportunities

The structural divides will not subside with an increase in material access; once material access is more universal, structural divides concerning digital skills and usage will come to the fore (Kvasny & Truex, 2001). Part of the psychological access and usage access is to understand that ICT is not about networks and computers (the means to the end), but about information and communication (Roman & Colle, 2003). It is dangerous and naïve to follow a "field of dreams approach" by assuming that people will adopt the ICT project or use the provided content. It is important to raise awareness about the role of the ICT project while also exploring every opportunity to sensibly integrate into the existing local community structure (Roman & Colle, 2003).

ICT can make a tremendous contribution to human development for those that have access (Kozma, McGhee, Quellmalz, & Zalles, 2004). ICT contributes directly to human capabilities by increasing people's ability to participate more actively in the social, educational, economic and political life of a community, as well as supporting economic growth through the productivity gains that is generated. A virtuous circle is created when the development of a highly skilled workforce contribute to technology development with the potential to reduce poverty and improve the human condition (Kozma et al., 2004). However, according to the United Nations Development Programme, the digital divide reduces the prospect that citizens of developing countries will be able to participate in the growing global economy and minimises the potential that technology has for improving their health, educational, governmental, and cultural institutions (Kozma et al., 2004). Projects such as the World Bank's World Links program prove the dependency on government policy to promote the adoption of ICT in school curriculums and the success of combining teacher training with the classroom student experience. Students, teachers and administrators agree that the World Links

program contributed to student outcomes such as improved skills in reasoning with information, communication skills, knowledge of other cultures, better attitudes toward school and technology and improved technology skills (Kozma et al., 2004). The World Links program and other programs which aim to build the ICT infrastructure and teacher skills in developing countries can contribute to the improvement of education and the reduction of the digital divide, for their participants (Kozma et al., 2004).

The emphasis of the reduction of the digital divide should be on ensuring access to information and knowledge (Harris, 2004). ICT4D initiatives should always begin with development strategy and development activities should be addressed through analysing the challenges and associated contextual conditions adding ICT as just one ingredient of the solution (Harris, 2004). The information strategy follows the development strategy with a clear response to the information needs in support of development. The technology strategy falls into place as an enabler to deliver the information needs completing the relationship between development, information and ICTs as illustrated in Figure 2.3 (Harris, 2004).

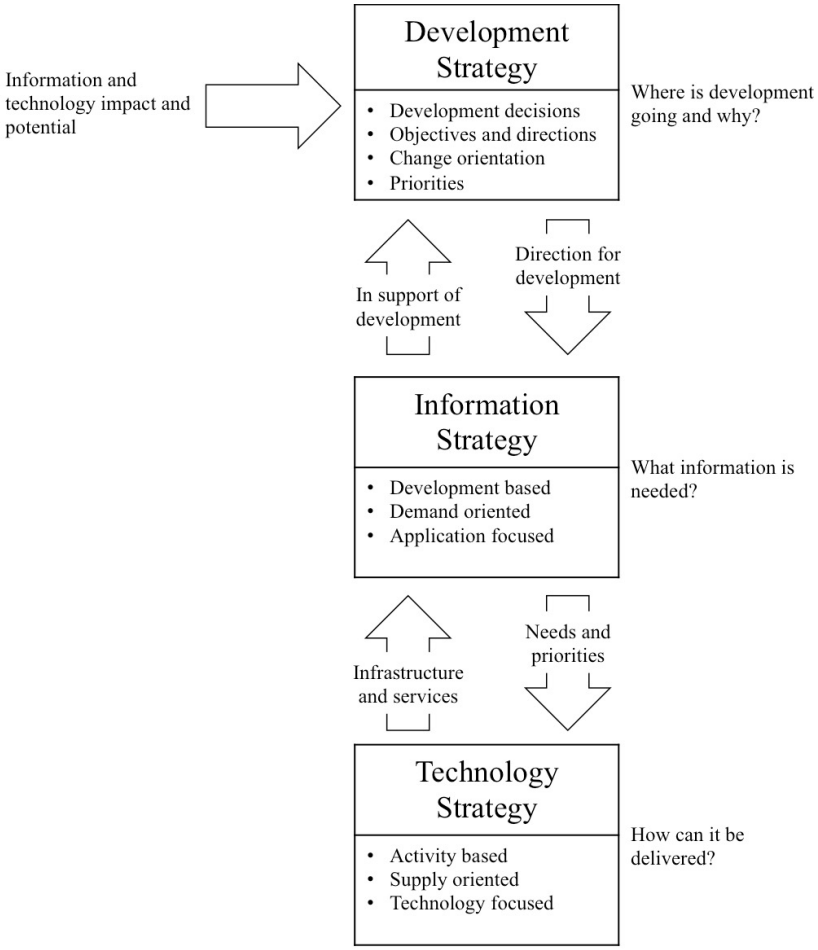

Figure 2.3. The relationship between development, information and ICTs (Harris, 2004)

Similar to the broader focus on people, development in the World Links program and addressing the digital divide as an outcome, Roode, Speight, Pollock and Webber (2004) propose a different focus, from the digital divide to a socio-techno divide. They argue that the real problem concerns the divide between the socio-centric approach of human scale development, and the techno-centric approach of providing ICT and access to it. ICT4D projects must surpass being just about access to technology, but have a specific purpose (Gilbert et al., 2008; Roode et al., 2004).

An example of addressing the socio-techno divide is provided by Jain (2006) who describes the knowledge management approach to empowering Africa's development. Knowledge management applications can be used to digitise indigenous knowledge. To use ICT as a catalyst in empowering Africa's development, the ICT conditions in Africa need to be addressed by ICT policy formulation, ICT literacy programs, legal and regulatory framework, manpower training, and empowerment of local people (Jain, 2006). The success of ICT4D programs rests on how well the needs of users are understood, with embedded technologies delivering on those needs (Unwin, 2009).

Although the focus proposed is on content and usability, many individuals do not own computers or have access to the Internet. This is where public ICT spaces such as libraries, telecentres and cybercafés fulfil an important role. Important attributes of these public spaces are (Gomez, Ambikar, & Coward, 2009):

- equitable access (urban-centered);
- appropriateness of technology (availability of local content in local languages and cost to access the venue);
- human capacity and relevance (trained, knowledgeable workers);
- integration into daily routines;
- trust in technology (public access);
- social appropriation of technology;
- enabling environment; and
- local and macro-economic factors.

Bailey and Ngwenyama (2010) stress the importance of basic literacy before computer literacy can be achieved, as well as the importance of social interaction, especially intergenerational interaction, in these public ICT spaces. To encourage the use of public ICT spaces, trust is one of the leading factors. Trust can be defined as perceived safety, relevance, reputation and coolness of the public access venues (Gomez & Gould, 2010). The success of telecentres depends on the usage and services should be offered that supports economic activities such as entrepreneurship. Social ties, opportunity recognition and support from the telecentre staff are factors that influence the usage of telecentres by entrepreneurs (Bailey & Ngwenyama, 2013). Public ICT spaces appear to be used

more for building and maintaining the users' social networks, personal relations and entertainment and less for education, health, e-government or e-commerce activities (Gomez, 2014). The importance of personal information needs and entertainment indicates an impact that ICT has on their lives and should be considered when designing services in public ICT spaces (Gomez, 2014). Gomez (2014) identifies four common factors of successful public ICT spaces, namely meet local needs first; build alliances and collaboration; strengthen sustainability; and train infomediaries and users. Infomediaries are information brokers who bring local knowledge and information resources to the public ICT spaces and assist users with finding information so that the experience is more meaningful to the local communities (Gomez, 2014).

Parallel to providing access to computers and the Internet, questions must be asked about user adoption and user resistance. One way of addressing this is by profiling the non-user, to understand if the non-users are hard to convince to use ICT and the Internet, under-skilled, or simply lacking the financial resources to afford connectivity. The findings from profiling the non-user suggested the need for a shift in focus of traditional inclusion away from "removing barriers" towards "adding value" (Verdegem & Verhoest, 2009). In summary, the principles required for effective ICT4D implementations are: a focus on needs; vision and commitment; infrastructure; effective partnerships; monitoring and evaluation; and accessibility (Unwin, 2009).

The challenges that ICT4D initiatives attempt to address, for example job creation, financial inclusion, skills development and social capital enhancement, are eminently present in the world with increasing urbanisation and its shadow of urban poverty lengthening (Omole, 2013). Half of the world's population reside in urban areas with urban populations in low-income countries projected almost to triple, increasing by over 500 million by 2050 (UN-Habitat, 2016). The lack of corresponding economic and infrastructure growth will worsen the problem with poor urban residents facing rising unemployment and underemployment, constrained access to financial services, market exploitation, poor housing, crime, unsatisfactory health services and scant education opportunities (Omole, 2013). According to Omole's (2013) analysis of five case studies of ICT4D projects in urban developing areas, mobile phones and the Internet hold the most promise for ICTs to contribute to poverty reduction.

Poorly formulated policies, ambiguous requirements, lack of understanding the link between ICT and development, lack of user participation, poor project management and the lack of frameworks to guide development through ICT are reasons for ICT4D project failures (Mamba & Isabirye, 2014). Mamba and Isabirye (2014) propose a framework for successful ICT4D project implementations in rural areas that is influenced by four themes identified in their study. The four themes are understanding community needs, appropriate technology, sustainability and project implementation (Mamba & Isabirye, 2014).

The question has clearly shifted from whether development can benefit from ICT, to how ICT can benefit development (Walsham et al., 2007; Walsham & Sahay, 2006). Bridging the digital divide should not be addressed as a technological fix, but as part of a capabilities approach and in terms of social capabilities (Nederveen Pieterse, 2010).

Given the background on the role of ICT in development, a further review is presented in the next subsection on the discourses on ICT4D research, research quality and research gaps for future research.

2.3.2 Discourses on ICT4D research

ICT4D research emerged during the late 1980s. A landmark in this emergence was the first IFIP conference in New Delhi in 1988 (Avgerou, 2008). Due to the nature of ICT4D research, concerned with developing the freedoms of people and their communities, interpretive research is useful to understand human thought and action in social and organisational contexts (Klein & Myers, 1999). The fundamental principle of interpretive work of a hermeneutic nature is the hermeneutic circle, a meta-principle that is the foundation of six other principles. The idea of the hermeneutic circle suggests that insight into a complex whole is gained from the preconceptions about the meanings of its parts and their relationships (Klein & Myers, 1999). The six principles of the hermeneutic circle are: the principle of contextualisation; the principle of interaction between researchers and participants; the principle of abstraction and generalisation; the principle of dialogical reasoning; the principle of multiple interpretations; and the principle of suspicion.

The principles identified by Klein and Myers (1999) are useful to evaluate the quality of existing ICT4D research. Much of the ICT4D literature that uses qualitative analysis methods within an interpretive paradigm fail to satisfy the principles for high-quality interpretation of qualitative data. Walsham and Sahay (2006) agree with this sentiment with a request for more studies to be explicitly critical, include quantitative data and more action research. They propose a conceptual framework based on four questions (Walsham & Sahay, 2006):

1. What is the "development" to which ICTs aim to contribute?
2. What are the key issues being studied related to ICTs?
3. What is the theoretical and methodological stance?
4. What level and focus of analysis is being adopted?

The rapid expansion of ICT4D research is advocated (Walsham et al., 2007; Walsham & Sahay, 2006). Walsham and Sahay (2006) and Walsham, Robey and Sahay (2007) suggest a wider geographical spread, locally based research with researchers from the developing country, type of organisations and level of analysis as dimensions for research expansion with topics for future work

scalability (most research projects were small-scale pilot projects), in-depth studies of particular technologies, the relationship between development and ICT, society-wide critical issues and gender studies. The focus of the gender studies should be the role of women in connection with ICT in developing countries (Gillard, Howcroft, & Mitev, 2008; Walsham et al., 2007).

Avgerou (2008; 2009) contributes to the discourse by arguing for the understanding of ICT innovation in relation to the social context and the recognition of the ICT4D research contribution to the expansion of the ICT research agenda. Avgerou (2008) identifies three discourses in the current ICT4D research. The first discourse is the concern that ICT4D innovation is mainly concerned with catching up with the technologically advanced rich economies through transferring their technologies and emulating their institutions. Catching up is a process of technology and knowledge transfer and adaptation to local social conditions. The second discourse is about constructing new techno-organisational structures within a given local social context, with research emphasis on exploring local meanings and working out locally appropriate techno-organisational change, that is a process of socially embedded action. The third discourse is about creating possibilities for the improvement of life conditions in a particular locality amidst the global socio-economic order and considers ICT4D innovation as a transformative socio-economic process. Creating possibilities is therefore a process of transformative techno-organisational intervention associated with global politics and economics. There is a distinctive ICT4D research agenda comprising of failure, outsourcing and the strategic value of ICT. One of the contributions of the ICT4D research is the potentially significant theoretical contribution of ICT4D research for understanding ICT innovation in relation to social context and in relation to socio-economic development theories and policies (Avgerou, 2008).

ICT innovation is further explored by Avgerou (2009). Avgerou defines ICT4D innovation as the application of technologies that are common and widespread elsewhere, in an ICT4D context. The experience may be considered as innovation for the organisation undertaking the implementation, as well as in its socio-economic context. Seeing ICT4D project implementations as innovation sensitises the researcher to consider the effort of technology and associated organisational change and the value of such change in relation to an organisation's context. Avgerou (2009) argues that this is particularly important in ICT4D research and recognised that development is a contested notion due to conflicting interests and power relations. There are two perspectives on addressing issues of context of ICT innovation in ICT4D research, firstly transfer and diffusion and secondly, social embeddedness. Transfer and diffusion assume ICT technology and associated practices are independent from social circumstances. Social embeddedness is about constructing new techno-organisational structures within a given local social context and considers transfer and diffusion over-simple. It is a process of innovation in situ, tracing cognitive, emotional and political capabilities that individuals nurture. ICT4D research has the potential capacity to contribute towards the

improvement of many different aspects of life – from alleviating poverty to strengthening the democratic polity.

Avgerou (2009) further distinguishes between two perspectives of ICT-enabled development as the progressive transformation perspective and the disruptive transformation perspective, and four discourses in ICT4D research concluding that ICT4D research faces two major challenges. The first challenge is methodological/theoretical and the second is related with the legitimacy of discourses that openly address contemporary political issues and urged that theoretical strengthening is needed (Avgerou, 2009). Only through rigorous research can models of reality that provide the basis for a discourse where matters of agreement and disagreement, frame effective policies and actions, and potentially resolve matters of disagreement, be formulated (Weber, 2009).

Brown and Grant (2010) argue that there is confusion in the research agenda between ICT for Development and ICT in developing countries and propose a framework to partition the existing research literature into two distinct streams of research. The first stream contains the studies that focus on understanding technology "for development" and the second stream for studies that focus on understanding technology in "developing" countries. Brown and Grant (2010) urge that increased attention should be placed on the "for development" stream, which is critically underrepresented within the literature, but imperatively important within the practitioner and donor agency environment, similar to Walsham, Robey and Sahay (2007) and Avgerou (2009).

Infrastructure and access are only the starting point in understanding the contribution of ICTs to development as inputs to the value chain where the focus of research should be on the outputs (Heeks, 2010; Heeks & Molla, 2009). The ICT4D value chain (Figure 2.4) originally proposed by Heeks and Molla (2009) builds on a standard input-process-output model to create a sequence of linked ICT4D resources and processes within four domains (Heeks, 2010):

- **Readiness**: the systemic prerequisites for any ICT4D initiative such as ICT infrastructure, skills and policy as well as more specific inputs for any individual initiative.
- **Availability**: implementation of an ICT4D initiative turns the inputs into a set of tangible ICT deliverables such as a telecentre (with publicly-accessible Internet-connected PCs) or mobile phones.
- **Uptake**: the processes by which access to the technology is turned into actual usage; also noting that key concerns around this process and its ability to contribute to development have related to the sustainability of this use over time, and, for various innovations that are prototyped, the potential or actuality of scaling-up (Walsham & Sahay, 2006).
- **Impact**: three sub-elements are part of impact namely outputs, outcomes and development impacts. Outputs are the micro-level behavioural changes associated with technology use.

Outcomes are the wider costs and benefits associated with ICT. Development impacts are the contribution of the ICT to broader development goals.

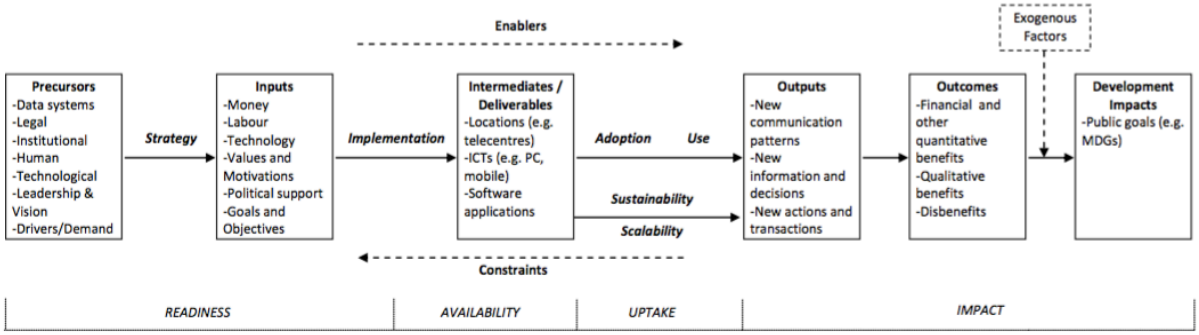

Figure 2.4. ICT4D value chain (Heeks, 2014; Heeks & Molla, 2009)

Research on the impact of the contributions to development of ICT4D initiatives is limited, but a firm base of good practice guidance for implementations exists that is distilled from general development lessons but also from the specific differences identified between those ICT initiatives which do, and which do not, make a development contribution (Heeks, 2010). The good practice guidance for ICT4D project implementations comprises of three areas namely design, governance and sustainability as depicted in Figure 2.5. Project managers must ensure that designs are sufficiently aligned to local realities, draw on the strengths of multiple actors with a governance program and deliver sustainable solutions by ensuring local ownership and addressing it from an economic and socio-political perspective (Heeks, 2010).

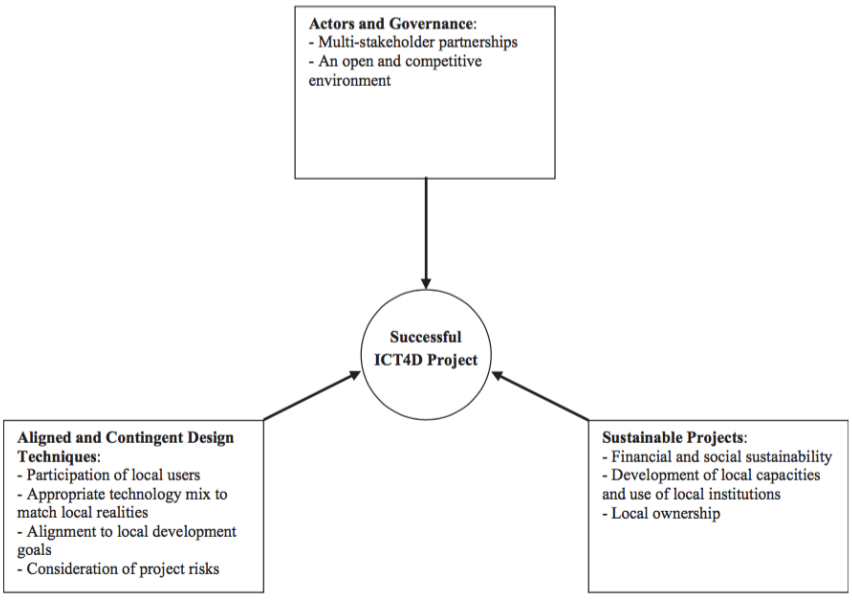

Figure 2.5. Good guidance for ICT4D project implementations (Heeks, 2010)

Africa brings its own challenges where there are many competing demands for scarce funding and infrastructure challenges. There is currently a lack of papers with an explicit focus on ICT as

strategic developmental enabler in Africa (Thompson & Walsham, 2010). Developmental ICT can be defined as the conception, development, implementation, and use of ICT as an explicit vehicle for furthering developmental aims – where ICT functions both as enabling artefact and enabled set of social behaviours (Thompson, 2008). Thompson and Walsham (2010) identify four strategic dimensions where ICT has potential as a significant enabler for transformational development in Africa namely: institutional infrastructure; governance, accountability and civil society; service production and economic activity; and access to global markers and resources. They warn against the naïve attempts to "transfer in" ICT to African contexts regardless of cultural relevance or sustainability and recognised the political challenges of driving a developmental agenda. However, African developmental research intertwined with African ICT research deserves commitment from a body of research (Thompson & Walsham, 2010). The approach of home-grown ICT for Africa solutions is in contrast with the initial idea of development where the developed world will modernise the developing countries with technology, systems of government and economic improvements transported from developed countries (Qureshi, 2013a).

Loudon and Rivett (2011) call for openness in ICT4D research. Openness in ICT4D research includes openness in system design and implementation and openness in the developmental role of universities in the global South. Openness can be defined as a way of doing research that actively promotes (Loudon & Rivett, 2011):

- universal over restricted access to research products;
- universal over restricted participation in the research process;
- collaborative over centralised production of knowledge, and recognition of diversity in knowledge systems.

Weyers, Geyer and Rankin (2011b) recommend a practical strategy for conducting research in communities following the community development model. The strategy will be:

- To first negotiate entry into the community,
- then mobilise community members into different task groups,
- then enable these groups to identify, prioritise and take ownership of their own and/or the community's problems and needs, and
- then help them to develop the will and ability to eliminate these impediments.

Although people-centered and bottom-up development efforts are encouraged by some development institutions in an attempt to empower people, ICTs can only be helpful if they are able to use it in beneficial ways or receive support for example overcoming an illiterate hurdle when looking for information on the Internet (Qureshi, 2013b). Traditional research and existing conceptions on how

ICTs affect people's search for quality of life must be challenged because for some the promise of equity, freedom and justice are still a distant fantasy (Qureshi, 2014).

Current research still shows discrepancies between western knowledge and its application in the marginalised context experienced in Africa with frameworks that can be culturally inappropriate and locally impractical (Van Stam & Van Greunen, 2014). The discrepancies such as cultural positioning, non-alignment of locally relevant topics with available (international) research and validation by international-peer-reviewed versus local-community-reviewed are listed by the researchers (Van Stam & Van Greunen, 2014). The researchers also find that current academic discourse is disconnected with topics of interest in developing countries and identified topics of interest such as:

- people;
- analysis of effects of interventions in social relationships;
- the empowerment of individuals or communities;
- sense of accomplishment and feelings of being part of the world;
- effects of interventions to the social cohesion of the community;
- opportunities to strengthen local culture and archive events in the past; and
- abilities to interact as a community at a collective level.

Thapa and Sæbø (2014) review 80 ICT4D research articles and identify six research gaps that relate to six areas of future research direction. Most prominently is the need for research on the link between ICT and development. The six research gaps and suggested areas for future research are:

1. Missing understanding of the relationship between ICT and development
   The suggested future research areas are to investigate the interaction between ICT and development before focusing on outcomes and to apply the theoretical lens of social capital as a good interpretive lens.
2. The view on development is only implicitly stated, missing knowledge on how various views influence projects
   In future research, clearly state the development perspective and explore views on development from various stakeholders in ICT4D-related projects.
3. Socio-cultural issues less emphasized
   To represent the impact on socio-cultural issues, the influence of issues such as corruption, de-politicisation, and social exclusion factors such as the caste system should be explored.
4. Part of the developing world and mountain regions are not included
   Future research need to be more inclusive of all developing geographical areas for example the mountain regions.

5. Only some characteristics related to the digital divide are investigated
   The digital divide is a multi-dimensional phenomenon and future research should broaden the focus of research of the digital divide by including issues such as remoteness and gender.
6. Missing diversity concerning the research method, theories, and frameworks used
   Future research should include a diversity of methods, including action research and theories and frameworks should be deployed to understand the causal process of socio-technical interaction and its consequences on human development.

The discourses on ICT4D research indicate the need for further research specifically in Africa and the link between ICT and development. The next subsection explores the relationship between ICT4D projects and sustainability and measurability as a contributor to development.

2.3.3 Sustainability and measurability

The shadow side of ICT4D studies and projects are the challenges around sustainability and measurability to benchmark the success of ICT4D projects given that sustainable benefits is the main purpose of ICT4D initiatives (Pitula & Radhakrishnan, 2007a). ICT tools, resources and skills within an ICT4D initiative should be measured against feasibility, affordability, usability, relevancy, trustworthiness, improvement, advancement and sustainability (Pitula & Radhakrishnan, 2007b; 2007a). Access to technology alone is insufficient and needs to be the means by which people engage in meaningful and gainful social activities in a sustainable manner (Pitula & Radhakrishnan, 2007b).

There are a set of challenges specific to ICT4D projects that conventional ICT projects rarely have to address such as intermittent power and connectivity, harsh climatic conditions, low population densities, long travel times, a lack of secure locations to house equipment, and culturally different views towards privacy. The intended users typically have limited schooling, high illiteracy rates, are underemployed, and have low disposable incomes (Pitula & Radhakrishnan, 2007a). The simultaneous occurrence and dynamic interaction with the environment in ICT4D projects lead to the following significant differences that complicate sustainability (Pitula & Radhakrishnan, 2007a):

1. Success is measured by achieving sustained communal benefits that evolve over the long term, as opposed to short term. Metrics to measure the communal benefits are difficult but necessary in order to justify the investments needed to sustain the project.
2. Deployment and sustained operation constraints cannot be resolved from a purely technological perspective, but are dynamically interrelated to the broader socioeconomic context of the community.
3. There are major economic, social, political and cultural differences between rural and technologically developed societies that impact how they can make effective use of ICT.

> The technical success of a project is not enough. Other factors include: evolving a suitable deployment model for a technically successful project, accessibility, affordability, fail safe operation and dependability of the service provided by the project, along with other motivating factors needed to encourage people to use it.

Pitula and Radhakrishnan (2007a) recommend the use of a for development (4D) assessment process embedded in the traditional software engineering process to ensure that the development goals are primary drivers in the requirements, design and evaluation of the ICT4D initiative. The 4D assessment process consists of the following key activities (Pitula & Radhakrishnan, 2007a):

1. Analyse and specify the deployment context.
2. Specify community and stakeholder requirements with respect to the technology.
3. Generate design solutions in terms of the set of ICT tools, resources and skills required to benefit from the technology.
4. Evaluate proposed design solutions against the specified requirements.

Traditionally, sustainability is divided into five types: financial/economic, social/culture, political/institutional, technological and environmental, with ICT4D projects focussing on economic sustainability (Ali & Bailur, 2007; Madon et al., 2009; Van Rensburg et al., 2008). Sustainability is one of the key measurements, together with context and community participation, to benchmark successful ICT4D projects (Ali & Bailur, 2007) as well as long-term value and scalability (Madon et al., 2009). However, questions are asked about what can be done differently on ICT4D projects to either improve the chance of sustainability or to redefine the sustainability measurement (Ali & Bailur, 2007; Braa, Monteiro, & Sahay, 2004; Madon et al., 2009; Van Rensburg et al., 2008).

Pitula and Radhakrishnan (Pitula & Radhakrishnan, 2007b) describe a sustainable cycle that is achieved by selecting goals which result in a balance between social and economic benefits. This cycle shown in Figure 2.6 can be described as follows: needs stimulate the discovery of relevant knowledge that leads to actions resulting in benefits. As the community's situation improves, its needs evolve creating more wants stimulating the discovery of more relevant knowledge and the cycle continues.

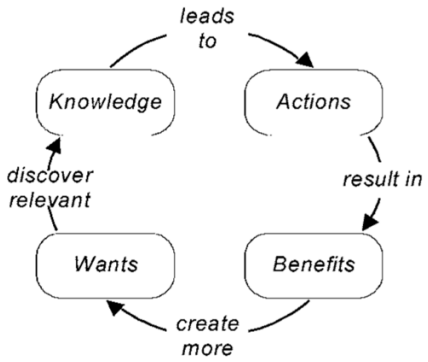

Figure 2.6. The sustainable cycle (Pitula & Radhakrishnan, 2007b)

Different approaches that start with the design of research projects, such as building sustainable networks of action, are called for (Braa et al., 2004). The concern is how to facilitate politically charged changes and build capacity to sustain the changes when most ICT4D projects are small-scale pilot projects (Braa et al., 2004; Walsham et al., 2007). To counter the problems experienced by researchers on small-scale projects such as scalability and isolation, Braa, Monteiro and Sahay (2004) promote the networks of action approach. This approach is characterised by abandoning single, one-site action research projects in favour of a network of research sites, generating local self-sufficient learning processes, nurturing a robust, heterogeneous collection of actors, and aligning interventions with the surrounding existing institutions.

The challenges with measuring sustainability is firstly conceptual in that sustainability implies stability, yet undergoes movement, therefore making it impossible to define what may be essential for sustainability and what might not (Fowler, 2000). The second challenge is that of operationalising sustainability, more so in sustainable development (Ali & Bailur, 2007). Understanding these challenges, Ali and Bailur (2007) offer bricolage as an alternative to sustainability. Bricolage is the process of improvisation and unintended consequences of technology. The bricolage process allows people at the local level to apply known tools and routines at hand to solve new problems (Ali & Bailur, 2007). In addition, Ali and Bailur (2007) recommend that the ICT4D field should differentiate more clearly between the sustainability of a concept and sustainability of the artefact. The challenge of sustainability is that it tries to achieve a tenuous balance between progress and stability, satisfaction and dissatisfaction of the artefact (Fowler, 2000). The balance is an impossible task as nothing has ever been sustainable and nothing will ever be (Ali & Bailur, 2007). This viewpoint needs to be balanced by the theory of unintended consequences, as the need exists to anticipate the unintended but predictable consequences. Any action has very many consequences, and only some of the consequences could have been intended by the actors (Sen, 1999). One may not know beforehand the exact unintended consequences, but can assume or predict that unintended consequences will occur; causing benefits on both sides of the relationship and therefore contribute to sustainability (Sen, 1999).

Van Rensburg et al. (2008) argue that sustainability is achievable, but requires a more socially responsible approach to business development through the enhancement of the service delivery channel by a coordinated approach to ownership and to channel support promoting community-based businesses. The approach requires a changed mindset, one that sees the creation of ICT-enabled service-orientated entrepreneurs focused on using ICT in "production" mode as well as creating local content. These entrepreneurs are trusted members of the community selected through a process testing a variety of skills, personality, and consideration for their position within and relationships with the community. The entrepreneurs render services that benefit the community, at the same time generate sustainable livelihoods for themselves, and require ongoing skills development beyond the ICT enablement. Skills include business skills and soft skills such as conflict resolution and negotiation. Important to the success of such an ICT4D initiative is the local ownership; local service needs assessment; and local participation by suitable entrepreneurial-minded individuals. Ongoing mentoring is required to counter the more serious challenges where long-term poverty had diminished the belief in a better and improved life (Van Rensburg et al., 2008).

ICT4D projects need to be designed for sustainability as practiced by the rural connectivity project with village operators in South Africa (Roux & Marais, 2011). The design of the project focuses on sustainability and resilience in providing the connectivity service in rural areas navigating adverse conditions, limited resources and the cultural and political contexts (Roux & Marais, 2011). The approach to sustainability is extended to create micro enterprises for entrepreneurs from the communities and to support existing local businesses for example sourcing the network equipment and installation services (Roux & Marais, 2011). The village operators build, operate and support localised network infrastructure and offer ICT related services. They are well equipped with resources, knowledge and the contacts to grow their businesses, support their communities and be the real advocates of ICT. The village operator feasibility framework considers six dimensions of feasibility (Roux & Marais, 2011):

- Market: There needs to be a market that values and pays for the services.
- Technical: It must be feasible to establish the business and provide services with the available technology at the desired site.
- Social: It must be socially and politically feasible to establish operations and provide services in the community.
- Management: The structure must conform to legal requirements, be appropriate to the operating model and managed by the right people.
- Financial: The business needs to be profitable with manageable financial risks.
- Operational: The underlying business model must be sound.

The results after the first year of the project are encouraging that the project designed with sustainability as the main driver will be successful. The results include the development of the village operators as successful entrepreneurs who create additional jobs in the community, extend the services for example helping community members to find work using the Internet and have a positive impact in their communities (Roux & Marais, 2011).

The three issues that are critically important to digital inclusion projects are determining the value and beneficiaries of these projects, sustainability and scalability (Madon et al., 2009). In order to improve the chances of long-term value, sustainability and scalability, Madon, Reinhard, Roode and Walsham (2009) identify four key processes of institutionalisation based on institution theory. These four key processes are: getting symbolic acceptance by the community; stimulating valuable social activity in relevant social groups; generating linkage to viable revenue streams; and enrolling government support. Crucial to the sustainability discourse is that ICT4D initiatives can only be sustainable or effective if the embedded technologies deliver on the demands of users in appropriate ways (Unwin, 2009).

Recognising the positive impact that ICTs have on people's lives is described as ICT for good (ICT4G) and provides a different view on measuring value delivered by ICT4D (Eshete, Mattioli, Villafiorita, & Weldemariam, 2010). In order for ICT4D initiatives to be sustainable, the focus should shift from needs, often defined from outside the targeted societies in rather paternalistic terms, to wants, what the societies themselves actually demand and how their communities would use ICTs if left to their own devices (Eshete et al., 2010). Characteristics of ICT4G initiatives are seamless integrated with society; self-motivation for ICT professionals to deliver value in solidarity with society; environment friendly, tangible and measurable, and reproducible (Eshete et al., 2010).

The study of sustainability of rural ICT projects could assist in developing ways in which to address the challenges associated with the use of ICTs in rural areas and focuses on two views of analysis namely the sustainability of ongoing rural ICT access and the sustainability of rural development results through ICT-enabled development (Pade-Khene, Mallinson, & Sewry, 2011). Rural ICT sustainability can be organised in five categories: social and cultural; institutional; economic; political; and technological sustainability (Pade-Khene et al., 2011). In particular, sustainability of rural ICT projects are influenced by rural society, economic and technological issues (Pade-Khene et al., 2011).

ICT4D projects develop over time towards sustainability (Breytenbach, De Villiers, & Jordaan, 2013). The definition of development as active increases in freedom (Sen, 1999) and ICT4D projects as projects that increase freedom using some form of ICT, and the definition of ICT4D project success as a state of project maturity and sustainability (Leem, Kim, Yu, & Paek, 2008) are applied to

describe how the process of maturity towards sustainability can be accelerated as summarised in Table 2.4 (Breytenbach et al., 2013).

Table 2.4. Summary of the Five Stages Maturity Model (Leem et al., 2008) with links to Sen (1999) and Avgerou (2009) adapted from Breytenbach, De Villiers and Jordaan (2013)

Stage	**Description**	**Link with Sen** (1999)	**Link with Avgerou** (2009)
1. Initiation	Project is conceptualised; investments are made; implementation within isolated environments is completed.	Unsure if project will result in any increase in freedom. Very low initial developmental impact, even with intensive resource investment.	Initial character of project becomes apparent: level of social embeddedness, level of social disruption. Level of allowance and momentum is very low.
2. Recognition	Acknowledgement of project as a source of potential development. Still requires a high level of external resource investment and external motivation.	Community members experience small but distinct increases in freedom directly related to the project. Still a very low level of developmental impact.	The community allows the project to become part of its social structure and tolerates a higher level of disruption.
3. Diffusion	The project's influence starts to grow outside the initial implementation environment, with already benefitting members experiencing greater benefits or sustainability.	The project increases freedom of community members beyond original intent – possible diffusion of development potential between classifications of freedom. Medium developmental impact.	A change in the community's perception of the project: greater acceptance of social changes due to visible direct and indirect benefits. Community starts to recursively support project with their actions (Giddens, 1984).
4. Control (Ownership)	Local community takes control of the project and outside resource investment becomes less significant to project sustainability.	Community members identify the potential benefits of the project as important freedom within the community. Freedoms are continually being increased. High developmental impact.	Social structures have been rearranged to allow for the continual functioning of the project within the community. Project is no longer perceived as disruptive or epistemologically foreign.
5. Integration	Project is locally sustainable, locally managed according to	The increase in freedom (direct and diffused) that the project brings has	The project is sustainable and perceived as such. The

Stage	Description	Link with Sen (1999)	Link with Avgerou (2009)
	local development strategy, supported by community members, part of how the community functions. Project can handle/manage changes to internal and external environments.	been fully acknowledged, and the project is a constant growth factor within community. Recognised development observed.	relationship between project and community is strong, well tolerated, and has momentum.

Understanding what communities want and what they would value are contributors to sustainability of ICT4D initiatives. Design science research is a methodology that enables co-creation with communities and can be used as a research methodology in ICT4D projects as discussed in the next subsection.

2.3.4 Design science research (DSR) and ICT4D

ICT4D is an interdisciplinary field as an intersection of IS, computer science and development studies, with IS as the main custodian (Heeks, 2008; Walsham, 2012). It is still a new area of research boosted by the emergence of new technologies such as the mobile phone and social networking and a renewed interest in the potential markets represented by poorer people (Walsham, 2012).

ICT4D research is criticised on the one hand for being technology driven and on the other hand for becoming a social science concerned with creating theories of explanation without engaging with technology (Avgerou, 2008; 2009; Dutton, 2013; Harris, 2016; Heeks, 2008; Kleine & Unwin, 2009; Krauss, 2009a; 2013; Maniatopoulos, 2005). Both criticisms have disengagement with the beneficiary community and a lack of understanding their worldview in common (Avgerou, 2009; Harris, 2016; Heeks, 2010; Krauss, 2013; Unwin, 2009). Active participation of the community as producers and innovators are encouraged, even though community participation is complicated as it creates divides between those who participated and the rest of the community (Gurstein, 2013; Heeks, 2008).

DSR is a methodology that has the potential to bring balance between the two opposing criticisms of technology determinism and explanatory theories given that the community is involved as co-creators and the goal of the research is to create an artefact (Islam & Grönlund, 2011; Walsham, 2012). Identifying characteristics of DSR are the knowledge and understanding of the problem domain and the solution artefact (Hevner et al., 2004). DSR is not only concerned with understanding the problems, but also to offer solutions (Hevner et al., 2004; Islam & Grönlund, 2011). Islam and

Grönlund (2011) use the summary in Table 2.5 to describe to what extend and how a DSR approach can be applied to ICT4D research.

DSR contributes to ICT4D research' three strategic questions namely what sort of technology or artefact (instrument); for what sort of development (goals); and how these two can be fitted together in order to achieve these goals (effectiveness) (Islam & Grönlund, 2011). However, the use of DSR in ICT4D research is significantly lacking with ICT4D over focusing on evaluating the feasibility of existing technologies than designing new technology solutions (Islam & Grönlund, 2011; Mramba, Apiola, Kolog, & Sutinen, 2016). Examples of ICT4D research where DSR is applied are deploying AMIS, a mobile phone based solution, in rural Bangladesh (Islam & Grönlund, 2011); a mobile phone solution for home-based healthcare in South Africa (De la Harpe, 2014); ICT for rural education development in South Africa (Herselman & Botha, 2014); and technology for street traders in Tanzania (Mramba et al., 2016).

Table 2.5. A general comparative characteristics of ICT4D research and DSR (Islam & Grönlund, 2011)

General criterion	ICT4D	DSR
Research perspectives	Techno-centric human development	Introduces demonstrable artefacts or innovations dealing with systems and solving a class of problems
Normative dimension	Problem solving and problem investigations	Problem solving paradigm; offers prescriptions on creating artefacts
Nature of problems	Socio-economic and human development problems	Business problems
Views on reality	Multiple, contextually situated and socio-technologically enabled	Multiple, contextually situated and socio-technologically enabled
Research objectives	To investigate how development is influenced by or associated with information technology (IT) artefacts	To create effective artefacts or innovations
Dominant approach and method	Interpretive approach, qualitative case study; no particular epistemological assumptions	Developmental measure artefactual impacts on the composite systems; positivist epistemological assumptions, but also open to alternative epistemologies
Dominant views	Tools and ensembles for development	Design process and evaluation of tools or artefacts
Relation to knowledge	Knowledge producing and using; subjective as well as objective knowledge	Knowledge-using/prescriptive; knowing through making; objective knowledge
Results/outputs	Knowledge of task or situation in	Heuristic, design knowledge,

General criterion	ICT4D	DSR
	order to understand deployment, access, use, efficiency and effectiveness of ICTs for meeting a particular developmental agenda	knowledge of tasks or situation in order to create effective artefacts or innovations
Research direction and guidelines	Not so well defined	Well defined

Islam and Grönlund (2011) apply Vaishnavi and Kuechler's (2004) process model for DSR to the AMIS mobile phone based solution in Bangladesh to illustrate the value of DSR in ICT4D research. The process steps of the model are awareness of the problem, suggestion, development, evaluation and conclusion (Vaishnavi & Kuechler, 2004). Islam and Grönlund conclude that while ICT4D research focuses on any of five strategic issues (how, why, when, what and whom), DSR addresses the solution (how) as well as knowing the context of the artefact (why, when, what and whom) that is a comparatively more complex process than the design itself (Islam & Grönlund, 2011).

De la Harpe (2014) discusses the design and development of a mobile care data application to assist community care givers in their professional activities with reference to Kuechler and Vaishnavi's (2012) design science research in information systems (DSRIS) framework as a theoretical contribution. Key elements distinguishing DSRIS from behavioural IS research are: the ability to explore new areas, constructivist rather than statistical methods and the ability to build as well as test theory (Kuechler & Vaishnavi, 2012). The study follows a participatory design approach with the caregivers as co-designers and actor-network theory (ANT) as a suitable lens for development study. De la Harpe posits that the DSRIS framework does not provide for development studies and asks the question if there is a need to develop such a framework, suggesting a DSRIS4D (De la Harpe, 2014).

The ICT for Rural Education Development (ICT4RED) is a large scale pilot over a period of three years that tests the use of tablets in 26 deep rural schools in the Eastern Cape in South Africa (Herselman & Botha, 2014). The study contributes the Evidence-based ICT4RED Implementation Framework that is developed using DSR as the methodology with the DSR cycles and guidelines defined by Hevner et al. (2004) as shown in Table 2.6. The framework guides the way in which one type of technology can support and enhance teaching and learning in a specific resource constraint environment (Herselman & Botha, 2014).

Table 2.6. DSR guidelines as applied to the ICT4RED study (Herselman & Botha, 2014; Hevner et al., 2004)

Guideline	Description	Application in the ICT4RED study
Guideline 1: Design as an artefact	DSR must produce a viable artefact in the form of a construct, a model, a method, or an instantiation	A research-related operational ICT4RED framework has been developed as an artefact based on knowledge gained from the application of technologies and resources in the 26 schools.
Guideline 2: Problem relevance	The objective of DSR is to develop technology-based solutions to important and relevant business problems	Technology-based solutions have been created to support the teaching and learning at the schools.
Guideline 3: Design evaluation	The utility, quality, and efficacy of a design artefact must be rigorously demonstrated via well executed evaluation methods	The framework has been evaluated by the ICT4RED core team after each phase before replication and monitoring and evaluation processes have been applied to evaluate the different components of the framework.
Guideline 4: Research contribution	Effective DSR must provide clear and verifiable contributions in the areas of the design artefact, design foundations, and/or design methodologies	The elements of the framework have been able to contribute to new processes and artefacts that can assist schools to use technology enhanced learning resources to support teaching and learning. There is a theoretical, methodological and practical contribution.
Guideline 5: Research rigor	DSR relies upon the application of rigorous methods in both the construction and evaluation of the design artefact	Rigor will be achieved through the use of the framework by new researchers or practitioners from industry and academia. Additions to the knowledge base as well as determining through monitoring and evaluation what worked and what not, with reasons, have assisted in strengthening the elements of the framework.
Guideline 6: Design as a search process	The search for an effective artefact requires utilising available means to reach desired ends while satisfying laws in the problem environment	Each component has developed research question, deliverables and methods that they applied to add to the knowledge base of the elements of the framework.

Guideline	Description	Application in the ICT4RED study
Guideline 7: Communication of research	DSR must be presented effectively to both technology-oriented as well as management-oriented audiences	A communication strategy in consultation with the Department of Science and Technology, Department of Basic Education and Department of Rural Development and Land Reform was developed. Various presentations at various forums, conference and workshops were done to communicate the framework.

Departing from the viewpoint that development informatics is over focused on social development and under focused on economic development, Mramba, Apiola, Kolog and Sutinen (2016) set out to identify barriers to economic development for street traders in Tanzania that can be addressed by technology. This study describes the initial stages of a DSR study that aims to improve the street traders' business prospects with technology solutions. The common objective for the initial stages of a DSR study is to identify and represent opportunities, problems, and potential technology solutions in a given environment (Hevner, 2007; Mramba et al., 2016). The study covers the problem explanation and requirement definition with one active DSR thread of a group of street traders working with a software engineer and researchers to co-design activities to prototype on various smartphone-based applications (Mramba et al., 2016). The researchers call for an improved integration between ICT4D and DSR in order to construct technology solutions that are adapted to the demands and requirements of people in developing regions with opportunities for students to work specifically on African problems (Mramba et al., 2016).

Baskerville and Myers (2015) explore the relationship between DSR and ethnography and propose a framework for design ethnography (DE) in IS with ethnography applied as practical action in discovering information and data to enable design and the artefact as a by-product of the study in contrast with DSR where the contribution revolves around the artefacts produced by the study (Gregor & Hevner, 2013). The comparison is done using nine characteristics and summarised in Table 2.7 (Baskerville & Myers, 2015). In DE, it is the shared design experience that is key because it is an opportunity to learn about social and cultural practices and values (Baskerville & Myers, 2015). The revelations of social and cultural practices and values are needed for successful ICT4D projects (Avgerou, 2009; Heeks, 2008; Krauss, 2013).

Table 2.7. Comparative characteristics of design science research, ethnography and design ethnography (Baskerville & Myers, 2015)

Characteristic	DSR	Ethnography	Design ethnography
Conceptual origin	Engineering and computer science	Anthropology	Anthropology and design practice
Temporal orientation	Future	Past	Future
Temporal mode of theorising	Prescriptive	Descriptive	Descriptive and prescriptive
Research scope	Nomothetic	Idiographic	Idiographic
Empirical mode	Invention	Immersed observer	Immersed in intervention
Research activity	Design IT artefacts	Fieldwork	Design IT artefacts during fieldwork
Validation	Evaluation	Thick descriptions	Thick descriptions
Main context residual	IT artefacts	Shared cultural knowledge	Shared design knowledge
Research aim	Technological knowledge about artefacts	Knowledge about social and cultural practices and values	Knowledge about social and cultural practices and values

As discussed, ICT4D research is criticised for being technology deterministic on the one hand and producing explanatory theories on the other hand. DSR can balance the two approaches through co-creating solutions with the research community and iteration to evolve the solution. DSR with ICT4D creates an intersection of people (researcher, community and other stakeholders), society and technology as studied in the field of informatics. The next subsection explores a call to move ICT4D research towards informatics for development.

2.3.5 Towards informatics for development (I4D)

The MDGs have been a key force shaping the international development agenda since the early 2000s giving purpose to ICT4D initiatives (Heeks, 2014; 2016). The MDGs were written around a peak of global interest in ICTs followed by an inevitable descent from the heights of the early 2000s and recovering during the 2010s due to the phenomenal growth in ICTs worldwide (Heeks, 2014). The failures of ICT4D initiatives are well documented and explain the absence of ICT on the current version of the Sustainable Development Goals (Heeks, 2014). Heeks (2014) summarises the reasons for the failures as:

- ICT4D's inability so far to effectively and significantly engage with the twin colossi of development goals going forward: poverty eradication and environmental sustainability; which partly relates to
- ICT4D's inability to really speak the language of development: not just saying the words but grasping the underlying meaning and grammar by fully understanding development concepts and discourse; and
- ICT4D's inability to create a compelling role for itself in emerging development paradigms of sustainable development and inclusive development.

Table 2.8. Summarising changes in development issues from MDGs to the post-2015 agenda (Heeks, 2014)

MDG to post-2015 development agenda	Development goals	Development mechanisms
Diminution	• MDG 8 with ICTs/Digital • Manufacturing • Insecurity	• Traditional development finance • Development strategy
Continuity	• Well-being • Infrastructure • Urban development • Institutional development • MDGs 1-6	• Informatics
Some expansion	• Rural/Agricultural development • Services • Livelihoods • Growth and jobs • Rights and justice	• New development finance • Technology innovation including data and mobile
Significant expansion	• Open development • Inclusive development • Migration • Environment and sustainability	• Development projects • New stakeholders

ICT4D beyond 2015 will be significantly shaped by the post-2015 development agenda that succeeds the MDGs from the end of 2015 as listed in Table 2.8 (Heeks, 2014). ICTs and development should not be viewed through a technology deterministic lens, but seen as an intersection between people, society and technology. It can be conceptualised through these four assumptions (Heeks, 2016):

- **People**: there is an interrelation between agency and structure because ICT systems contain people. Human actions shape the organisations and institutions of society and the organisations and institutions of society shape human action.

- **Society**: can be thought of as operating in three interlocked systems as economic, political, and social. Each of these shapes and is shaped by ICTs.
- **Technology**: because of this interrelation, ICTs cannot be thought of as just hardware and software. ICTs are always socio-technical systems: a network of software, hardware, people, processes, and institutions involved in design, use and governance.
- **Technology and Society**: there is an inter-relation between technology and society with each connected to, and influencing the other. ICTs shape society and society shapes ICTs.

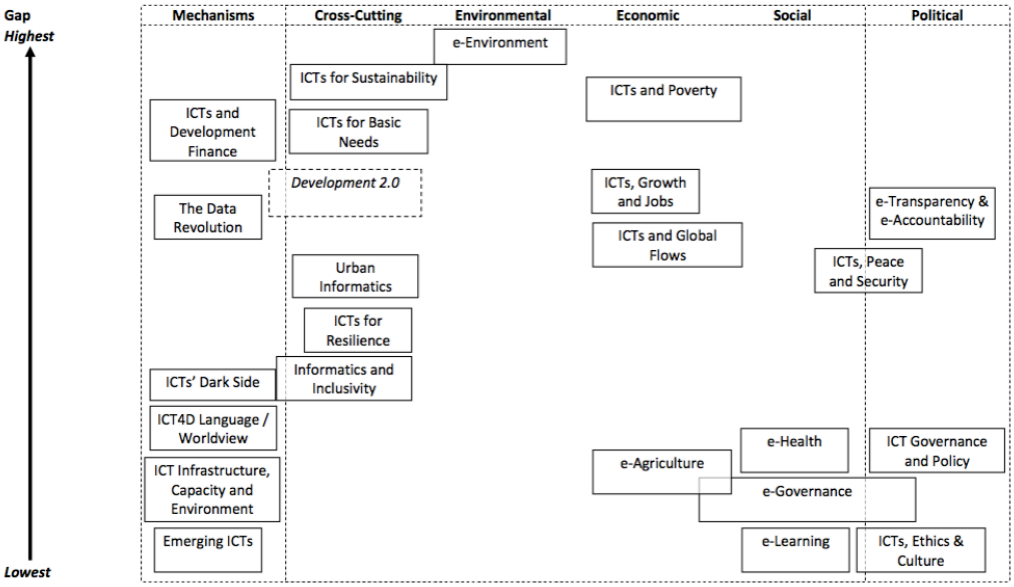

Figure 2.7. Map of post-2015 ICT4D priorities (Heeks, 2014)

ICT4D initiatives are predominately leading with technology that encourage technology deterministic designs that fail when confronted with social realities (Heeks, 2014). There should be a greater emphasis on ICT4D hybrids with socio-technical people and structures that combine an understanding of informatics with an equal understanding of development. Informatics includes data, information, knowledge, information systems, and information and communication technologies and offers a holistic approach to development with technology (Heeks, 2014). The post-2015 ICT4D priorities shown in Figure 2.7 emphasise the prevalent role of ICTs, data and human development with informatics for development (I4D) as the more descriptive term.

2.4 Community Informatics (CI)

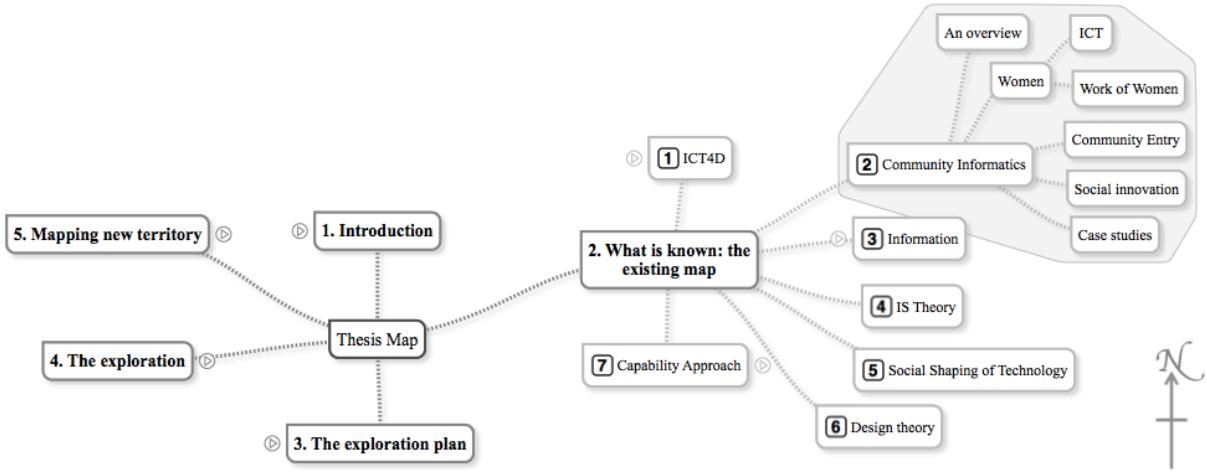

Figure 2.8. What is known about CI map

The study of the requirement of community involvement to strengthen the sustainability and success of an ICT4D project is described as Community Informatics (CI). Gurstein (2003; 2007) defines two forms of CI. The first definition describes CI as the application of ICTs to enable community processes and the achievement of community objectives. The second definition describes CI as the terminology used to describe the academic discipline and practice for systematically approaching IS from a community perspective.

The literature review on CI is mapped in Figure 2.8 and starts with an overview anchored by Gurstein (2003; 2004; 2007; 2013). The overview is followed by a review on women and ICT in a developing context and understanding the work of women. This leads to the section on community entry using Weyers (2011b) and Krauss (2013) as an entrance to the body of work. Social innovation and a review on selected case studies complete the CI review.

2.4.1 Overview

Gurstein (2004) advocates the adoption of innovation strategies on local level and defines innovation as "*a change or introduction of new processes or products which are novel in the context into which they are being introduced and where such an introduction has the effect of stimulating a localised adaptation and change*". Gurstein further encourages the adoption of a CI approach to the process of innovation to embed innovation as an ongoing element of community life and activity (Gurstein, 2004).

However, this is an emerging field and caution must be practise not to see all problems as technological given its concentration on the computer as the central tool (Stoecker, 2005). It should not only focus on addressing the digital divide, but indicate precisely for that the access would or could be used through answering Clement and Shade's (Clement & Shade, 2000) three questions:

"Access for what purposes?", "Access for whom?", and "Access to what?" (Gurstein, 2003). CI goes beyond the digital divide by examining how and under what conditions ICT access can be made usable and useful to the range of excluded populations and communities through supporting local economic development, social justice and political empowerment using the Internet (Gurstein, 2007).

Stoecker (2005) reflects on the contribution of CI to build community by asking the following questions:

- Can technology help create a focal point where people satisfy their daily needs?
- Can technology help provide informal support networks?
- Can technology provide a sense of security?
- Can it help develop an identity?
- Can it help provide unique goods and services?
- Most importantly, can it do any of those things by itself?

Technology is unfortunately the tail that wags the dog with information needs and the community itself considered (if at all) after the technology decision (Baumer & Silberman, 2011; Stoecker, 2005). CI should encourage the practitioner to follow a community-centric approach to determine the information needs of the community that will inform the appropriate information technologies, in this order (Stoecker, 2005). Access to ICT in itself is insufficient, rather it is what is and can be done with the access that makes ICT meaningful (Gurstein, 2007). Although the contribution of ICT to the socio-economic development of a community is difficult to describe and assess, there is a need to indicate the effect of a technology intervention on the whole social system (Turpin, Alexander, & Phahlamohlaka, 2013). However, the question must be asked if the technology intervention results in more trouble or harm than the situation it is meant to address (Baumer & Silberman, 2011).

Heeks (2008) describes the evolution of ICT4D as different versions namely ICT4D 0.0, ICT4D 1.0 and ICT4D 2.0. ICT4D 0.0 supports the technology-centric approach where ICT solutions are developed outside of the community. ICT4D 1.0 includes some community feedback, but the projects are still implemented in isolation from the community. ICT4D 2.0 sees the co-creation of solutions of what the community wants in contrast to what somebody else thinks the community needs. An important aspect of this approach to ICT4D is that the developing community becomes active producers and innovators of ICT solutions (Coetzee, 2010; Heeks, 2008) described by Gurstein (2013) as grassroots innovation that enables communities to better undertake existing or new tasks which they are responsible for. By using a CI approach the community is included in the ownership of the innovation and innovation strategy and ensures that innovation is done by, with and in the community and not simply something that is done to or for the community (Gurstein, 2013).

Participatory design in CI can balance this obsession with technology by integrating two radical propositions about design namely the moral proposition arguing that users have the right to be included in the process of design and the pragmatic proposition arguing that by including direct user input, the chances of a successful design outcome will be increased (Carroll & Rosson, 2007). Community participation in ICT project design is complex and difficult, raising questions around who should participate, how the participation happens and their motivation – why they participate (Heeks, 2008).

Although participatory design adds a layer of complexity to the designer's role as the designer needs to faithfully translate, collaborate and respond to the concerns of more stakeholders, it raises new opportunities with respect to human development for all stakeholders (Carroll & Rosson, 2007). As Carroll and Rosson (2007) state, the challenge of participatory design in contemporary CI is chiefly one of creating a self-directed and sustainable process of continuous learning. Community members must take ownership of their ICT4D projects and rearrange social structures as appropriate to increase their options for development such as economic freedom, social freedom, political freedom, trust relationships and access to security resources (Breytenbach et al., 2013; Sen, 1999). True sustainability of an ICT4D project can be measured if it can continue to grow using only local resources and management (Breytenbach et al., 2013).

When designing effective community ICT solutions, social cohesion and social capital are important. Social cohesion describes the connectedness and solidarity of the group addressing who and why community members will participate in the project. Examples of social cohesion values are belonging, inclusion, participation, recognition and legitimacy. Social capital describes the resources available to the group members and will influence how the participation will happen. Examples of social capital values are levels of trust, perceived reciprocity, extent of obligation, empowerment, and collective norms and values (Erete, 2014). Community technologies should be designed to increase both social cohesion and social capital with emphasis on engaging small groups with a specific interest (Erete, 2014).

The implementation of CI projects is the link between project ambitions and the impacts delivered to the community (Osah, Pade-Khene, & Foster, 2013). The focus is often on the supply of the infrastructure than on the demand of the beneficiaries to use ICT, their attitudes and acquired capacity to use ICT (Osah et al., 2013). The ability to continuously assess the projects is imperative. Osah, Pade-Khene and Foster (2013) suggest the following guiding principles that support effective process assessment exercises in rural ICT project environments: collaborative evaluator and stakeholder relationships; program theory specification; validate assessment questions; quality control throughout data collection and analysis; and ethical considerations. These guiding principles should be applied in the assessment following three critical themes: service utilisation; organisational function; and

external project factors. Explicitly elaborating on the service utilisation theme reminds the project members to focus on the beneficiaries' perspectives as they are the main reason for these projects (Osah et al., 2013).

Given the focus of the research study on women, the next subsection reviews existing literature on women and ICT.

2.4.2 About women and ICT

Research has found that when women use ICTs they increase their productivity, gain confidence and status in the community, and use the information to improve their lives and well-being (Huyer, 2005; Morrell & Sterling, 2006). Women-friendly approaches to development benefit women, their families, communities, productivity and the nation as a whole (Gillard et al., 2008; Huyer, 2005). The potential for women's empowerment lies in the possibilities for social transformation contained in ICTs through its oppositional proclivities to democratise as well as centralise resources and power (Gurumurthy, 2008).

However, in many of the developing communities, gender inequalities are embedded deeply in the culture (Krauss & Turpin, 2010; Morrell & Sterling, 2006). The MDGs and the SDGs reflect this by defining the third MDG as "Promote gender equality and empowerment of women" and "Gender equality" is the fifth SDG (Sachs & McArthur, 2005; Statistics South Africa, 2010; United Nations Development Programme, 2016b). The Heads of States of the African Union announced 2010-2020 as the decade for the African Woman, in recognition of her role in combating poverty and stimulating sustainable development (Government Communications, 2010).

One of the challenges in the ICT4D field is that the true depth of the gendered digital divide remains unknown due to the lack of clear data on gender access, content, employment, education, and related areas (Morrell & Sterling, 2006). Research areas have been identified as: the long term cultural and socioeconomic impact of ICTs on women; the aspects of software and hardware design that best serves the needs; and the cultural factors that influence girls' and women's interest in the adoption of ICTs (Morrell & Sterling, 2006). In addition, Mbarika, Payton, Kvasny and Amadi (2007) argue that most of ICT4D studies that portray a positive view of ICT in Sub-Saharan Africa, tell the story of the urban African "elites" and future studies should concentrate on rural "forgotten" parts of developing countries (quotation marks in original). The importance for research on the role of women in connection with ICT in developing countries has been identified (Gillard et al., 2008; Huyer, 2005; Morrell & Sterling, 2006; Walsham et al., 2007).

Fact:

- Women make up a substantial portion of the lowest income groups in most countries
- Women play a central role in the well-being of family and community
- Women engage in 60-90 per cent of agricultural production activities
- Women tend to be responsible for the gathering and use of energy for cooking as well as for the water and sanitation needs in their communities
- Women are holders of much of the world's indigenous knowledge about medicinal and agricultural uses and processing of plants and seeds
- Women are the providers of family health care

Therefore:

- The value of information to women is enormous and affects all aspects of their lives (Huyer, 2005).

Given the background of the role of women in communities and families, the existing gender-digital divide is counter-productive to the contribution women aided by ICT, can make to society. Women are being left behind in the information society because they have lower levels of literacy and education, less time available to use ICT, with more commitments in the household, less money, less control, fewer learning opportunities and are restricted by socio-cultural and religious customs that restrict travel, restrict interactions with men and created preconceptions about the ability of females to understand ICT (Goyal, 2011; Huyer, 2005; Joseph & Andrew, 2009). Another contribution to the low adoption of ICT by women is that ICTs and their content are overwhelmingly designed by men, in English, and do not reflect the interest, concerns, perspectives and information needs of women (Huyer, 2005).

ICTs can be seen as the forerunner of new freedoms for women as the starting point of a new set of capabilities that can expand valuable states of being and doing, just like literacy and education (Gurumurthy, 2008; Sen, 1999). ICTs provide opportunities for assuming new social roles for women, such as software engineers, knowledge workers, "infomediaries", call centre operators and social entrepreneurs (Gurumurthy, 2008).

Women in developing regions stand to benefit from well-executed ICT initiates in a variety of ways: healthcare, distance education, vocational and technical training, rural productivity, commercial opportunities, access to credit, participation in public policy, activism, self-expression and social connectivity (Goyal, 2011; Gurumurthy, 2008; Lewis, Tigist, & Van Vuuren, 2013; Mbarika et al., 2007; Morrell & Sterling, 2006). It creates new meanings of citizenship through avenues for voice,

agency and participation in the public sphere and breaks the barriers to learning and knowledge imposed by literacy and print technology-based systems (Gurumurthy, 2008). Gurumurthy (2008) identifies four achievements that are possible through access to ICTs:

1. New organisational systems such as women's enterprises and livelihood support structures to gain operational efficiencies and build institutional capabilities for greater accountability.
2. New community informatics structure that democratises local ICT and allow ICT appropriation by women.
3. The construction of new knowledge processes that the women participate in providing illiterate women and their collectives new ways of learning and sharing and kindling solidarity through collective reflection and action.
4. New institutional alternatives to enable social inclusion.

To realise these benefits, ICT initiatives should adopt strategies to increase access to ICT education for women, such as promoting social and political capabilities; coordinating efforts of women's groups; creating networks of community-based ICT learning centres; overcoming barriers such as language and local content; providing professional development for teachers; creating an enabling environment; and redefining ICT skills for women (Dlodlo, 2009; Goyal, 2011). The lens of appropriation must be applied where women are allowed to create contextual meaning and self-directed uses of ICTs. Appropriation includes making women familiar with the possibilities of ICTs without taking for granted what it ultimately offers (Gurumurthy, 2008). Women are not likely to need and much less likely to demand, connectivity, unless it provides meaning to their lives (Gurumurthy, 2008).

Research has found that there is a link between gender equality and economic growth. The reason for this is the instrumental role women can play in lifting their families out of poverty by participating in the labour force, enabled by ICTs. Women are more likely to invest their earnings in their children and to assume critical, life-sustaining responsibilities (Mbarika et al., 2007; Sarker, Abed, & Seelos, 2016). Through learning new skills and using digital ICTs, women and girls have been able to build self-confidence, increase their economic power and independence and make better-informed decisions (Cummings & O'Neil, 2015).

Although ICT is not the solution to all the socioeconomic problems women face, it is a skill-seeking, potential income-earning alternative (Mbarika et al., 2007) and has the potential to increase the equity and efficiency of female participation in the labour force (Goyal, 2011). ICTs help restore flexibility in female external labour supply since it facilitates distance work, flexitime, and location activity (Goyal, 2011). The extent to which ICTs can contribute to the empowerment of women and girls relates to whether they are able to use the ICT opportunities to build their self-believe and express

their views and to influence private and public decisions as voice and influence are central to empowerment (Cummings & O'Neil, 2015). Women empowerment is therefore less about the hardware, software and other components of ICTs and more about whether and how women access and use these tools and the effect of this on power relations and institutions (Cummings & O'Neil, 2015).

ICT is uniquely suited to help women acquire vital economic capabilities and functionings, but supporting social and political capabilities are required first (Goyal, 2011). Cummings and O'Neil (2015) posit that ICTs are a mirror on society with social, economic and political structures relating to gender and to class influence how women and girls access and use ICTs.

To further understand the role of women and the possible impact of ICTs, the next subsection discusses toe work of women.

2.4.3 Work of women

Women's economic empowerment is not only about participation in the labour force, but also about the choice of work, sector, location and working hours (Chopra, 2015). Women are concentrated in sectors such as home-based work, domestic work, construction and labour-intensive manufacturing, packaging and handicrafts (Chopra, 2015). There is an estimated number of 67 million people working as domestic workers worldwide of which 80 per cent are female (International Labour Organisation, n.d.). This high concentration of women contributes to the stereotype that perpetuates these jobs as being "women's work" (Chopra, 2015). In South Africa about a million people, mainly black women, are employed as domestic workers (Budlender, 2010).

Women have a double burden of unpaid care work in their own households and economic empowerment referred to as time poverty (Chopra, 2015). Due to the fact that work opportunities are typically away from their residences and their reliance on public transport, women face the prospect of increasing levels of time poverty (Chopra, 2015; Joseph & Andrew, 2009). Time poverty is a critical determinant of women's poverty and a critical determinant of their economic empowerment (Chopra, 2015). The exclusion of women from many formal economic activities has contributed to their involvement in casual or unregulated labour as a means of coping with economic hardship (Joseph & Andrew, 2009).

There is a lack of decent work for women working as domestic workers due to increasing poverty in many countries, coupled with structural adjustment programs, a declining agricultural sector and the economic crisis, have pushed many women and girls into the domestic labour market with generally low education levels and few marketable skills (Chopra, 2015; Mansour, 2015). The domestic sector is characterised by longer work hours, lower wages, few if any benefits, less legal or social benefits or

protection, no maternity leave, health care or pension provision than the other formal sectors. Female domestic workers are subjected to gender discrimination, prejudice and stereotyping in relation to their work, that is regarded as low status and accorded little value (Budlender, 2010; Chopra, 2015; D'Souza, 2010).

The domestic labour market is globally poorly regulated with domestic workers in South Africa included in the labour law from 1993 (Budlender, 2010). Even with limited legal labour protection, it is difficult to enforce the laws in a situation where most workers are the only such employee in a workplace that is a private home and the relationship between the worker and employer is very unbalanced in terms of power with minimal trade union membership (Budlender, 2010). The knowledge of most workers and employers about details of the legal provisions is poor and often incorrect (Budlender, 2010). Awareness-raising and information-sharing are very limited within the domestic sector adding to the hidden nature of the workplace (Budlender, 2010; D'Souza, 2010).

If domestic work is performed under fair working conditions, it has tremendous potential for reducing poverty and empowering women (D'Souza, 2010). Women working as domestic workers allow other female workers with family responsibilities to achieve equilibrium between work and family life and remittances of migrant domestic workers create pockets of relative prosperity in otherwise resource-starved communities (D'Souza, 2010; Wardoyo & Mahmud, 2013).

Women in the domestic sector use ICTs mostly for personal reasons such as finding child-rearing information, adaptation in the work environment away from home by building social networks, maintaining their emotional links with family, and finding information about work, security and health (Mansour, 2015; Wardoyo & Mahmud, 2013). However, low income and low education levels are barriers to accessing and using ICT (Mansour, 2015). Mansour (2015) describes the information-seeking behaviour profile of women in the domestic sector who participated in a study as showing a preference for verbal over written information sources such as speaking to other people, watching television and listening to radio with a small number of the participants using the Internet.

ICTs can be used as an opportunity producer, capacity enhancer, knowledge producer and social enabler by women in the domestic sector (Wardoyo & Mahmud, 2013). ICTs can provide access to information and public services such as health and education that can further women's empowerment and offer a creative solution to provide safe locations and environments for women to work in without contributing to time poverty (Chopra, 2015). Wardoyo and Mahud (2013), Chopra (2015) and Mansour (2015) recommend further research into the use of ICTs and its contribution to women's empowerment.

Central to the theme of community informatics and the role of women, is the community. Project adoption by the community is identified as a critical success factor of ICT4D initiatives starting with community entry as discussed in the next subsection.

2.4.4 Community entry

The failure of many ICT4D projects can be attributed to the failure of the project adoption by the community (Avgerou, 2009; Krauss, 2009b). An ICT approach alone is not enough as there are other complicated factors, such as poverty and health that influence the success of an ICT4D project. Community participation is required for success (Krauss, 2009b). It is crucial not to see the community as just a reservoir of unfulfilled needs and unsolved problems, but rather as a pool of assets, strengths and abilities, waiting to be tapped (Weyers, 2011b).

Sen (1999) highlights the intrinsic value of participation as a freedom by individuals to influence the decisions that affect them. Participation by community members is both a means and an end of development (Moens, Broerse, Gast, & Bunders, 2010). In context of ICT4D, a community can be defined as a group that provides a focal point in which one's daily needs are satisfied; informal support networks; a sense of physical and psychic security; an identity; agglomeration benefits; and a shared ethnicity (Stoecker, 2005).

Success development of community-based ICT4D initiates requires strong links between social and technical networks that are most likely established if grown over time through gradual, localised and organic developments with the community (Slater & Tacchi, 2004). Responsiveness to the needs of the users and reflexivity about progress and improvements are strategies required to maintain strong links with the community (Slater & Tacchi, 2004). ICTs play a crucial aspirational role in communities as skills necessary for the future with many poor people investing, at huge sacrifice, in ICT education and access for themselves or their children (Slater & Tacchi, 2004; Stillman et al., 2012). However, researchers working in developing communities need to understand that poverty itself is a major barrier to participation for many people as those who are marginalised through gender, social standing, ethnicity and other factors feel most excluded from ICTs and therefore from future hope; they feel they have no proper place in ICTs and ICT initiatives (Slater & Tacchi, 2004).

Working in developing communities and specifically Africa, requires a paradigm shift from the Eurocentric researcher. Working in Africa requires an approach described as the African Renaissance management systems by Jackson (2002) and consists of sharing; deference to rank; sanctity of commitment; regard for compromise and consensus; and good social and personal relations. This approach corresponds to Habermas' theory of communicative action that covers issues related to participation, empowerment, and dignity (Kanungo, 2004). Weyers (2011b) suggested the "R.E.A.L." approach to community participation:

- R = Respect the people and their customs, protocol, knowledge, values, views and standards
- E = Encourage them to share their knowledge and ideas by using appropriate techniques
- A = Ask questions and give feedback
- L = Listen carefully

Research has shown that ICT4D projects in collaboration with the community are more successful (Madon et al., 2009). An example of community collaboration is the introduction of infopreneurs on a project in South Africa (Van Rensburg et al., 2008). Infopreneurs are established and trusted community members with good track records in their communities and entrepreneurial interest (Van Rensburg et al., 2008).

Often the researcher and the community represent different cultural groups and economic realities. Inter-cultural communication and sensitivity towards poverty and hope are important aspects to consider when engaging with ICT4D projects (Krauss, 2009a; 2009b). Community participation is required for success and the role of a cultural interpreter is indispensable. A cultural interpreter is a member of the community who can translate the culture, customs, existential understanding, social structures or any cultural aspect that might be unique and might help to gain understanding and enable the researcher to act appropriately (Krauss, 2009b). Cultural interpreters play an integral role in deciphering meaning and interpreting social phenomena in the ongoing process of community entry (Krauss & Turpin, 2010).

Krauss (2009a; 2009b) follows Weyers' indirect route for negotiating entry into a community:

- Identify community leaders
- Visit the community leaders and explain the reasons for the involvement in the community
- Use the snowball technique (asking for referrals) to get new contacts
- Make more informal contact with 'ordinary' community members
- Give community leaders and members the opportunity to express any negative feelings
- Give the community leaders and members hope for a better future
- Help community leaders and members to realise that they should accept responsibility to deal with their own needs and to become involved in the process
- Work towards mutual trust and being accepted by the community
- Encourage and enable community leaders to start working towards a plan for future action

The community development model is based on the perception that community members are ultimately in the best position to develop themselves and their communities and to eliminate the obstacles that impede this process. Development should be a community driven and owned process, actively involving the local power structure and leadership, following democratic procedures and

promoting self-help and the participation of the community in their own affairs (Weyers, 2011b). The researcher should fulfil the role of catalyst, motivator/supporter, enabler/facilitator, consultant and guide, and view the role of community members as that of participants in an empowerment process (Weyers, 2011b).

An interesting observation of participants in ICT4D research is the emancipation of both sides of the development divide (Krauss & Turpin, 2010). Researchers should accept that community members are experts on their own situations (Weyers, 2011a).

Most important, researchers must explain to the community that outsiders need to understand the community and their impediments first before the outsiders can provide assistance. Researchers first have to learn from the community. As explained by participants in a participatory rural appraisal workshop:

"*During introductions it is important to give a full account of who you are, where you are from, why you are there and what you plan to do while you are there. The community should know ... what is going to be done with the outcome of your visit, what you expect from the community and what they can expect from you ...*" (Weyers, 2011b).

CI introduces novel ICT solutions to communities often addressing a social problem as described in the next subsection as social innovation.

2.4.5 Social innovation

The social challenges facing the world today require radical innovation that cuts across organisational, sectorial and disciplinary boundaries causing a phenomenal surge of interest in social innovation as a way to achieve sustainable economic growth and development (Foster & Heeks, 2015; Krause, 2013; Phills, Deiglmeier, & Miller, 2008; Urama & Acheampong, 2013). Social innovation is a novel solution to a social problem that is more effective, efficient, sustainable, or just, than the existing solutions and for which the value created accrues primarily to society as a whole rather than private individuals (Phills et al., 2008). It is a complex process that profoundly changes the basic routines, resource and authority flows or beliefs of the social system in which it occurs (Westley & Antadze, 2010).

Social invention is an everyday occurrence in a response to perceived needs to improve people's wellbeing (Westley & Antadze, 2010). Often these inventions remain hidden without any attempt at generating a wider impact or have a limited impact in a community through diffusion (Westley & Antadze, 2010). Social innovation occurs in the rare occasion when an invention succeed in having a lasting or revolutionary impact by challenging and changing the very institutions responsible for the social problem that they address (Westley & Antadze, 2010).

The starting point for deliberate social innovation is identifying an unmet need coupled with ideas of how it could be met while fostering empathy (Mulgan, 2006). Some of the most effective methods for cultivating social innovation start from the presumption that people are competent interpreters of their own lives and competent solvers of their own problems (Mulgan, 2006). Social innovation efforts should be approached as if it were a research project with ethnography usually a more relevant tool than statistical analysis (Mulgan, 2006; Seelos & Mair, 2016).

Foster and Heeks (2015) call for innovation to be inclusive. They describe inclusive innovation as the means by which marginal groups develop new goods and services to meet their needs. They argue that innovation is a principle driver of economic growth supporting the economic core and not the periphery thereby causing inequality and exclusion (Foster & Heeks, 2015). The policies to support inclusive innovation must be broadened to include sectors that matters most to marginalised communities like health, education and small scale agriculture, and to include various stakeholders like innovators, entrepreneurs, and low-income consumers (Foster & Heeks, 2015). The worldview adopted by the policies should have a different focus of social inclusion and not just profits. The objectives of the policies include the orientation of formal innovation systems towards the poor; promoting grassroots innovators; improving absorptive capacity of low-income group for innovation and learning; driving more effective use of innovations among low-income groups; and reducing structural barriers to inclusive innovation (Foster & Heeks, 2015).

Innovation is both a process and an outcome with four distinct elements namely the process of innovation that involves technical, social and economic factors; the product or invention as the outcome of innovation; diffusion or adoption of the innovation; and the ultimate value or social good created by the innovation (Phills et al., 2008). Innovation can deliver consumer benefits, economic benefits and social benefits that can result in social good for communities (Gordon, Dakshinamoorthy, & Wang, 2006). Job creation and reliable access to capital are economic benefits; new products, better prices or improved facilitation of services are consumer benefits; and cultural preservation, empowerment of women, improved healthcare and improved education are social benefits (Gordon et al., 2006). When creating social good, there are six pathologies to avoid (Seelos & Mair, 2016):

1. Never getting started
2. Stopping too early
3. Stopping too late
4. Innovating again too soon
5. Pursuing too many bad ideas
6. Scaling too little

The process of social innovation starts with defining a clear objective with the beneficiaries of the innovation (Mulgan, 2006; Seelos & Mair, 2016). It is important to gain a good understanding of the need by asking meaningful questions and drawing on relevant knowledge before formulating a hypotheses and testing potential solutions (Seelos & Mair, 2016). Synthesize findings of the social innovation efforts by conducting innovation debriefings in order to solidify emerging knowledge and describe implications for future innovation efforts (Seelos & Mair, 2016).

An innovation is truly social only if the balance is tilted towards social value (Phills et al., 2008). The fair trade movement is an example of social innovation. The umbrella organisation, Fairtrade Labelling Organizations International (FLO), sets standards for fair pricing, humane labour conditions, direct trade, democratic and transparent organisations, community development, and environmental sustainability (Phills et al., 2008). The novel contribution of fair trade is the transparency in the value chain, linking farmers, retailers and consumers with a direct economic benefit to the farmers as well as promoting sustainable agricultural techniques, international certification and labelling, child labour prevention, and fair prices. The impact of the fair trade movement is in the reasonable and guaranteed wages that release farmers from the trap of pre-harvest predatory lending, help them to afford better health care and better education for their children, improve their financial skills, and foster community solidarity (Phills et al., 2008).

Microfinance is another example of social innovation where financial institutions provide services such as banking, lending, and insurance to the poor and disadvantaged who otherwise have no access to these services. By saving money, getting loans, and having insurance, the poor can improve their lives and even rise out of poverty (Phills et al., 2008; Urama & Acheampong, 2013). M-PESA, a mobile payment system, is an example of an African social innovation success story that started in Kenya (Urama & Acheampong, 2013). More than nine million people in East Africa have access to secured financial exchange services through M-PESA (Urama & Acheampong, 2013).

In South Africa, the Community and Individual Development Association (CIDA) City Campus, is an example of social innovation in the education sector (Mulgan, 2006). CIDA is the first private higher education institution in South Africa to offer a virtually free business degree to students from disadvantaged backgrounds (Mulgan, 2006). Open Africa is an example of social innovation that uses tourism as an economic platform to create and sustain jobs for rural communities in Africa (Booyens & Rogerson, 2016). Open Africa is a network of self-drive routes throughout South Africa, Lesotho, Swaziland, Mozambique, Namibia and Zambia with an innovative model to facilitate social innovation working closely with local municipalities and tourism associations with funding from corporate firms, provincial and national government departments, the South African National Lotto, and the World Bank (Booyens & Rogerson, 2016).

Other examples of social innovation worldwide are the Freecycle Network, AfroVumbua, KiberaNet and DadaabNet (Urama & Acheampong, 2013). The Freecycle Network is a supply and demand application where unwanted items can be offered to others who might need them with the motivation to reduce waste and diminish landfills. AfroVumbua in Kenya helps innovators in Africa connect with global investors interested in technological opportunities in Africa. KiberaNet and DadaabNet are wireless ICT networks that bring education, empowerment and economic opportunities to slum dwellers and refugee camps in Kenya using fibre optic cables and solar power (Urama & Acheampong, 2013).

Social innovation efforts are challenged in environments where power is tightly monopolised, where free communication is inhibited, or where there are no independent sources of money (Mulgan, 2006). Social problems are complex and social innovation efforts do not always transfer successfully between communities. Though social challenges such as poverty may look similar in new environments, the initial focus must be on identifying what is different before applying lessons from past successes (Sarker et al., 2016). Re-engagement of vulnerable populations in mainstream economic, social and cultural institutions, is intimately tied to social-ecological resilience (Westley & Antadze, 2010). In order for social innovation to have a lasting impact, vulnerable populations must be active participants and contributors to social innovation, not just as recipients of services (Westley & Antadze, 2010).

The implementation of social innovation is easier where the risks are contained; where there is evident failure; where users have choice; and where expectations are carefully managed (Mulgan, 2006). When innovation is done right, it is a patient process of iteration, learning, evaluation, implementation and scaling up what works (Musa & Rodin, 2016). Social innovations involve institutional and social system change, they contribute to overall social resilience, and they demand a complex interaction between agency, intent and emergent opportunity (Westley & Antadze, 2010). Although the innovation trend is still relatively new in the development world, it is possible that it will become the newest basis for organising the development aid industry (Krause, 2013; Phills et al., 2008).

The review of CI is concluded with the next subsection that describes examples of CI case studies.

2.4.6 Examples of CI case studies

The involvement and participation of community members who are the beneficiaries of the initiatives should be an integral part of CI projects. The case studies present in literature on this topic have various degrees of success (Pade, Mallinson, & Sewry, 2008). It an attempt to measure the success of ICT4D projects, Pade, Mallinson and Sewry (2008) identify 19 critical success factors by analysing existing case studies. They applied the critical success factors to the Dwesa project, an initiative in

the Eastern Cape in South Africa to create an e-commerce and telecommunications platform based on open source and standard technology to promote tourism in the area. Pade-Khene, Mallinson and Sewry (2011) contribute a further study where they apply the critical success factors to the project lifecycle against the Dwesa project and the Rhodes University Mathematics Education Project (RUMEP). The critical success factors are (Pade et al., 2008; Pade-Khene et al., 2011):

1. Simple and clear project objectives
2. Approaching the project in a holistic way
3. Using ICT to enhance existing rural development activities
4. Cultivating an influential project champion
5. Incorporating socially excluded groups
6. Awareness of specific ICT policy influencing the project
7. An understanding of the local political context
8. Participation of community target groups in the project process
9. Focussing on local- / demand-driven needs
10. Building on local information and knowledge systems
11. Appropriate training and capacity building
12. Facilitating local content development
13. Motivation and incentives for ICT job placement in the community
14. Focus on economic self-sustainability – entrepreneurship
15. Encouraged local ownership
16. Building local partnerships
17. Choosing appropriate technology
18. Building on existing public facilities
19. Ongoing monitoring and evaluation of the project

The Dwesa and the RUMEP case studies have shown that rural ICT projects should be community driven, initiated with a pilot project in the community, and should be iterative and incremental in nature (Pade-Khene et al., 2011).

The Digital Doorway Initiative (DDI) in Zandspruit near Johannesburg in South Africa evolved from an educational initiative to a Living Lab as a socio-technical innovation to benefit the broader community (Stillman et al., 2012). The relevancy of the project in the community is linked to the requirement of technology literacy and mastery of English in the South African economy. People are expected to use some form of technology that requires an understanding or use of English, whether it is an electronic order device or cash register as a waiter, or using software and emails in a clerical position (Stillman et al., 2012). The Living Lab approach to the DDI has adopted a broader social-political viewpoint where the Living Lab takes a role influencing and assisting collaboration

between different community-oriented stakeholders using technology for community building and community problem-solving (Stillman et al., 2012). Stillman et al. (2012) use the experiences of the Living Lab to expand the CI perspectives as summarised in Table 2.9.

Table 2.9. CI perspectives expanded through the Living Lab experiences (Stillman et al., 2012)

Concept	CI perspective	Living Lab perspective
IT as individual tool	Community networks are social technical relationships and structures for local communities; both people ICTs have degrees of agency.	Observing and assisting with the innovative use of the ICT artefact in a real life community.
Traditional business model	A community model is needed that incorporates depth understanding of community and community organisations as supporting group social solidarity and human agency.	Facilitating negotiation between business and community over ownership of intellectual property (IP) created. Living Lab acts as an incubator for community innovation.
Implementation	Implementation is an ongoing social process and is ideally a community-orientated participatory process.	Co-creation of innovation by all stakeholders for example community members, social and technical specialists and entrepreneurs.
Technological effects	Technological effects are indirect and involve different time scales.	In addition to technological effects, research is directed towards finding means to demonstrate economic and social impacts and outcomes.
Political	Community politics are as complex as any other politics. Social justice is critical.	In order to achieve institutional collaboration, institutional politics need to be managed (community, business, academic, funders).
Incentives to change	Incentives are in the social domain as the value to the community.	A complex mix of stakeholder incentives. Striving for alliances and alignment between stakeholders.
Relationships	Power, language, power, gender, class, disability, ethnicity need to be accounted for.	Also complex and dynamic where culture, social structure, and technology concepts play a role. There are different power relationships.
Social impacts of ICT	Potentially enormous social impacts as well as potentially enormous social and community repercussions of ICT.	In addition, one of the Living Lab's aims is to demonstrate impacts and usage for different stakeholders.
Context	The vocabulary and agency of community and community organisations need to be well understood. Gender, class, disability, and ethnicity need to be accounted for.	Contexts are complex and different based on specific community requirements and needs. The composition of key stakeholders differs in each context.
Knowledge and expertise	Knowledge and expertise are inherently tacit/implicit. ICTs are not at the core	There is a complex relationship between IS or artefact designers, social

Concept	CI perspective	Living Lab perspective
	of many community or community agency actions. Social (people) technology is just as important.	researchers, and communities in explicating knowledge and expertise; developing a shared language is difficult.
ICT infrastructure	ICTs are an additional layer to human-technology networks and may encounter resistance.	ICT infrastructures are evolving with the key question unanswered if it works for the community or not.

Bagui and Bytheway (2013) explore e-participation in the City of Cape Town in South Africa. They found that there is still a perception that citizens are summoned to be heard at a chosen time and that the attitude of certain officials towards community members should be re-examined. They identified the following issues that hamper the success of e-participation:

- Government transformation needed to accommodate the new technologies and achieve the organisational and procedural changes necessary
- Lack of e-skills
- Government is seen as not listening and non-responsive
- Government is perceived as being almost totally ICT illiterate
- Community members showed ignorance of regulations and structures
- Some officials find social media more ludicrous than useful
- Cost of SMS is expensive
- Lack of City policy regarding ICT
- Availability of cellular networks that provides Internet access

The e-participation initiative at the City of Cape Town is in its beginnings due to a lack of participation where community members have a poor perception of government, hampered by the high cost of communication in South Africa and an unclear mobile communication channel strategy from the City (Bagui & Bytheway, 2013).

Increasing public participation in local government by means of mobile phones are further investigated with a focus on South African youth (Van Belle & Cupido, 2013). Van Belle and Cupido (2013) adapt the unified theory of acceptance and use of technology (UTAUT) model as shown in Figure 2.9 to measure the behavioural intention of the study participants to use mobile phones to interact with government.

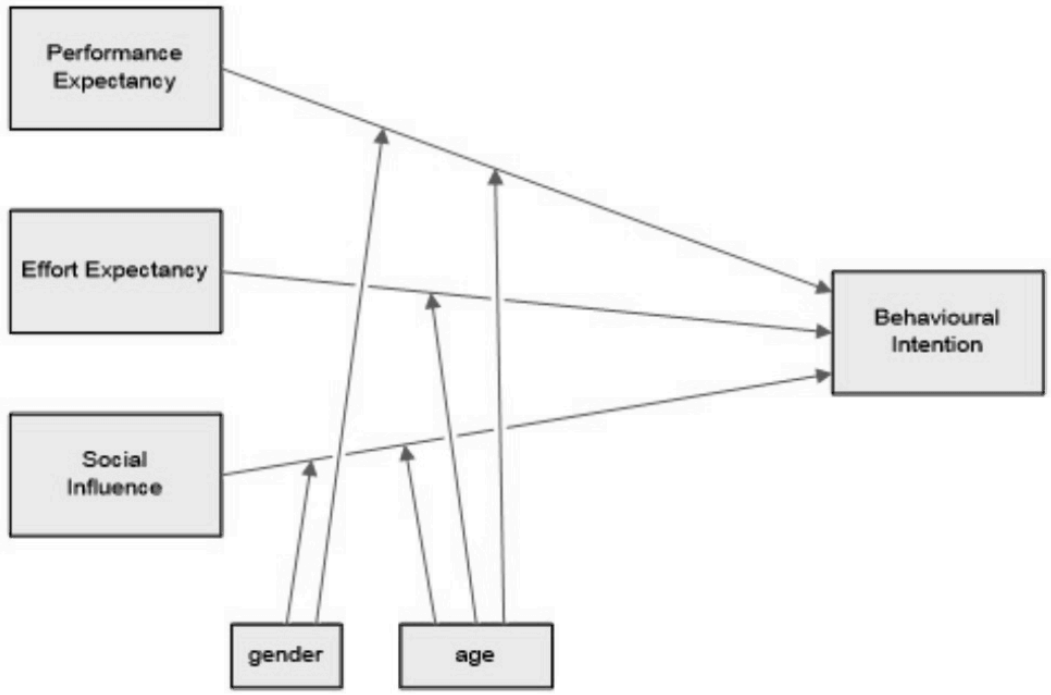

Figure 2.9. Modified UTAUT model (Van Belle & Cupido, 2013)

The study survey a group of people aged 18 – 35 years resulting in 131 useable questionnaires and four interviews. The response is overwhelming positive about using mobile phones for public participation with the need for public transport information, location service for government clinics and offices and job information. The participants also express a wish to provide information for example crime, over full taxis, service delivery problems and corruption. They are willing to communicate with their community and local councillor. The researchers find that mobile phones serve to empower citizens through access to information and report and communicate more easily than before (Van Belle & Cupido, 2013).

The importance of community participation and an understanding of the community members' communication preferences are highlighted in the study by Jones, Smithson and Hennessy (2014). The study focuses on older people in rural areas in South West England, Wales and Canada and recognises that the digital divide affects older people in rural areas. The purpose of the study is to determine if the researchers could facilitate inter-regional and inter-sectorial communication on issues concerning older people in rural areas via the Internet. The study uses webcasts, discussion forums, Twitter and email as communication channels. On reflection, they find that email is the most effective communication method and even though the project attempts to engage with community members, this is an example of a project done "to" and not "with" community members.

In contrast to the previous case study, the study on making information technologies work at the end of the road explores community innovation (McMahon, Gurstein, Beaton, O'Donnell, & Whiteduck, 2014). The community innovation is described as a two-step model with the first step when the

community recognises that it has the efficacy to respond to its local circumstances. The second step involves partnering with community intermediary organisations to provide economies of scale and other shared resources (McMahon et al., 2014). The case study describes the "First Mile" approach by communities in Canada to deliver their own ICT services and broadband connectivity.

Tacchi, Kitner and Mulenahalli (2014) review case studies referring to the bottom of the pyramid in the DakNet project in India and human development and capability approach in the Finding a Voice project in India, Indonesia, Nepal and Sri Lanka. The DakNet provides asynchronous Internet connectivity with services are email, SMS, voice mail, e-shopping, information search, matrimonial service and job search. The e-shopping service proves to be the most popular with community members participating in shaping the product catalogue. Finding a Voice uses a variety of technologies to experiment with participatory content creation. The researchers recognise that innovation is done by, with, and in the community and not simply something that is done "to" or "for" the community (Gurstein, 2013; Tacchi et al., 2014).

2.5 Information as a development resource

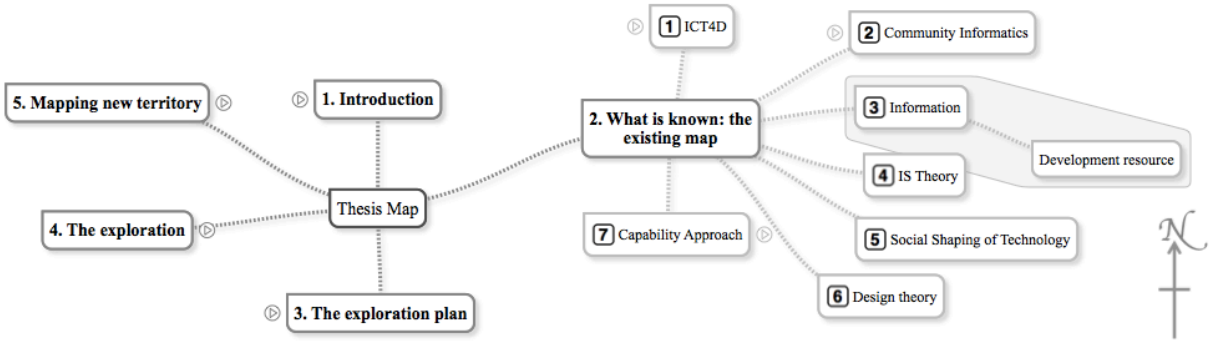

Figure 2.10. What is known about information as a development resource map

Information is viewed as a social construction that enables human decision-making and problem solving (Britz, 2004). Information in one of the resources in the development chain and poverty alleviation together with education, skills, infrastructure, land and money, and plays an important role in enabling choice (Harris, 2004; Macgregor, 2005; Meyer, 2002; Roman & Colle, 2003; Sturges & Neill, 1998). In order to become aware of choices and support the ability to enact choices that can lead to development outcomes and an experience of the good life, access to information is required (Alsop, Bertelsen, & Holland, 2005; Hatakka & Dé, 2011; Kleine, 2011). Access to information is recognised as a human right and access to public and personal information is protected in South Africa through the Constitution, the Promotion of Access to Information Act and the Protection of Personal Information Act (The Presidency, 1996; 2000; 2013; United Nations Human Rights Council, 1948).

Development requires some kind of action and needs information to set the development process in motion (Meyer, 2002; Sturges & Neill, 1998). The intention of a development intervention is to bring about change and to intervene with the purpose of improving (Meyer, 2002; Rogers, 1992). Change, intervention, continuation, participation, and the use of information are ubiquitous sub-processes in any development process (Meyer, 2002). Development is an ongoing process with single projects contributing to development, but do not become an end in itself, and without participation of those on the receiving end, the development process will be less successful (Rogers, 1992).

It is important to understand the nature of information, because the development process can be retarded without appropriate information (Meyer, 2002; Sturges & Neill, 1998). Information is characterised as a dynamic force, constantly altering and extending a store of knowledge (Eaton & Bawden, 1991; Rogers, 1992). Information has no set value and has to be utilised before value can be attributed (Macgregor, 2005). Some of the attributes of information such as its ability to act as a dynamic force make it an appropriate resource for development, but other attributes such as its dependency on culture and media, make it less suitable (Meyer, 2002). These attributes, listed in

Table 2.10, need to be considered during the design of the development project, especially where information from the developed world is applied (Meyer, 2002). Information is not a ready-made resource given its ability to act as a dynamic force (Meyer, 2002).

Table 2.10. Comparison of the attributes of information (Meyer, 2002)

Attributes suitable for development	Attributes less suitable for development
Dynamic force	Intangibility
Extending knowledge base	Interdependence
Increase perceptions	Culture-dependent
Enhance competencies	Medium-dependent
Enhance self-esteem	Content-dependent
Enhance growth	Conversion-dependent
Multiplicative quality	
Versatility	

Sturges and Neill (1998) suggest asking six questions when information is introduced to a community as a new service. The answers to the questions will inform the design of the development project and should be tested against the attributes of information to support good decisions. The questions are:

1. For whom should it be provided?
2. What should it deliver?
3. Where should it be provided?
4. By whom should it be provided?
5. In what forms should it deliver information?
6. How should it deliver information?

When communities are asked the second question of what information the project should deliver, a common response is the need for information on income generating activities, agriculture, health and hygiene, education, domestic skills, spiritual sustenance, entertainment and mental stimulation; addressing the whole human being (Sturges & Neill, 1998). However, often information services are not use by the targeted local population due to the lack of understandable and relevant content (Roman & Colle, 2003). Roman and Colle (2003) recognise that most ICT4D projects have an element of technology determinism that have to be countered with community participation in the design and implementation activities to integrate normative needs and community demand. People may not necessarily respond to simple service availability given the power structures and culture dependency and awareness must be raised about the value of information through co-creating locally

relevant content (Roman & Colle, 2003). A basic strategy to increase the information service' chances for success, is continuous monitoring of community needs and uses through a needs assessment (Roman & Colle, 2003). Roman and Colle (2003) offer seven suggestions for universities to play a significantly broader role in the world's efforts to employ ICTs for sustainable development and poverty reduction:

1. Conduct continual research on community information needs so that appropriate information resources can be developed.
2. Convert its own research and academic knowledge into education, information, and training packages suitable for community use.
3. Mobilise, interpret, integrate, and package information from external authoritative sources and tailor it to the needs of populations in surrounding regions.
4. Include students in the ICT4D projects as interns, collecting case studies, data and lessons learned.
5. Design and execute ICT training programs for various community groups, especially those that are likely to be ignored by conventional ICT training.
6. Through their participation as students in this program, prepare a new generation of ICT4D professionals.
7. Orient university officials and faculty to the emerging ICT4D field so they can be opinion-leaders in this area.

The suggestions illustrate the dynamic nature of information that benefits the communities, the universities and broader society as a contribution to solving information poverty. Information poverty is defined as the situation in which individuals and communities, within a given context, do not have the requisite skills, abilities or material means to obtain efficient access to information, interpret it and apply it appropriately (Britz, 2004). Communities suffering from information poverty lack essential information and have poorly defined information infrastructure. Britz (2004) posits that information poverty is a serious moral concern and a matter of social justice. It is a complex problem that is not restricted to the digital divide, but also to cultural and language diversity, levels of education and the ability to access and benefit from information (Britz, 2004). Information poverty can be viewed from three perspectives:

1. An information connectivity approach: lack of access to ICTs
2. An information content approach: the affordability, availability and suitability of the information
3. A human approach with the knowledge aspect: the ability to derive value from information

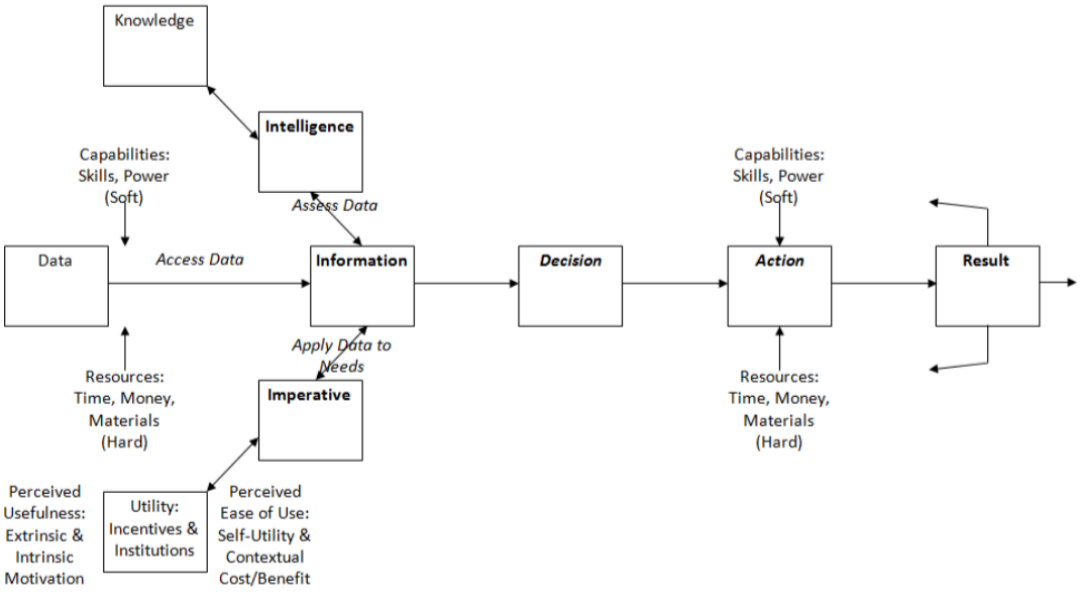

Figure 2.11. Extended information value chain (Heeks, 2016)

Heeks (2016) illustrates in the extended information value chain (Figure 2.11) that value and development results are only derived when information is used in decisions that lead to actions. The ability to derive value from information is determined by people's level of skills, experience and other contextual factors and highlights the importance of education in the information era (Britz, 2004; Heeks, 2016). As information poverty has an overall impact on the development of people in nearly all spheres of life, Britz (2004) proposes six practical guidelines to reduce information poverty:

- Guideline 1: Each person in the community has an equal right of access to essential information required to develop and exercise other basic rights.
- Guideline 2: Access to essential information implies the accessibility and benefit thereof.
- Guideline 3: The creation of a minimum information standard for society.
- Guideline 4: The creation of equal opportunities to exercise the right of access to information.
- Guideline 5: The adoption of the right to communicate.
- Guideline 6: Inequality in the distribution of information is allowed if it contributes to the improvement of information-poor communities' lives.

Apart from the economic, political, and educational challenges that information poverty creates, it also raises a serious ethical dilemma that speaks to the moral conscience of the information-rich (Britz, 2004). Information is one of the most important resources conducive to development and helps people in communities to expand horizons, increase perceptions, enhance competencies, enlarge a sense of perspective and enhance self-esteem (Meyer, 2002; Rogers, 1992; Sturges & Neill, 1998). Access to information alone does not guarantee development; what matters are people's actions once they are provided access (Alampay, 2006).

2.6 Information systems theories

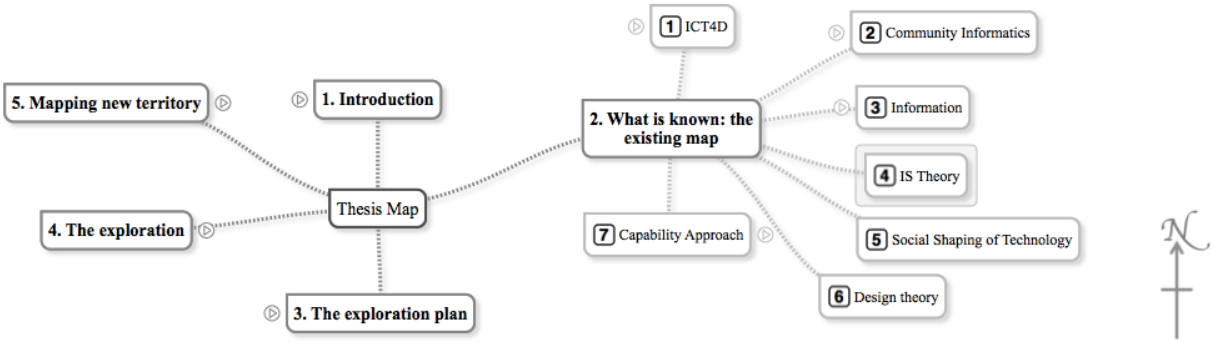

Figure 2.12. What is known about IS theory map

According to Gregor (2006) the IS discipline is at the intersection of knowledge of the properties of physical objects and the knowledge of human behaviour with theory required to link the natural world, the social world and the artificial world of human constructs. Theories are abstract entities that aim to describe, explain, and enhance understanding of the world. Some theories provide predictions of what will happen in the future and give a basis for intervention and action (Gregor, 2006).

Table 2.11. A taxonomy of theory types in IS research (Gregor, 2006)

Theory type	Distinguishing attributes
I. Analysis	Says what is. The theory does not extend beyond analysis and description. No causal relationships among phenomena are specified and no predictions are made.
II. Explanation	Says what is, how, why, when, and where. The theory provides explanations but does not aim to predict with any precision. There are no testable propositions.
III. Prediction	Says what is and what will be. The theory provides predictions and has testable propositions but does not have well-developed justificatory causal explanations.
IV. Explanation and prediction	Says what is, how, why, when, where, and what will be. Provides predictions and has both testable propositions and causal explanations.
V. Design and action	Says how to do something. The theory gives explicit prescriptions (e.g., methods, techniques, principles of form and function) for constructing an artefact.

As Gregor (2006) states, theories are practical. They allow knowledge to be accumulated in a systematic manner to enlighten the professional practice. Gregor (2006) describes five types of theories, namely the theory of analysis, the theory of explanation, the theory of prediction, the theory of explanation and prediction, and the theory of design and action with distinguishing attributes as listed in Table 2.11.

In addition to the five types of theories described by Gregor (2006), a theory of the problem and a theory of the solution are proposed to expand the definition of theories in IS (Majchrzak, Markus, & Wareham, 2016). It is suggested that the IS field has problems with theory with a need for a broader definition to include IS research impacted by societal challenges (Avgerou, 2013; Gregor, 2006; Majchrzak et al., 2016).

A theory of problem is a theory, defined as an argument specifying relationships among conceptual elements, of an important substantive problem (Majchrzak et al., 2016). The theory would describe different view points of how and why the problem occurs referring to relevant theories and empirical findings about conditions to impact the outcomes of the problem and adding divergent perspectives gained from different cultural contexts (Majchrzak et al., 2016).

A theory of solution addresses how and why ICT is expected to contribute to solving a particular organisational or societal problem, along with the additional (non-ICT) conditions necessary for the success of the ICT solution (Majchrzak et al., 2016). Majchrzak, Markus and Wareham (2016) explain that it is not a theory like a theory of IS implementation, but it is a theory of how and why ICT is expected to make a difference with respect to a specific important substantive problem in a specific context.

A theory of the problem and a theory of the solution are distinct from theories of a phenomenon (such as technology use, computer-mediated communication, or IT governance) because theories of the problem and theories of the solution make explicit value judgments that the situation is problematic from the perspective of certain stakeholders and needs to be improved (Majchrzak et al., 2016).

The theory of design and action is of interest to the study and describes how to do something. It is about the principles of form and function, methods, and justificatory theoretical knowledge that are used in the development of IS (Gregor, 2006). The outcome of the study contributes to a theory of the solution.

The relevant theories for this study are social shaping of technology (SST), design theory (DT) and the capability approach.

2.7 Social shaping of technology

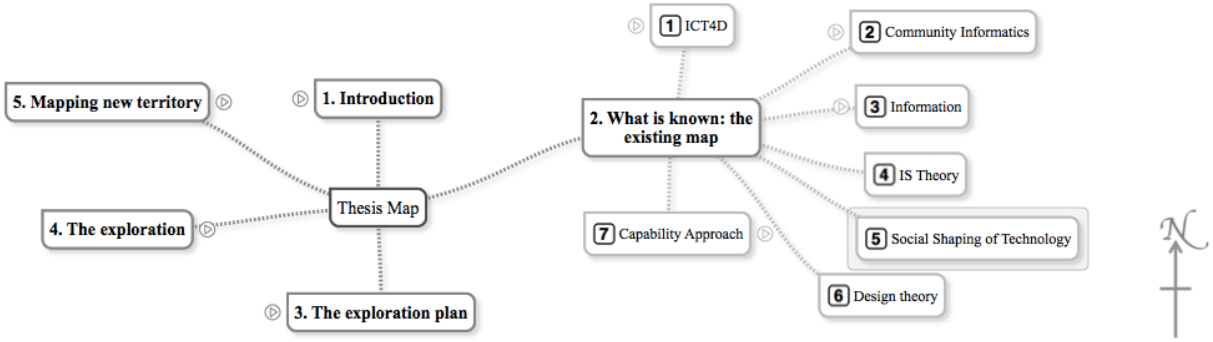

Figure 2.13. What is known about social shaping of technology map

2.7.1 Overview of SST

MacKenzie and Wijcman edited a book published in 1985 with the title "Social Shaping of Technology". This event is seen as the launch of the SST phrase (Howcroft, Mitev, & Wilson, 2004; MacKenzie & Wajcman, 1999; Williams & Edge, 1996). Various initiatives were underway in the 1980s to develop new approaches to technological studies as an alternative to technological determinism (Howcroft et al., 2004). Technological determinism means that technological development is seen as autonomous and that societal development is determined by the technology.

Practitioners of SST reject both technological and social determinism. William and Edge (1996) describe SST as a "broad church" encapsulating a wide range of perspectives and concepts in an attempt to explain the relationship between technology and society. It goes beyond the technological deterministic approach of describing the impact of technology to examining what shapes the technology, and why and how the impacts (if any) are achieved (Dutton, 2013; Howcroft et al., 2004; MacKenzie & Wajcman, 1999; Williams & Edge, 1996). It is argued that both society and technology are human constructs with technology continuously being shaped by societal structures, power relations and the ingenuity and emotional commitment of individuals (Bijker, 1997).

SST explores and describes the relationship between society and technology (Williams & Edge, 1996). It leans itself to pragmatism as it is concerned with the practical impact of technology in society (Rammert, 1999). ANT is one of the conceptual tools used to analyse the construction of sociotechnical entities (Williams & Edge, 1996) within a SST study.

2.7.2 Application of SST

Social construction of technology (SCOT) and ANT are the primary conceptual tools used within SST to illuminate the numerous elements of sociotechnical change (Howcroft et al., 2004). Bijker (1997) published a key influential SCOT study on the effect society has on technology (referred to as social construction) with case studies on the safety bicycle, Bakelite plastic and fluorescent light bulbs. Wijetunga (2014) uses SST to study how the incorporation of social relations in the design of

technology artefacts affects their use in a case study in the developing Southern Asia. Pozzebon and Titah (2006) apply SST in their study to examine rhetorical closure in information technology. Maniatopoulos (2005) uses SST as an argument against technological determinism in context of an e-government study where technologies by themselves are often expected to be effective and reliable vehicles for achieving organisational change, without acknowledging the complexity of organisational, political and social factors that shape the adoption, design and use of the technologies.

2.7.3 Benefits of SST

SST plays a positive role in integrating social (people) and technology concerns by offering a greater understanding of the relationship between scientific excellence, technology innovation and social well-being (Williams & Edge, 1996). The application of SST challenges the assumptions about the progress tied to technical advances and contributes a balanced view of factors other than technical design that play a major role in how technology is used and with what effect (Dutton, 2013). It provides an alternative to the traditional approach of technological determinism to looking at social consequences and allows people to "*get inside science and technology themselves*" (Latour, 1988; Williams & Edge, 1996).

2.7.4 Limitations of SST

SST has drawn many authors with different perspectives, often differing on an epistemological level. The wide rage of concepts can be problematic for researchers attempting to access the ideas. SST also includes a variety of models, conceptual frameworks and domains of study that led to overlapping and reuse of terms with different meanings (Howcroft et al., 2004; Williams & Edge, 1996). When using SST in organisational studies, it should be supplemented with a critical management perspective as the conceptualisation of power is flawed using SCOT and ANT (Howcroft et al., 2004). It can also results in book-length output (Walsham, 1997).

2.8 Design theory

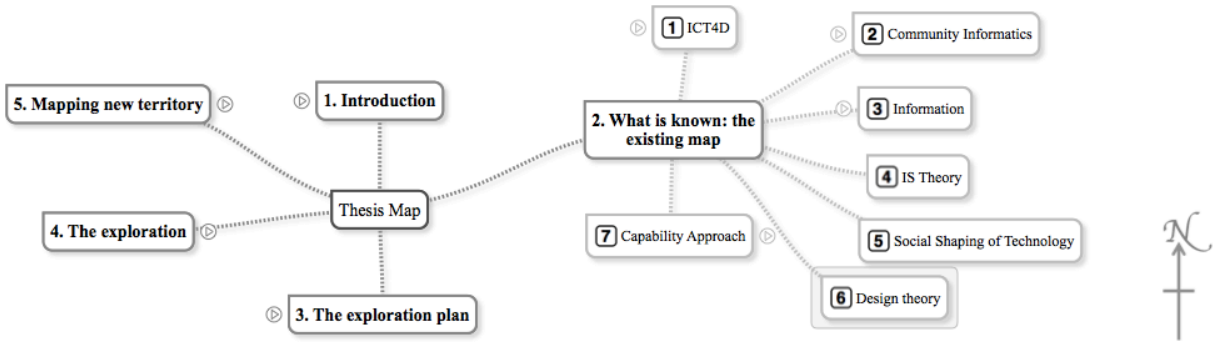

Figure 2.14. What is known about design theory map

2.8.1 Overview of design theory

The word "design" is both a noun and a verb. Design theory can therefore be about both the principles underlying the form of the design and also about the act of implementing the design with the design artefact either products or methods (Gregor & Jones, 2007; Walls, Widmeyer, & Sawy, 2004). Early work focuses on the artefact, rather than the challenge of what a special design-type theory might look like (Gregor, 2006).

Design theory is recognised as the fifth type of theory: theory for design and action (Gregor, 2006). Design theories differ from natural science theories as they are both prescriptive and evaluative (Baskerville, 2008; Gregor, 2006; Gregor & Hevner, 2013). Design theory can be informed by all classes of theories (Gregor, 2006; Sidorova, Evangelopoulos, Torres, & Johnson, 2013; Walls et al., 2004). Gregor and Jones (2007) define eight components of information systems design theory where at least the first six should be included in a design theory for validity as shown in Table 2.12.

Design theories' contribution to knowledge can be defined as utility to a community of users, the novelty of the artefact, and the persuasiveness of claims that it is effective. Preferred characteristics of models and methods are completeness, simplicity, consistency, ease of use, and the quality of results (Gregor, 2006). Simon (1996) posits that "interestingness" is a contribution to knowledge (Gregor, 2006).

Design theory describes "how to do" something (Gregor, 2006) and is prescriptive knowledge (Gregor & Hevner, 2013). The aim of design theories and knowledge is to support IS professionals to solve practical problems (Carlsson, Henningsson, Hrastinski, & Keller, 2011) and to guide artefact creation (Walls et al., 2004). Design theory is a practical theory that can be applied within a pragmatism paradigm (Goldkuhl, 2007; 2012; Vaishnavi & Kuechler, 2004).

Table 2.12. Eight components of Information Systems Design Theory (Gregor & Jones, 2007)

Component	Description
Core components	
1) Purpose and scope (the causa finalis)	"What the system is for," the set of meta-requirements or goals that specifies the type of artefact to which the theory applies and in conjunction also defines the scope, or boundaries, of the theory.
2) Constructs (the causa materialis)	Representations of the entities of interest in the theory.
3) Principle of form and function (the causa formalis)	The abstract "blueprint" or architecture that describes as IS artefact, either product or method/intervention.
4) Artefact mutability	The changes in state of the artefact anticipated in the theory, that is, what degree of artefact change is encompassed by the theory.
5) Testable propositions	Truth statements about the design theory.
6) Justificatory knowledge	The underlying knowledge or theory from the natural or social or design sciences that gives a basis and explanation for the design (kernal theories).
Additional components	
7) Principles of implementation (the causa efficiens)	A description of processes for implementing the theory (either product or method) in specific context.
8) Expository instantiation	A physical implementation of the artefact that can assist in representing the theory both as an expository device and for purposes of testing.

2.8.2 Application of design theory

IS projects based on design theory with an artefact design are opportunities for refining theories from other fields for use in IS (Kuechler & Vaishnavi, 2008). Kuechler and Vaishnavi (2008) use design theory to create the cognitively enhanced process model presentation software as their artefact. A design theory was formulated based on complex adaptive systems (CAS) theory that addresses the complexity of information infrastructures and how to develop it (Hanseth & Lyytinen, 2010). Further, a design theory was created to improve the management of IS integration in a merger and acquisition (Carlsson et al., 2011). Gregor (2006) mentions methodologies (for example structured systems analysis methods), prescriptions for building specific applications (for example decision support systems), and Codd's theory of relational database design as examples of design theories.

2.8.3 Benefits of design theory

A better understanding of the nature of design theory enables a more systematic specification of design knowledge as it supports the cumulative building of knowledge (Gregor & Jones, 2007). Design theories contribute to knowledge creation as partial theory, incomplete theory, or even as a particularly interesting empirical generalisation in the form of a new design artefact (Gregor & Hevner, 2013).

2.8.4 Limitations of design theory

Design theory is a growing field of study with few well developed theories that makes comparison of theories with the same purpose and scope difficult (Aier & Fischer, 2011). Design theory is "knowing through making" by creating artefacts. This process typically requires access to resources (for example equipment, people, time) that may be challenging (Carlsson et al., 2011; Kuechler & Vaishnavi, 2008; Vaishnavi & Kuechler, 2004).

2.9 Capability approach

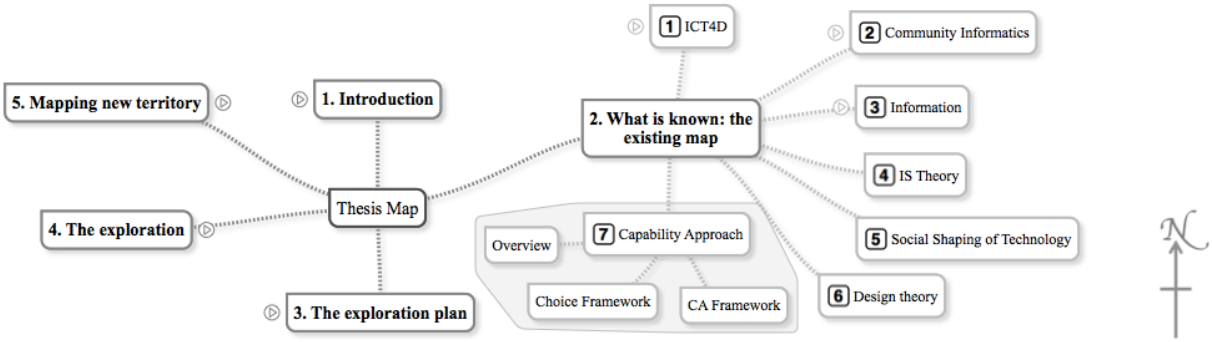

Figure 2.15. What is known about the capability approach map

2.9.1 Overview of the capability approach

Reflecting on the problem statement of the study, how should the information needs that are meaningful to women working as domestic workers, be effectively translated through the use of ICT in order to enhance their experience of the good life as defined by Sen's capability approach (1999) and contribute to the success and social value of ICT4D projects, Sen's capability approach is selected as the theoretical framework for the study. Access to information can be seen as a type of freedom (when you know better, you can do better) with information as a resource for development and access to information a constitutional right in South Africa (The Presidency, 1996).

Development can be seen as a process of removing unfreedoms and of extending the substantive freedoms of different types, that people have reason to value (Sen, 1999). Sen (1999) argues that there are two distinct reasons for the crucial importance of individual freedom in the concept of development related to evaluation and effectiveness. Firstly, to evaluate the success of a society by the substantive individual freedoms that the members of that society enjoy, as opposed to traditional normative approaches that focus on other variables such as utility, procedural liberty or real income. Secondly, freedom is also a principal determinant of individual initiative and social effectiveness.

Greater freedom enhances the ability of people to help themselves and also to influence the world – central to the process of development (Sen, 1999). Development is therefore the expansion of the capabilities of persons to lead the kind of lives they value, and have reason to value. Sen (1999) defines capability as "*A person's capability refers to the alternative combinations of functionings that are feasible for her to achieve. Capability is thus a kind of freedom: the substantive freedom to achieve alternative functioning combinations*." Functionings are defined as the various things a person may value doing or being. This approach to development as freedom is referred to as Sen's capability approach.

2.9.2 Discussion

The capability approach is a broad normative framework for the evaluation and assessment of individual well-being and social arrangement. The framework is developed and refined over three decades after the Tanner lectures in 1979, in a number of books and journal articles across disciplines (Zheng, 2009). The focus is on what people are effectively able to do and to be – their capabilities (Robeyns, 2003; 2005). Capability in this approach reflects the real opportunities (environmental opportunities and individual abilities) that a person has, to lead a valued life (Zheng, 2009).

The capability approach distinguishes between achieved functionings and capabilities as the realised and the effectively possible, or between achievements and freedoms (Robeyns, 2003). As Robeyns (2003) explains, what is ultimately important is that people have the freedoms (capabilities) to lead the kind of lives they want to lead, to do what they want to do and be the person they want to be. They have the freedom to choose whether to act on those freedoms in line with their own ideas of the kind of life they want to live, or not: their own definition of the good life.

The capability approach can be used to measure poverty or inequality, or can be used as an alternative for traditional utilitarian cost-benefit analysis (Robeyns, 2003). The distinction between commodities and functionings is another distinction in the capability approach.

Commodities are goods and services (means) and are of interest when they enable a functioning (ends). Only the ends have intrinsic importance and the means are only instrumental to reach the goal (Robeyns, 2005). The conversion of a capability to a functioning, by means of a commodity, is influenced by a possibility of three conversion factors namely personal conversion factors such as physical conditions; gender; intelligence; or literacy, social conversion factors such as public policies; social norms; or gender roles, and environmental conversion factors such as climate; or geographic location (Robeyns, 2003).

ICT is a commodity through which people can enable sets of functionings and achieve an expansion of capabilities to lead a valued life (Qureshi, 2011). ICTs provide the means by which people may take actions and make decisions that lead them towards a better quality of life (Qureshi, 2011).

The capability approach differentiates between standard of living, well-being and agency. Sen (1999) uses the term "agent" as someone who acts and brings about change. The capability approach is particularly concerned with the agency role of the individual as a member of the public and as a participant in economic, social and political actions (Sen, 1999). Robeyns (2003; 2005) explains the main differences between these concepts as standard of living is "*personal well-being related to one's own life*", well-being as standard of living with the outcomes resulting from sympathies (such as from helping another person and thereby feeling oneself better off), and agency

as well-being supplemented with commitments (such as an action which is not beneficial to the person herself).

The capability approach recognises the importance of human diversity and can account for interpersonal variations in conversion of the characteristics of the commodities into functionings. Two different persons have quite divergent opportunities of quality of life even when they share exactly the same commodity bundle (Robeyns, 2003; Sen, 1999; Zheng & Walsham, 2008).

2.9.3 Applications of the capability approach

There are three different levels at which the capability approach is used (Robeyns, 2003):

1. As a framework of thought for the evaluation of individual advantage and social arrangement
2. As a critique of other approaches to the evaluation of well-being and justice
3. As a formula or algorithm to make interpersonal comparisons of welfare or well-being

Researchers have found that the focus on the individual and the open-endedness of the capability approach make it challenging to operationalise, but agree on the usefulness of the capability approach as alternative to the traditional economic measurement. Examples of such models are the Choice Framework and the Capability Approach Framework to contribute to the implementation of the capability approach in ICT4D projects (Andersson, Grönlund, & Wicander, 2012; Hatakka & Lagsten, 2012; Kleine, 2010; Robeyns, 2006).

2.9.3.1 The Choice Framework

Kleine (2010; 2011; 2013) identifies controllability and operationalisability as two key stumbling blocks preventing the capability approach from being more widely used. The Choice Framework is designed in response to these challenges. The Choice Framework is presented as a way of operationalising the capability approach and visualising the elements of a systemic conceptualising of the development process as illustrated in Figure 2.16 (Kleine, 2010; 2011; 2013). Choice is both the aim and principal means of development and can be seen as the primary development outcome (Sen, 1999). According to the capability approach, people themselves identify the capabilities they value. The advantage of this approach in an ICT4D context is that it reduces the risk of forcing a technology on people without the existence of the need (Kleine, Light, & Montero, 2012).

The Choice Framework is based on the capability approach and on Alsop and Heinsohn's Empowerment Framework while taking elements from the Sustainable Livelihood Framework used by the Department for International Development in the United Kingdom (Kleine, 2010; 2011; 2013; Kleine et al., 2012). Increased freedom of choice for people can be attained using the Choice Framework to:

- Deconstruct embedded ideologies
- Analyse the appropriateness of development goals
- Map development as a systemic process
- Plan interventions

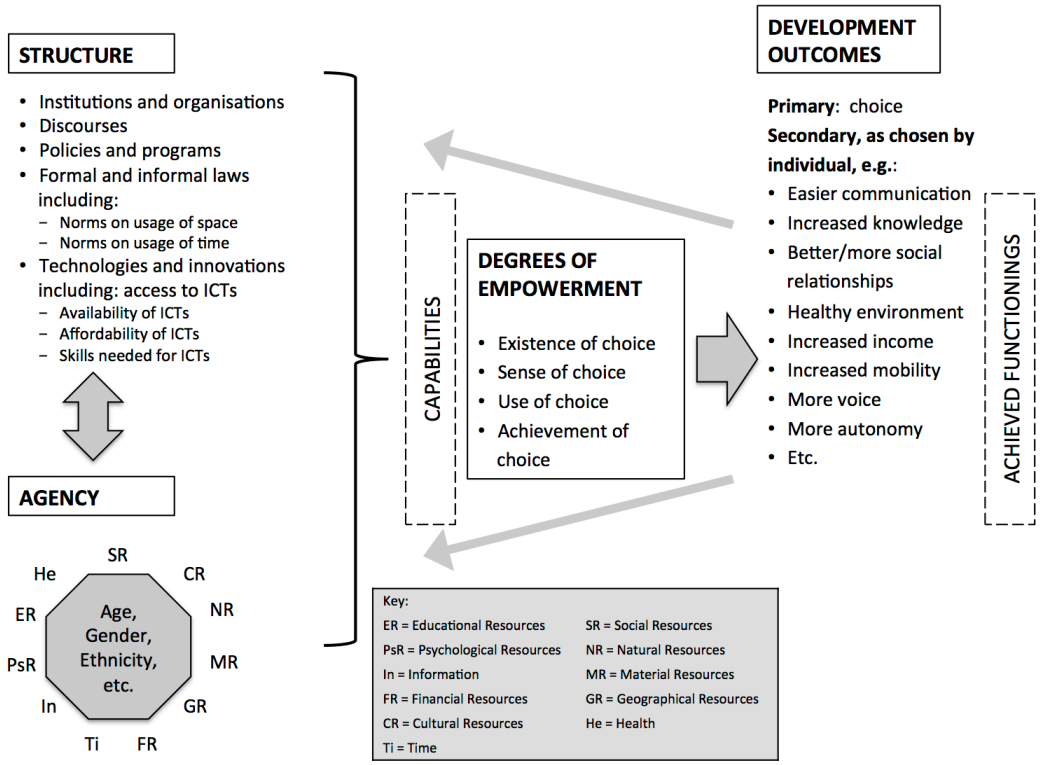

Figure 2.16. The Choice Framework (Kleine, 2013)

Kleine (2013) identifies eleven agency resources that include psychological resources such as self-confidence, tenacity, optimism, creativity and resilience; informational resources; and time. The Choice Framework offers a suggestion as to how the capability approach could be applied in practice, both in analysis and planning of projects, and should be seen as a map or simplified view of reality (Kleine, 2011; 2013; Kleine et al., 2012).

2.9.3.2 The Capability Approach Framework

The capability approach is the foundation of the Capability Approach Framework (Figure 2.17) designed in an attempt to answer how ICT can lead to development (Hatakka & Dé, 2011; Hatakka & Lagsten, 2012). The framework focuses on the difference between potential and achieved functionings and the importance of context, as well as including a role for technology as a commodity.

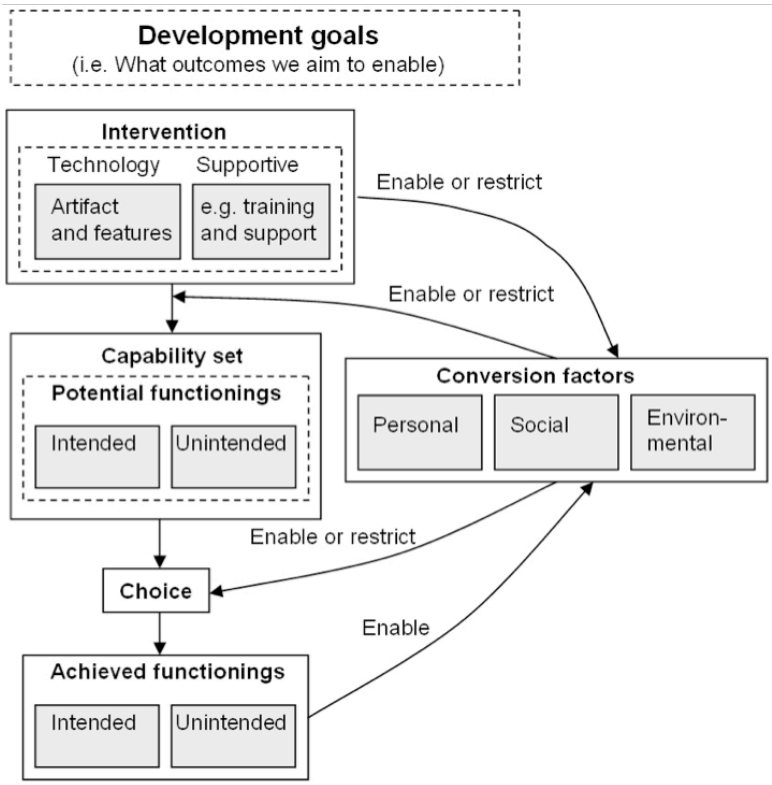

Figure 2.17. The Capability Approach Framework (Hatakka & Dé, 2011)

Hatakka and Dé (2011) find that the capability approach allowed them to go beyond superficial variables of technology implemented and focus on actual outcomes. It enables the researchers to gain a deeper understanding of how and why development outcomes are achieved (Hatakka & Lagsten, 2012). Using the Capability Approach Framework, researchers are able to focus on what people actually want and not only what is technically possible to implement (Hatakka & Lagsten, 2012). The Capability Approach Framework is a practical tool that can be used to structure interviews, for example background of the interviewee, intervention (the "as is"), conversion factors (i.e. what enabled or restrict them in the study's context), and potential and achieved functionings (within the study's context) (Hatakka & Lagsten, 2012). The Capability Approach Framework can also be used to visualise the analysis of the interviews (Hatakka & Lagsten, 2012).

The capability approach can be applied to empirical data so that the benefits outweigh the methodological difficulties associated with Sen's capability approach using the Capability Approach Framework (Hatakka & Lagsten, 2012).

2.9.3.3 Other examples

Other examples of the application of the capability approach are:

- United Nations Development Programme's Human Development Report that is in part based on the capability approach (Robeyns, 2006; United Nations Development Programme, n.d.).
- Alampay (2006) applies the capability approach to access to ICTs based on the literature on the use of ICTs for development.
- Zheng and Walsham (2008) applies the principles of the capability approach to define questions to explore social exclusion in the e-society.
- Zheng (2009) generates e-development research questions from the capability approach grouped by the four elements of the capability approach: means and ends of development; commodities, capabilities and human diversity; agency and restricted agency; and evaluative spaces.
- Sen's five freedoms, namely transparency guarantees, protective security, political freedoms, social opportunities and economic facilities, highlight areas in which ICT might reasonably be expected to make an enabling contribution. The areas of enabling contribution are defined as four enabling dimensions for ICT in development (Thompson & Walsham, 2010).
- Johri and Pal (2012) apply the principles of the capability approach and Illich's notion of the conviviality approach to designing an ICT design framework.
- Thapa, Sein and Sæbø (2012) extend Sen's view by incorporating collective capabilities. They introduce a conceptual framework that links an ICT initiative to human development by building collective capabilities using social capital as a possible mechanism to foster collective action.
- Breytenbach, De Villiers and Jordaan (2013) extend Leem's (2008) maturity model with Sen's work to describe how to reach ICT4D maturity stage faster through adding variables to measure social embeddedness and local ownership; direct and diffused increase in freedom; and social recognition and celebration. Development is recognised if an expansion of freedom has measurably increased. Sen (1999) identifies five types of freedom that can be increased through ICT4D initiatives as economic freedom (greater income, fair competition), social freedom (better health care and education), political freedom (access to unbiased information and to freedom of expression), trust relationships (between authorities and subjects), and access to security resources (legal justice, police force, prisons) (Breytenbach et al., 2013).
- Thapa and Sæbø (2014) use the capability approach to explore the link between ICT and development through a literature review of 80 research articles and propose the capability approach as a common approach for researchers and practitioners to understand this relationship.

In summary, Robeyns (2006) identifies nine different types of capability applications: general assessments of the human development of a country; the assessment of small scale development projects; identification of the poor in developing countries; poverty and well-being assessments in advanced economies; an analysis of deprivation of disabled people; the assessment of gender inequalities; theoretical and empirical analyses of policies; critiques on social norms, practices and discourses; and the use of functionings and capabilities as concepts in non-normative research.

2.9.4 Summary

The capability approach is well suited for application within the pragmatic paradigm with the focus on the impact of an intervention on the functions or ends. As defined for a pragmatic study, this study is concerned about how should the information needs that are meaningful to women working as domestic workers, be effectively translated through the use of ICT in order to enhance their experience of the good life as defined by Sen's capability approach (1999) and contribute to the success and social value of ICT4D projects, what works and what does not work through applying the capability approach as a socio-technical theoretical framework to the study.

2.10 Conclusion

This chapter describes the existing map of knowledge through a literature review following categories derived from the problem statement. The categories are ICT4D, community informatics, information as a resource for development, IS theories, social shaping of technology, design theory and the capability approach. ICT4D, community informatics, social shaping of technology, design theory and the capability approach are further divided in sub-categories. ICT4D is explored through presenting an overview, discourses on ICT4D research, sustainability, DSR and ends with an overview of informatics for development. Community informatics is explored through an overview, women and ICT, the work of women, social innovation and a selection of case studies. The sub-categories for the social shaping of technology and design theory categories are overview; application; benefits; and limitations as sub-categories. The capability approach is explored through an overview, discussion and a summary of applications of the capability approach in ICT4D projects.

The next chapter describes the exploration plan as the theoretical underpinning of the study, the research design and research methodology.

Chapter 3 – The exploration plan

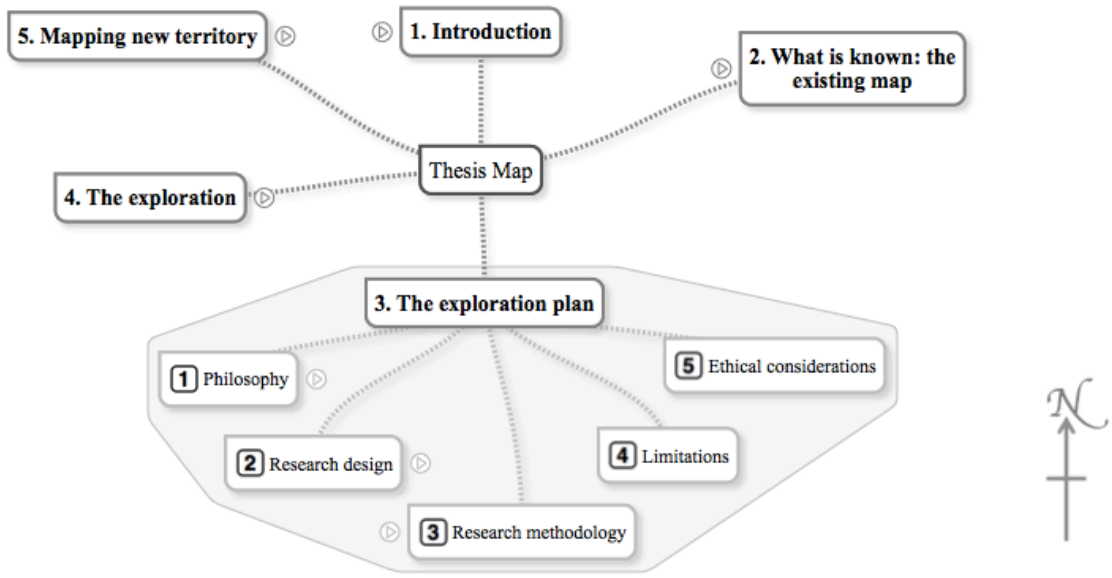

Figure 3.1. The focus of this chapter on the thesis map is the exploration plan

3.1 Introduction

The researcher has discussed the background and the problem statement that this study pursues, the research questions and a general outline of the thesis in Chapter 1. Chapter 2 presents the existing map of knowledge through the literature review based on categories derived from the research questions. This chapter is mapped in Figure 3.1 and describes the exploration plan as the methodology followed by the researcher to gain an understanding of how the information needs that are meaningful to the lives of women working as domestic workers in context of the developing agenda can be more effectively translated through the use of ICT so that their experience of the good life as defined by the capability approach (Sen, 1999) can be enhanced. The resulting framework as the artefact, and the research findings contribute to the success potential of ICT4D projects and the body of ICT4D knowledge.

The study follows a pragmatic research approach using design science research with a case study to develop and evaluate the framework, gain an understanding of the functionings of women working as domestic workers in terms of their need for information and the approach to information inclusivity of the participating organisations. The study is interpreted in terms of the capability approach as explained by Robeyns (2003). The research design elements are summarised in Table 3.1.

Table 3.1. Summary of the research design elements

Element	Value
Ontology	Subjectivism
Research philosophy	Pragmatism
Research approach	Inductive
Research strategy	Design science research and case study
Research population	A group of women working as domestic workers in Johannesburg, South Africa A selected group of cross-sector organisations
Data collection methods	Design thinking methods and workshop Semi-structured interviews Participant observation
Data analysis methods	Qualitative content analysis

3.2 Theoretical underpinning

A well designed research study requires awareness and knowledge of the governing research paradigm of the researcher (Cibangu, 2010). Research paradigms define the philosophy, worldview, or values use to justify, interpret and describe research priorities, choices and sense-making of the study and consist of assumptions about knowledge, how to acquire it and about the physical and social world (Cibangu, 2010; Hirschheim & Klein, 1989). Researchers need to understand the different philosophical paradigms, their different assumptions, strategies and methods and the ways that readers with different worldviews will assess the quality of research (Oates, 2006).

The research strategy is directed by the researcher's worldview as defined by the ontology, epistemology and methodology choices. The ontology, or nature of reality, can either be objective or subjective. Objectivism views that existence of the object or phenomenon is independent of the researcher and that the researcher has little or no impact on the object or phenomenon being observed (Maree, 2007). The object or phenomenon has ontological status in itself and the researcher is concerned with facts. Subjectivism recognises the interdependence of the social world as a human-constructed entity and that the researcher cannot be separated from the research with research findings created and not discovered. The researcher is concerned with people and wants to gain an understanding of the deeper meaning of social actions (Maree, 2007). This study concerns itself with the relationship between people and information to gain a deeper understanding of the phenomenon and therefor can be described as viewing reality as subjective.

The epistemology defines how reality can be known, discovered and disclosed. The two viewpoints are that knowledge can be revealed or discovered through the use of the scientific method independently of the intentions of people, and secondly, through exploring the experiences of others regarding a specific phenomenon in terms of meanings whilst recognising the relationship between the researcher and the participants (Maree, 2007). Positivists hold the first viewpoint and qualitative researchers hold the second viewpoint.

Traditionally, IS research follows the scientific method of positivism and it is still the dominant research paradigm, especially in the USA (Feilzer, 2010; Hirschheim & Klein, 2012; Maree, 2007; Oates, 2006). However, interpretivism has been increasingly applied as a research paradigm since the 1990s, with more recent emergence of critical research and pragmatism (Goldkuhl, 2012; Hirschheim & Klein, 2012; Oates, 2006). Researchers such as Mingers (2001), Robey (2003) and Feilzer (2010) advocate against a dominant paradigm to ensure a more representative and richer IS discipline.

The problem addressed in this research is how should the information needs that are meaningful to women working as domestic workers, be effectively translated through the use of ICT in order to enhance their experience of the good life as defined by Sen's capability approach (1999) and contribute to the success and social value of ICT4D projects.

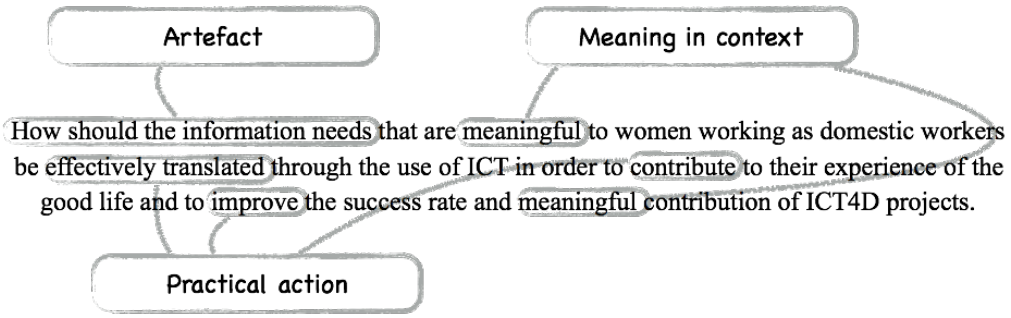

Figure 3.2. Analysis of the problem statement to determine the relevant research paradigm

The problem statement disqualifies a positivist paradigm, as the focus of the study is to understand "meaning" both in terms of what is meaningful to women working as domestic workers and what is a meaningful contribution to ICT4D projects, and the study is focused on a specific group (women working as domestic workers) in a social setting, whereas a positivist approach would focus on an objective study in search of generalisations that can be repeated (Oates, 2006). The analysis of the problem statement is depicted in Figure 3.2.

Interpretivism, critical research and pragmatism can be applied depending on the methods and intended output, such as a description, model, theory or artefact. Examples of methods suited to interpretivism are interviews, case studies and observation, characterised by researcher reflexivity,

studying people in their natural social setting, qualitative data analysis and multiple interpretations of the study (Oates, 2006). The goal of an interpretivism study is to explain the phenomena observed in the study (Maree, 2007; Myers, 2009; Oates, 2006).

Critical research is concerned with identifying power relations, conflicts and contradictions, and the emancipation of both the people involved in the study as well as the researcher (Krauss & Turpin, 2010; Oates, 2006). Examples of methods suited for critical research are longitudinal ethnographic and participatory action research (Maree, 2007; Oates, 2006).

Pragmatism is associated with action, intervention and constructive knowledge that is appreciated for being useful in action (Goldkuhl, 2004; 2012). It is not only concerned with describing the current situation, but also what might be and sees action as the way to change existence (Goldkuhl, 2004). Pragmatists are known to use pluralist methods (or mixed methods) because they believe that the research questions are more important than the methods used to answer them as the truth is what works best to gain an understanding (Maree, 2007). Examples of methods suited for pragmatism are design science and action research (Baskerville & Myers, 2004; Goldkuhl, 2004; Gregor & Hevner, 2013).

As the objective for the study is to create an artefact that will contribute to describing a more effective way to uncover the information needs relating to the lives of women working as domestic workers without investigating the justness of their social structures, pragmatism will be the most relevant research paradigm for this study.

The choice of ontology and epistemology informs the methodology and methods that are available to the study. If reality is defined as objective and knowledge discovered through a positivist scientific method, then a deductive methodology must be followed to acquire the knowledge leading from general to specific findings using quantitative methods such as an experiment that can be repeated. On the other hand, as described for this study, reality is defined as subjective and knowledge is created through a non-positivist philosophy such as pragmatism, then an inductive methodology must be followed to acquire knowledge leading from observations to theory using mostly qualitative methods as described in the next section.

3.3 Research design

Design science research and case study are selected as the qualitative research methods with design thinking, interviews, self-documentation journals, WhatsApp chat, workshop tools and participant observation as data collection techniques as shown in Figure 3.3. The study aims to discover an effective way of translating information needs of a developing community through ICT following a pragmatist research paradigm. Design science and case study research are used as a mixed method

approach with an artefact as the research output. As a deeper understanding and an artefact that could lead to a change in action in future ICT4D projects are the intent of this study, design science and case study research satisfy the pragmatism research paradigm.

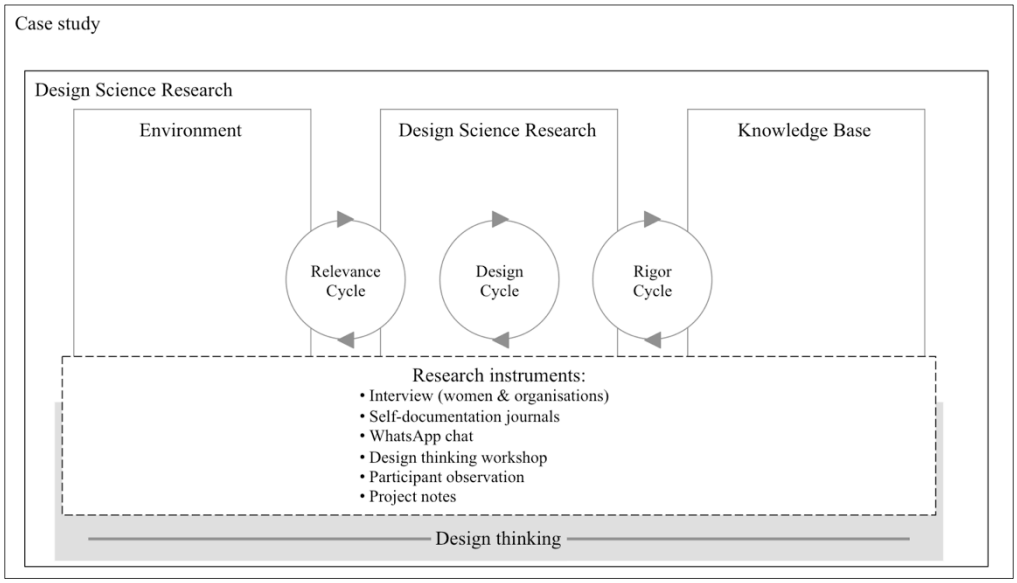

Figure 3.3. Research design elements

3.3.1 Design science research

Design science research is a research paradigm that originates from engineering and the sciences of the artificial (Simon, 1996). The goal of design science is utility in the form of an artefact designed to solve identified business problems (Hevner et al., 2004). To contribute to the rigor of design science rigor, Hevner et al. (2004) define seven guidelines to understand the requirements for effective design science research. The guidelines are design as an artefact; problem relevance; design evaluation; research contributions; research rigor; design as a search process; and communication of research. Design science research is a problem-solving process and the guidelines are adaptive and process-oriented (Hevner et al., 2004). Hevner (2007) defines three cycles (Figure 3.4) that link the components in the IS research framework defined by Hevner et al. (2004) and argues that design science research should clearly contain all three cycles with the contributions from the relevance cycle and the rigor cycle defining good design science research.

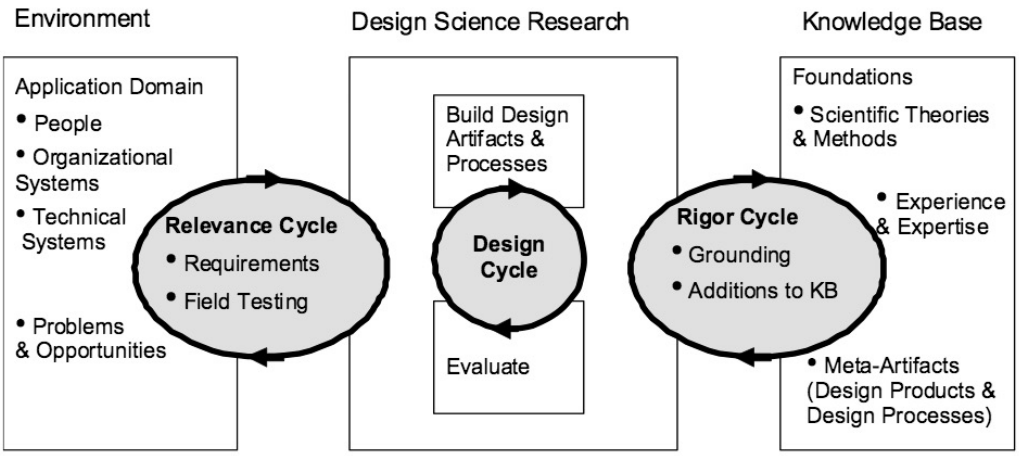

Figure 3.4. Design science research cycles (Hevner, 2007)

Peffers et al. (2006; 2008) create the design science research process model to address the need for a conceptual process and mental model to guide the creation and evaluation of design science research projects. The process has six steps that can be mapped to the design science research cycles presented by Hevner (2007):

A. Relevance cycle

1. Problem identification and motivation

   The goal of the first step is to define the research problem with justification of the value of the solution.

2. Objectives of a solution

   The objectives of the research study must be inferred rationally from the problem statement. The objectives are important for the evaluation step to validate if the artefact solves the problem.

B. Design cycle

3. Design and development

   The purpose of this step is to define, design and create the artefact.

4. Demonstration

   During this step, the artefact is implemented to demonstrate the efficacy of the artefact to solve the problem.

5. Evaluation

   The objectives documented in the second step are used to evaluate the effectiveness of the artefact. Evaluation can take the form of a case study.

C. Rigor cycle

6. Communication

In the last step, the story of the design science research project is told to relevant audiences such as researchers and practitioners using appropriate communication platforms.

The challenges faced using design science research are that design science research is an emerging discipline lacking a common terminology with a small collection of design theories (Aier & Fischer, 2011; Walls et al., 2004) and needs rigor, discipline and transparent constructive research methods to create IT artefacts (Iivari, 2007). Gregor and Hevner (2011) argue for a more expansive definition of the IT artefact as difficulties arose with different interpretations of the term "IT artefact" based on the artefact type.

3.3.2 Case study

A case study is a detailed study of a single social unit and can be of a social process, an organisation or any collective social unit (Myers, 2009; Payne & Payne, 2004). Case studies can be used to describe, test or build theories (Eisenhardt, 1989; Myers, 2009). Furthermore, case studies assist researchers to gain a deep understanding of the phenomena of interest as a basis for their subsequent theory-building efforts in response to asking "how" and "why" questions (Baxter & Jack, 2008; Myers, 2009; Payne & Payne, 2004; Weber, 2009).

The case is determined through determining the unit of analysis or the focus of the research (Baxter & Jack, 2008; Maree, 2007). The unit of analysis could be a system of action, individual or group of individuals (Baxter & Jack, 2008). A case study has boundaries that must be clearly defined to prevent a question that is too broad or a topic that has too many objectives for one study. Examples of boundaries for a case are combinations of time, place, activity, definition and context (Baxter & Jack, 2008).

The study purpose determines the type of case study research for example explanatory, exploratory, descriptive, multiple-case study, intrinsic, instrumental and collective (Baxter & Jack, 2008; Eisenhardt, 1989). The use of multiple sources and techniques to gather data is an advantage of case study research (Baxter & Jack, 2008; Maree, 2007). Archives, interviews, questionnaires and observations are typical sources of data used in case studies (Eisenhardt, 1989; Maree, 2007; Payne & Payne, 2004). The findings from a case study cannot be generalised and should be treated as a contribution to knowledge (Payne & Payne, 2004). Eisenhardt's (1989) case study design decisions as applied to this study is listed in Table 3.2.

Table 3.2. Eisenhardt's (1989) case study design decisions, with considerations as recommended by Weber (2009), applied to this study

Design step	Considerations
Getting started	Research question and sub questions are defined.
Selecting cases	Careful consideration is given to the selection of the case study population of women working as domestic workers in an urban environment. This study is limited to one case.
Creating instruments and protocols	Participant observation, interviews, self-documentation, WhatsApp chat and design thinking tools are used to collect data by one researcher.
Entering the field	The researcher follows the R.E.A.L. approach to community entry with the assistance of a cultural interpreter (Weyers, 2011a).
Analysing within-case data	The case is documented in detail with explanations of how the case study data has been analysed.
Searching for cross-case patterns	This study is limited to one case study. Searching for cross-case patterns could be part of the recommendations for future study.
Shaping hypotheses	The study must explain how constructs were identified and refined and their levels measured. Explaining how relationships among constructs were identified and evidence in support of these relationships was deduced, is also necessary.
Unfolding literature	Use conflicting and similar literature to strengthen internal and external validities.
Reaching closure	Explain the duration of the case study data collection and the process of analysis of the case study data.

The disadvantages of case study research are that it can be difficult to gain access to the relevant people, the researcher has no control over the situation she is observing, it could be difficult to focus on the most important issues, and it is time consuming (Myers, 2009). Case studies have been used extensively as a research method in the ICT4D field, but lack rigorous design and clearly stating choices made, and the reasons for these choices (Weber, 2009).

3.3.3 Design thinking

There are many definitions of design thinking in the literature. What they have in common is to describe design thinking as a human-centered iterative process aiming at exploring problems in response to the question "how do we make it better?" (Beacham & Shambaugh, 2010; Brown & Wyatt, 2010; Dolak et al., 2013). Design thinking can be used as a method to guide qualitative design science research (Devitt & Robbins, 2013; Dolak et al., 2013).

The growth in popularity of design thinking as a method to apply a problem solving mindset to business challenges has been observed as a response to an ethical question surfaced by the challenges

people faced in the designed man-made world and the need to become human-centric in finding solutions. Science is seated in the natural world with a primary objective to answer "what is" through experimentation, classification and analysis. Social sciences focus on the human experience using observation, analogy, induction and criticism to describe the observed phenomenon. In addition to the natural world and the human experience, the man-made world exists that design uses modelling, synthesis and abduction to seek improvement (Beacham & Shambaugh, 2010).

Brown (2009) defines design thinking not as a linear process but three overlapping spaces namely inspiration, ideation and implementation with iterative activities. In the inspiration space, time is spent with the question, also known as the wicked problem or design challenge, through research, observation and interviews to gain a deeper understanding. In the ideation space, ideas are generated, developed and tested using a variety of design thinking tools. Ideas then flow into the implementation space where it is developed into sustainable solutions. Learning from one space can flow into another space, for example the lessons learned in the implementation space can result in ideas on how to improve the solution in the ideation space or start fresh exploration in the inspiration space. The design thinking approach is iterative by design. The Human-Centered Design toolkit refers to these spaces as the Hear, Create and Deliver phases (IDEO, 2012).

The challenges experienced with design thinking is to understand and work within the constraints best visualised in terms of three overlapping criteria for successful ideas namely feasibility, viability and desirability (Brown, 2009; Dolak et al., 2013; IDEO, 2012). Failing to understand the constraints may lead to unsustainable or unsuitable solutions. The iterative nature of design thinking may also cause challenges when the overall project has a severe time constraint (Brown, 2009).

Additional challenges are identified by Dolak et al. (2013) when they evaluate design thinking against the design science research guidelines as defined by Hevner et al. (2004) and Peffers et al. (2006). The challenges identified are:

- Guideline – Design as an Artefact: Designed artefact solves a more specific, identified problem, rather than a generic class of problems.
- Guideline – Design Evaluation: Lack of rigor, in terms of reliability and validity of the design evaluation process.
- Guideline – Research Contributions: The creation of an artefact scarcely provides precise and implementable additions to the evaluation methodologies.
- Guideline – Research Rigor: No rigorous assessment with respect to the applicability and generalizability of the designed artefact.

3.3.4 Participant observation

Participant observation is a data gathering technique where the researcher participates in and observes people in their natural setting; similar to fieldwork (Myers, 2009). Participant observation, also referred to as fieldwork, usually involves observing people who have a different culture or sub culture from the researcher and therefore involves a period of enculturation, a time where the researcher learns to become a member of another culture or sub culture (Myers, 2009). Participation means playing a role so that the participants think that the researcher is not really researching but in fact part of the group and the extent of participation varies from observation to full participation (Payne & Payne, 2004).

Participant observation consists of three phases as adapted from Jackson (1987) by Myers (2009). The phases are planning, collecting and analysing. In the planning phase the researcher has set the study goals, determined what equipment (such as a voice recorder and stationery) is required, determined the budget and identified other resources needed, planned and gained access to the participants' community, and discovered what other research may already have been done on the same subject.

During the collection phase, the study participants must accept the researcher. Information can be collected through asking questions, listening, watching, and recording observations. The data harvested in this study through participant observation are observations captured in field notes and recorded conversations. As recommended by Payne and Payne (2004), a qualitative researcher should record as much as possible in the field notes, including the researcher's own reactions.

The final phase is analysing the collected information. The information collected through the research instruments is unstructured text that will be analysed using qualitative content analysis.

Key to participant observation is gaining access to the community and the study participants (Krauss, 2009a; Myers, 2009). A cultural interpreter and translator is crucial to the success of the study when there is a cultural difference between the researcher and the study participants (Krauss, 2009a; Krauss, 2009b; Myers, 2009).

3.3.5 Interviews

Interviews are widely used in qualitative research to gather data. An interview is a guided conversation between the researcher and one or more people, referred to as interviewees or subjects with the purpose of gathering data. In a good interview, the researcher listens, prompts, encourages and direct interviewees to share rich insights into their worlds (Myers, 2009). Interviews are classified as structured interviews (adhering to a script), semi-structured interviews (guided by a script) and unstructured interviews (no script) (Myers, 2009; Myers & Newman, 2007). In this

study, semi-structured interviews are used. Myers and Newman (2007) summarise the problems and pitfalls of interviews as follows:

- Artificiality of the interview
- Lack of trust
- Lack of time
- Level of entry
- Elite bias
- Hawthorne effects (the interviewer may intrude upon the social setting and potentially interfere with peoples' behaviour).
- Constructing knowledge
- Ambiguity of language
- Interviews can go wrong

In a semi-structured interview, the researcher is guided by a set of prepared questions, and is willing to improvise based on the responses from the interviewee (Myers, 2009; Myers & Newman, 2007). The flexibility of the semi-structured interview is a benefit as it allows the researcher to gain a deeper understanding of the social situation (Myers & Newman, 2007). A well-designed semi-structured interview has a prepared script that contains an opening to introduce the researcher, an introduction to explain the purpose of the research, a set of prepared questions, and a close to explain the next actions or further requirements (Myers & Newman, 2007). It is important to remember that the script is a guideline and that the researcher requires openness, flexibility and improvisation and should be guided by the responses and attitude cues of the interviewee (Myers & Newman, 2007).

3.4 Research methodology

3.4.1 Research instruments

Myers and Newman (2007) depicted the qualitative interview as a drama. Using their descriptions of the elements of the drama, with an addition of the duration of the run of the drama, the description of the study and research instruments can be directed as follows:

a. Drama

   As in a drama, the interviewer has to give stage directions and pay attention to stage management (Myers & Newman, 2007). The study has three acts. The first act starts with the enrolment of participants from women working as domestic workers, aligning on the purpose of the study and directing the participants to self-document their interactions with information in journals. The second act is the design thinking workshop with the participating group of women. The third act is the interviews with participating organisations on their

views on information inclusivity, vision for future interactions with developing communities as represented by the women participating in the study and to test the concept of the framework used in the research project with the women. All the interactions and data gathered in the three acts are weaved together to form the drama and outcome of the study.

b. Stage

The stage is the location in which the interview takes place (Myers & Newman, 2007). The study has multiple stages for the various acts located in Johannesburg and Pretoria, South Africa. The stage for the first act is varied between the work places and homes of the participating women. The stage for the second act is a venue for the design thinking workshop in Johannesburg. The venue is a space that leads to creative interaction. The stage for the third act is the offices of the participating organisations. In addition to the physical stages, a digital stage is used through mobile phones using the communication application, WhatsApp, and SMS. The researcher has created a WhatsApp group with the participating women who are willing to use the application. The type of phone and cost of data are prohibiting factors for some of the women to use applications such as WhatsApp. For inclusivity, SMS messages are used to communicate to those participants who do not use WhatsApp.

c. Actor

Both the interviewer and the interviewees can be seen as actors (Myers & Newman, 2007). The actors in this drama are the researcher, a cultural interpreter who assists the researcher, the women working as domestic workers, employees from the participating organisations and the researcher's supervisor. At the start of the study, the roles of the researcher and the participants have been explained. The discussions are lead in turn by the researcher and the community interpreter, depending on the language preference of the participating group. South Africa has nine official languages with English as the recognised business language. The women represent diverse cultural groups for example Sotho, Xhosa and Zulu as well as migrant workers from other African countries such as Zimbabwe and Malawi. The researcher has encouraged active participation and language inclusivity by making the participants feel at ease in a respectful manner.

d. Audience

Both the interviewer and the interviewees can be seen as the audience as the interviewer should listen intently while interviewing and the interviewee should listen to the questions or other participants' responses (Myers & Newman, 2007). An important characteristic of design thinking is observation by the facilitator, in this instant, the researcher. The researcher has to be an active listener and observer, in other words, become the audience, for a successful workshop.

e. Script

The interviewer has a research instrument of questions to put to the interviewees, to guide the conversation. The interviewee normally has no script and has to improvise (Myers & Newman, 2007). The script for this drama is carefully designed to guide the actors in their various roles with sub-scripts for each of the acts following the principles of the Human-Centered Design (HCD) (IDEO, 2012) as aligned with the design science research cycles (Hevner, 2007). The goal is to collect data to support the formulation of answers to the primary and secondary research questions of the study applying a human-centered approach. As a reminder, the secondary research questions are:

(1) What is meaningful information for the group of women?
(2) How are the information needs of the group of women currently fulfilled?
(3) What are the existing organisational views on information inclusivity with reference to developing communities?
(4) How can access to information through the use of ICT contribute to the experience of the good life as defined by Sen's capability approach?

The human-centered design approach starts with a specific design challenge that is human centered and proceeds through three main phases namely Hear, Create and Deliver (IDEO, 2012). The study includes the Hear (preparation, interviews and observation), Create (workshop and framework prototype) and Deliver (finalise the framework and thesis document) phases.

The Hear phase guides the researcher through the process of preparing for the research and maps to Hevner's (2007) design science research relevance cycle and the first two steps of the design science research process created by Peffers et al. (2006) namely problem identification and motivation, and objectives of a solution. The Hear phase includes six steps described in Table 3.3.

The first act of the drama is part of the Hear phase. In the first act, the actors are the group of women working as domestic workers and their script is the journals with the purpose of the study and guided questions. The journal entries contribute to the answer formulation of the first, second, and fourth secondary research questions, and inform the design of the design thinking workshop in the Create phase. Regular in-person or digital contact sessions are held to provide motivation for the participants to continue with the self-documentation process, ensure quality of the information and build empathy.

Table 3.3. The Hear phase from IDEO's (2012) HCD toolkit mapped to the study

Step	Fulfilled in the study
(1) Identify a design challenge	The primary research question is the design challenge: How should the information needs that are meaningful to women working as domestic workers be effectively translated through the use of ICT?
(2) Recognise existing knowledge	Existing knowledge is gathered through the literature review, self-documentation in journals and interviews
(3) Identify people to speak with	The study includes two groups. The first group is 26 women working as domestic workers in the Johannesburg area. The second group includes six organisations across various industries. The organisations are selected based on the following initiatives: • A public sector organisation: urban development planning and public participation • A public sector organisation: inclusive trade platform and small-buyer programs • A global financial institution: ICT4D community projects • An international financial organisation: initiatives in developing countries focusing on women • An insurance company: insurance product innovation for low income groups • An international telecommunications company: Handset insurance project in Africa
(4) Choose research methods	These HCD toolkit methods (IDEO, 2012) are selected: • Self-Documentation • Individual interview
(5) Develop an interview approach	The self-documentation journal and an approach for the individual interview for the recruitment orientation are designed.
(6) Develop your mindset	The HCD toolkit encourages the researcher to adopt a beginner's mind and observe first before attempting to interpret. The beginner's mind is a reminder to set own experiences aside and prevent assumptions based on prior experiences.

The journal contains a combination of blank pages and guided pages. The guided pages as shown in Figure 3.5 have sections prompting the participant to write about when information is needed, where she needs the information for example at home or at work, what information she

needs, why she needs the information and how she resolves the information need. The prompts on the guided page are provided in English, Afrikaans, isiZulu and Sesotho to accommodate the language diversity of the participants and strengthen the inclusivity approach of the project.

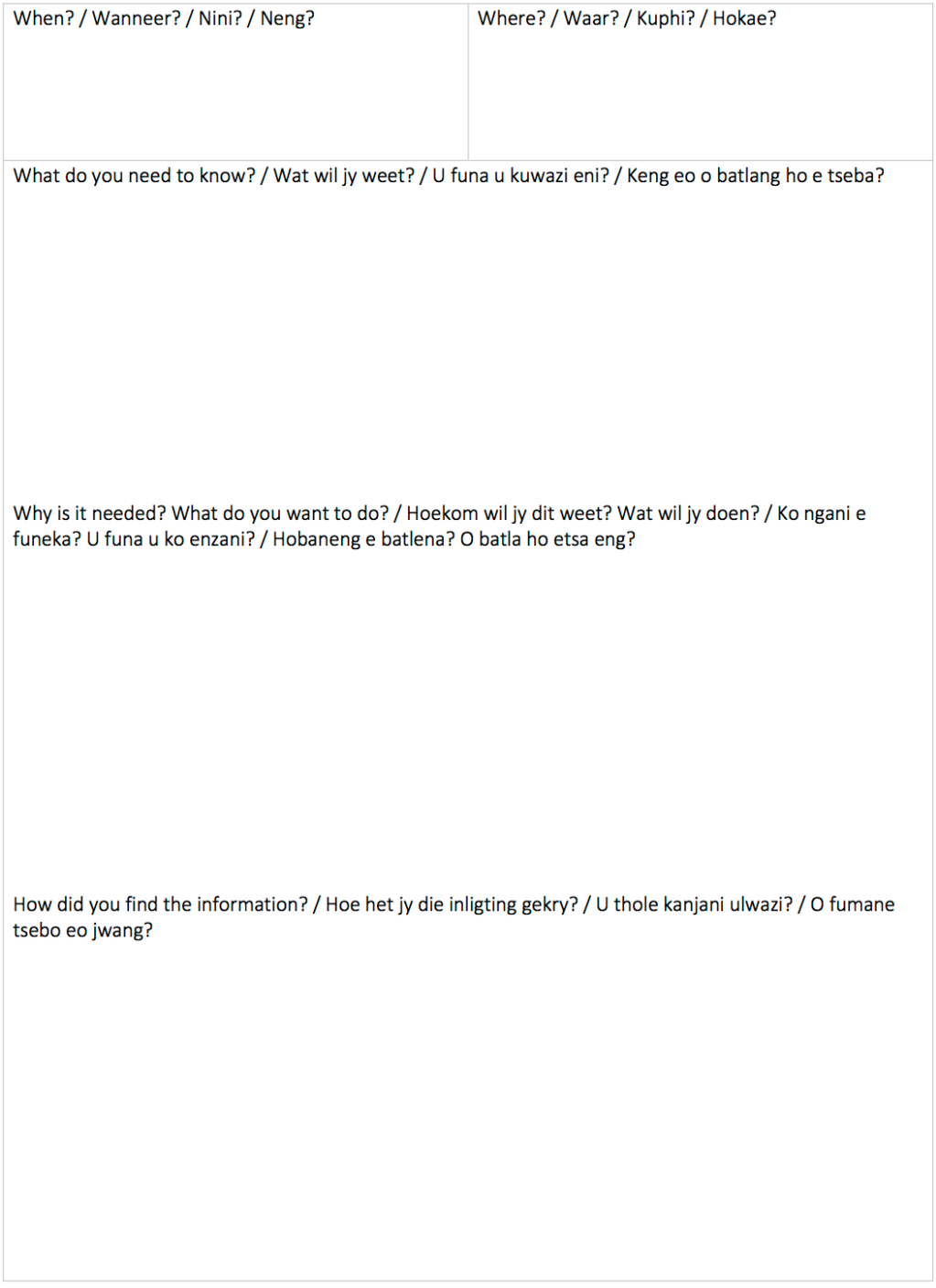

Figure 3.5. Example of the guided journal pages to record interactions with information

Table 3.4. The Create phase from IDEO's (2012) HCD toolkit mapped to the study

Step	Fulfilled in the study
(1) Develop the approach	The design thinking workshop is a co-design workshop that is facilitated by the researcher with active participation by the group of women. At the start of the workshop, the participants create a **persona** who represents the women working as domestic workers and evokes empathy.
(2) Share stories	Sharing stories allow the experiences to be codified and used as data. The participants are invited during the workshop to share their experiences with the group while the group members take notes on post-it notes that are displayed on a big sheet of paper. Referring to their experiences, the **jobs-to-be-done** tool is used for the persona created in the first step.
(3) Identify patterns	Patterns are identified during the workshop by extracting key insights, finding themes and creating frameworks. The jobs-to-be-done information is used to identify patterns and find themes as input to the next step.
(4) Create opportunity areas	Opportunities are stepping stones to idea generation and start with the question "**How might we…?**". Using the themes identified in the previous step, the participants create "how might we" statements without jumping into solutions. Three to five "how might we" statements are selected to use in the next step by giving each participant three vote-dots to mark their three favourite opportunity areas. The three or five opportunity areas with the most votes are the input for the next step.
(5) Brainstorm new solutions	For each of the "how might we" opportunity areas, the seven brainstorming rules (defer judgement, encourage wild ideas, build on ideas of others, stay focused on topic, be visual, one conversation at a time, go for quantity) are followed and ideas generated using the "**Current, Barriers, Future" framework**. The barriers are grouped and then flipped to identify possible solutions as the future solutions.
(6) Make ideas real	Ideas are made real through prototyping in the Human Centered Design process. The importance of prototyping is to develop a deeper understanding of the idea and reveal questions that still need to be answered (IDEO, 2012). In this study, the artefact is the research design framework that is tested through the research activities and the prototype framework evaluated with the participating organisations.
(7) Gather feedback	The prototype of the artefact and other results from the data analysis are shared with the participants from the organisations. The feedback is used to enhance the artefact further.

The next phase of the human-centered design process is the Create phase. In the Create phase, the researcher and the research participants distil the collected learning and observations and collaborate in a design thinking workshop in the second act to co-create frameworks, solutions, opportunities and prototypes (IDEO, 2012) with the resulted prototype evaluated with participating organisations in the third act. The Create phase maps to the design cycle and the rigor cycle of Hevner's (2007) design science research cycles and steps three to six of the design science research process model as defined by Peffers et al. (2006). The Create phase has seven steps described in Table 3.4.

The second act is the design thinking workshop and relies on improvisation with the script directed by the selected templates as specified in the Create phase. Templates are used in the workshop to facilitate the surfacing of information. A combination of templates from the Human-Centered Design toolkit and the Design for Growth Field Book are used (IDEO, 2012; Liedtka, Ogilvie, & Brozenske, 2014).

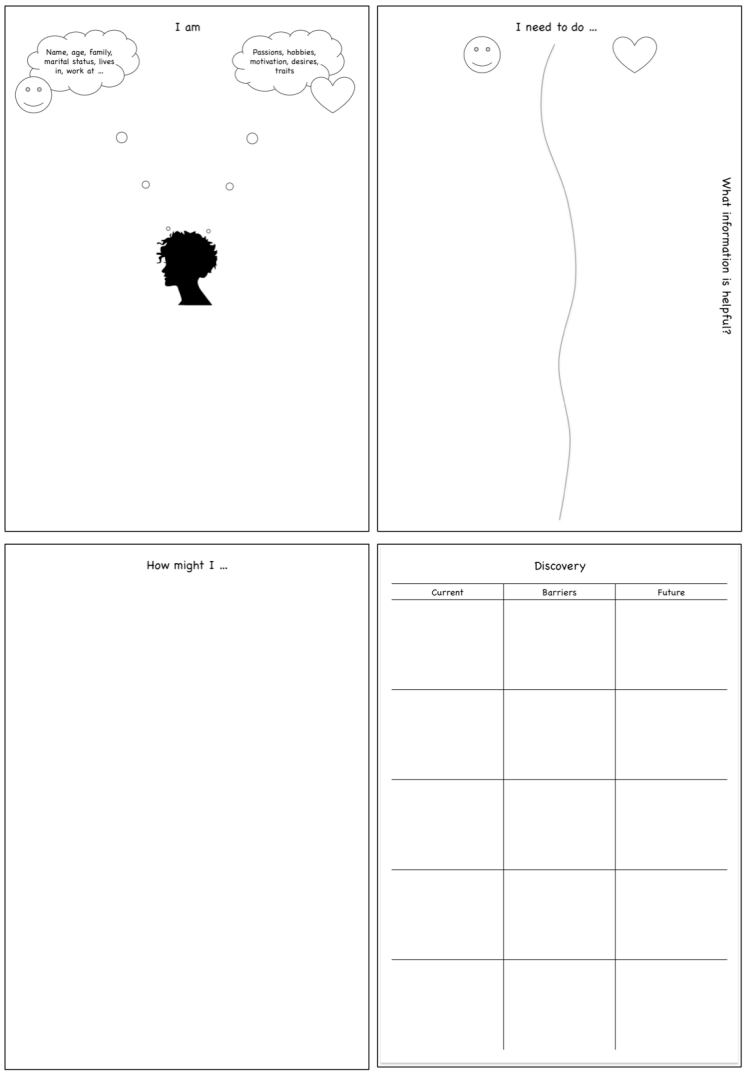

Figure 3.6. The templates used in the design thinking workshop

The templates used in the workshop are defining a persona, story telling, jobs-to-be-done journey map, "how might we" opportunity areas, and ideation using the "Current, Barriers, Future" framework as shown in Figure 3.6.

The script for the third act is a set of questions to guide semi-structured interviews. The prepared questions are mapped to the secondary research questions (SRQ) and analysis categories in Table 3.5.

Table 3.5. Questions in the semi-structured interview script for participating organisations

Question	SRQ	Analysis category
Who are your client segments?	Qualification question	Relevance to the study
How would you describe your knowledge and information management policies and processes?	SRQ 2	Needs currently fulfilled
What are the processes to access information?	SRQ 2	Needs currently fulfilled
How can people request or access information?	SRQ 2	Needs currently fulfilled
Do you receive information from clients? If yes, how do you receive the information?	SRQ 3	Information inclusivity
Have you implemented processes to comply with the Protection of Personal Information Act?	SRQ 3	Information inclusivity
How would you define inclusivity in context of your organisation's interactions with clients?	SRQ 3	Information inclusivity
Is there a focus or interest in innovation in your organisation?	SRQ 3	Social innovation
Is there a focus to impact your clients' lives or is it internal improvements?	SRQ 3	Social innovation
What are examples of innovation (for example, service innovation or social innovation) from your organisation?	SRQ 3	Social innovation
What is your organisation's vision for their interactions with clients?	SRQ 3	Information inclusivity

The third phase of the Human Centered Design process is the Deliver phase. The Deliver phase maps to the rigor cycle of Hevner's (2007) design science research cycles and step six of the design science research process model as defined by Peffers et al. (2006). In summary, the

Deliver phase provides the implementation tools to promote the prototype and ideas to solutions and plans (IDEO, 2012). It has six steps, namely:

(1) Develop a sustainable revenue model
(2) Identify capabilities for delivering solutions
(3) Plan a pipeline of solutions
(4) Create an implementation timeline
(5) Plan mini-pilots and iteration
(6) Create a learning plan

The artefact designed by this study is evaluated through the discussions with the participating organisations in the Create phase. Following the guidance of the rigor cycle and communication step of the design science research process model, the framework is completed and documented in this thesis and journal articles (Hevner, 2007; Peffers et al., 2006). The steps defined by IDEO's Deliver phase are not relevant for delivering the artefact, because the artefact is a framework to improve ICT4D information requirement definition and relevance and delivered through this thesis.

f. Entry

Impression management is important, particularly first impressions, and it may be important to dress appropriately to the situation (Myers & Newman, 2007). The researcher relies on her experience as a South African and her relationship with the woman employed by her household as a domestic worker to act as a cultural interpreter for guidance on the various interactions and for acceptance by the community. Business etiquette is followed for the interviews with the participating organisations.

g. Exit

The exit involves leaving the stage, possibly preparing the way for the next performance or another performance at a later date (Myers & Newman, 2007). The researcher has explained the purpose of the study to the participants and manages the expectations for feedback. The findings of the research will be available to all the participants.

h. Performance

All of the above, together, produce a good or a bad performance. The quality of the performance affects the quality of the disclosure that in turn affects the quality of the data (Myers & Newman, 2007).

i. Duration

Expanding on the analogy of the drama, the duration of the drama is added to the elements. The various acts of the drama are the participants using the self-documentation journals, the contact sessions, the design thinking workshops, the interviews at the participating organisations and the feedback sessions. The duration of the acts is over a period of four months.

3.4.2 Data collection

The data have been collected during interactions with the group of women working as domestic workers and the interviews with employees of participating organisations. The group of women work in Johannesburg, South Africa and the offices of the organisations are in Pretoria and Johannesburg, South Africa. The data sources for this study are:

- Journals from the group of women with guided entries
- WhatsApp and SMS messages
- Observation notes
- Design thinking templates completed during the design thinking workshop
- Interview notes and audio recording of the interviews with the participating organisations

3.4.3 Analysis

Qualitative content analysis is used as an analytical method to interpret the information collected during the study. Qualitative content analysis is a method for systematically describing the meaning of qualitative material (Schreier, 2012). The following chapter describes the process followed to analyse the data in detail.

3.5 Limitations

The limitations observed in this study are linked to the nature of the study, the participants, the duration and the researcher. The study is a qualitative study that is limited to a small research population. The findings of the study cannot be generalised to a larger population due to the sampling size, however the a qualitative study can contribute to theory (Myers, 2009). The research population is a group of women with 26 members working as domestic workers in Johannesburg and a selected group of six organisations in Pretoria and Johannesburg, South Africa. The selection is based on snowball sampling for the women and purposive typical case sampling for the organisations.

The women are encouraged to expressed themselves as they feel comfortable when writing in the journals or participating in the interviews and design thinking workshop. The journal entries are written using English, isiZulu and Sesotho and the interviews and design thinking workshop are conducted in a combination of languages (English, isiZulu and Sesotho). The cultural interpreter

translates the isiZulu and Sesotho contributions to the researcher loosing some of the nuances and intent of the communication in the translation. The idea of accessing information through ICT has been perceived as abstract by some of the women and they need time to adjust to the concept and possibilities that it could offer.

Furthermore, time is recognised as a limitation as the study is conducted over a period of four months. The participants from the organisations expressed time constraints and their schedules, due to the nature of their roles at their organisations, made it difficult to secure appointments. The interviews are limited by the length of time gifted by the interviewee with a minimum of one hour requested. To address this limitation, the researcher prepared the interviewee using email correspondence and secured access to the interviewee for any clarification needed after the interview.

The researcher is also aware of her own limitations for academic research due to her limited experience and her own worldview, culture and interpretations that will influence the study.

3.6 Ethical considerations

As stated in the Code of Ethics Research, privacy and safeguarding of the participants' information enjoy a high priority (University of Pretoria, n.d.). In addition, the proposed Protection of Personal Information Bill emphasise the importance of using personal information with consent and purpose (The Presidency, 2013).

The participants will be provided with a consent form to agree on participation in the study. The purpose of the study will be clearly explained. A cultural interpreter will be consulted to ensure clear understanding of the study and assist with the interactions and workshops with the group of women.

The participants' identities are protected in the following ways:

a. The participant details and consent forms will be kept separately from the interaction notes, interviews and voice recordings.
b. The consent forms will be stored in a sealed envelope in a locked storage container for the duration of the study.
c. The interaction notes, journals, interviews and voice recordings will not refer to the identity of the participants. Pseudonyms will be used that is only known to the researcher. The pseudonym association will be stored separately to minimise the risk of identifying the participants.
d. The identity of the participants will not be disclosed without consulting with the University of Pretoria Ethics Committee.

The study's data will be safeguarded in the following ways:

a. The paper copies of the interaction notes, interviews and other field notes will be taken using archival quality paper and pens.
b. The paper copies of the interaction notes, interviews and other field notes will be stored in a sealed envelope in a locked storage container.
c. The interaction notes, interviews and other field notes and voice recordings will be transcribed using computers (iMac and Macbook) with data encryption.
d. A backup copy of the transcribed notes and voice recordings will be stored in an encrypted format using private online storage.
e. The digital folder containing the research material, analysis work in progress and the dissertation document will be backed-up daily to private online storage and an encrypted external hard drive.
f. The computer equipment, paper copies and voice recorder will be stored in a room with limited access and the necessary security system in place.

The information related to the study, that includes the interview and field notes, digital voice recordings and the analysis of the data will be provided to the University of Pretoria.

3.7 Conclusion

This chapter presents the research design and methodology as the exploration plan of the study. The study follows pragmatism as a research paradigm and is a qualitative study. The various elements of the research design, such as design science research, case study, design thinking, participant observation and interviews have been discussed. The metaphor of a drama has been used to discuss the research instruments within the research methodology and data gathering activities such as self-documentation journals, the design thinking workshop and the interviews with the addition of the duration of the run of the drama. Data collection and analysis are mentioned and will be further described in the next chapter. The chapter concludes with recognising some of the limitations experienced during the study and describing ethical considerations.

The next chapter discusses the exploration journey of the study following the exploration plan described in this chapter. The exploration includes the description of the study participants, the research activities and data collection, the data analysis and sub-conclusions.

Chapter 4 – The exploration

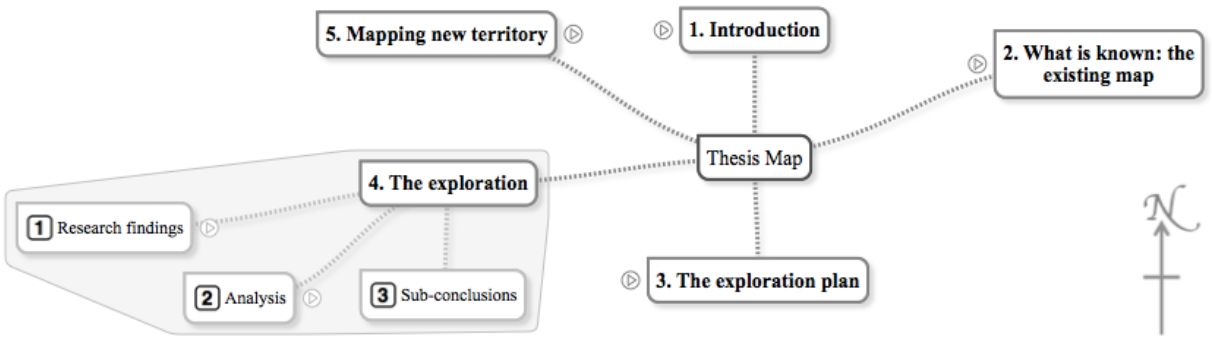

Figure 4.1. The focus of this chapter on the thesis map is the exploration

4.1 Introduction

The preparation for the exploration is discussed in the previous chapters with Chapter 1 setting the scene with the background to the study, the problem statement, the research questions and the summary of the thesis structure. The existing map of knowledge is explored in Chapter 2 through a literature review using categories derived from the problem statement and the research design and the methodology as the exploration plan to discover the uncharted territory defined by the problem statement is described in Chapter 3. This chapter is mapped in Figure 4.1 and describes the fieldwork exploration conducted during the study, the process of data collection, analysis of the data and the reaction from the field to the framework applied by the study. The identities of the participants are protected with pseudonyms and random alphabet letters to indicate different participants for example "Participant A or B". The participants' names in the WhatsApp chat extracts have been replaced with "Participant x" where x is a sequential alphabet letter within the context of the extract and is not permanently associated with the real participant. The exploration ends with the sub-conclusions in answer to the secondary research questions.

4.2 Research project timeline

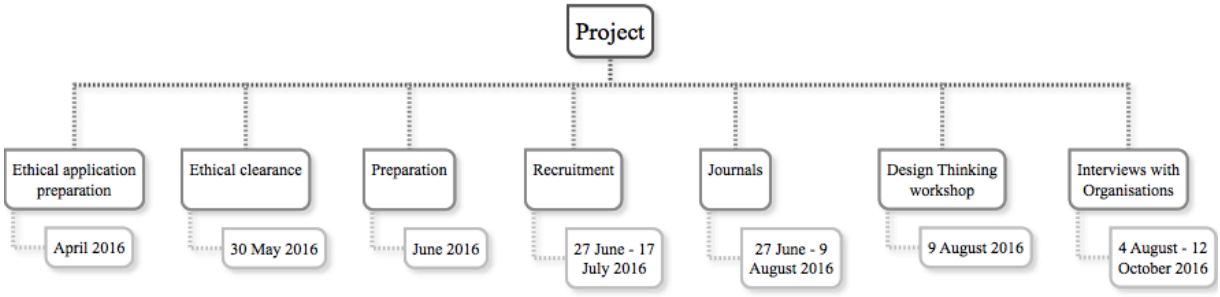

Figure 4.2. Primary project activities in the timeline

Figure 4.2 represents the timeline of the research project. The design of the research instruments described in the previous chapter and permission letters form part of the activities in the preparation

for the ethical application preparation. Once the Faculty Committee for Research Ethics and Integrity at the University of Pretoria's Faculty of Engineering, Built Environment and Information Technology approved the ethical application for the research project, the preparation for the project started. The preparation includes creating the journals and contacting organisations that work in the domestic cleaning sector and religious organisations that ran programs for domestic workers.

Access to women working as domestic workers is a key milestone in the project and proved challenging. Recruitment ran over a period of three weeks, where the women were introduced to the objectives of the project and the journals. The women used the journals from the date of recruitment to the design thinking workshop varying between three to five weeks over a period that included a month-end. WhatsApp chat and SMS messages are used as a way to communicate in the group for the duration of the project. The interviews with the participating organisations were conducted once the project with the women was underway to provide feedback on the project and test the artefact with the organisations.

4.3 Participants

A group of women working as domestic workers and a selection of organisations participate in this study to provide different perspectives and facets to the study.

4.3.1 Selection of the women

This study set out to explore how information needs of women may be identified more effectively with the focus on women in context of the developing agenda in an urban setting. The reviewed literature include various studies of ICT4D projects in rural areas in Africa, some in an urban context, and a gap exists for research that focus on women who work as domestic workers in an urban context. The researcher selected an urban setting in close proximity of her home for the study to facilitate regular access to the research participants over the three months duration of the project. A group of 26 women participated in the study over a period of two months.

Access to participants proved problematic. As an initial tactic, the researcher contacted various organisations that provide domestic cleaning services and have a register of women working as domestic workers. Only one organisation acknowledged receiving the requests (phone calls and emails), but without willingness to engage. It wasn't a viable option as the organisations were protective of their information. Religious organisations that ran programs for domestic workers were also contacted, but the timeframe for the project and their programs was problematic. It became clear that a direct approach was the best option to engage with this hidden population using snowball sampling.

4.3.1.1 Snowball sampling

Snowball sampling is a non-probability sampling method where participants are recruited through contact information that is provided by other participants and relies on the dynamics of natural and organic social networks (Atkinson & Flint, 2001; Maree, 2007; Noy, 2008). The sampling process is repetitive and accumulative where access is gained to hidden or hard-to-reach populations (Atkinson & Flint, 2001; Noy, 2008). The group of women working as domestic workers can be defined as a hidden or hard-to-reach population because they are isolated within the households they work at and requires a trust relationship to gain access to them. Snowball sampling allows for the development of trust as the referrals are made by acquaintances or peers (Atkinson & Flint, 2001) where the researcher relinquishes a considerable amount of control over the sampling phase to the participants (Noy, 2008). Social knowledge and power relations are part of the dynamics of accessing and approaching participants and add another perspective to the study (Noy, 2008).

The limitations to use a non-probability sampling method are that the sampling population is not representing the population and the results cannot be generalised to the population (Atkinson & Flint, 2001; Maree, 2007). Snowball sampling was effectively used as a research tactic because representation and generalisation are limitations of qualitative research as an understanding of the phenomena is more important (Myers, 2009), with qualitative research as a whole a social site for knowledge generation (Noy, 2008), and access to the women within a geographical area and timeframe important to the study. Atkinson and Flint (2001) identify two additional difficulties with snowball sampling, namely:

i. Finding respondents and initiating referrals
ii. Engaging respondents as informal assistants to counter initial hostility or suspicion

To address these difficulties, clear criteria for participation are defined as literate women currently working as domestic workers within Region B of the City of Johannesburg. The researcher is a resident of Region B and the study includes a workshop that requires ease of access for the participants who are dependent on public transport. Region B is a diverse region with historic and newer suburbs and situated in the centre of Johannesburg where households have disposable income and employ domestic workers (City of Johannesburg, 2015). Employment status is important, as it provided a common denominator for the group of women. Literacy is important because self-documentation in journals is the first phase of the project. A design choice was made early in the project to cater for multiple languages, such as English, isi-Zulu, and Setswana, to support the women in their expression.

4.3.1.2 Recruitment of participants

The researcher used her network of acquaintances to recruit the first eight participants setting the snowball effect in motion with a further eighteen referrals. Permission was requested from the participants' employers before the women agreed to participate. The permission from the employers is important for the women even though the research activities did not impact their duties and highlights their perceived vulnerability in society.

Extract from research notes reflecting on the discussion with Mpho:

I discussed the project idea with Mpho, my housekeeper. Her first reaction is scepticism, unsure, offering reasons why it is a bad idea. Her reasons are lack of time during the day, understanding, and access to people. I asked her to think about it with an open mind, with consideration.

A few days later: She sounded more positive and open to assist. I realise I need to be clearer in communication the purpose and expectations. Mpho mentioned two of her friends who work in the area as well as a good suggestion to approach guesthouses. She explained time as a constraint to participate as well as demands from their own households. I think the journals will be non-intrusive and might just work.

The researcher's own trust relationship with the woman who she employs as a domestic worker was beneficial to act as an informal assistant and bridge the cultural gap with the participants. The researcher's assistant knows some of the women and can speak and read multiple languages relevant to the research population. It was clear from engaging with the women that trust is essential and participants asked for reassurance that the information they provided will be protected similar to Atkinson and Flint's observations about the importance of trust and information protection (Atkinson & Flint, 2001). Each participant signed and received a copy of a consent form that includes a confidentiality clause with the protection of her identity. The assistant's presence and ability to translate the project's objectives to the participants to their own home language and relate her own stories were valuable contributions to establishing trust and goodwill to the project.

WhatsApp chat extract:

2016/07/06, 6:24:12 PM: Researcher: My lesson today was how important it is that you know the information you share is confidential and your identity is protected. I will not say Mpho said so and so, or Susan said this and your journals will be private. Thank you for reminding me today that this is important to you too.

2016/07/06, 6:25:31 PM: Participant A: Ok

2016/07/06, 6:27:15 PM: Participant B: That's really relieving to know

2016/07/06, 6:39:20 PM: Participant C: We tnk u fr that

4.3.1.3 Duration

The snowball sampling selection commenced on 27 June 2016 with the aim to recruit 20 to 30 women. The participants start using the journals after recruitment until the workshop on 9 August

2016. Recruitment ended when the 26th women joined the project three weeks before the workshop. That meant that the minimum time spent on the journals for all of the participants is three weeks stretching over the July 2016 month-end period. There were further referrals after this date and closer to the workshop, but the decision to work with the 26 women was upheld.

4.3.2 Selection of organisations

A selection of organisations is included in the study to add another perspective to the insights on the current approach to information sharing, information inclusivity and social innovation, and test the artefact resulted from the engagement with the group of women. As described in literature, many ICT4D projects are done "to" communities and not "with" communities with little regard for culture and context (Unwin, 2009; Van Stam & Van Greunen, 2014). To have a meaningful contribution from organisations, organisations across various sectors are selected that engage with people as represented by the study's group of women. Handpicking participants for a study is described as purposive sampling.

4.3.2.1 Purposive typical case sampling

Purposive sampling is a non-probability sampling method where the participants are selected because of specific attributes they have that will contribute to the study (Maree, 2007; Robinson, 2014; Suri, 2011). Purposive sampling can be applied using various strategies, for example stratified, criterion, quota, significant case, deviant case and typical case sampling, to ensure that certain types of cases within a sample universe definitely end up in a final sample (Robinson, 2014). A typical case strategy is selected for this study because the objective is to describe what is typical regarding information inclusivity between organisations and developing communities to those unfamiliar with the setting (Robinson, 2014; Suri, 2011). Participant cases are chosen precisely because they are typical examples to contribute to the search for meaning in the study (Robinson, 2014).

4.3.2.2 Recruitment

The criteria for the selection of organisations are relevant projects with their customers that can be described as developing communities, representation across different sectors and access. Six organisations participate in the study from three different sectors, namely public, financial services and telecommunications sector. The organisations are well known in the South African, African and international contexts and the projects are typical examples of engagements with customers from developing communities. To gain access to the individuals at the selected organisations, the researcher used her network of acquaintances and purpose of the study. Ten organisations were initially approached to participate in the study, two did not respond to the email request, one declined due to time constraints, one declined due to perceived relevance and six accepted. The researcher feels encouraged by the support of the study by these organisations and the access to individuals with demanding schedules she enjoys because it is a doctoral study. As described in the ethical

considerations of the research methodology, the identities of all the participants are confidential and information is shared with consent.

There is a concerted effort in South Africa to established social integrated cities and towns and economic inclusive societies to address the spatial and economic problems. The public sector and financial services sector are contributing to the efforts with programs such as the integrated urban development framework and creating financial services products and services to promote economic inclusivity. ICT is recognised by these organisations as a bridge to the public. The group of women participating in the study meet the profile of customers that the participating organisations are targeting with new products and services. The primary reason the six organisations are included in the study is their projects with customers from developing communities as listed in Table 4.1. Their experience of engaging with and providing information to customers in developing communities make them suitable to evaluate the study's framework.

Table 4.1. Summary of projects

Sector & pseudonym	**Project**	**Motivation for inclusion in the study**
Public sector PS01	Public participation project Integrated urban development framework project	One of the policy levers of the integrated urban development framework is to create cities and towns that are stable, safe, just and tolerant, and respect and embrace diversity, equality of opportunity and participation of all people, including disadvantaged and vulnerable groups and persons. The role of ICT in improved citizen participation is recognised in the integrated urban development framework and one of the key enablers of the public participation project. Some of the objectives of the framework are to bridge the digital divide and to recommend investment in training and education of the urban poor and other excluded groups to shift the digital divide from material access to actual use of the Internet and ICTs. Information from government departments, economic information and transport are identified as meaningful information categories in the journals and confirmed the inclusion of PS01 in the study.
Public sector PS02	Online trade platform project Micro buyer support project	PS02's customers include similar segments as the group of women included in this study. The objectives of the online trade platform project and the micro buyer support project are to bridge the digital divide by providing public information for fresh produce prices and include former excluded people from participation in trading without prescribing quantity.

		The group of women in the study expressed the need for information on food savings and small business ideas in the economic category that confirmed the inclusion of PS02 in the study.
Financial services FS01	Community development project	FS01 is involved in various community development projects that include ICT4D initiatives. Including FS01 in the study gave access to field experience that was valuable in the evaluation of the study's framework.
Financial services FS02	Women development project Community savings project	The women development project and the community savings project are of interest to women as represented by the study's participants. FS02 is known for digital innovation and interested in bridging the digital divide to their customers in all segments. FS02's relevancy to the study was further confirmed by the information categories that the women identified in the journals that included financial services (need for public information, personal account information and financial development information) in the economy category.
Financial services FS03	Low-income insurance products project Financial education programs	FS03 is active in the customer segment as represented by the study's group of women. They develop insurance products to protect vulnerable groups as well as offer free financial education programs to their customers. The study's group of women expressed a need for information about working better with money in the journals in the economy category and ways to develop in the personal development category that confirmed the inclusion of FS03.
Telecommunication TC01	Low-income handset insurance project	TC01 offers insurance for handsets to low-income customers as a way to offer protection to their most vulnerable customers to replace a valuable asset based on specified conditions. TC01 engages with their customers to understand their needs and offer appropriate services. In the journals the women shared their economic vulnerability and their participation on the WhatsApp chat demonstrated their use of mobile phones that confirmed the relevancy of TC01 to the study.

4.3.2.3 Duration

The engagements with the organisations are conducted over a period starting from 4 August 2016 to 12 October 2016. The engagements include emails, semi-structured interviews and telephone conversations. The semi-structured interviews vary in duration from one to two hours with one to three individuals per organisation.

4.4 Collecting and analysing the data

The primary sources of the data for this study are the journals, the design thinking workshop and the interviews with the organisations. Supporting data sources are the text from the WhatsApp group chat, personal notes and observations, email correspondence with representatives at the organisations and literature.

The approach followed in the data analysis of the journal entries and the interviews is qualitative content analysis. Qualitative content analysis is a method for systematically describing the meaning of qualitative material (Schreier, 2012). Three approaches are used for qualitative content analysis namely conventional or data-driven, directed or concept-driven and summative (Hsieh & Shannon, 2005; Schreier, 2012). The data-driven and concept-driven approaches are used to analysis the data generated by this study.

Applying Hevner's design science research cycles, the research study activities traverse the relevance cycle, the design cycle and the rigor cycle as depicted in Figure 4.3, starting with the relevance cycle where the problem statement is defined, the background of the study sketched and the participants recruited (Hevner, 2007). The framework as the artefact of the study undergoes a number of iterations during the study to refine the design of the framework from concept to final version.

Overlaying the design science research cycles with the Human-Centered Design toolkit from IDEO (2012), the guidelines in the hear phase of the human-centered design approach aligns with the principles in the relevance cycle through the application of the journals. Following the hear phase is the create phase that corresponds with the design cycle with the design thinking workshop, interviews and evaluation elements of the study. Lastly is the deliver phase that corresponds with the rigor cycle with the finalisation of the model, project conclusion and published research findings.

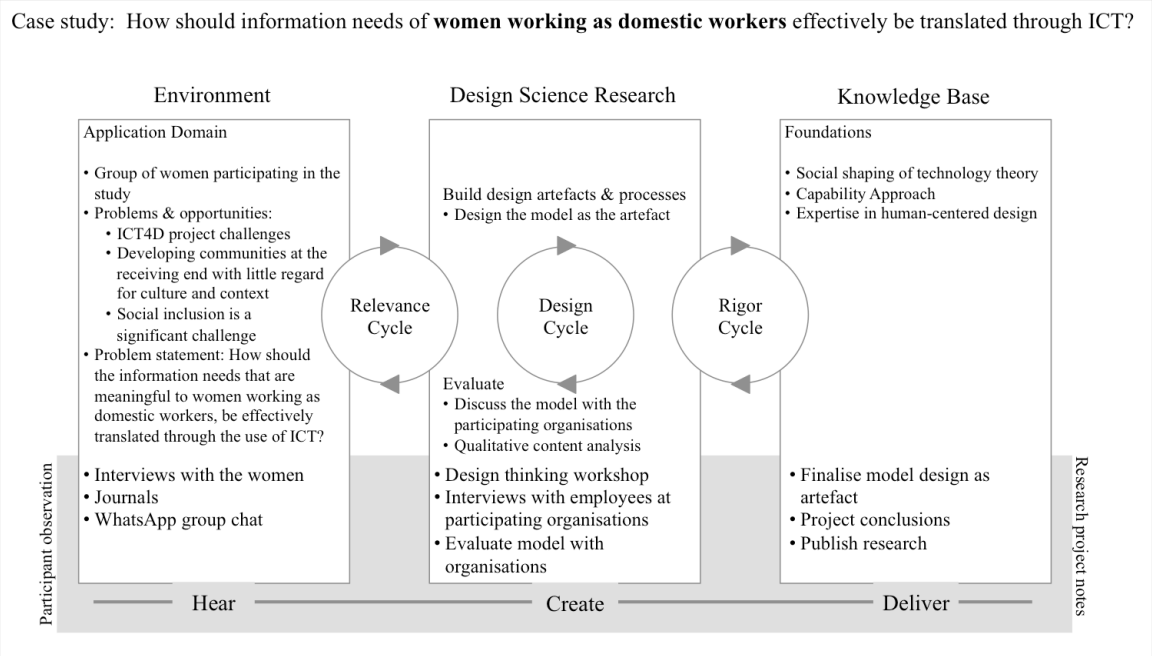

Figure 4.3. Hevner's (2007) design science research cycles overlaid with the Human-Centered Design toolkit (IDEO, 2012) as implemented in the research project

4.4.1 Journals

The Capability Approach Framework is used to add rigor to the design of the journal phase and provide further insights to the participants. Hatakka and Dé (2011) developed the Capability Approach Framework to operationalise Sen's capability approach in an attempt to answer how ICT can lead to development. The capability approach enables the researcher to go beyond superficial variables of technology implemented and focus on actual outcomes (Hatakka & Dé, 2011; Hatakka & Lagsten, 2012). The capability approach provides a way to distinguish between functionings that a person can achieve and capabilities as the ability to utilise the functionings and choose between them (Hatakka & Lagsten, 2012; Sen, 1999). Using the agency definition to extend the framework, it can be applied to measure the impact of the project (Grobler & De Villiers, 2014).

The extended framework as illustrated in Figure 4.4 assists in focussing attention on (Grobler & De Villiers, 2014; Hatakka & Lagsten, 2012):

- Intervention: agency, technology and supportive. Sen (1999) uses the term agency as a person affecting change starting with standard of living (focused on self), expanding to well-being (benefiting from the positive feeling of helping someone else) and agency (taking altruistic action which is not beneficial to the person herself). By noting the agency of the participants at the start of the intervention, a change in agency can provide an indication of the impact of the intervention (Grobler & De Villiers, 2014). The technology used by the intervention is cell phones, SMS and WhatsApp chat messages. The supportive

interventions are the interviews and discussions to explain the concept, the journals and the design thinking workshop.

- Functionings: discover which potential and achieved functionings can be enabled by the results of this study.
- Conversion factors: which personal, social and environmental conversion factors restrict or enable participants to engage in the study.

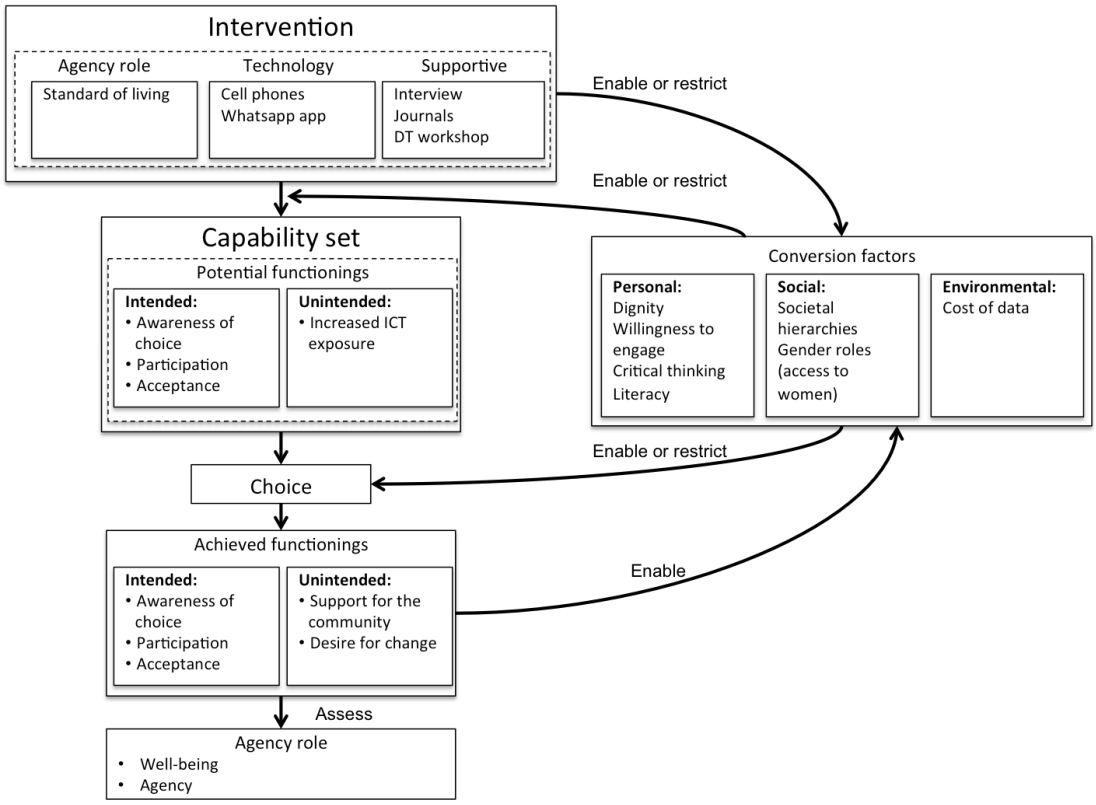

Figure 4.4. The study mapped to the Capability Approach Framework with the addition of the agency role (Grobler & De Villiers, 2014; Hatakka & Dé, 2011)

If people do not use a new solution, their choices have increased, but their freedom has not been expanded as they do not value the new enabled solution, as often the case with ICT4D projects (Alampay, 2006; Hatakka & Lagsten, 2012). It is therefor better to look at what people actually want and not just what is technically possible to implement (Hatakka & Lagsten, 2012). This recommendation harmonises with the human-centered design approach where the researcher is encouraged to observe and engage with the participants to gain a deeper understanding of the problem space (Brown, 2009; IDEO, 2012).

4.4.1.1 The reason for using journals

Reflecting on ICT4D studies, the researcher's experience with a study in Limpopo and her interactions with women working as domestic workers, a way is needed to allow unarticulated needs to surface and create an empathic understanding (Grobler & De Villiers, 2014). Generating empathy

for the participants is a way to understand their reality, behaviour and motivations that will lead to better design (IDEO, 2012). As found in the Limpopo study, an initial conversation about ICT and information use can be abstract and difficult for the women in developing communities to relate with that would make interviews and surveys less effective. Time must also be given consideration as women's work continues from the workplace to home and time poverty is a limiting factor (Chopra, 2015). As guided by the relevance cycle of the design science research cycles and the hear phase of the human-centered design approach, the problem space must be well understood.

Using a method that the women will relate to, find non-threatening, easy to use and draw on functionings in their capability sets motivated the researcher to use journaling as part of the method to discover previously unarticulated needs. Journals provide a way for the participants to contribute to the study in their own time and convenience, reflect on their interaction with information and share information with the researcher in their own words. The combination of initial interviews, ongoing contact in the WhatsApp group and journal writing should give the researcher insights to experience empathy with the participants.

Literacy is a prerequisite to use written journals and the WhatsApp app, and in the event that literacy is challenged, voice recordings can be used as a substitute. All of the women who participate in the study are literate.

4.4.1.2 Journal design

Physical paper and a digital solution on the Internet or as a mobile app were considered as a medium for the journal. If a digital solution is selected, access to a relevant device will be added to the selection criteria for participation. Given the capabilities of the participants that they are mobile phone literate rather than computer literate, a mobile app will be the preferable choice over an Internet solution. Benefits of using a mobile app are the accessibility of the data to the researcher while the project is underway, the mobile phone is a companion device to most people, and the novelty factor of using an app can encourage interaction and contributions. The challenges of an app are data usage, creating the app and supporting the app users. The cost of data in South Africa is a prohibiting factor for low-income users and consideration for subsidising the data cost through the research project is needed (Calandro, Gillwald, & Rademan, 2014; RIA, 2016; Tariffic, 2016). Furthermore, the purpose of the journal is to allow the participants to share their interactions with information freely and not be hindered by new technology, as the research focus is not about technology adoption. The decision was made to use a paper journal that is a low cost option, familiar to the participants, confidential through anonymity and reflective through writing.

The researcher designed the journal to evaluate if the method of using journals as the observation method in combination with the design thinking workshop is an effective way to discover actual

needs. The women's interaction with information is used as the scenario. The journal design includes a letter from the researcher as an introduction to her and the intention of the research, the participation consent form in duplicate to be signed by the researcher, the participant and a witness, notes pages and guided pages with space to write about what information is needed, why it is needed and how it was resolved. The journal is an A5 size and is given to the participants in a protective sleeve with a pen as shown in Figure 4.5.

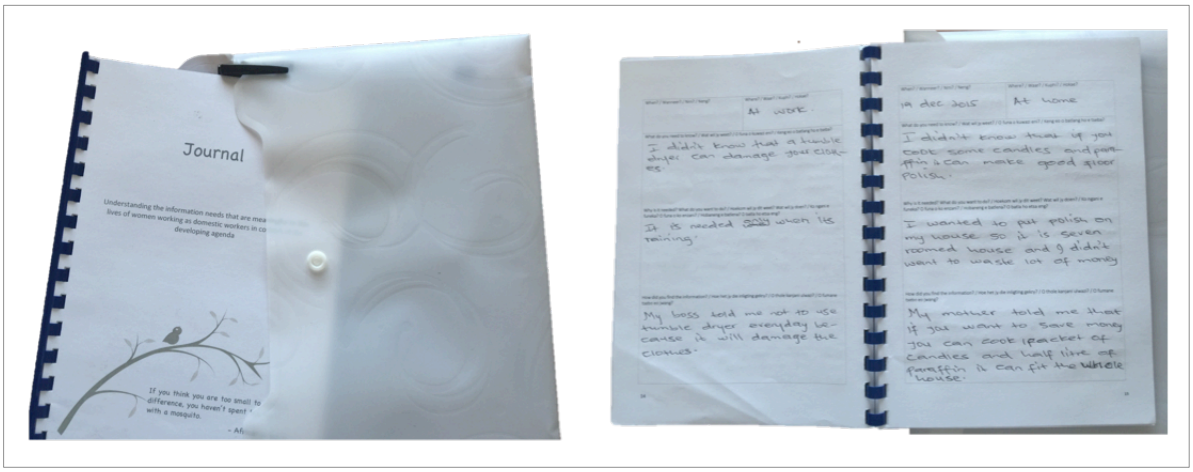

Figure 4.5. Example of the journal

4.4.1.3 Dear Journal

The researcher and the researcher's assistant met each participant at either the participant's place of work or home. The researcher's assistant plays the role of the cultural interpreter, translates the conversation from English to the participant's home language when needed and shares her own experiences working with the journal. The assistant could not attend all of the interviews as a few interviews took place after her work hours.

The purpose of the interview is to ensure that the woman met the criteria for the study, understand the expectations of participation and secure participation. Storytelling is used to convey the background and use of the journals. Following the agreement to participate in the study, the consent form is signed and removed from the journal. The researcher has the original consent forms in safekeeping and the participants have their copies.

This started the self-documenting phase of the project. To keep contact with the participants and offer support, the researcher created a WhatsApp group. Most of the women are familiar with the WhatsApp app with 23 of the 26 women using either a smartphone or a tablet. The three women who have basic mobile phones use SMS to communicate with the researcher during the journal phase. The cost of data and airtime are prohibiting factors for using mobile communication methods and seen as a luxury by the participants. The researcher provided each participant a data or airtime bundle to participate in either the WhatsApp group or the SMS group for the duration of the study.

The WhatsApp group created a sense of community during the journal phase. Examples of information use, personal experiences such as the birth of a baby and the loss of a relative and spiritual encouragement are shared. The WhatsApp group is still active with the participants supporting each other.

WhatsApp chat extract:

2016/08/13, 4:39:45 PM: Participant A: Hi Ladies [Participant X] got a bby boy this morning

2016/08/13, 4:41:53 PM: Participant B: Glory that's Good news ☺ thank you [Participant A]

2016/08/13, 4:52:32 PM: Participant C: Hi Ladies happiness and joy to [Participant X] ❤❤❤❤

2016/08/13, 4:59:43 PM: Researcher: Thanks for letting us know, [Participant A]! Congratulations to [Participant X]

2016/08/13, 5:01:21 PM: Participant C: All the best sister ❤

The participants used the journals for three to five weeks depending on when the participant joined the project. The journals were returned to the researcher at the design thinking workshop. During the workshop, the researcher asked the participants their thoughts on using the journals and mapped it as seen in Figure 4.6. They used words such as: supportive, difficult, helpful, situation reflection, achievements, advice, peace of mind. They agreed that the best way to describe how they experienced the journals is “support group”.

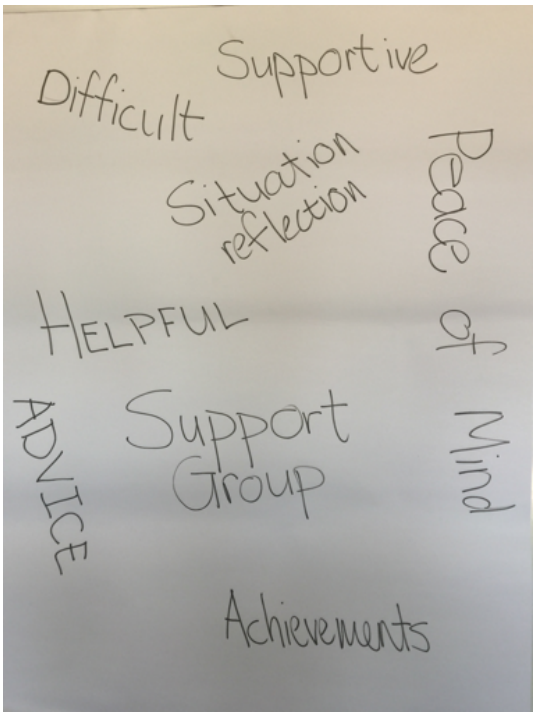

Figure 4.6. How participants feel about using the journals

4.4.1.4 Data-driven qualitative content analysis

Some of the participants share their life stories in the journals. They write about their hurts, hopes and aspirations. It gives a unique view into the lives of these women. In the structured pages, they describe the interaction with information. Some of the women use the blank pages to expand on their examples of interacting with information. All of the content of the journals are transcribed in a document and the journals are stored. The information is de-identified to protect the identities of the women. Three of the journals contain entries in Sesotho or isiZulu that the researcher's assistant translated to English. The document is organised using the "what, why, and how" headings to reflect the written entries in the journals. Where narratives are given in the blank pages, a summary of the content is transcribed to reflect the interaction with information.

The content of the journals is analysed using data-driven qualitative content analysis where the categories are derived inductively from the data (Schreier, 2012). Figure 4.7 describes the process of analysing the journal text with the categories emerging from the data.

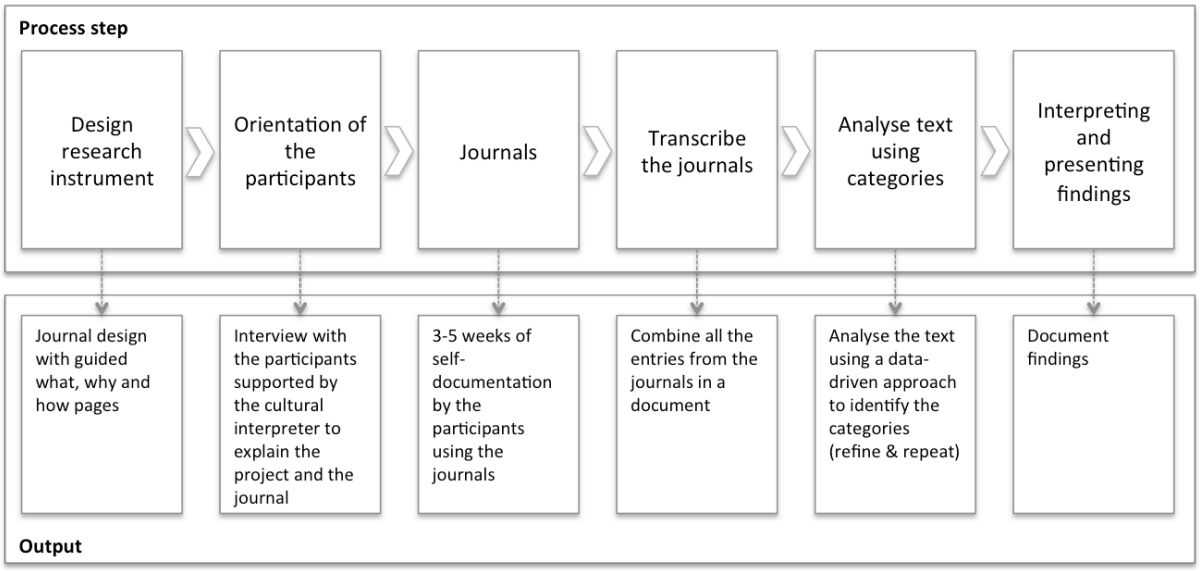

Figure 4.7. Data analysis process for the journals with reference to Qualitative Content Analysis steps (Schreier, 2012)

The transcribed data resulted in 234 entries. Following the data-driven qualitative content analysis, eight categories are identified using the type of information as indication of the category. The analysis of the number of journal entries with the number of participants per category is shown in Figure 4.8. The categories are communication with nine entries, domestic with 46 entries, economic with 33 entries, government with 20 entries, health with 43 entries, legal with 16 entries, personal development with 55 entries and transport with 12 entries.

Most of the entries are about personal development information with 14 participants contributing. The second highest number of entries is the domestic category with 12 participants writing about their interactions with domestic related information in their journals. The categories following personal development and domestic that received the most attention are economic, government, health, transport and legal.

Three participants contributed to the nine entries in the communication category. Each participant mentions three to four different categories of information in their journals.

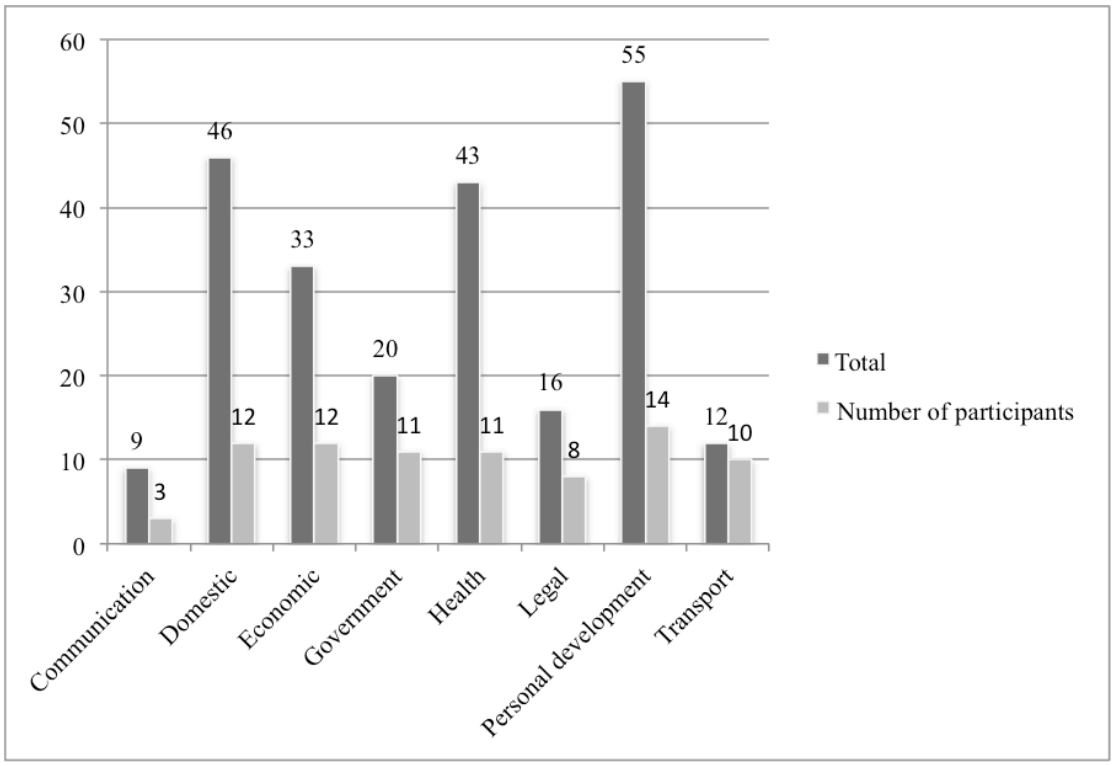

Figure 4.8. Journal entries per category with number of participants analysis

The participants wrote freely about their frustrations and dreams in the journals in the need for information scenario. The journal entries cover all the aspects of their lives from family, health, financial, career, spirituality and personal growth as summarised in Table 4.2 with examples from the journals and the WhatsApp chat.

The WhatsApp chat is predominantly used for support and connection, for example greeting each other during the day or sharing an inspirational photo. Examples of interaction with information that correlate with the categories from the journal entries exist in the WhatsApp chat that is shared in the normal day-to-day activities such as sharing news about a sick child (communication), asking for assistance to find work (economic), and asking for advice about working in South Africa (government).

Table 4.2. Summary of the journal content categories with examples from the journal entries and WhatsApp chat

Category	Description
Communication	The information required relates to communication with another party. *"Supposed to meet Mamas Group from church 8:00 at the funeral parlour but they are nowhere to be seen."* – Participant F *"I am starting my leave on 4 July. My boss asks me to come to work on the 4th in case my colleague can't make it to work, but says she'll (boss) find out first and let me know."* – Participant F WhatsApp chat extract: 2016/08/05, 5:12:49 PM: Researcher: Please spare a thought for [Participant A] - her daughter is in hospital with food poisoning. 2016/08/05, 5:17:53 PM: Participant B: Haa shem will pray for her thnx 2016/08/05, 5:21:03 PM: Participant C: Ah shame bt why? Will pray for her, thnx for letting us know 2016/08/05, 5:28:07 PM: Participant D: Will pray for her its so sad 2016/08/05, 5:49:52 PM: Participant E: We will pray and believe she will be fine 2016/08/05, 6:28:09 PM: Participant F: Sorry [Participant A] u know she will be okay just believe ok God is on our side always 2016/08/05, 6:30:15 PM: Participant A: Thank you for all your prayers
Domestic	All the entries relating to information regarding household activities are collected in the domestic categories. *"I want to know about my vacuum machine, the lid is broken and I want to know how can I get another lid."* – Participant A *"How do I make fatcakes I forgot what to mix."* – Participant T *"What can I do to remove the stickiness on the iron?"* – Participant T *"Need to know which season to grow onions"* – Participant C
Economic	The participants write about looking for information to safe money, earn more money and interactions with their banks. All of the related entries are collected in the economic category. *"Owning a guest house"* – Participant D *"Why do banks refuse to give us loans?"* – Participant G *"How can I help ladies in rural areas?"* – Participant I *"I want to know about bursaries"* – Participant N *"How to find another days of work"* – Participant W *"I didn't know that if you cook some candles and paraffin it can make good floor polish."* – Participant S

	WhatsApp chat extract: 2016/07/19, 8:03:47 AM: Participant A: I want to know about my acc it was been used while I was in a bus on my way to work. The BANK send me an sms on my phone that withdrawal went through , and I had to go to the bank to fix the problem 2016/07/19, 8:06:04 AM: Researcher: Nice one [Participant A]! I hope you get it resolved. Wonderful how SMS can help us. 2016/07/19, 8:06:52 AM: Participant A: It helps 2016/07/19, 8:13:11 AM: Participant B: My update arlett us wow is good u did get help 2016/07/19, 8:20:58 AM: Participant A: Thank you [Participant B] 2016/10/04, 11:20:01 AM: Participant C: Hie, ladies how you doing 2016/10/04, 11:22:00 AM: Participant C: M just looking for a job for next yr , if you hear somethinh pls let me know 2016/10/04, 10:18:24 PM: Participant D: No problem sister we will
Government	All the entries related to information regarding government services are collected in the government category. *"How can I get the ID book for my foster child (orphan)"* – Participant A *"About our electricity. We have a serious problem with our electricity because where we stay, not having it for more than 2 to 3 days a week."* – Participant A *"Do domestic workers have pensions when they decide to go home?"* – Participant M *"Wondering of street kids in the area"* – Participant R WhatsApp chat extract: 2016/07/22, 4:42:23 PM: Participant A: Hi ladies,,,, l jst need your knowledge, l hve got my daughter who is in zimbabwe and she wants to come and do her teaching practise (temporary teaching) here in S.A 2016/07/22, 4:43:17 PM: Participant A: What is it which is needed and how can she do that 2016/07/22, 4:45:15 PM: Participant B: Sorry im in a taxi to Brits but i will find out 2016/07/22, 4:46:24 PM: Participant C: I think home affairs can help you with that information 2016/07/22, 4:48:39 PM: Participant D: I think if she have all her papers. She can go to dep of education . They will look school for her to do her practicals 2016/07/22, 5:01:56 PM: Participant A: K [Participant B] l will be so thankful 2016/07/22, 5:02:07 PM: Participant A: Thank you ladies 2016/07/22, 6:37:19 PM: Participant E: [Participant A],she can have all and work permit find out w with home affairs. 2016/07/22, 6:47:39 PM: Participant A: . Ohk thnx

Health	Health related information is the third highest category that the participants write about and represents general and specific requests for information relating to health issues. *"Need to know some home remedies to cure ringworms"* – Participant C *"Is it a good thing to put your teenage daughter on family planning at an early age?"* – Participant G *"At what age does a woman reach menopause?"* – Participant G *"How I can help my daughter she got tonsils."* – Participant W *"I wanted to know if ginger and lemon can reduce flu."* – Participant S WhatsApp chat extract: 2016/07/23, 4:14:01 PM: Participant A: Hi ladies, I have lot of children but I have never experience what im going through now plz tell me can you be in labour but not have a single show, does a baby moves when you are in labour cnt seem to remember please help * confused and in lot of pains 2016/07/23, 4:16:45 PM: Participant B: Hie I have 3 girls and from what I can remember ,when I was in labor it was very pain full,have yo water broken 2016/07/23, 4:19:21 PM: Participant B: I think jus hurry to the nearest hospital they will know what to do 2016/07/23, 4:19:26 PM: Participant C: Hi [Participant A] I understand that when the baby comes is when he or she makes a way to come yes the baby moves be strong [Participant A]
Legal	Eight participants have information needs regarding labour and matrimony legal matters. *"How long should you be a casual staff in a company? When do you become permanent staff?"* – Participant G *"I want to know if you have a husband who doesn't give you anything for your children's school things, what should you do."* – Participant L *"How do I file a maintenance for my kids from my ex-husband"* – Participant O *"Domestic workers do not have a union who represents domestic workers rights except CCMA."* – Participant M *"How can I be protected from unfair practice at work"* – Participant Z
Personal development	Personal development is the category that represents all the information needs of the participants relating to self-improvement. Fourteen women contribute to this category with 55 entries making this the highest number of entries for a category. *"The problem I am facing with my children about their school work."* – Participant D *"Better life for my children"* – Participant E *"What is the purpose of having a partner in your life? The one who can not help you in any way."* – Participant G

	"My future is more important than anything. And from thinking about it. It will make good for me." – Participant I *"How do you ever heal from being raped by your own uncle and the family hide that"* – Participant O *"How to stop gossiping, hatred and jealousy"* – Participant O *"To deal with four year old daughter after work and fourteen year old with homework after work."* – Participant W WhatsApp chat extract: 2016/08/28, 4:58:14 PM: Participant A: For me im tired had a rough month o off the hole month my cholic went on leave so didnt rest not ones tnx next weekend im going home 2016/08/28, 4:58:24 PM: Participant B: Cul on a blessed Sunday 2016/08/28, 5:00:00 PM: Participant B: Askies at [Participant A] it's part of job 2016/08/28, 5:01:21 PM: Participant C: Amen amen. 2016/08/28, 5:06:49 PM: Participant A: True sure ladies hv all blessed one ❤ 2016/08/30, 10:10:56 AM: Participant D: Sorry [Participant A] about job you don't have a choice is just to hold on,God will answer our prayers one day then we will be happy after all. 2016/08/30, 10:18:54 AM: Participant D: Hi ladies we have to arrange time and place to talk through things that can make our lives easier
Transport	The participants rely on public transport and write about their struggles with using public transport. *"I went to the depot to buy my ticket and I found the offices closed not operating on that day and they say they are going to open on Friday (01/07/2016) because of the systems."* – Participant A *"I need to know that when there is a delay about trains they should let us know in time."* – Participant D *"It's seven o'clock in the morning, I am at the bus stop and the bus takes a long time to come."* – Participant P *"How to get to work, there was a taxi strike."* – Participant W WhatsApp chat extract: 2016/07/19, 7:28:49 AM: Researcher: The information that I need this morning is what time the Gautrain arrives in Rosebank leaving Pretoria around 9am. 2016/07/19, 7:29:43 AM: Participant A: Morning,please google on yo phone 2016/07/19, 8:01:36 AM: Participant B: Whay i knos is 30 to 35mnts 2016/07/19, 8:38:09 AM: Participant C: Sorry to ask this again, say you don't have a smart phone to google the information and you have no idea where to start, eg like what [Researcher] has just asked 2016/07/19, 8:47:13 AM: Participant B: U will sms some1 to help u as easy as that 2016/07/19, 8:49:15 AM: Participant D: May you please use a call to this numbers its a

costomer center no 080042887246 I hope they will give you the info

2016/07/19, 8:50:02 AM: Researcher: Thanks [Participant D]!

2016/07/19, 8:52:10 AM: Participant B: Yes i do got lots off ppl that i know doing tours

2016/07/19, 8:54:41 AM: Participant C: Thank you so much [Participant D] for this information I think it's also wise to get telephone directory if no smart phone or less data

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In addition to the categories of information that the women find meaningful, data-driven content analysis on the "how" responses in the journals revealed how the women currently solve their information needs. The analysis of the responses is shown in Figure 4.9. Nine categories are identified from the data where "none" indicates unresolved needs, "self" indicates needs met through past experience or guessing, "service provider" indicates external service providers such as doctors, nurses, pastors or other staff (banks, retailers, transport), "friend", "family", "employer" and "colleague" indicate the relationship to the person who supplied the information requested, "media" indicates radio, television and newspapers and "Internet" indicates using mobile Internet search to find the information.

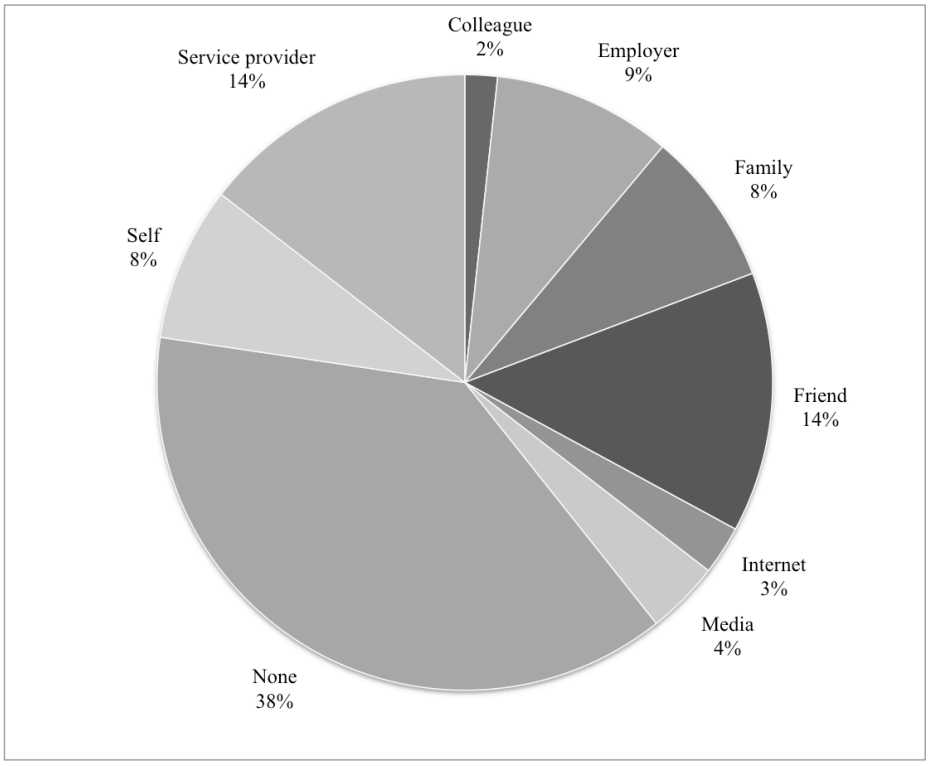


Figure 4.9. Data-driven content analysis of the "how" responses in the journals (n=234)

The insight from the analysis is that the women rely mostly on asking for information from service providers, friends, family, employers and colleagues. The dependency on people as the primary information source is a limitation factor when looking at the quality of responses and the cost in time and transport, for example traveling to the bus depot to ask for information about the changed

schedule only to find that the relevant employees are not available or going several times to the letting office to try and resolve a query.

Journal extract:

"*I have been to the letting office several times.*" – Participant F

"*I went to the bank to apply for a loan but the bank could not give me the loan because I am a foreigner. I was confused because I have a work permit and I have been banking with this bank for more than 5 years now but how come they can't help me. Still confused about this.*" – Participant G

"*I spoke to one of the people who are working there, but I'm not sure about the information they gave to me.*" – Participant A

The use of media and the Internet are low with the Internet as a source for information only mentioned six times in the 234 journal entries. The main reason for the underutilisation of the Internet as a source for information is the cost of data. The unresolved and self-resolved categories also speak to the limitation of finding information with 38 per cent of information requests unresolved and eight per cent addressed through guessing or drawing on past experience.

At the beginning of the project during the initial interview, the researcher observed that the women expressed the challenges that they experience in their own lives. These challenges include low income, anxiety about job security, lack of support, time restrictions due to work hours and public transport, feelings of isolation and frustration, and concern for their children. They express little hope for changing their circumstances. Having an inward focus mostly on their survival is related to Sen's standard of living agency type (Sen, 1999). In the journals, some of the women express desires to help others showing a transition to well-being (having the choice to help someone) and agency (having the freedom to bring about change). The journals facilitate reflection that enables the women to see beyond their everyday challenges and foster hope for a better life. This observation about the emergence of hope through the journals concurs with Heeks and Krishna's (2016) discussion on hope leading to agency and hope as an outcome of behaviour and developmental activities.

Examples of journal entries expressing the desire to help others:

"I'm so troubled what can be done to the street kids which are wondering about in the streets of Melville." – Participant R

"How can I help ladies in rural areas?" – Participant I

"How people life for survival out there. Women play cards to earn living to put food on the table." – Participant I

Some of the participants shared personal details in the journals giving the researcher insights into their lives. It contributes to the richness of the journal content and empathy with the participants. The picture painted through the journals is one of vulnerability, personal hardship and deep longing for a better life. The researcher reflected about the thin line between researcher and rescuer and is touched deeply by the stories shared in the journals. She experienced the subjectivity of the qualitative researcher.

4.4.1.5 Impact of the journals on the design of the framework

A conceptual framework design was the starting point of the research design and considered as input to the relevance cycle. During the data analysis phase of the journal data and WhatsApp data, the conceptual framework was revised as illustrated in Figure 4.10, Figure 4.10a and Figure 4.10b.

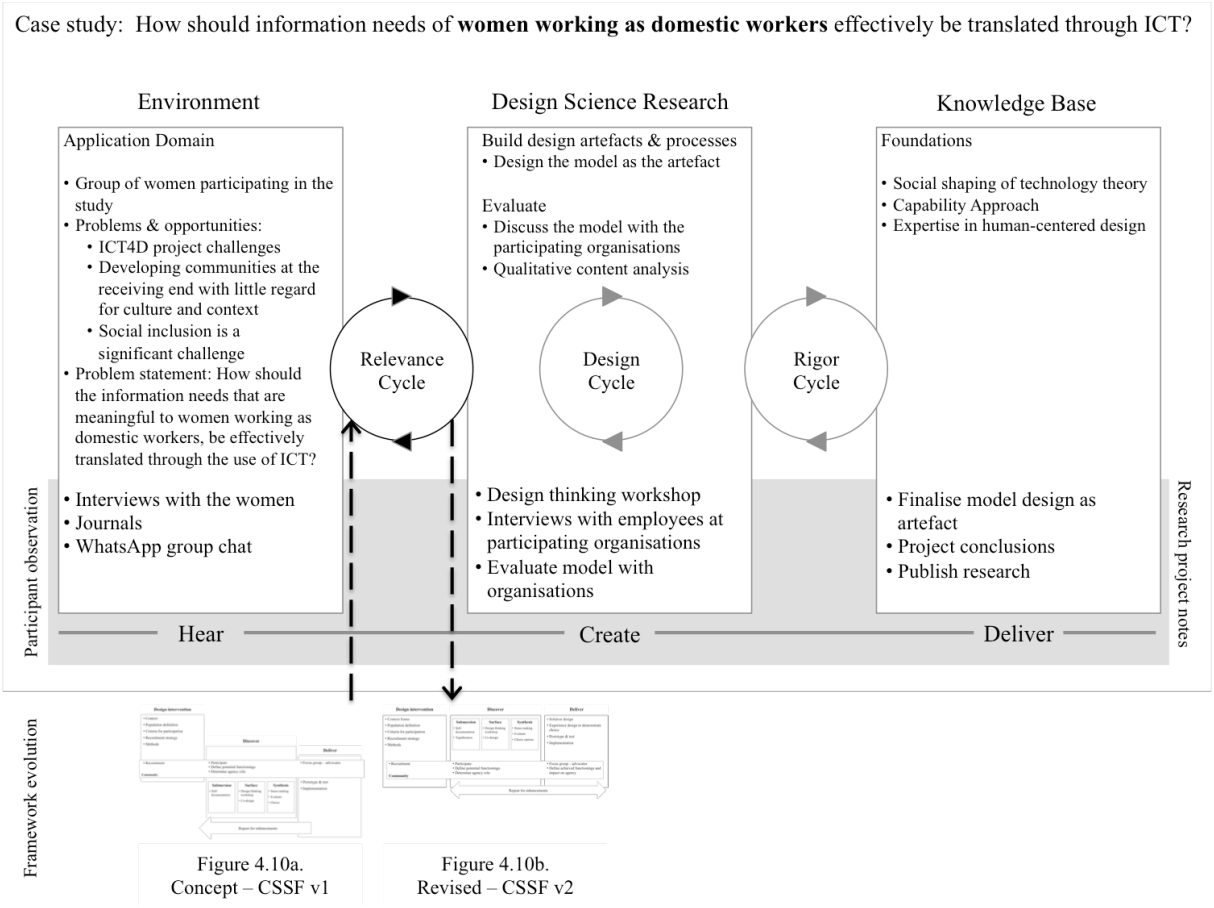


Figure 4.10. First design iteration to refine the framework

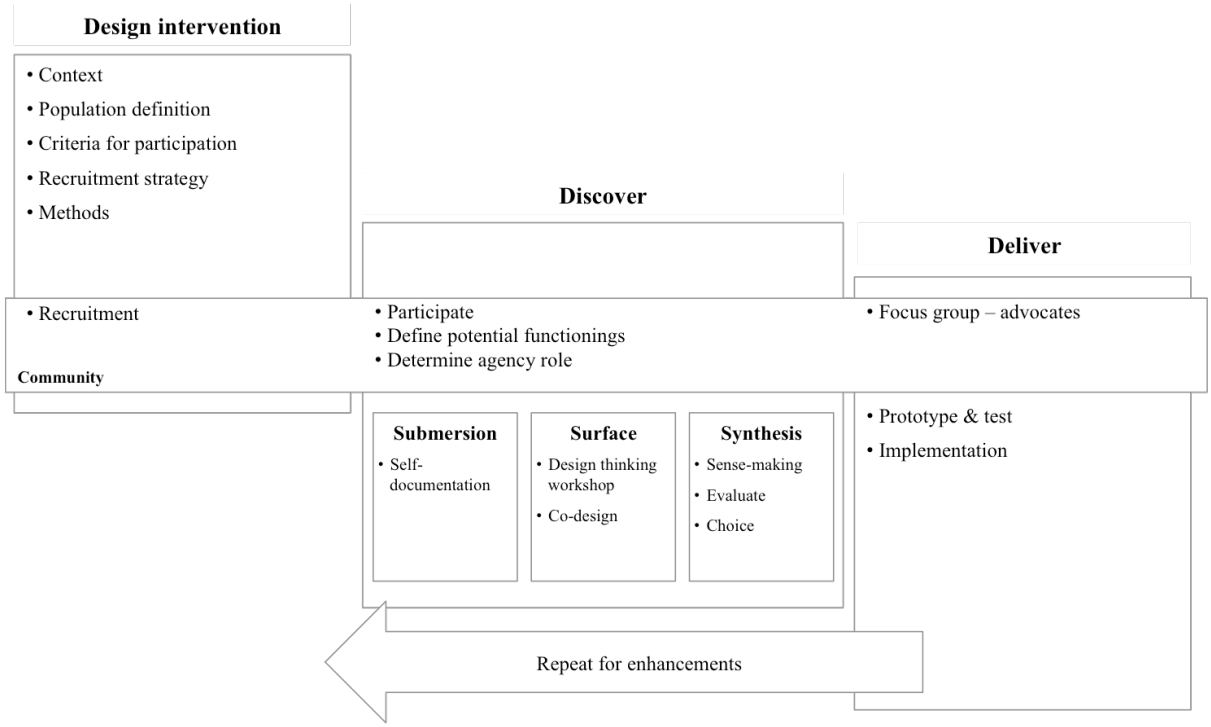


Figure 4.10a. Concept – CSSF v1

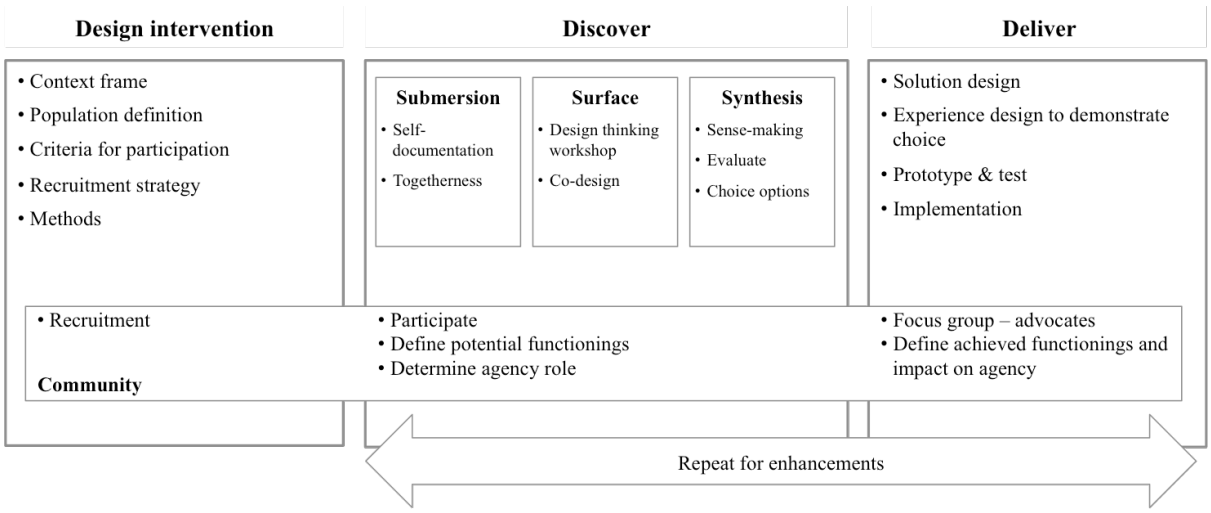


Figure 4.10b. Revised – CSSF v2

The concept of "Togetherness" was identified as an important element of the framework and included in the revised version based on the WhatsApp data that demonstrated the emergence of a community rallying around a shared cause as evident from the examples shared in Table 4.2. The data from the journals emphasise the need for choice with 47 per cent of the information requests dependent on other people and 38 per cent of the information requests unresolved. This leads to enhancements in the discovery and delivery phases to emphasise the importance of choice as an indicator of development. Lastly, the presentation elements of the framework were redesigned.

4.4.2 Design thinking workshop

The design thinking workshop transitions the project from the relevance cycle of the design science research cycles and the hear phase of the Human-Centered Design toolkit to the design cycle and the create phase. In the design cycle, activities focus on creating and evaluating the artefact. A design thinking workshop is selected as the container for these activities with the group of women that corresponds to the activities in the create phase.

4.4.2.1 The reason for using a design thinking workshop

In the create phase, a workshop format brings together the women participating in the project and the researcher to translate the observations, reflections and ideas into frameworks, opportunities, solutions, and prototypes (IDEO, 2012). By definition, design thinking is a human-centered iterative process exploring ways to improve things, processes and experiences through empathy with the designee community (Beacham & Shambaugh, 2010; Brown & Wyatt, 2010; Dolak et al., 2013). In a workshop scenario, logical and creative activities are used to find whole-brain solutions to complex problems using techniques to allow all the workshop attendees to participate (Brown, 2009; Brown & Wyatt, 2010; IDEO, 2012).

The purpose of the design thinking workshop is to test the methodology as a feasible contribution to determining the group's unarticulated needs for information. The secondary purpose was to strengthen the growing sense of community emerging from the WhatsApp group.

4.4.2.2 Design thinking workshop design

IDEO recommends two approaches in the workshop namely a participatory approach and an empathic approach (IDEO, 2012). The participatory approach is to co-create solutions with members from the recipient community, while the empathic approach is to design solutions from a standpoint of empathy achieved through observation without participation from the recipient community. A combination is used in the workshop where the researcher uses the empathic approached gained through the interviews, interactions and the WhatsApp group and the members of the research project are active participants in the workshop.

Finding a time for the workshop is a challenge due to the work schedules of the women and commitments to their employers. The women express their vulnerability and insecurities regarding employment and will not consider actions such as asking for time during work hours to attend the workshop that they perceive may jeopardise their employment. The group are a combination of women who stay on their employers' premises and others who stay at their own homes and use public transport to commute to work. Both present challenges to run a workshop after work hours as the group that stay in have duties such as helping with the employers' children, cooking and cleaning after the evening meal, and the commuting group are depended on public transport schedules, travel

one to two hours and have their own household duties waiting from them at home. The women have typical long days, with the women who commute rising between 3am and 4am to return home after 6pm. The researcher found a compromise in the form of a public holiday with the approval of the women.

The workshop took place in a community hall in the area where most of the women work and continued for three hours. The researcher assisted the women unfamiliar with the area and those who commute with public transport arrangements given that it is a public holiday.

1. Welcome and introductions
2. Sharing stories from the journals
3. Creating someone who can represent the group (Persona)
4. A day in her life (jobs to be done) linked to information needs
5. Reflecting on how things might be (How might I)
6. Discovering how things are currently done, what are the challenges and how might it be done in future (Ideation using Current/Barriers/Future)
7. Lunch

Figure 4.11. Design thinking workshop agenda

The planning for the workshop activities included storytelling to allow the participants to share their experiences with the journals to allow for deeper introductions and confidence seeing that it is the first time many of the women meet face to face and none of the women have previously participated in formal workshops. The design thinking tools selected for the workshop are persona, jobs to be done, how might I, and current/barriers/future building on templates described by IDEO (2012) and Liedtka, Ogilvie and Brozenske (2014). The agenda items of the workshop are listed in Figure 4.11 and the templates are shown in Figure 4.12.

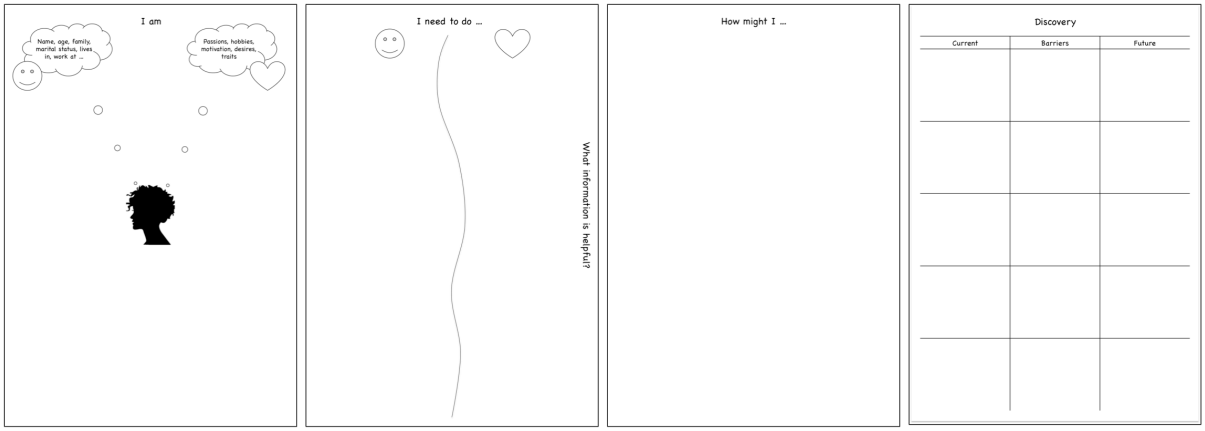


Figure 4.12. The four templates used in the design thinking workshop: persona, jobs to be done, how might I, and current, barriers, future

The templates steer the conversation and discovery from creating a character using the persona, to deepening the understanding in the life of the character. The reasons for selection these templates are:

- **Persona**: The persona tool guides the participants to create a fictional character as a representative or archetype for the group using a synthesis of characteristics of the women in the group. It helps the women to experience empathy for someone else, allows for abstraction of the experiences and brings a level of anonymity. The persona becomes a real person with a name, challenges, hopes and dreams (Liedtka et al., 2014).
- **Jobs to be done**: Keeping the persona in mind, identify what are the jobs she seeks to accomplish in a given circumstance. The participants think about the experiences she is trying to create and not the tasks. Jobs should be both physical and emotional jobs. Once the jobs are defined, identify information that could be helpful in getting the job done. This tool provides a way to reframe the experiences the women want (Liedtka et al., 2014).
- **How might I**: This tool is selected to introduce the participants to ideation and create future statements. The "how might I …" statements will build on the jobs to be done and help to create opportunity areas moving from the current state to envisioning future possibilities. Opportunities are the starting point for ideas and solutions (IDEO, 2012).
- **Current, barriers, future**: The current, barriers, future tool is a brainstorming tool and useful to discover how jobs are currently done, the barriers to getting the job done and how it may be done in future. It uses the "how might I" statements created in the previous tool and enables further ideation (IDEO, 2012).

The interactive nature of the design thinking workshop is a key characteristic of the workshop and all the attendees are encouraged to participate. One of the ways to achieve participation is through using post-it notes, big posters and coloured pens with a combination of silent brainstorming and sharing. The stationery used in the workshop is listed Figure 4.13.

Stationery list:

- Different coloured pens, more than attendees
- Different coloured post-it notes
- Index cards
- Board cards
- Coloured sticky dots
- Templates printed on A1 size paper
- Flip chart and paper
- Temporary adhesive products for example prestik or blu tack and masking tape

Figure 4.13. List of stationery items for the workshop

The project participants are invited to the workshop through a message on WhatsApp to their individual accounts and SMS with follow up communication on the WhatsApp group and phone calls to confirm attendance. The women's reactions are enthusiastic to attend the workshop on the public holiday with 20 confirming attendance from the group of 26. The reasons why the six women declined attendance are three women have long distance travelling arrangements, one woman is close to giving birth, and two prefer not to attend. On the day of the workshop, two women cancelled attendance; one due to a sick child and one fell ill. Eighteen women attended the workshop and worked on the templates in two groups of nine members. The researcher's study leader from the University of Pretoria, Professor Carina de Villiers, attended the workshop and facilitated one of the small groups.

WhatsApp chat extract:

2016/07/27, 11:36:44 AM: Researcher: I've send invitations to the workshop to everyone. Thank you to [Participant A], [Participant B], [Participant C], [Participant D] and [Participant E] for your quick responses. [Participant F] & [Participant G] are traveling and won't be able to join us on the 9th. I hope to hear from everyone soon.

I look forward to our own meeting on Women's Day.

2016/07/27, 12:05:11 PM: Participant H: [Researcher] I will let u know next wk if am available

2016/07/27, 1:10:49 PM: Participant I: C u soon ladies on womans day

2016/07/27, 1:15:20 PM: Participant I: nice what fun we will hv n get to know each other n learn more

2016/07/27, 1:19:23 PM: Participant J: I cant wait for the day see you soon ladies

The researcher introduced each template and explains the purpose of the exercise. The two groups work separately facilitated either by the researcher or the researcher's study leader. The researcher monitors the time spent on each exercise. After the small group work on the templates, a member from the small group provides feedback to the group.

4.4.2.3 Meet Abigail and Michelle

The workshop's atmosphere was that of a reunion with the women meeting in person following the weeks of WhatsApp group communication. The women who were most active on the WhatsApp group leading to the workshop were greeted enthusiastically and thanked for the encouragement they provided. The warm and friendly atmosphere contributed to the participation and success of the workshop.

The introductions followed the welcome, a spontaneous opening song and a moment for individual prayer and reflection. Some of the women elaborated on their backgrounds and their current situations showing that they felt it was a safe environment to share. The introductions flowed into a

discussion about their experience with using the journals where the consensus was that the phrase "support group" best describe the experience.

The first small group exercise was to create the persona. The group working with the researcher created Abigail and the group working with the study leader created Michelle. The rest of the exercises built on the experiences of Abigail and Michelle. The completed persona templates are shown in Figure 4.14.

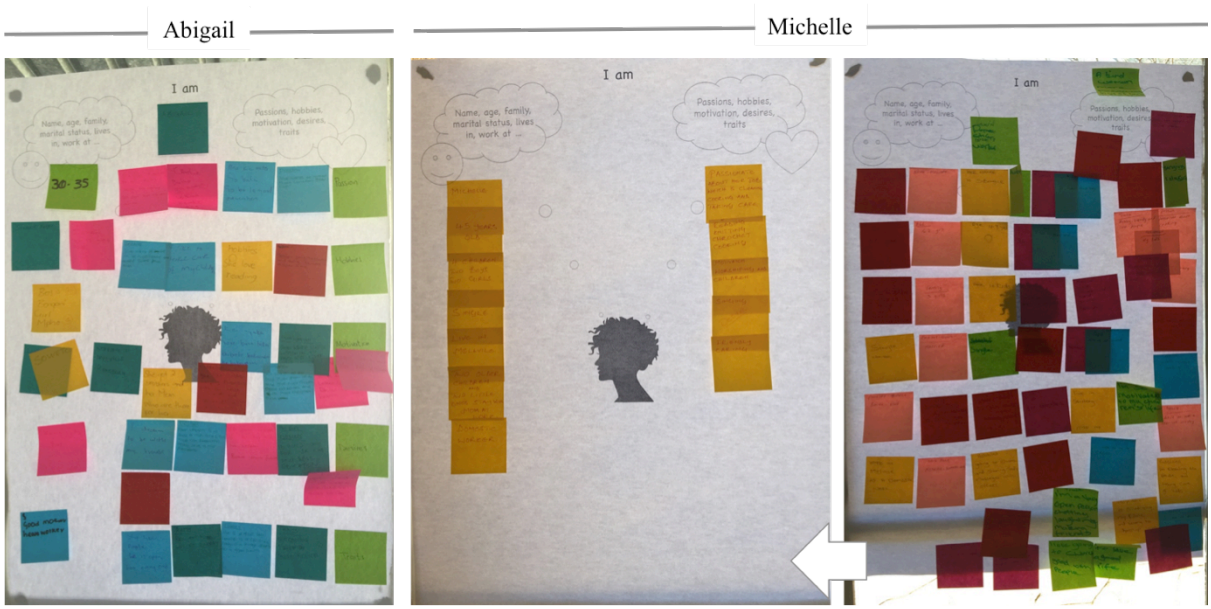


Figure 4.14. The completed persona templates

A profile of Abigail

Figure 4.15. I am Abigail transcribed

I am Abigail

I am in my early thirties and mother to Bongani who is 12 years old and Mpho, my baby girl, she's now four. We live in Soweto with my mother. Every morning I take the bus at 6am to Randburg where I work as a domestic worker with a family for the past three years.

You may wonder why I stay so far from work. It's not easy, but I need the support of my mother and my two brothers. I count on them since Mpho's father left us. I know my family are there for us, like the time Mpho fell ill at nursery school and my mother could take her to the clinic or the way that my brothers support Bongani's football team. They are his biggest fans.

I want my children to have a better life. To have choices that I didn't have. I want to build a house for us, have nice things and make sure my children get a good education. This is what drives me to get up at 5am and take that bus to work, come rain or shine.

I really believe education is the way. I used to switch the TV on when I got home, but now I make time to read, or ask Bongani to read for us while I'm cooking supper. I love reading and it fills a gap for me, like I'm trying to improve my own life. I'm worried about the poverty in our country and that it is hard to find work. I don't want Bongani to have the wrong friends and get into trouble. And for Mpho, I want her to have more choices than what I had.

Church is important to me. It makes me feel part of my community and I love cooking at the events with the other ladies. Sometime we get lessons in crafts on a Saturday and I enjoy sewing and hope to get very good at it. My faith is important for me. It keeps me going and I want my children to have Christian values.

People often ask my advice. I think it is because I'm an open person and like people. I feel blessed that I have a good employer who thinks I'm smart and can be trusted with their home and children. Even when things are not easy for me, I try to be a good mother and show my children that through hard work we can have a better life.

A profile of Michelle

Figure 4.16. I am Michelle transcribed

I am Michelle

Where do I start telling you about myself? I always feel just to say I am a domestic is so limiting. Even though that is how I feel some days behind these walls. But then, when I walk to fetch my kids from school, I am grateful that they can have better opportunities that what I've had. So let me start with myself.

I am 49 years old. I am a woman, single mother, daughter, cook, carer, cleaner and singer. My family describe me as caring and friendly.

I have two boys and two girls. My sons stay with my mother in Madibeng. It is better for them not to be in the city. My young girls stay with me. I've lost my husband four years ago.

I am what you call a stay-in domestic worker. I live on my employer's property in Melville. I am grateful that my daughters can stay with me and that my employer helped me to enrol my daughters into the primary school close to the house. I want them to have a better life. My children's future motivates me to keep on going. That and my faith.

Believe me, I am passionate about my job and want to be the best at it. I love cooking and you will hear me singing when I'm alone in the house. I wish I had the chance to sing professionally. On Sundays I lead the worship at church and it is such a blessing. I love going to church and help with the Sunday school for the children. It is important for the children to learn early about God.

One of the nice things of being a stay-in is that I don't have to spend all my free time struggling with taxis. I enjoy reading, knitting and crocheting. My girls always have something nice to put in their hair. Sometimes I crochet square-blankets that people order. It is nice to get some extra money. I guess I'm still a dreamer.

4.4.2.4 Synthesis

Similarly to the journals, the data created in the design thinking workshop is analysed using data-driven qualitative content analysis where the categories are derived inductively from the data (Schreier, 2012). Figure 4.17 describes the process of analysing the design thinking workshop data with the categories emerging from the data.

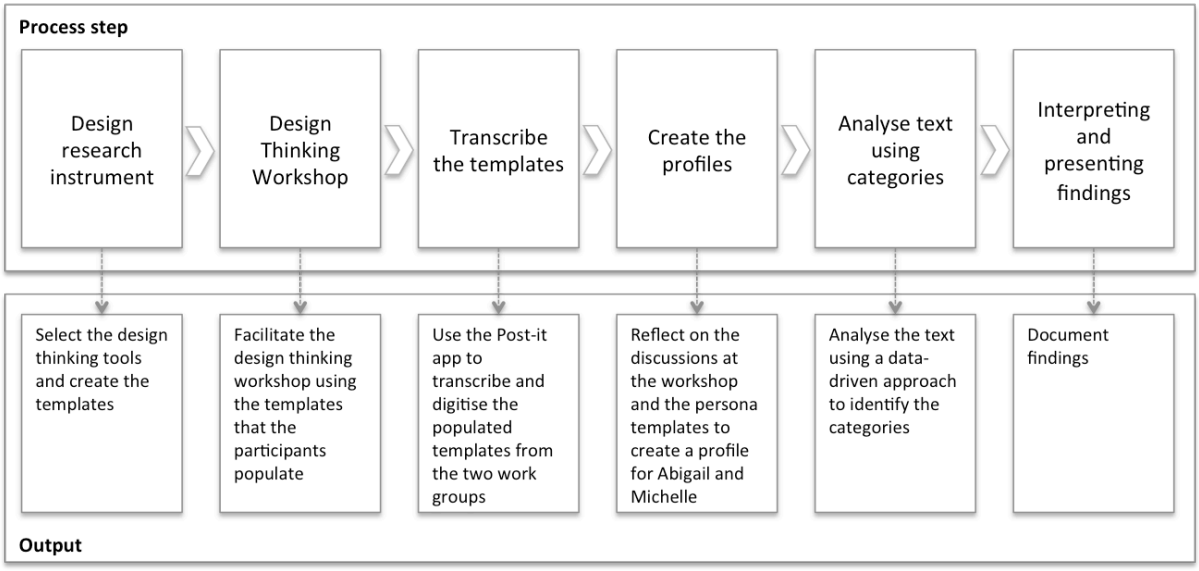


Figure 4.17. Data analysis process for the design thinking workshop with reference to Qualitative Content Analysis steps (Schreier, 2012)

The workshop participants worked through the four templates writing their ideas on post-it notes in their language of choice. Most of the participants used English with a few notes in Sesotho that were translated by the research assistant. The WhatsApp group also participates in verifying some of the notes during the transcribing process as the researcher orientates her to the phonetic spelling of English words.

4.4.2.4.1 Jobs to be done

The jobs to be done exercise built on to the persona created for Abigail (Figure 4.18) and Michelle (Figure 4.19). The two groups are asked to stand in their shoes and describe the things (or jobs) they are trying to accomplish during the day. The jobs should be both the physical things that they do as well as the emotional experience they want to achieve. A good example of a job listed for Abigail is that she helps her children to go to school so that they can have a better life.

Most of the jobs listed for Abigail and Michelle are tasks in their typical day working as domestic workers with Abigail using public transport and Michelle staying on her employers' property.

Figure 4.18. Abigail's jobs to be done

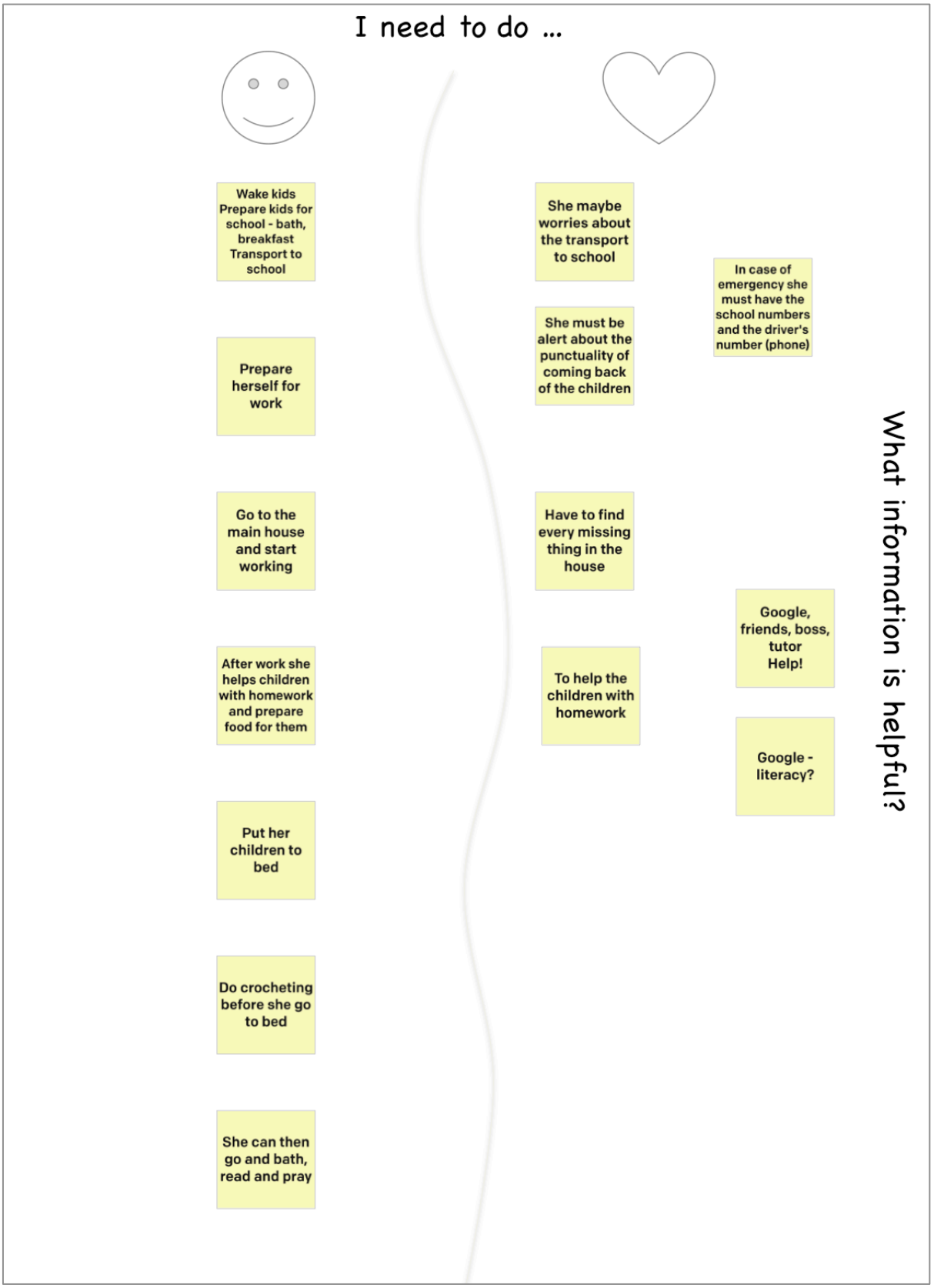


Figure 4.19. Michelle's jobs to be done

The categories that emerge from the jobs to be done tool are children, transport, work, better life and friends.

- **Children**: Abigail and Michelle focus on their children from helping them to get ready for school, worrying about them when they are at school, struggling to help them with homework, making sure there is food at home to getting them ready for bed at night. They feel frustrated about their inability to help the children with their school homework. The main job can be described as helping the children to go to school so that they can have a better life.
- **Transport**: Abigail and Michelle use public transport. They are concerned about the reliability of public transport. Abigail uses buses or taxis to get to work. Michelle's primary concern is for her children's transport to school.
- **Work**: The language used to describe work shows dedication ("*She focuses on her work", "she loves work so much"*) and frustration *"have to find every missing thing in the house"*. The women's work does not end at the place of employment, but continues at home with helping the children with homework, cooking and preparing the children for bed.
- **Better life**: Abigail expresses her motivation as helping her children to get a better life, her wish to have a support group of women where she can share her ideas and receive support. Michelle finds time for her hobby and crochets before she goes to bed. They begin and end their day with prayer.
- **Friends**: Abigail wants to help her friend to find work. She describes her friend as a "good lady" and considers different options from agencies to referrals to her employer's friends. Sen (1999) describes the willingness to help another as the well-being agency type. Michelle relies on her friends to help her with the children's school homework.

4.4.2.4.2 How might I

Reflecting on the jobs listed in the previous exercise, the teams are asked to create "how might Abigail or Michelle …" statements to identify opportunity areas for change. Although the idea with this exercise is to avoid specific solutions, the participants listed solutions as well. These solutions are useful as insights to form better opportunity questions, for example, a solution "*buy an Afrikaans dictionary*" can be changed to "How might Michelle help her children with Afrikaans homework when she doesn't understand Afrikaans?". The transcribed template for Abigail is shown in Figure 4.20 and the transcribed template for Michelle in Figure 4.21.

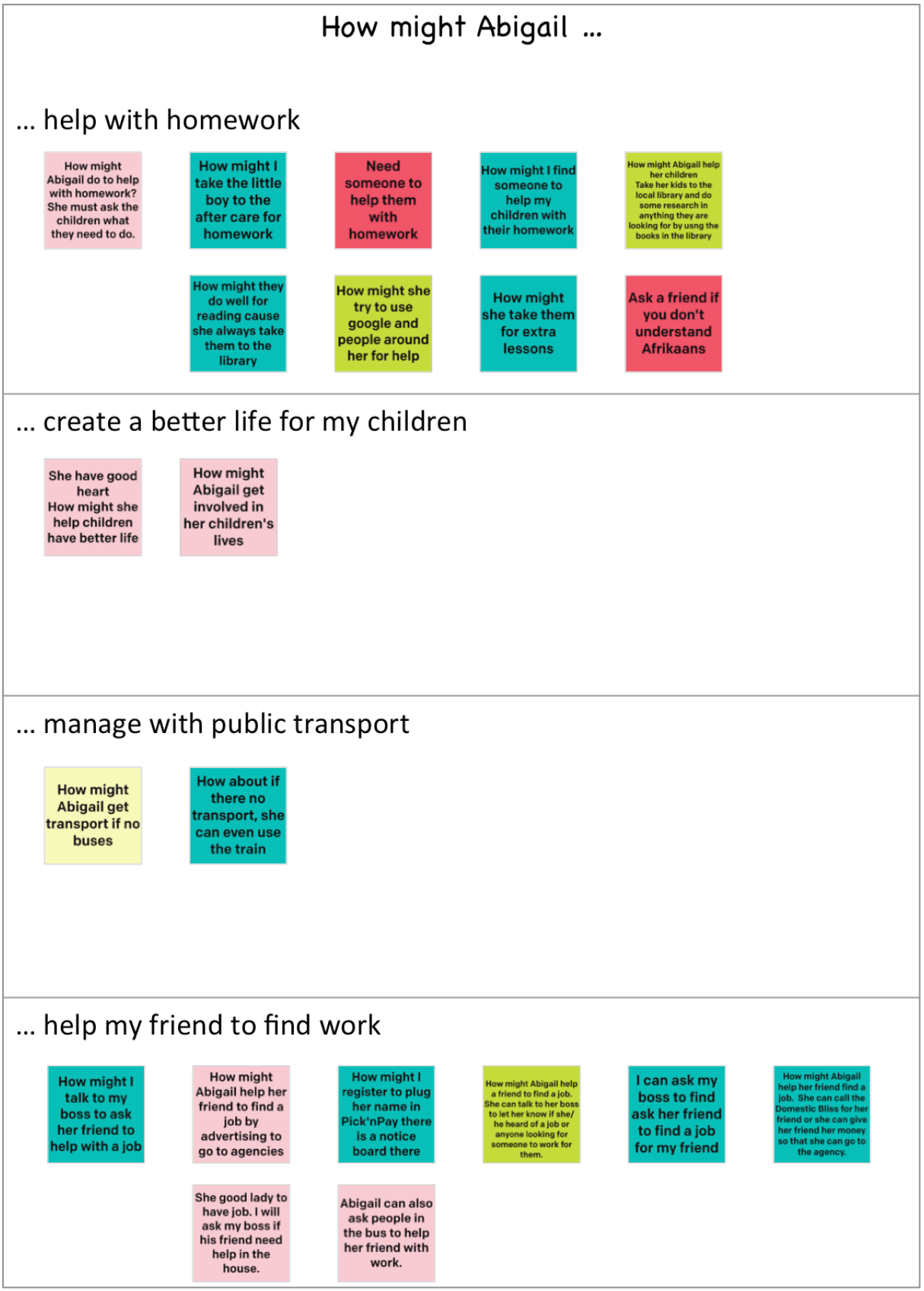


Figure 4.20. How might I results for Abigail

Figure 4.21. How might I results for Michelle

The main opportunity areas listed are:

- How might I help my children with homework?
- How might I create a better life for my children?
- How might I manage with public transport?
- How might I find transport for my children to school?
- How might I find missing items at work?
- How might I help my friend to find work?

4.4.2.4.3 Current, Barriers, Future

The last exercise is a discovery exercise to reflect on the opportunity areas from the previous exercise and describe how it is currently done, the existing barriers and how it might be done in future. The purpose of the exercise is to gain deeper insights in the challenges and lead the participants further into ideations for future solutions. The transcribed results are shown in Figure 4.22 for Abigail and in Figure 4.23 for Michelle.

The teams are asked to select three "how might I" statements from the previous exercise for the discovery. Team Abigail selected "How might I help my children with their homework", "How might I help my friend to find work" and "How might I improve my life". The team didn't complete the third item. Team Michelle selected "How might I help my children with homework", "How might I find transport for my children for school", and "How might I find missing items". The selection indicates the priorities of these opportunity areas in their lives.

- **How might I help my children with their homework**: The current way consists of asking for help from friends and teachers, trying to use the Internet, using the library and dictionaries. The barriers are the cost of data, fees for tutors, and the lack of their own knowledge and time. The future solutions rely on more affordable access to the Internet, free Internet at libraries, access to volunteers and study groups, and digital solutions for example a school curriculum app, teacher-parent WhatsApp group, and social media. The challenges with helping children with homework are also in the journal entries, for example: "*My daughter brings home an Afrikaans homework and I know nothing about the language.*" and "*I have been to school and I have got matric. The syllabus they doing now is much different to what I have done before. It is very difficult for me to help my kids with their work.*"

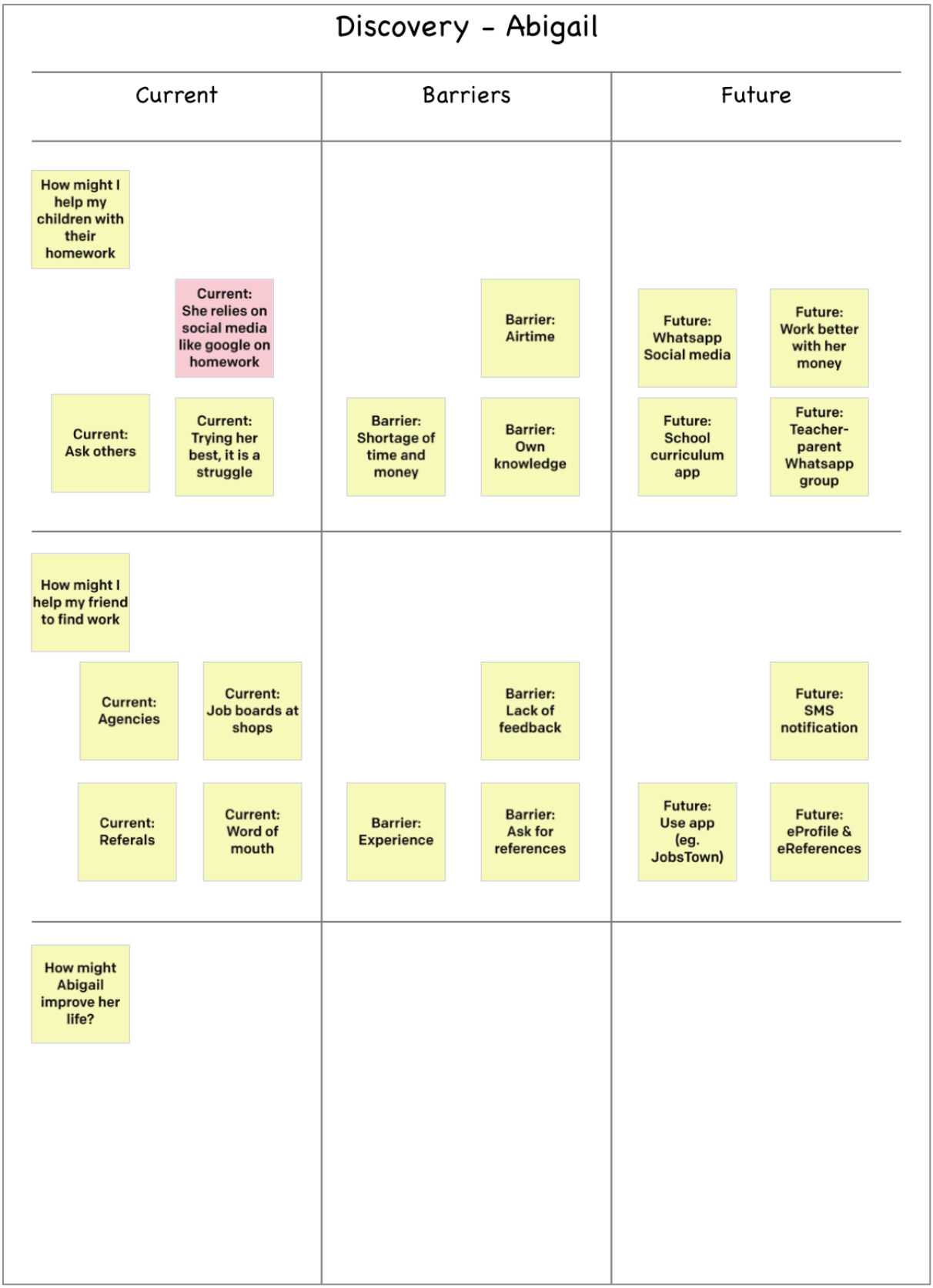


Figure 4.22. Expanding on the "how might I" statements with current, barriers, future discovery for Abigail

Figure 4.23. Expanding on the "how might I" statements with current, barriers, future discovery for Michelle

- **How might I help my friend to find work**: To find work today, the women use agencies, job boards at shops, referrals and word of mouth. The challenges are a lack of feedback, experience required and written references. For the future the women described the benefits of an online capability like Facebook where they can create a profile and collect references and referrals given that data should be more affordable. Other future solutions are SMS notification from agencies on their applications and using an app for job applications. The women mentioned an existing app, but that the cost of data is a prohibiting factor to adopt a digital solution. Finding work and looking for ways to improve their economic situations are written about in the journals, for example: " *How to find another days of work*" and "*I need to learn and try to make my life easy. I will learn to use machine for jerseys, blankets and etc. and sell them because my wages is not enough.*"
- **How might I find transport for my children for school**: To find school transport today, the women have to know about a driver that they can call directly, or find the information about drivers from the school or friends. The challenges are that the existing transport is unreliable and insufficient causing the vehicles to be overloaded. To overcome these barriers, the women suggested that the schools should have official transport or there should be school transport similar to Uber. The women wrote about their own frustrations with public transport in the journals, for example: "*I need to know that when there is a delay about trains they should let us know in time.*" and "*It's seven o'clock in the morning, I am at the bus stop and the bus takes a long time to come.*"
- **How might I find missing items**: Finding missing items are a frustration for some of the women. Currently they try to pack their employer's things neatly to make it easier to find items. The challenge is that the employers travel often and they are not sure where the items are located. As a future solution the women suggest taking a photo with their phones of the items packed for travelling for record keeping. This frustration is also noted in the journals: "*When we were looking of hair brushes which were in the cupboard but can't find it.*" and "*How to keep my boss happy*".

4.4.2.5 Workshop conclusion

The combination of the journals and the design thinking workshop is effective. It creates empathy for the women that means creating a deep understanding of the problems and realities of the women and will lead to a better solution design (Beacham & Shambaugh, 2010; IDEO, 2012). The effectiveness is further highlighted given that it was the first time for the women to attend a workshop and using journals. The women wrote on the WhatsApp chat about the positive impact of the experience.

WhatsApp chat extract:

2016/08/09, 3:42:34 PM: Participant A: Thanks [Researcher] we really appreciate you as weman, God bless you

2016/08/09, 3:43:34 PM: Participant A: Thank you ladies we had fun love you all.

2016/08/09, 3:46:57 PM: Participant B: Thanks [Researcher] you r God send im truely happy meeting all ladies wa thinta bafazi wa thinta imbogoto [*women are brave and they are overcomers*] all the best all

2016/08/09, 4:20:37 PM: Participant B: For me its an eye opening for me cs i can c how women got so much on their shoulders n help me so much to put togerther what i hv to do when i wright my book cs every women got a story to tell

2016/08/09, 4:30:02 PM: Participant C: Ahh [Researcher] thank you so much may God increase wisdom in you.coz yes as woman we are the pillars of our families and we need one another to share ideas of moving foward all the time.

2016/08/09, 4:40:12 PM: Participant D: Thank very much [Researcher] god will be with you all the way may you see many more years to come I really enjoyed every time we had today thank u Lady's to u all

2016/08/09, 4:41:05 PM: Participant E: Thank u so much ladies that was a day well spent

2016/08/09, 4:44:30 PM: Participant F: Thank you so much [Researcher] for the work you have done,that was a great thing to put woman together to share about things we are going through I think with all the ideas and the views of other woman someone can have a brake through in life that was wonderful

2016/08/11, 10:27:29 AM: Participant G: This meeting helped a lot [Researcher] coz it awakened a lot of Abigails & Michelle in us. The food was very tasty too. Thanks to everyone who attended.

4.4.2.6 Impact of the design thinking workshop on the design of the framework

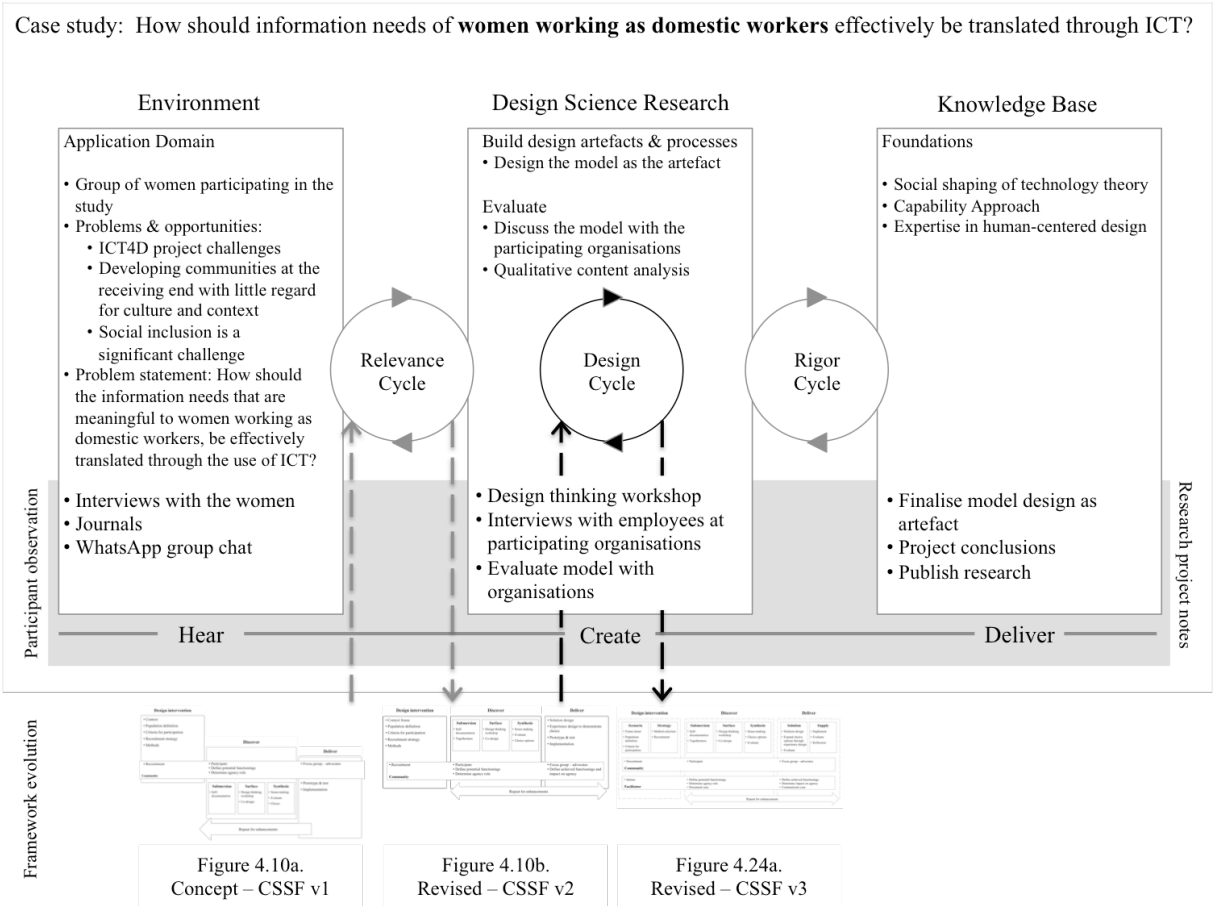


Figure 4.24. Second design iteration to refine the framework

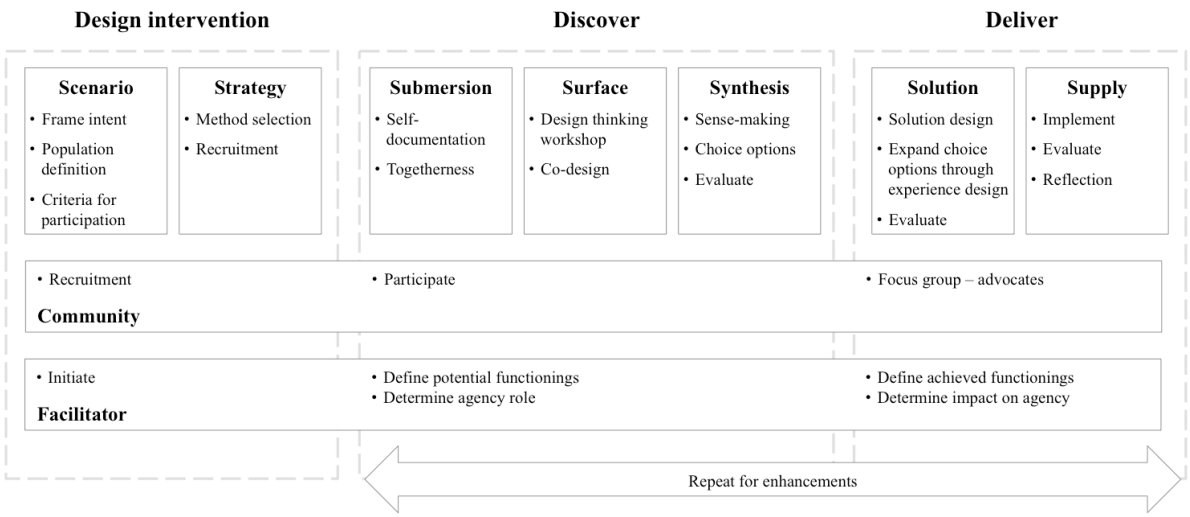


Figure 4.24a. Revised – CSSF v3

The revised framework design as illustrated in Figure 4.10b was the input to the design cycle. During the data analysis phase of the design thinking workshop, the revised framework was further revised as illustrated in Figure 4.24 and Figure 4.24a. The design thinking workshop and the analysis of the data created in the workshop demonstrated the role of the facilitator as catalyst for the community to co-create solutions to their identified needs. The facilitator stream was therefor added to the framework. The design intervention and deliver phases were divided into sub-phases to create focus areas of activities with milestones for example in the delivery phase the solution is designed and evaluated before the solution is supplied.

4.4.3 Interviews

The interviews address the evaluate step in the design cycle and the gather feedback step in the create phase. During the interview, the research progress and the framework are shared followed by discussion to evaluate the relevance and feasibility of the framework and using the interview questions, gathering information regarding the organisations' approach to information inclusivity, social innovation and vision for interaction with their customers. The organisations are identified using pseudonyms as listed in Table 4.3.

Table 4.3. Organisation identification legend

Sector	Pseudonym
Public sector	PS01
Public sector	PS02
Financial services	FS01
Financial services	FS02
Financial services	FS03
Telecommunication	TC01

4.4.3.1 The reason for using semi-structured interviews

The idea to include the organisations in the project is to evaluate the framework and to include another perspective to the study on information inclusivity, social innovation and future interactions with groups as represented by the women working as domestic workers participating in the study. The employees of the selected organisations who participated in the study have senior positions with limited time available for external engagements such as participating in a doctoral research project. Reflecting on her experience working with corporate organisations, the researcher knows that in-person interviews are more effective than relying on questionnaires that disappear in email inboxes. In addition to the effectiveness of an in-person interaction, the researcher wants to make the best use of the available time to evaluate the framework and gather the information as well as learn about the relevant projects of the organisations. The doctoral project offers a rare chance to interact with these role players.

4.4.3.2 Concept-driven qualitative content analysis

Given the fact that this study uses open-ended questions in conducting the interviews, the directed or concept-driven approach to the qualitative content analysis is used where the codes are defined before and during data analysis based on the interview questions (Hsieh & Shannon, 2005; Schreier, 2012). Schreier (2012) describes the directed approach as following a concept-driven strategy. Figure 4.25 describes the process followed in analysing the data, with the research question, sub-questions and interview questions already defined.

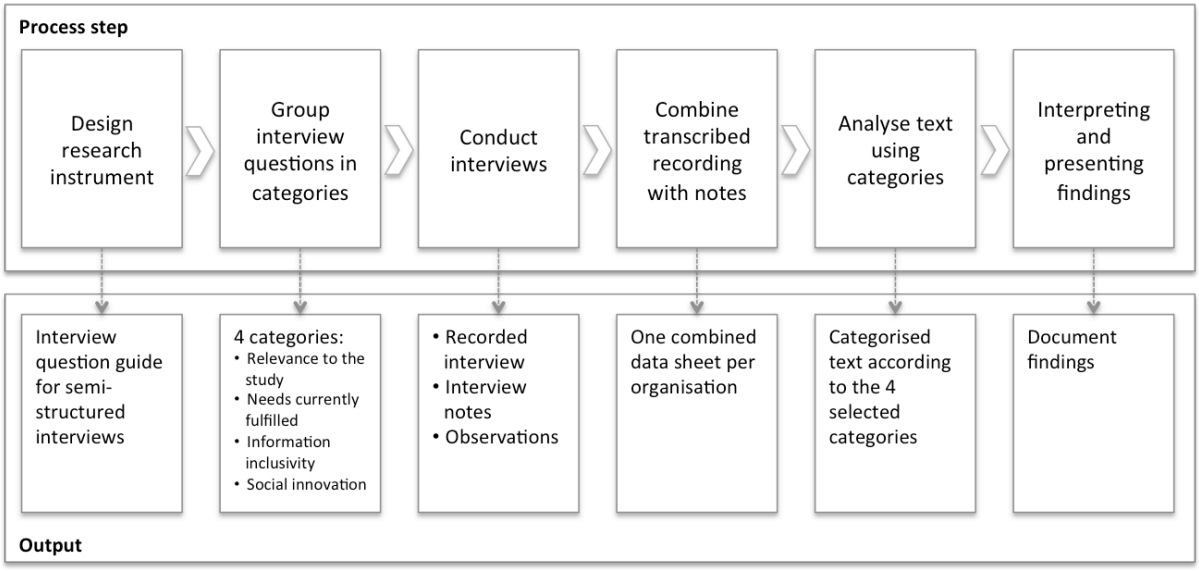


Figure 4.25. Data analysis process for the interviews with reference to Qualitative Content Analysis steps (Schreier, 2012)

Four categories are identified to group the data for analysis using the concept-driven approach. The four categories are relevance to the study, needs currently fulfilled, information inclusivity, and social innovation. The Protection of Personal Information Act is used in the discussion with the

organisations as a way to demonstrate the right of people to access information in a context that the interviewees can understand. It relates to the ability of customers to access any kind of information and gages the mindset of the organisations about access to information whether it is about the services that the organisations provide as public information or about customer transactional information as personal information. The group of women indicated in the journals that they have a need for information from banks, government departments and mobile phone companies.

- **Relevance to the study**

  Question: Who are your client segments?

  Purpose: The question is asked to confirm the relevance of the organisation to the study and the interest of the study to the organisation.

  All of the organisations include the group represented by the women in the study either directly as clients or indirectly as customers of their corporate clients. Organisation PS01 has other public sector organisations as their clients and public participation programs that interact with all citizens; organisation PS02 engages directly with clients from developing communities; organisation FS01 has corporate clients who have customers in developing communities as well as running community development programs; and organisations FS02, FS03 and TC01 have clients in developing communities.

  All of the selected organisations are relevant to the study.

- **Needs currently fulfilled**

  Question: How would you describe your knowledge and information management policies and processes?

  Question: What are the processes to access information?

  Question: How can people request or access information?

  Purpose: The questions are asked to determine the current state of information sharing between organisations and their clients.

  The organisations have to comply to regulatory processes that govern information policies for example the Protection of Personal Information Act (POPI) and the Consumer Protection Act (CPA). Organisation PS02 describes their information policy as "*The future is behind us and we need to catch up*" with limited access and plans to implement digital access to information. Organisation FS01 is the most progressive with an access to information policy and describes the policy as maximizing access to information with a clear list of exceptions, safeguarding the deliberative process, with clear procedures for disclosing information, the right to appeal, simultaneous disclosure of some board papers and declassification of certain

types of information after five, ten or twenty years. Organisation FS03 defines different processes for knowledge and information management for employees (internal access) and customers (external access) supporting various channels and means to share information with customers, including contact centres, email, SMS, post, social media, customer education workshops, online videos, radio and television.

All the organisations have processes to access the information that is differentiated between proactive sharing information through their organisational websites, email or printed communication and on-request information when customers or other stakeholders request information. The request for information can be done through digital channels, mailed letter or in person at an office or branch. There is a move towards digital information access with all the organisations supporting apps and the Internet as a preferred platform for self-service information sharing. Some of the organisations also use social media, videos and blogs. However, they do realise that a pure digital strategy is not yet feasible for everyone and support other channels for information access such as call centres, mail, service centres and branches while organisations such as FS02, FS03 and TC01 offer affordable mobile devices (smartphones and tablets), data plans and purposeful designed apps to bridge the digital divide.

Extract from the interviews:

"*Comprehensive information is also available on the company's website and the blog is one of the busiest sites. The blog allows one to post more comprehensive information and "how to".*" – TC01

"*For the informal market, we uses the concept of foot soldiers – these are branded agents that work in a community.*" – TC01

"*Our business has great customer value management initiatives that see information sharing and value creation happen across various internal and external channels.*" – FS02

"*Customers can engage with any of our customer facing channels or touch-points (branches, email, website, social media, etc.) to request information we maintain of them.*" – FS03

In summary, all of the organisations have policies and procedures in place for knowledge and information management that ensure compliance to regulation and support proactive and reactive information sharing through digital and traditional channels with a tendency towards self-service through apps and the organisational websites. With the drive to digital, organisations are aware of the prohibiting factors such as the cost of smart devices, data and

know-how. Organisations FS02, FS03 and TC01 are addressing the challenge for their customers by providing affordable devices, data solutions and relevant apps.

- **Information inclusivity**

  Question: Do you receive information from clients? If yes, how do you receive the information?

  Question: Have you implemented processes to comply with the Protection of Personal Information Act?

  Question: How would you define inclusivity in context of your organisation's interactions with clients?

  Question: What is your organisation's vision for their interactions with clients?

  Purpose: The questions are asked to gain an understanding on the organisations' views on information inclusivity.

Access to information is a differentiator for development as it supports and informs choice. Choice leads to greater freedom that is the essence of development (Sen, 1999). Communities as represented by the participating women in this study do not have the freedom of money, time and know-how to freely exercise access to information especially as more information transition to digital locations.

Organisation PS02 receives information through forums and not directly from clients or external stakeholders. All the other organisations have processes in place to receive structured information, complaints or information requests through digital or traditional channels. Examples of traditional channels are letters or forms delivered through fax or mail, call centres and branches. All the examples given are about business related structured information such as personal information to apply for a product, statistical information related to the performance of a project (FS01 and PS01) and feedback of a service experience. All the organisations that store information of individuals (TC01, PS02, FS02 and FS03) have implemented processes to comply with the Protection of Personal Information Act. FS01 and PS01 do not have individuals as their clients with indirect relationships with individuals through community or public participation programs.

Extract from the interviews:

"*Yes, we do receive information from customers – either provided by them, whether prompted by us or not, during an interaction with our business, such as their personal details required to sell them a policy, finalise a claim or interaction related feedback (satisfaction feedback on a specific experience), or sourced from data suppliers, such as credit bureaus.*" – FS03

The organisations defined interaction inclusivity in terms of their business and clients as making it easy for clients to interact with them by providing different options as interaction mediums, understanding the needs of clients and offering education workshops to clients. Organisation PS02 describes the impact of exclusivity as hampering people to reach their potential optimally. Organisation PS01 defines inclusivity in terms of social inclusion.

Extract from the interviews:

"*Inclusivity is a huge buzz work in financial services across Africa. In our business it means access to basic banking, which is moving the money from underneath the mattress into a bank account. Creating a savings culture and credit behaviour. Micro credit becomes a topic in this space as well*." – FS02

"*This would be defined in ensuring that it is as easy as possible for our customers to interact with our business, through their channels of choice. This thinking has resulted in the introduction of various customer touch-points and channels, including weekend based education workshops, cost effective USSD based communication (cell phone based), branches placed in communities, etc.*" – FS03

"*From a customer perspective, you are a customer (no labels), yet internally there are different mechanisms in managing that customer (the "label" or segment is an internal principle) for an optimal customer experience.*" – TC01

"*Even in our daily lives, we need to create an information society. People need access to information, in a work environment, we need to understand what information is needed, information that directs their lives and how it will impact my life. If not, you hamper people to reach their potential optimally.*" – PS01

"*Information inclusivity is all encompassing and must include everybody who makes use of the market. Stakeholders are everyone who engages with the market, even to look for information.*" – PS02

"*Social inclusion aims to empower poor and marginalized people to take advantage of burgeoning global opportunities. It ensures that people have a voice in decisions that affect their lives and that they enjoy equal access to markets, services and political, social and physical spaces.*" – FS01

The organisations' visions for future interactions with their clients build on their definition of inclusivity. They use phrases such as "*being part of customers' daily lives to deliver solutions to daily problems*" (FS02), "*contribute to standard of living and social economic*

transformation" (PS02), and "*ensure the dreams and dignity of our customers and employees*" (FS03) that indicate an intention to engage with their clients beyond the products and services they offer and recognise their impact on clients. Organisation FS01 recognises the diversity of clients and the need to tailor programs to specific needs. All of the organisations focus on digital platforms for future interactions such as the Internet and mobile apps.

Extract from the interviews:

"*Formally communicated and lived in the organisation: the vision is "The delivery of a bold new digital world" and our mission is "To make our customer's lives a whole lot brighter".*" – TC01

The organisations agree that inclusivity is relevant for them. Inclusivity informs their design decisions for client interaction focusing on a digital platform for delivery.

- **Social innovation**

  Question: Is there a focus or interest in innovation in your organisation?
  Question: Is there a focus to impact your clients' lives or is it internal improvements?
  Question: What are examples of innovation (for example, service innovation or social innovation) from your organisation?
  Purpose: The questions are asked to explore their focus on social innovation.

  Innovation is important to all the organisations. It is described as being part of the organisation's DNA; a great focus; key building blocks and transformational. The innovation focus of organisation PS01 focuses on internal improvements, while the focus at the other organisations are both internal improvements and impacting their clients' lives.

Extract from the interviews:

"*Innovation and entrepreneurship are recognized as key building blocks of competitive and dynamic economies. Countries and regions with vibrant innovation and entrepreneurship ecosystems tend to witness higher productivity rates, leading to increased economic growth and more robust job creation, the main pathways through which the poor can escape poverty. As a key driver for firm growth, innovation fosters shared prosperity by stimulating formal employment and increasing wages.*" – FS01

Social innovation is defined as a novel solution to a social problem that is more effective, efficient, sustainable, or just, than existing solutions and for which the value created accrues primarily to society as a whole rather than private individuals (Phills et al., 2008). This definition rings true for the examples of social innovation provided by the organisations summarised in Table 4.4.

Table 4.4. Examples of social innovation from the participating organisations

FS01: **Financial Innovation for Smallholder Families** They collaborate with a diverse array of stakeholders in the financial inclusion space, including donors, policy makers, regulators, and implementing agencies in order to ensure that new evidence around smallholder demand is actionable and tailored to address the important data gaps that have thus far stymied efforts to drive financial innovation for smallholder families.	FS02: **Mobile money, low value loans and community savings** Mobile money is a great example of a remittance innovation to assist in transferring funds to people in the unbanked segment. They are currently exploring this as a full low cost banking solution for this segment. Other examples of social innovation include low value loans to cooperatives and a community savings solution.
PS01: **Integrated urban development** The organisation is developing an integrated urban development framework to promote inclusivity in society.	PS02: **Market of the Future** The organisation is creating a digital platform to include smallholder farmers in the supply chain.
TC01: **Affordable device insurance** The organisation realises the value of mobile devices and created an affordable insurance product for low-income clients to replace the device in case of loss.	
FS03: **Ensure dream and dignity of customers and employees** The organisation recognises the important role they play in ensuring that their customers' dreams are realised and the factors that have a negative impact on their dignity are removed. Some of the service innovation that results from this purpose statement are delivering reeds and flowers to customers when they lost a loved one, providing employees with opportunities to start their own businesses, running free financial and insurance literacy workshops over the weekends for new customers, approving claims in 24 hours, paying back all premiums to customers when they experienced a death of an insured member whilst their policy is still in the waiting period and reducing waiting periods from twelve months to six months and designing digital solutions that will include data and airtime with the use of the app for low income customers.	

Innovation is a driving initiative at the organisations searching for better ways to interact with their customers and contribute to their customers' experience of well-being and dignity. Organisation FS03 summarises their approach to social innovation as interwoven with their core business: "*We aim to not just generate shareholder equity and returns, but social capital and social dividends. For us it means we need to create value for the communities we operate in, in addition to our core business.*"

4.4.3.3 Reaction to the framework

The criteria applied to evaluate the framework with the organisations are relevancy, feasibility and perceived value. The organisations express an interest in the framework applied during the research project. A common thread in the discussions is the limited interaction with clients to understand their needs and co-develop solutions. Some of the organisations use elements present in the framework, but not the holistic approach of co-creating solutions with a client community as advocated by the framework. The interviewees evaluated the framework as relevant, feasible and valuable as described in Table 4.5 followed by a discussion on the similarities and differences between the framework and the organisations' current practice for projects effecting customers.

Table 4.5. Evaluation criteria

Evaluation criteria	Evaluation description
Relevancy	The organisations were selected based on the projects that effect people from developing communities as described in Table 4.1. The interviewees confirmed that the framework is relevant to their projects with some of the components like focus groups used by FS01, FS02, FS03 and TC01.
Feasibility	The interviewees agreed that the framework could be applied in projects that require insights from customers and solution co-creation.
Perceived value	The use of submersion through journaling is a novel concept to the interviewees that they found interesting and potentially valuable. PS01, PS02, FS02 used the words "valuable contribution" in describing perceived value. FS01, FS03 and TC01 relate to the customer engagement components of the framework and commented on the submersion through journaling as valuable.

- **Similarity**

  Organisations FS01, FS02, FS03 and TC01 apply some of the elements such as running client focus groups to receive feedback about products and services. Organisation FS01 is

involved with community projects that use design thinking for human-centered empathic design of solutions, and finds the use of journals for submersion innovative.

- **Difference**

  On reflection, organisation PS01 comments that they feel disconnected from communities. The researcher shared stories from the journals and workshop about the experiences of a low-income person (Michelle) working and staying with her employer in a more affluent area and finding that she cannot afford shopping in the area. Michelle has to find time to use public transport to travel to an area with hawkers and affordable goods for her shopping. This narrative from the research data alerted the interviewee that they haven't considered affordability of retail and services in their proposed integrated urban planning framework with the emphasis only on affordable housing and reducing travel time to workplaces. The framework is based on shaping solutions with the community with submersion to create empathy and insights. Through sharing this example, the interviewee is convinced that the framework will be a valuable contribution to their projects.

  One of the FS02 interviewees comments on the importance of trust and credibility when a new product or service is launched. He mentions that it is one thing to understand the needs, but quite another thing to help people across the adoption chasm. He sees the framework with the continuous participation of the community playing a role.

  Extract from the interviews:

  "*Do you realise that the continuous involvement of the focus group is the key to get adoption?*" – Interviewee, organisation FS02

  Organisation PS02 finds the framework a novel concept, as their interactions with stakeholders are limited to forums. Given the innovation they focus on to contribute to socioeconomic change, the interviewee expresses interest in the framework and that it will be valuable to them.

  Although organisations FS03 and TC01 use focus groups for feedback, co-development of solutions are not commonplace. The concept of submersion using journals as demonstrated by the project is a novel idea and has not been used by the participating organisations. Similarly, the insights gained from the journals about the women working as domestic workers intrigued the interviewees as they knew little about the population as represented by this group reminding the researcher that she is working with a hidden population.

4.4.3.4 Impact of the evaluation on the design of the framework

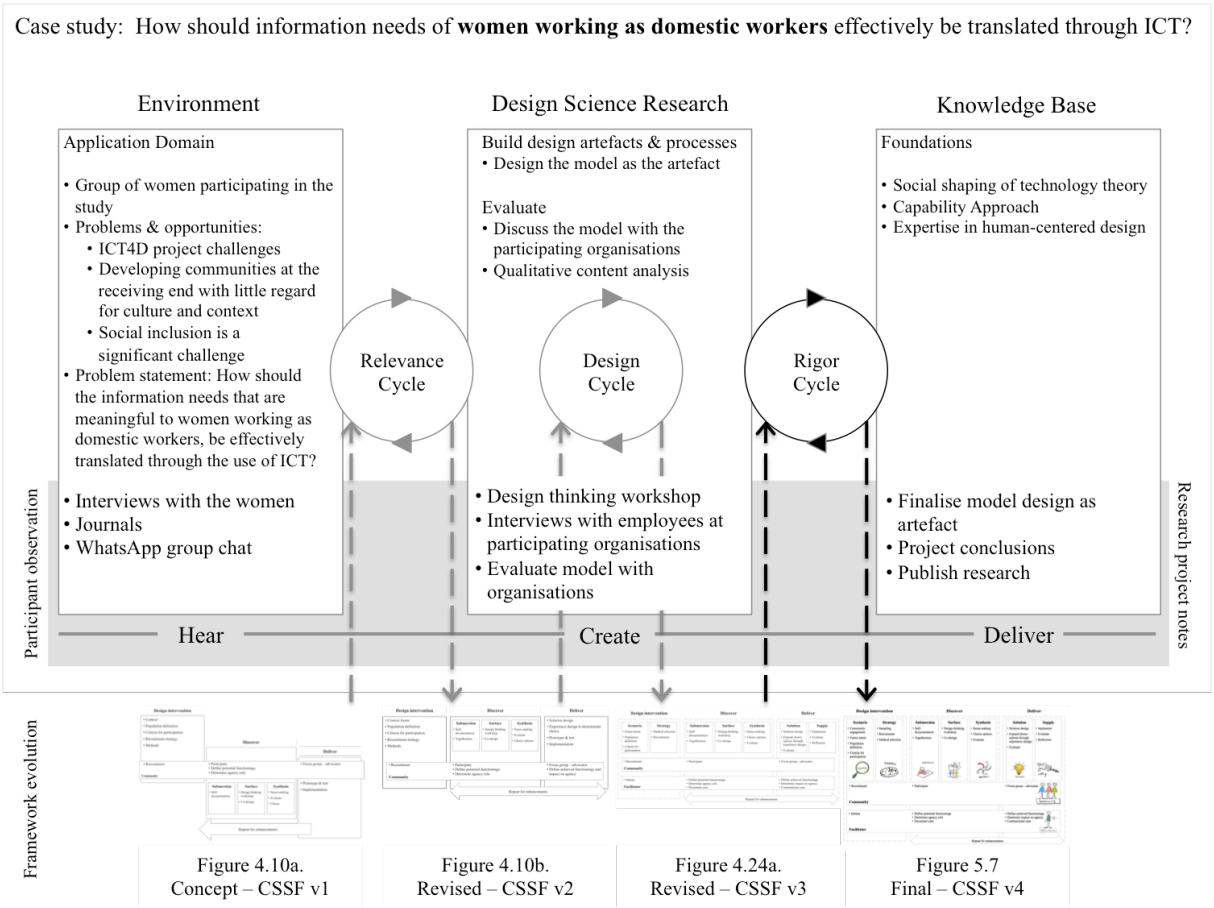


Figure 4.26. Final design iteration to refine the framework

The third version of the framework design as illustrated in Figure 4.24a was evaluated with the organisations and used as input to the rigor cycle to finalise the framework as illustrated in Figure 4.26. The interviews with the organisations emphasised the need to document and communicate the case to create awareness of the community's project, to demonstrate the alternative approach to co-create solutions with communities and to contribute to the knowledge base. The case documentation and case communication activities were included in the facilitator stream in the final version that is discussed in Chapter 5's Conclusions and presented as Figure 5.7.

4.5 Sub-conclusions

This study investigates the primary research question: "How should the information needs that are meaningful to women working as domestic workers be effectively translated through the use of ICT?" where the label of domestic work is represented of the developing agenda in an urban context. Four secondary research questions as mapped in Figure 4.27 are used to direct the inquiry viewing the data through the lenses of the capability approach and social shaping of technology theories (Dutton, 2013; Sen, 1999).

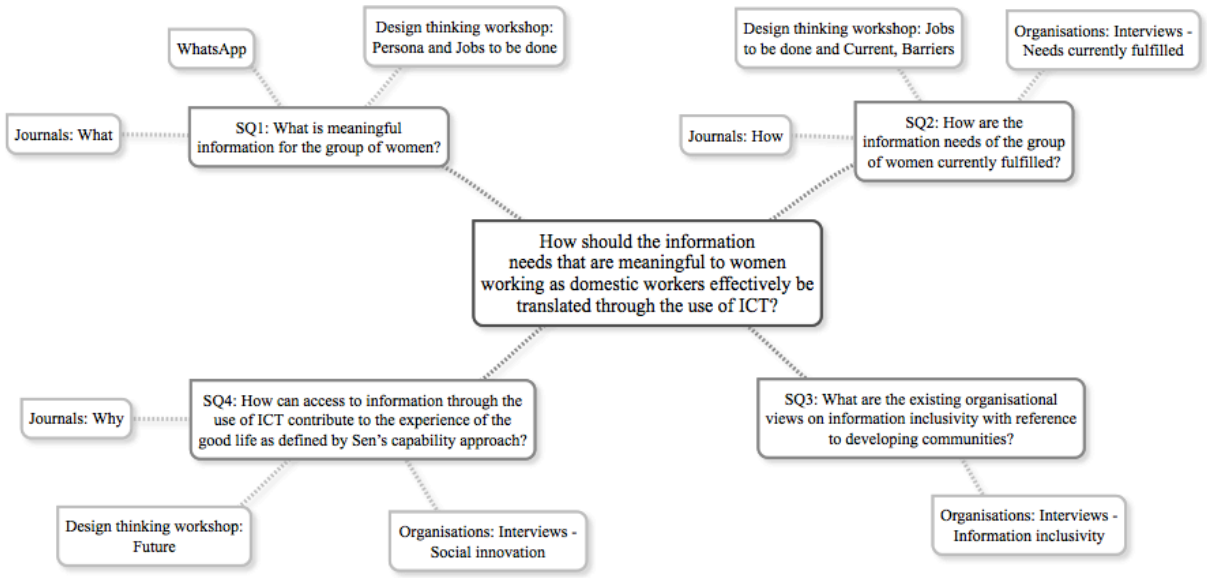


Figure 4.27. Mapping the research project activities as data sources to the secondary research questions

4.5.1 Secondary research question 1

What is meaningful information for the group of women?

Answer: Information to improve their experience of life be it personal development, providing a better life for their children, doing their work better, health issues or managing their money is meaningful information for the group of women.

Data sources: Journals ("what"), WhatsApp chat, design thinking workshop (persona and jobs to be done tools)

The purpose of including this question is to pause for reflection on what is meaningful and who can determine meaning. Meaningful information implies that it is important, useful and valuable to the consumer of the information. The value attached to information can change with time and circumstances. Each person will have a view of what information is meaningful given their unique situation, however, as this study shows, there are similarities that groups share with regards to meaningful information and are best identified by the consumers of the information. Allowing the

participants to discover and share what is meaningful information to them is aligned to the findings from research where community driven projects and user involvement are advocated as components of sustainability (Pade-Khene et al., 2011; Unwin, 2009; Van Stam & Van Greunen, 2014).

The data relevant to answer this question is found in the "what" section of the journals, text from the WhatsApp chat and the persona and jobs to be done tools in the design thinking workshop. As the data show, information that is meaningful to the women relates to living a better life and providing a better life to their children. Examples from the design thinking workshop supported by the journals are information to help their children with homework, information to help someone find work and information to navigate public transport better.

The four most mentioned information categories that surface from the journals are personal development, domestic, health and economic. The theme of the personal development category is information to have a better life, domestic is information to do domestic work better, health is information regarding health issues and home remedies, and economic is information to earn more money or manage money better.

4.5.2 Secondary research question 2

How are the information needs of the group of women currently fulfilled?

Answer: The primary source of information for the women currently is other people such as service providers, friends, family, employers and colleagues. The Internet is rarely used due to the cost of data and contributes to the information divide seeing that digital is the primary information strategy of organisations. A significant number of information needs across the information categories are unmet as indicated by the 38 per cent of unresolved information requests.

Data sources: Journals ("how"), design thinking workshop (jobs to be done, current and barriers), organisation interviews (needs currently fulfilled)

The purpose of this question is to confirm the need for improving access to information and understanding of information needs of developing communities as represented by the participating women. The women documented how they resolved their current information needs in the journals in the "how" section. The data from the jobs to be done and current and barriers tools in the design thinking workshop and the interviews with the organisations is also included in the analysis.

The data from the journals and the design thinking workshop confirms that the primary information source for the women is asking other people. The preferred method of asking for the information is in person as oppose to phone calls, emails or text messages. The journal entries indicated the women find it difficult to find information for all their needs and 38 per cent of the entries are unresolved.

The organisations offer a variety of ways to provide information such as digital channels, call centres, service centres, branches and mail. Although the organisations realise that some of their clients have limited or no access to the Internet, they subscribe to a digital strategy for client interactions using apps and the Internet and counter the digital divide argument with the expectation that the cost of data and devices will decrease in the near future while supporting their in-person traditional channels. The 2010 and 2015 ICT development index (IDI) for South Africa is 4.90 with a global rank of 88 showing no significant change in the period and below the global average of 5.03 (International Telecommunication Union, 2015). The index measures ICT access, use and skills and confirms that the digital divide is a worrying reality in South Africa.

4.5.3 Secondary research question 3

What are the existing organisational views on information inclusivity with reference to developing communities?

Answer: The organisations' inclusivity spectrum includes client interaction inclusivity, financial inclusivity and social inclusivity with the organisations in agreement that information inclusivity is relevant although their digital strategy impacts clients affected by the digital divide to have a simple experience of inclusivity.

Data sources: Organisation interviews (information inclusivity)

The purpose of this question is to understand the approach and willingness of organisations to include developing communities in their client interaction strategy. The organisations participating in this study have direct and indirect interest in clients from developing communities.

The organisations subscribe to the concept of inclusivity and define it in terms of their business and client interactions. The financial services institutions define inclusivity as facilitating access to financial products for all clients and the telecommunication institution defines inclusivity in terms of equal treatment for all clients. The public sector institutions view inclusivity through a social lens of access to opportunities and personal development.

The organisations use digital and traditional channels with an emphasis on the digital strategy to facilitate interactions with clients. This has a direct impact on inclusivity given the digital divide in South Africa that has a significant impact on developing communities (International Telecommunication Union, 2015; Mutula & Mostert, 2011).

In order for this digital vision to contribute to inclusion, data costs, access to smart devices, know-how and relevance of solutions must be addressed. Inclusivity should be viewed holistically as social inclusion and the ability of people to participate in all the aspects of life in society.

4.5.4 Secondary research question 4

How can access to information through the use of ICT contribute to the experience of the good life as defined by Sen's capability approach?

Answer: The good life is defined as having the freedoms to lead a life that one values with the freedom to choose whether to act on those freedoms. Information informs and enables choice with ICT as the gateway to access information given the global digital strategy. Access to information through ICT can contribute to an increase of self-controlled time. Information and time as resources have the potential to be converted into capabilities depending on individual conversion factors, structural conditions and an individual's own choices.

Data sources: Journals ("why"), design thinking workshop (future), organisation interviews (social innovation)

The purpose of this question is to explore the relevance of the research for the participants given the premise of Sen's capability approach and viewing development as freedom (Sen, 1999). Sen (1999) defines the good life as having the freedoms to lead the kind of lives people want to lead, to do what they want to do and be the person they want to be with the freedom to choose whether to act on those freedoms in line with their own ideas of the kind of life they want to live. Access to information is needed to be aware of choices and support the ability to enact choices that can lead to development outcomes and an experience of the good life (Alsop et al., 2005; Hatakka & Dé, 2011; Kleine, 2011).

The Choice Framework identifies eleven agency resources that can be converted into capabilities depending on individual conversion factors, structural conditions, and an individual's own choices (Kleine, 2011; 2013). During the interactions with the women who participated in the study, they expressed the need for information that could impact all of the agency resources as described in Table 4.6. Information resources and time are listed as two of the eleven agency resources (Kleine, 2013). As Kleine (2013) explains, access to information is the first step to knowledge acquisition and time as a resource is not about absolute time, but the combination of time and the degree of control over it. Access to information through ICT can contribute to an increase of self-controlled time and impact the other resources leading to choice as the development outcome.

Table 4.6. Reflections from the research data and the agency resources from Kleine's (2013) Choice Framework

Agency resource	Reflecting on the study's data
Information	The objective of this study is to create a framework to surface information needs of people in developing communities in a more effective way. The journals and the design thinking workshop surfaced the type of information that the women find meaningful and how they find information.
Cultural	Some of the women described their situation as isolated and "hidden behind walls". Most of the women visit their extended families occasionally and mentioned the need for information on how they can contribute to improving the lives of women in their cultural group.
Educational	The women identified the need for information on helping their children with their school homework and information on skills development.
Financial	The women expressed a need for information on earning more money and working better with their money. They are concerned about their children's futures.
Geographical	The women's homes are located far from their workplaces and they depend on public transport. They wrote in the journals about the need for information about transport and explored in the design thinking workshop the challenges caused by the long commute.
Health	Information about health is one of the categories the women wrote about in the journals.
Material	The women wrote in the journals about information needed on the material they would need to make products that they can sell.
Natural	Some of the women wrote in the journals about their need for information on growing vegetables and recycling.
Psychological	Self-development is one of the categories of information identified in the journals. The women need information about improving psychological resources such as self-confidence, creativity, optimism and resilience. During the design thinking workshop as the women received information, some of the women demonstrated self-confidence and creativity.
Social	A sense of community was created during the project with the WhatsApp group playing a pivotal role. The women shared information on the WhatsApp chat and supported one another. In the journals the women reflected on challenges faced in their family structures and the need for information to help them with their relationships.
Time	The women shared in the journals, on the WhatsApp chat and in the design thinking workshop the demands on their time and the wasted time when they have to find information at service providers (such as banks and transport companies). They are a vulnerable group without much self-controlled time.

However, ICT is driving the digital agenda with information predominately accessed through digital devices leading to a concern about the exclusion of people through the digital divide and emphasising

ICT and information as catalysts for development (Meyer, 2002; Unwin, 2009; Walsham & Sahay, 2006). The organisations participating in the study shared similar strategies for access to and interaction with information on digital platforms. They recognise their potential impact on the lives of their customers through social innovation and ICT. Access to information without ICT is restrictive and will add to information poverty (Britz, 2004). The significant collection of unresolved information requests shared by the women in the journals indicate the complexity of finding information without access to the Internet. In order for the women to exercise choice as a result of access to information and experience an increase of self-controlled time, the cost of data to close the digital divide must be addressed.

4.6 Conclusion

This chapter describes the exploration of the problem statement through the data collection and analysis and follows the research methodology described in Chapter 3. The project timeline, the population sample strategy, and the research instruments are discussed. Two perspectives are used in the study: a group of women working as domestic workers and six organisations from various sectors. Data are collected from the journals, WhatsApp chat, design thinking workshop and semi-structured interviews with the organisations. The design of the framework as the study's artefact is refined through various iterations with reference to the DSR cycles. The data are analysed using qualitative content analysis with a data-driven strategy for the journals, WhatsApp chat and design thinking workshop and a concept-driven strategy for the interviews. The reaction from the field to the framework applied in the study is discussed followed by the findings from the data analysis. The findings are presented as answers to the secondary research questions and draw insights from the capability approach theory.

The next chapter maps the new territory explored by the study through documenting the conclusions with reference to the research question, the study's contributions and recommendations for further research.

Chapter 5 – Mapping new territory

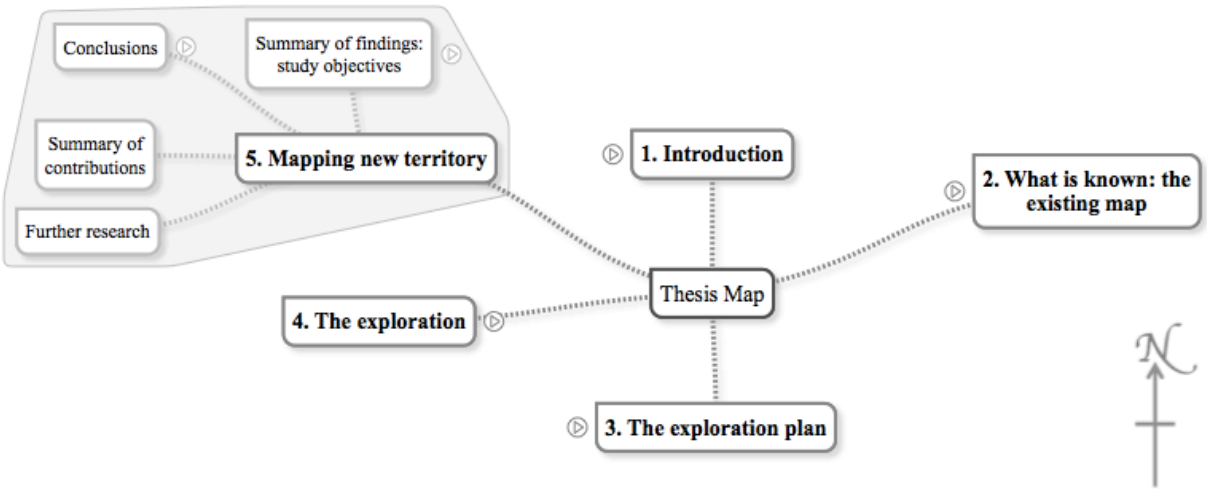


Figure 5.1. The focus of this chapter on the thesis map is mapping new territory

5.1 Introduction

The researcher has mapped the mission of this study through defining the problem statement, the background and the outline of the thesis in Chapter 1. The existing territory that is defined by the problem statement is explored in Chapter 2 by way of a literature study that is navigated using a constellation of categories. Chapter 3 describes the plan to explore the uncharted territory consisting of the research design and the methodology. The exploration journey is documented in Chapter 4 with detail on how the data are collected and analysed with the reactions from the field to the framework and answers to the secondary questions explored by the study.

The aim of this chapter as mapped in Figure 5.1 is to map the new territory explored by this study firstly by summarising the findings in response to the objective of the study; secondly by presenting the conclusions and answering the primary research question; thirdly, the contribution to the field of ICT4D research; and fourthly, recommendations for further research.

5.2 Summary of findings

The primary research question for the study is: How should the information needs that are meaningful to women working as domestic workers be effectively translated through the use of ICT?

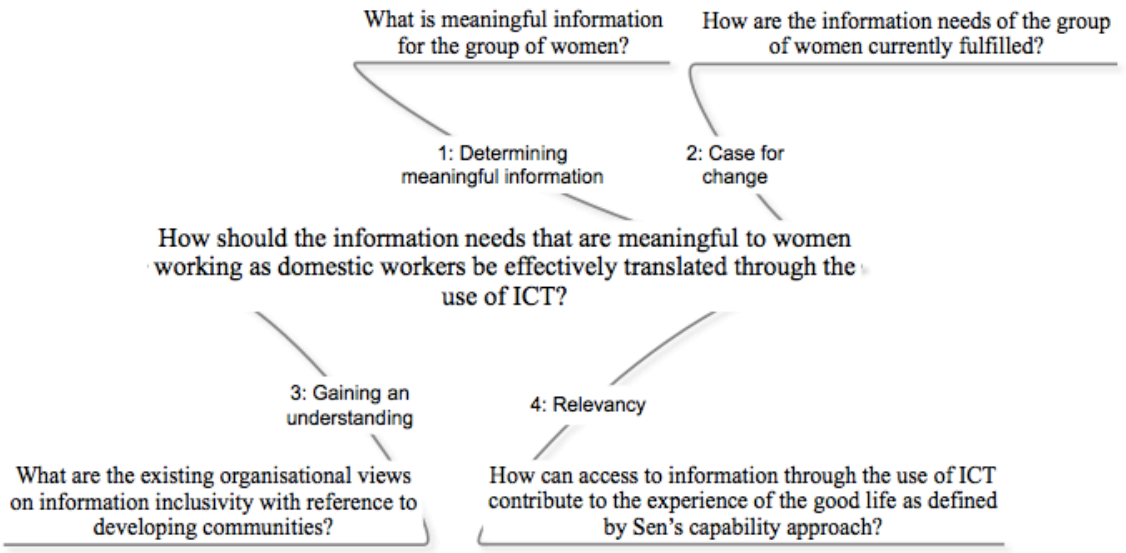


Figure 5.2. Primary research question with the secondary research questions and study objectives

The primary research question is explored through answering secondary research questions to meet the objective of the study as mapped in Figure 5.2. The objective of this study is to create a framework to surface information needs of people in developing communities in a more effective way through:

- Understanding what is meaningful information (Figure 5.3);
- Determining if change is needed from the current practice of fulfilling information needs (Figure 5.4);
- Understanding an organisational perspective on information inclusivity as a primary information provider (Figure 5.5); and
- Confirming the relevance of this study to the development agenda through the lens of Sen's (1999) capability approach (Figure 5.6).

5.2.1 Determining meaningful information

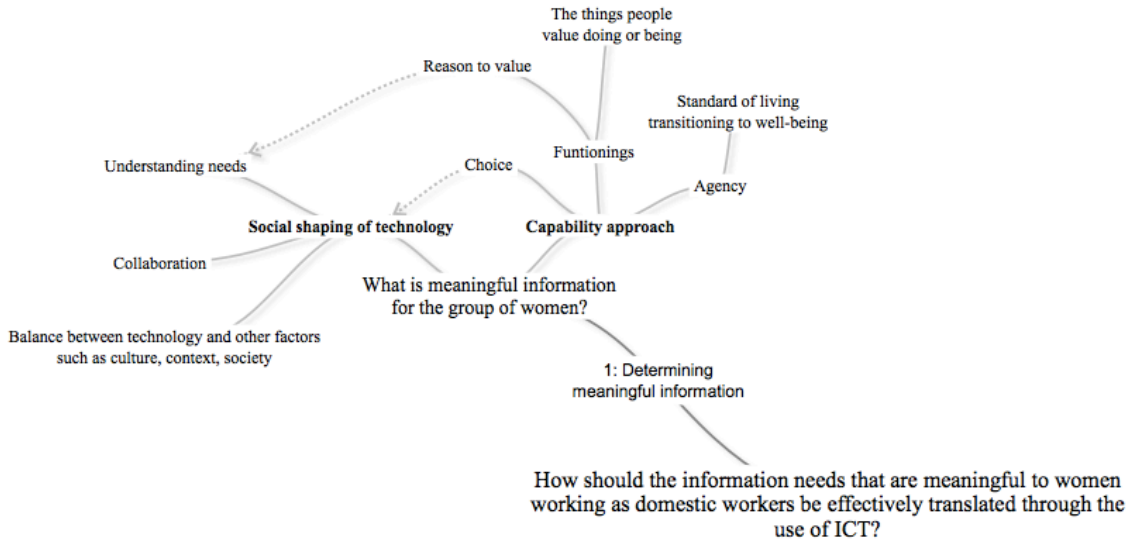


Figure 5.3. Framing the response to the first element of the study objective

In order to determine what is meaningful information to the group of women, it is necessary to understand what the women value doing or being. Sen's capability approach frames freedom as the development of choices about things people have reason to value (Robeyns, 2006; Sen, 1999). Valued information supports and enables the choices people make and becomes one of the commodities that can activate potential functionings in the capability set.

ICT4D projects are often criticised for the lack of understanding users' needs and an unbalanced focus on technology (Avgerou, 2008; 2009; Kleine & Unwin, 2009; Krauss, 2009a; 2013). A different approach to ICT4D projects is through applying a social shaping of technology perspective where technology and society are mutually constitutive (Dutton, 2013; MacKenzie & Wajcman, 1999). Social shaping of technology is a collaborative approach that engages the community to co-create meaningful solutions to their challenges.

The data from the journals, the interactions in the design thinking workshop and WhatsApp chat show that the women value information to improve their experience of life be it personal development, providing a better life for their children, doing their work better, health issues or managing their money. These insights are possible following a collaborative approach guided by the social shaping of technology perspective and the capability approach framework.

5.2.2 Case for change

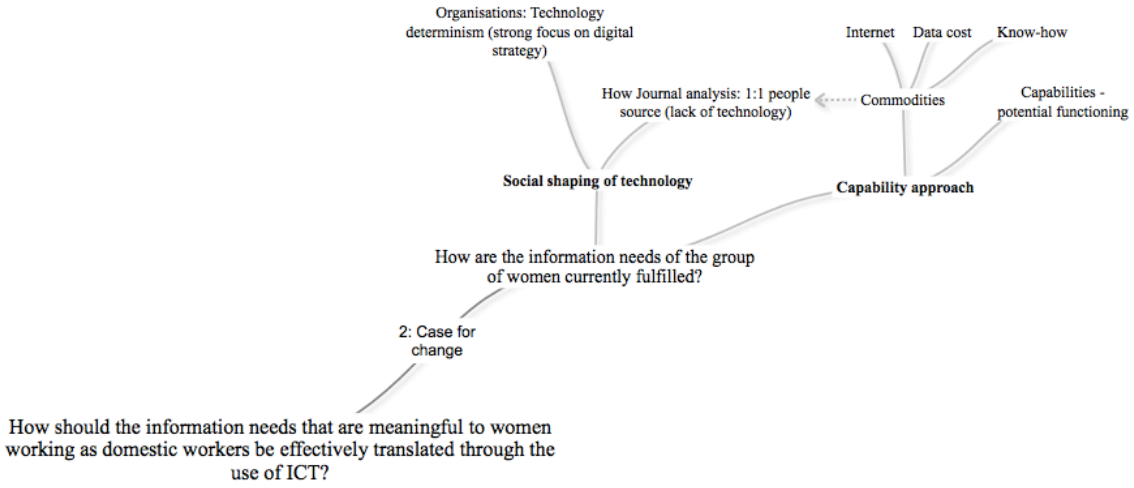


Figure 5.4. Framing the response to the second element of the study objective

The data from the journals and the design thinking workshop support the need for change in how the women's information needs are fulfilled. The primary source of information for the women currently is other people such as service providers, friends, family, employers and colleagues. A significant number of information needs across the information categories are unmet as indicated by the 38 per cent of unresolved information requests. The organisations subscribe to a digital strategy for information consumption while supporting traditional channels such as branches, call centres and mail for people without Internet access.

The women in the study rarely use the Internet due to the cost of data. This lack of use contributes to the information divide seeing that digital is the primary information strategy of organisations. The women lack access to the Internet, sufficient money to afford data or access to free broadband as commodities to achieve the functionings such as helping their children with school homework or finding ways to improve their economic situation. Sen (2000) argues that poverty is a form of social exclusion and needs a multidimensional approach to unlock the capabilities of people to lead a good life. Organisations are included in this multidimensional approach as they contribute to people's freedoms (Sen, 2000).

5.2.3 Organisational perspective on information inclusivity

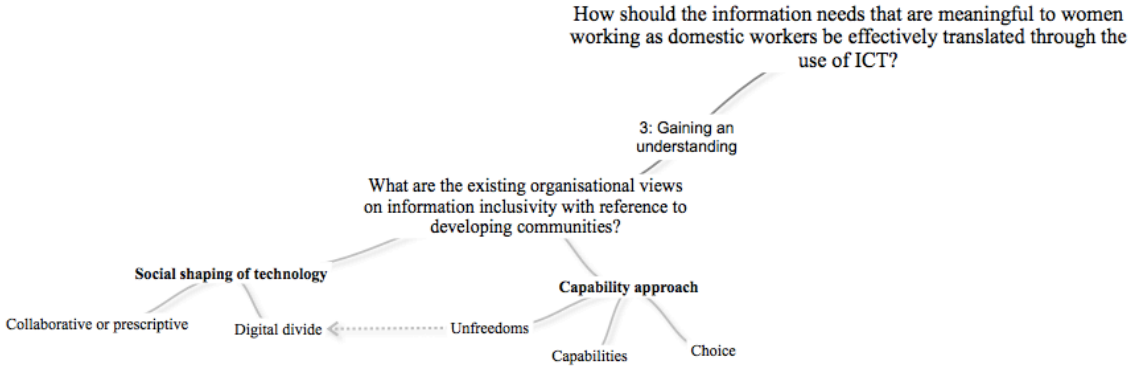


Figure 5.5. Framing the response to the third element of the study objective

By definition inclusivity means to be part of and information inclusivity means to have access to information. The organisations have different views on inclusivity ranging from interaction inclusivity, financial product inclusivity and social inclusivity. They view their definition of inclusivity through the lens of what they do and within that reference agree that inclusivity is important. The primary strategy for information inclusivity is a digital platform.

The women participating in the study are literate, have mobile phones and are aware of the Internet. They have the capability to access the Internet. However, three of the women have basic mobile phones without access to the Internet and all of the women cannot readily afford the cost of data in South Africa adding access to the Internet as an unfreedom that they experience that limits their ability to experience information inclusivity and impedes their development (Sen, 1999). The women find themselves on the opposite side of the digital divide from the organisations that provide services to them.

In addition, organisations provide a richer experience to clients who can access digital content for example videos and online support that traditional channels cannot offer. The organisations do not engage with clients from developing communities to shape solutions with them, but apply a mindset that progress is tied to technical advances (Dutton, 2013; Maniatopoulos, 2005).

5.2.4 Relevance

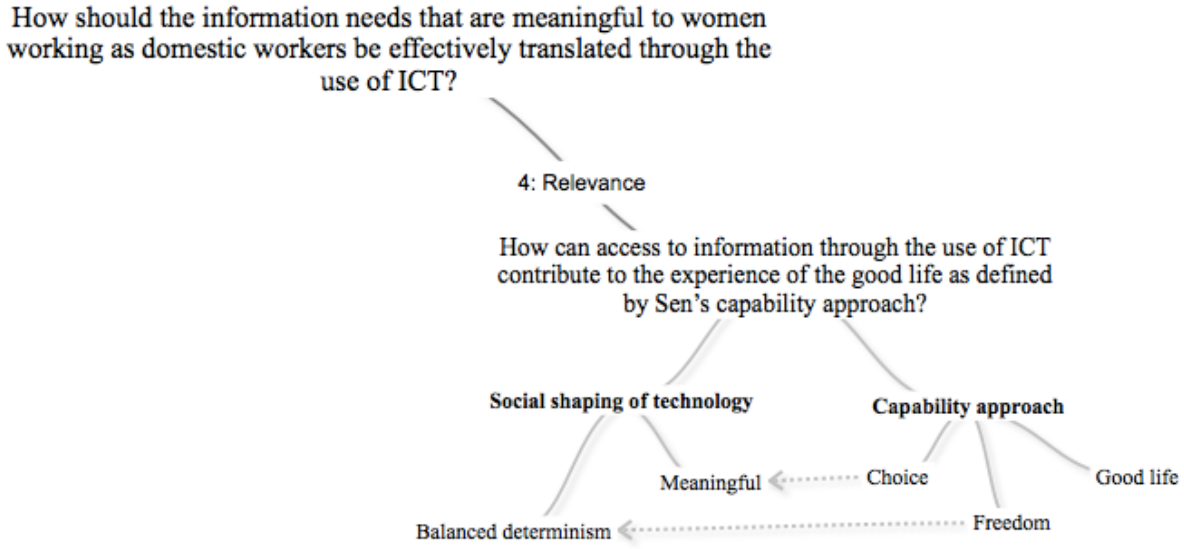


Figure 5.6. Framing the response to the fourth element of the study objective

The good life is defined as having the freedoms to lead a life that one values with the freedom to choose whether to act on those freedoms (Sen, 1999). Information informs and enables choice with ICT as the gateway to access information given the global digital strategy (Alsop et al., 2005; Hatakka & Dé, 2011; Kleine, 2011). Information needs are therefor relevant to development.

The organisations reacted favourably to the project's proposed framework that applies a social shaping of technology perspective. The women participating in the study defined the types of information that they value in the journals, but lack the means, such as finance and time, to fulfil all their information needs. In the design thinking workshop, the women participated to identify opportunity areas that they find meaningful and suggest possible future solutions to their challenges. The approach is human-centered that is analogous to Sen's focus on the individual in the capability approach (Hatakka & Dé, 2011; Robeyns, 2006; Sen, 1999).

The departure point of the project and the framework is not ICT and allows for solutions to surface given the capability set of the participants and the capability of the project. The journals allow everyone to participate to share what information they value and the sponsored data bundles (project capability) allow everyone to interact using their mobile phones or tablets through WhatsApp and SMS messages thereby illustrating the balanced determinism of social and technology in the project.

The study is relevant to the development agenda because of the inclusive approach to enable people to increase their choices through access to information to live a life they have reason to value and contribute to the body of knowledge with the framework to increase the potential for success of ICT4D projects.

5.3 Conclusions

Looking at the examples in literature of shipwrecked ICT4D and e-government projects, the common denominators are technology determinism and lack of understanding the communities' needs and worldview (Avgerou, 2008; 2009; Dutton, 2013; Heeks, 2008; Kleine & Unwin, 2009; Krauss, 2009a; 2013; Maniatopoulos, 2005). The social shaping of technology theory offers a perspective without a single dominant force with technology and society as mutually constitutive (Dutton, 2013; MacKenzie & Wajcman, 1999).

This research project applies concepts from the social shaping of technology and the capability approach theories. Instead of a top-down approach of leading with a technology solution, the research project group (as representative of a developing community) participates to share what they have reason to value and enables potential functionings as opportunities that can provide additional choices using ICT where relevant as a commodity. The resulting artefact of this project as illustrated in Figure 5.7 is a social shaping of technology framework inspired by the capability approach, namely the Community Shaping Solutions Framework (CSSF) in answer to the primary research question: "How should the information needs that are meaningful to women working as domestic workers be effectively translated through the use of ICT?"

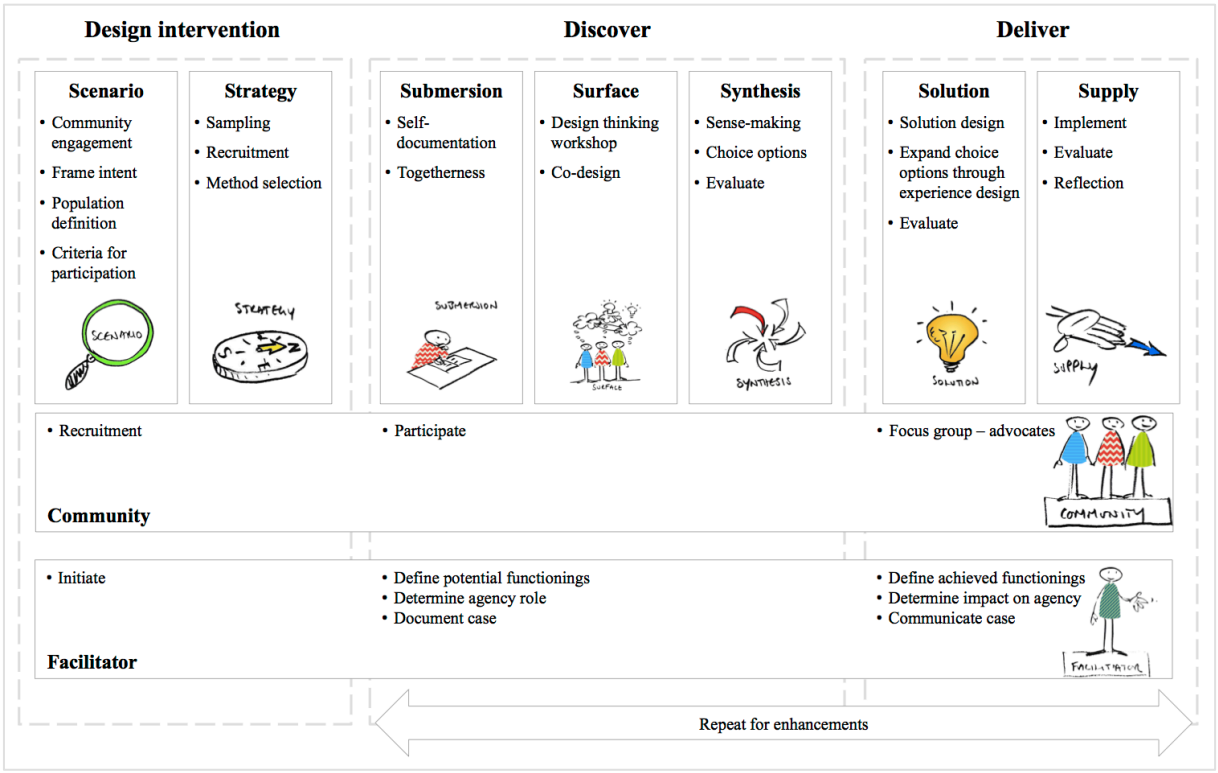


Figure 5.7. Community Shaping Solutions Framework (CSSF)

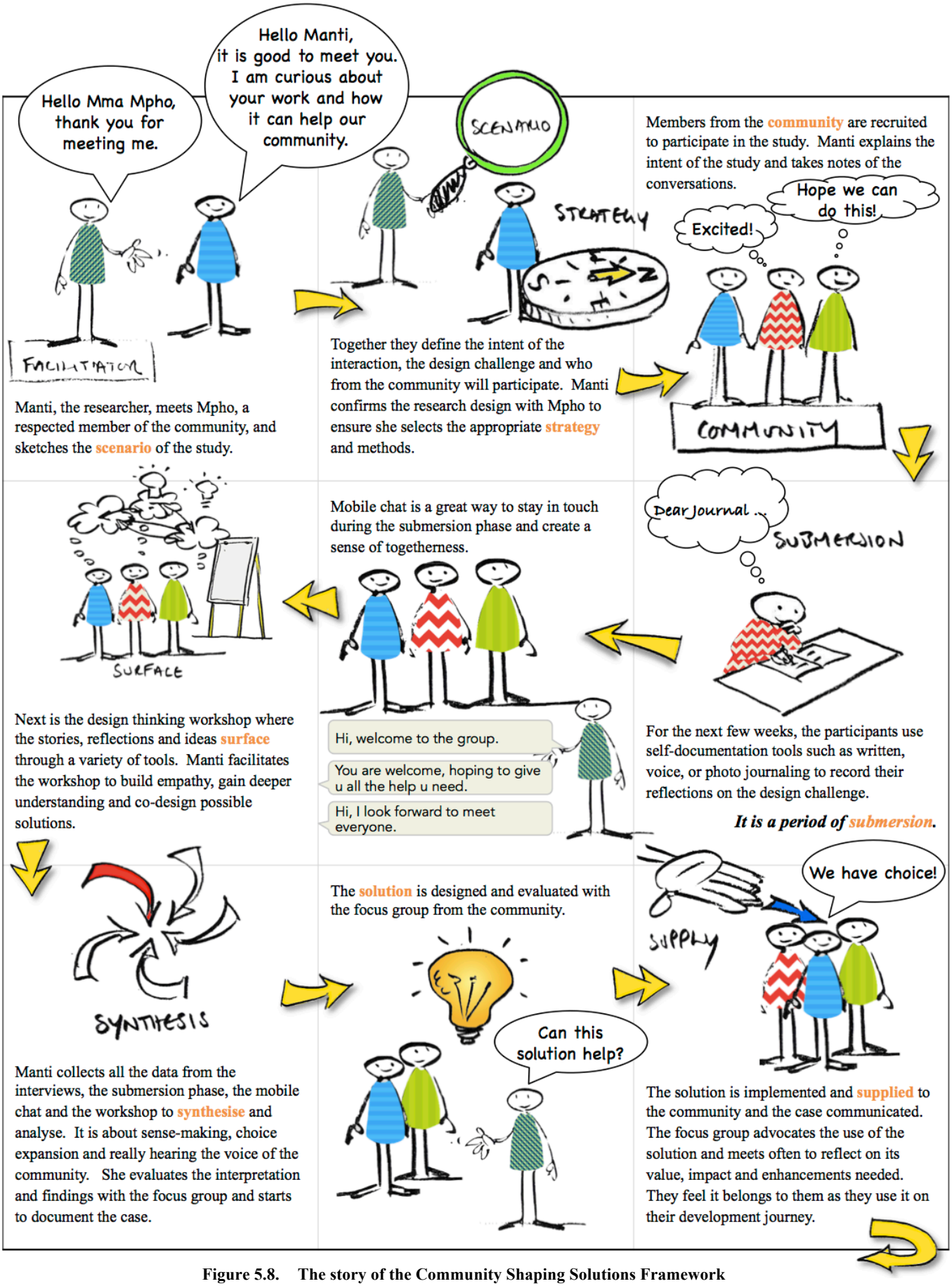


Figure 5.8. The story of the Community Shaping Solutions Framework

The CSSF has three distinct phases namely the design intervention phase, the discover phase and the deliver phase with the participants represented by the community lane across all the phases and the external project team or researcher as the facilitator lane, equally involved in all of the phases. Although the phases can be repetitive, the project is bookended by the design and the deliver phases demonstrating the clear intent of the project through design and the action orientation of the pragmatic paradigm through delivery.

5.3.1 Facilitator

An attribute of social shaping of technology, community informatics and community development is the involvement and empowerment of the researcher and the community that benefits from the project (Krauss, 2009a; 2013; Minkler, 2005; Rogers & Marsden, 2013; Weyers, 2011b). The act of empowerment means to create the space for someone where they can discover their own power and experience hope (Krauss, 2013; Weyers, 2011b). Hope is a precursor to action as well as an outcome of behaviour and should be recognised as an outcome of the project (Heeks & Krishna, 2016; Krauss, 2013; Weyers, 2011a). The optimal experience is when development in a community occurs organically, initiated and implemented by the community members, but communities are prevented from organic development by a number of factors summarised by Weyers (2011b) as:

- Domination by external systems;
- Social-cultural, economic, infrastructural and political stagnation;
- Feelings of powerlessness, apathy, fear of change and irresolution;
- Insufficient resources, organisational infrastructure, involvement, co-operation and solidarity; and sometimes
- Excessive community discord and conflict.

In addition, ICT4D programs fail because of deep rooted poverty, alienation and hopelessness in a community that makes it impossible for the community members to believe that a hopeful future or anything better is possible (Krauss, 2013). The researcher has a role to play as the initiator and catalyst, motivator and supporter, enabler and facilitator, consultant and guide in community development to initiate change and ignite hope (Heeks & Krishna, 2016; Herselman & Botha, 2014; Krauss, 2013; Weyers, 2011b).

The role of the researcher in the CSSF can be described as the facilitator of the process from design to deliver in the context of the project. The researcher has an additional responsibility to ensure rigor in the process, share knowledge and experience, contribute to the body of knowledge and accept empowerment. Cross-pollination of ideas and experience can occur between ICT4D projects that can steer projects forward.

The first principle of the CSSF is the responsibility of the facilitator towards empowerment.

5.3.2 Community

In the context of the CSSF, the community is the group of people who will benefit from the development efforts defined by the project. The community is part of the project from inception. Ownership of the project's artefact is clear, as the community stays involved throughout the lifecycle of the project. Should the project participant group be a small sample of the community, the group becomes the focus group and advocates of the project in the larger community. The design of the project from framing the intent to the solution delivery is done with the community (Krauss, 2013; Minkler, 2005; Rogers, 1992; Weyers, 2011b).

The second principle of the CSSF is that the facilitator creates the space for the community to participate in tandem.

5.3.3 Design intervention

The first bookend of the framework is the design of the intervention and it is critical to the success of the project. The role of the researcher is initiator, catalyst and consultant during this phase. The role of the initial members of the community is that of advisor and collaborator. Using a framework for example Hatakka's (2011) Capability Approach Framework, the researcher designs the scenario of the intervention and the research strategy in collaboration with the initial community members.

Scenario

The researcher may propose a design challenge or problem statement to initiate the project or receive a challenge from the community. Regardless of the origination of the idea, the researcher must **engage with members of the community** to confirm the legitimacy of the problem statement (Krauss, 2013; Minkler, 2005; Rogers, 1992; Rogers & Marsden, 2013; Weyers, 2011b). The agreement of the problem statement with the community is the handshake that sets the tone of the engagement.

Once the problem statement is defined, **the intent of the project must be framed** as human centered and empathetic with community members. For example, the women participating in the design thinking workshop discussed in Chapter 4 identified helping their children with schoolwork as a challenge. Framing this challenge as a human centered and empathetic design challenge that is solution-free, is: "Given the limited time Abigail has at home, how might we enable Abigail to help her children with their schoolwork so that they get a quality education and Abigail feels hopeful about their future?" Framing the intent of the project sets the boundaries of the project, provides a connection with the purpose of the project and shares the motivation of why the project is valuable.

Part of the design of the intervention is the **definition of the project participants** and the **criteria for participation**. The decisions include number of participants, timeframe of the project and the demographics of the participants for instance gender, age, occupation, location and capabilities. An example of participation criteria is: literate women currently employed as domestic workers in Region B of Johannesburg.

Strategy

Given the understanding of the capabilities of the participants and the involvement of the initial community members, informed decisions can be made about the **sampling strategy**, recruitment and research design with relevant methods. In a community, snowball sampling is an effective strategy to access hidden groups such as women working as domestic workers as illustrated in this study. Part of the **recruitment strategy** is to establish a good relationship with a respected member of the community who can act as a cultural interpreter, similar to the experiences of Krauss and Turpin (2010; 2013). The recruitment should happen within a clear timeframe and the intent and expectations of the project well communicated.

The capabilities of the community and the submersion element of the framework guide the **selection of the methods and data collection instruments**. For example, if written journals are used for submersion, then the participants must be literate, or if a digital solution like an app is used, then the participants must have access to appropriate devices and the Internet. The design include the instruments used in the discover phase for submersion, surface and synthesis activities.

The instrument for the self-documentation activity must be designed with much thought to the structure and the flexibility to guide the sharing of information. Structure is important to harvest information that is pertinent to the framed problem statement and flexibility is important to allow the community to share freely to build empathy. The flexible content often contains unexpected wisdom and insights. Examples of self-documentation methods are written, voice-recorded and photo journaling as shown in Table 5.1.

Table 5.1. Examples of self-documentation formats with suggestions for structure and flexibility

Self-documentation method	Structure	Flexibility
Written journaling	What, when, where, why and how type questions on form-style pages.	Blank pages for free-style writing.
Voice recorded journaling	Guide with questions to respond to.	Optional daily open-share conversation.
Photo journaling	List of items and moments to photograph.	Slots in the list for own choice of item or moment.

The design thinking workshop in the surface stream uses facilitation templates to unpack the problem statement and articulate ideas. The selection of the templates are important to guide the workshop participants on a journey of understanding who they are designing for, the stakeholders involved, the current way or situation, what are the challenges, ideation of opportunity areas to address the problem statement and potential solutions. Human centricity, engagement and prototyping are key elements of design thinking to keep in mind when selecting the design thinking templates, stationery and craft supplies.

The workshop design must consider the experience of the participants attending workshops and available time given their work commitments. If the participants are inexperienced with workshops, shorter workshops should be considered to allow for the participants to reflect on the experience and build confidence. The number of workshops depends on the desired outcome. The workshop agenda must allow for social interaction as it contributes to the sense of community in the project (some of the participants will meet each other for the first time at the workshop) and sets the tone for an interactive workshop.

Careful consideration must be given to the workshop attendees, for example, including other stakeholders. Design thinking is known for embracing diversity, but the community's power structures need to be understood to allow the project participants the freedom to interact at the workshop. Contributions from stakeholders, if needed, can be collected around the workshop should participation in the workshop prove problematic.

The aim of the design is twofold namely to learn what the community value and to facilitate the empowerment process by allowing the community members to discover solutions to their challenges and experience their power.

The third principle of the CSSF is to design the engagement standing in the shoes of the community.

5.3.4 Discover

The middle section of the framework applies the design in practice. As a result of the recruitment, a community is formed with the project as the common goal. The community participates in the activities that are focused in three streams namely submersion, surface and synthesis. The role of the researcher is guide, motivator and facilitator.

Submersion

Submersion through **self-documentation** is the cornerstone of the framework. It is a technique that allows the community to reflect on what they value in context of the framed problem statement. Sufficient time is allocated to the activity to allow the community to master the process and to include experiences that may occur during different times of the month for example receiving money at the end of the month or going to the clinic for a repeat of chronic medication prescription. Self-documentation gives everyone a voice and gives the researcher a unique insight into the community. It creates richer data than what is possible during an interview. A challenge with self-documentation is that some participants share less, but including sufficient number of participants and allowing enough time for the activity address this challenge.

The preparation for the submersion activities is done during the recruitment of the participants. The intent of the project and the expectations, especially of the submersion, are explained. Once the self-documentation activity starts, the responsibility of the researcher is to build the momentum of the project and facilitate the emergence of togetherness.

Togetherness is the sense that the community creates from involvement in a shared cause. A strong sense of togetherness motivates people to collaborate and support each other resulting in hopefulness. A way to foster togetherness is to facilitate regular and natural communication about the project and the participants, especially during the self-documentation activity when the participants work on their own. The participants should still feel part of the community as motivation to do the self-documentation activities. Provided all the participants have mobile phones and data bundles are addressed, a chat app such as WhatsApp can be used that supports group chat. Other means to achieve this is informal weekly meetings where any challenges with the self-documentation process are discussed and the participants have an opportunity to socialise.

Surface

Following the submersion activity, the researcher collects the self-documentation output, for example the written journals, the voice recordings or the photos. The participants are submersed in the context of the problem statement as it relates to their experiences. The

design thinking workshop offers a way to bring the group together and allow for solutions to surface and transition the participants from a closed mindset focused on the problem to an open mindset exploring solutions.

The templates selected in the design phase are used in the workshop guiding the participants on a human-centered journey to build empathy and understanding. The researcher uses this time to observe the participants and ensure that everyone is engaged in the workshop. The researcher facilitates and creates the space for the participants to complete the activities in the workshop.

The result of the workshop (conducted over one or more sessions) is opportunity areas and potential solutions that are **co-designed** with the participants. A low-fidelity design will crystallise the ideas and help the participants to visualise the intended outcome as confirmation. Techniques for low-fidelity design are storyboarding, sketching, modelling using craft supplies, and role-play.

Synthesis

The data from the self-documentation activity, communication tool such as a group chat app, observations and the design thinking workshop are synthesised to **make sense** of the community story, deepen insights and confirm the solution selection. Data analysis tools such as qualitative content analysis are used to unpack the data and find patterns.

The self-documentation and workshop data will surface the current **choice options** that the participants have around the problem statement and provide insights to their agency role, potential functionings and hopefulness. An expansion of choice options is an outcome of development (Kleine, 2011; Sen, 1999).

The researcher will lead the synthesis of the data and consult with the community if clarity is needed. The results of the synthesis and analysis are **evaluated** with the community and other stakeholders to confirm the need for the solution.

The fourth principle of the CSSF is self-discovery.

5.3.5 Deliver

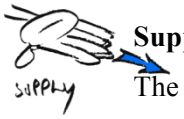
The last bookend of the framework is the delivery of the solution. While the design bookend defines the project, the deliver bookend realises the work done in the discover middle. The role of the researcher varies from facilitator, guide, and consultant. The community remains involved and participate as evaluators, users and advocates of the solution.

Solution

The ideas and low-fidelity designs from the discover phase enriched with the data analysis from the synthesis are the input to the **solution design**. The solution may take different forms from a digital solution such as an app to a skills program such as Internet literacy. The data gathered in the discover phase will inform the appropriate solution design.

Reflecting on the contribution of the solution to development, the researcher needs to facilitate a session with a focus group from the community on how the impact of the new solution will **expand their choice options**. An experience journey map in context of the problem statement and the new solution will illustrate the activities of the community and the contribution of the solution to expand their choice options.

Members of the community **evaluate** the solution design and the experience journey map before implementation. This is another confirmation of addressing a community development need that will be valued by the community.



Supply

The last stream in the framework contains the activities to supply the solution to the community. Depending on the solution requirements and complexity, for example, ICT technical development or skills course development, a team **implements** the solution design to create the artefact. The implementation project should develop skills in the community with a mixed team of outside experts and community members.

The community **evaluates** the solution and the focus group becomes the advocates of the solution. The members of the focus group have been involved with the project from design to delivery. The design and deliver phases can be repeated for enhancements to the solution.

After a period of use, the researcher interviews community members to **reflect** on the impact of the solution with reference to both the original problem statement and unintended consequences. During the reflection the researcher will learn what choice options are exercised to achieve additional functionings and the impact on the agency role.

The fifth principle of the CSSF is delivery of a solution shaped by the community.

5.3.6 The Community Shaping Solutions Framework

The answer to the primary research question of "how should the information needs that are meaningful to women working as domestic workers be effectively translated through the use of ICT?" is presented through the CSSF and the five guiding principles:

1. The facilitator has a responsibility towards empowerment.
2. The facilitator creates the space for the community to participate in tandem.
3. The engagement is designed standing in the shoes of the community.
4. Self-discovery is the cornerstone of the framework.
5. The community shapes the solution.

The research project followed the design science research methodology where the researcher confirmed the problem statement in the relevance cycle, designed the framework and evaluated the framework through the application with the group of women and the participating organisations in the design cycle. The applied framework delivered insights into the information needs of the women that they find meaningful and created empathy. The thesis completes the rigor cycle of Hevner's design science research cycles as a contribution to the knowledge base (Hevner, 2007).

5.4 Theory assessment and contribution

A set of evaluation criteria is used to verify if a theoretical contribution has been made followed by the description of the contribution. The contribution of this study to the body of work is multifaceted as reflected in Figure 5.9 with contributions to the research focus of the Department of Informatics at the University of Pretoria and in response to the recommendations for future research in existing literature as discussed in Chapter 2.

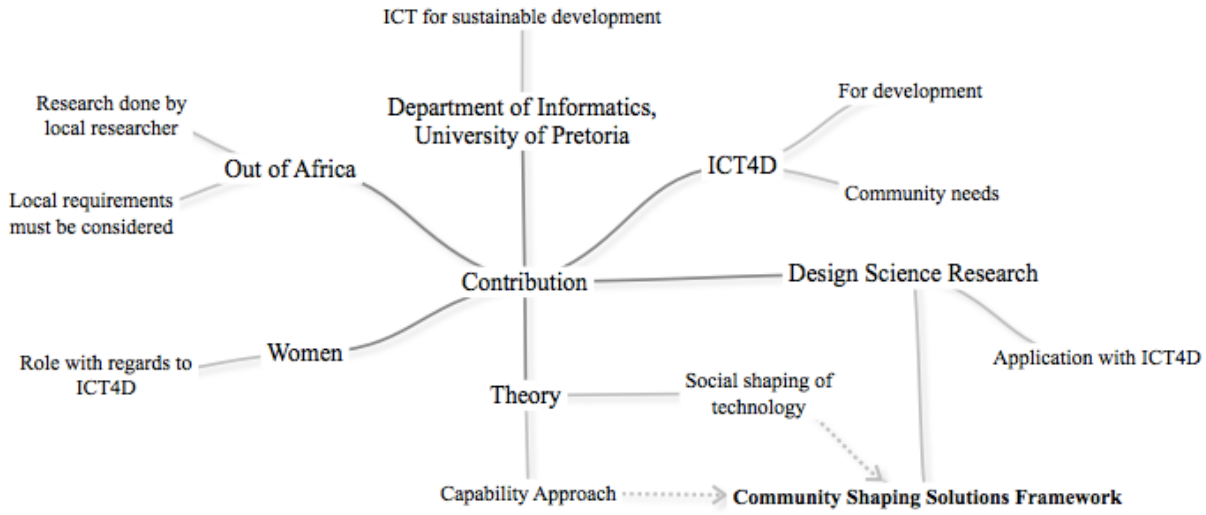


Figure 5.9. Summary of contribution areas of this study

Introna (1992) balances the subjectivity of evaluating own work with the potential to deepen the insight gained from the research. Evaluating the theory answers the call for rigor in ICT4D research by Avgerou (2009), Weber (2009) and Hevner (2007) as part of the rigor cycle in the design science research cycles.

5.4.1 Assessing the theory

Gregor (2006) defines five types of theory with Type V the theory for design and action that says how to do something. The theory for design and action is about the principles of form and function, methods, and justificatory theoretical knowledge that are used in the development of IS. Gregor (2006) draws on March and Smith (1995) and Hevner et al. (2004) to define what constitutes a contribution to knowledge with theory of design and action as:

- utility to a community of users;
- the novelty of the artefact; and
- the persuasiveness of claims that it is effective.

Models and methods can be evaluated for completeness, simplicity, consistency, ease of use, and the quality of results obtained through use of the method. According to Simon (1996) "interestingness" is a valid contribution. This study applied design science research to create the Community Shaping Solutions Framework as a theory of design and action. As Hevner et al. (2004) state the design science paradigm seeks to create what is effective.

In addition to the criteria Gregor (2006) proposes, Introna (1992) defines a set of content criteria to establish if a theoretical contribution has been made. Applying Introna's evaluation criteria, an example will be given to indicate whether the theory is supported by the criteria or not. The discussion also contributes to the evidence of utility, novelty and effectiveness of the artefact to demonstrate that the CSSF is a contribution to knowledge with theory of design and action (Gregor, 2006; Hevner et al., 2004; March & Smith, 1995). The utility to the community of users is delivered through the participation in shaping solutions that they value and the empowerment they experience as a result of the CSSF design and created artefact.

a. Does the theory raise problems previously not perceived? Does it raise problems of an increasing depth, and does it suggest new problems?

   The problem that the study addresses is how should the information needs that are meaningful to women working as domestic workers, be effectively translated through the use of ICT in order to enhance their experience of the good life as defined by Sen's capability approach (1999) and contribute to the success and social value of ICT4D projects. The CSSF is proposed as a response to the problem statement with the five guiding principles. The CSSF raises the problems of excluding the community from participating in finding and shaping solutions to their challenges. It acknowledges the complexity of ICT4D initiatives and the requirement of external involvement as a catalyst to start the change process with community involvement from inception to completion.

b. Does the theory anticipate novel facts and auxiliary theories?

Soft systems methodology (SSM) is an example of a theory that promotes participatory design. Group members participate in a workshop to collective create rich pictures to express a problem situation, define the root definition of the problem, make and test conceptual models, compare conceptual models with reality, and implement feasible and desirable changes (Checkland & Scholes, 1999). The outcome of SSM is feasible, realistic, well-reflected and desirable systems of activities that indicate how to change a problem situation (Checkland & Scholes, 1999). Although SSM incorporates participation to co-create solutions, all the activities occur within a workshop setting without a period of self-reflection through submersion.

A novel fact anticipated by the CSSF is the period of submersion of the participants to allow the surfacing of information through self-documentation. The use of self-documentation is observed as an empowering method of both the participants and the researcher during this study as an unintended consequence of the research study design.

c. Is the theory more precise in its assertions and in the facts it explains than previous theories?

The CSSF is created using DSR as a contribution to the dialogue on the criticism of ICT4D initiatives as either technology deterministic or becoming a social science concerned with creating theories of explanation without engaging with technology. DSR in ICT4D research is significantly lacking in ICT4D research (Islam & Grönlund, 2011; Mramba et al., 2016). The CSSF applies DSR in applying the framework of engaging the community to shape solutions in an inclusive approach:

- Relevance cycle: Problem identification and motivation and objectives of a solution
  CSSF: Scenario, strategy, submersion and surfaces phases to collaborate with the community to identify the problem, motivation and objectives of a solution.
- Design cycle: Design and development, demonstration and evaluation
  CSSF: Synthesis, solution and supply phases to design, develop, demonstrate and evaluate the solution.
- Rigor cycle: Communication
  CSSF: The facilitator and the community are involved through the initiative with evaluation and reflection activities to improve communication. The facilitator documents the case and communicates the case towards the end of the project to add to the body of knowledge, to raise awareness of the initiative and to motivate the community as a contribution to project maturity and sustainability. Breytenbach, De Villiers and Jordaan (2013) find that social

recognition and a positive use of media coverage can be used to accelerate a project along the maturity curve.

d. Has the theory unified or connected various hitherto unrelated problems, or concepts?

The CSSF draws on Sen's (1999) capability approach and the social shaping of technology theory (Williams & Edge, 1996) and applies DSR in context of an ICT4D initiative. It proposes a practical approach to facilitate community participation throughout the project lifecycle using self-documentation, design thinking, focus groups and communication.

e. Does the theory have positive and negative heuristic power?

Lakatos (1976) refers to the constellation of beliefs that forms a theory within a research programme as a heuristic with both positive and negative power. A research programme is a sequence of theories within a domain of scientific inquiry. The central premise of a research programme is described as the hard core that cannot change from one theory to the next and is defined by the negative heuristic that is not revisable (Lakatos, 1976). The positive heuristic is the collection of beliefs that are linked to the hard core as well as offering suggestions regarding revisions to these beliefs and forms a protective belt around the hard core (Lakatos, 1976).

The negative heuristic power suggests the following:

(i) There must be a connection between ICT4D initiatives and development
(ii) The needs of the users must be understood
(iii) An artefact is produced as guided by the DSR research method

The positive heuristic power suggests the following:

(i) The ICT4D initiative is designed standing in the shoes of the community
(ii) Self-documentation, design thinking and focus groups enable community participation throughout the project and apply the social shaping of technology theory
(iii) Self-documentation has the ability to empower the participants and the researcher
(iv) The community shapes solutions to their challenges in collaboration with the researcher
(v) Expansion of choice and agency can be measured as an indication of development

f. Has the theory produced a new perspective on existing problems and thus created a new understanding of existing problems?

The CSSF is proposed as a contribution to addressing existing problems of ICT4D initiatives being either technology deterministic or over-focused on theories of explanation. The CSSF is

designed to include the community from inception to completion, to allow unarticulated needs to surface by using self-documentation in a period of submersion followed by design thinking to co-create solutions with the community, to empower the participants and to contribute to development through the expansion of choice and agency.

g. Has the theory produced unconventional ideas or ideas that radically challenge current conceptions?

The premise of the CSSF is that the participants shape solutions that they value to their challenges facilitated by the researcher within the context of the initiative. It challenges conceptions that the outsider should provide the solution and the prevalence of superimposing ICT solutions from the global North to challenges in the global South. Engaging the community in shaping solutions can be a way to realise hope as a capability and enable choice as a way to experience development.

As stated at the start of the assessment, a brief example is given for each of the evaluation criteria. It is possible to expand the discussion in more detail, but Introna (1992) suggests that a lengthy discussion will not significantly improve the value of the evaluation. Reflecting on the theory assessment and the examples provided, scientific progress has been made.

5.4.2 Summary of contribution

The CSSF contributes to knowledge as a theory of design and action. The novelty of the CSSF is the combination of DSR with ICT4D, the use of journals as a self-documentation technique to collect data, followed by a design thinking workshop and interviews. The effectiveness of the CSSF and utility to the community of users are demonstrated through the participatory approach to facilitate the community to shape solutions that they value and the empowerment experienced through both the activities as well as the impact of the solution as an expansion of choice.

The study is an ICT4D study that uses the DSR methodology and applies the capability approach and social shaping of technology theories. The artefact is the CSSF as a contribution towards increasing the success of ICT4D projects. ICT4D projects are criticise for its technology deterministic approach and lack of understanding users' needs (Avgerou, 2008; 2009; Kleine & Unwin, 2009; Krauss, 2009a; 2013). The CSSF's contribution is a response to these criticisms by applying the social shaping of technology and the capability approach theories and suggesting a human-centered approach. The CSSF draws on the capability approach as a way to measure development and the social shaping of technology theory for the positive role in integrating people and technology concerns by offering a greater understanding of the relationship between scientific excellence, technology innovation and social well-being (Williams & Edge, 1996).

DSR is applied as a method to shape the solutions that they value with the community. DSR is a relatively new field in ICT research with Walsham (2012) and Österle et al. (2010) encouraging the application of design-orientated and mix-methods research. The CSSF artefact produced by this study is a contribution to and application of DSR.

This research will contribute to the ICT4D literature in a South African context as well as to the role of women in developing communities. It will also highlight the needs of affordable connectivity and access to meaningful information in an increasingly digital world that is causing further exclusivity.

ICT for Sustainable Development is one of the four research focus areas of the Department of Informatics at the University of Pretoria (University of Pretoria, n.d.). The Department recognises the importance of ICT to bring sustainable socio-economic development to impoverished communities. This study contributes to the body of work on ICT for Sustainable Development as an African ICT4D study.

The contributions that are relevant to the suggestions for future research from the literature review in Chapter 2 are collated in four categories namely for development; capability approach; out of Africa; and women and ICT4D. The study contributes to each of these categories as follows:

- **For development**: Increased attention should be placed on the "for development" stream, which is critically underrepresented within the literature, and understanding the relationship between ICT and development (Avgerou, 2009; Thapa & Sæbø, 2014; Walsham et al., 2007).

  Contribution: The study is categorised as "for development". The objective of this study is to create a framework to surface information needs of people in developing communities in a more effective way. In order to achieve the objective, the following are considered: understanding what is meaningful information; determine if change is needed from the current practice of fulfilling information needs; understand if information inclusivity is important to organisations that are primary information providers; and confirm the relevance of this study to the development agenda through the lens of Sen's (1999) capability approach. Women working as domestic workers in an urban environment represent a developing community. ICT4D research and projects are relevant, even crucial, for the digital and social inclusion of communities in Africa. The CSSF considers the expansion of choice and agency as measures of development and recognise the empowerment of the participants and the researcher as an outcome.

- **Capability approach**: The capability approach is difficult to operationalise with models and frameworks proposed, but few studies designed are based on it. Research is needed to evaluate the appropriateness of the capability approach in different situations and context

(Andersson et al., 2012; Grobler & De Villiers, 2014; Hatakka & Dé, 2011; Hatakka & Lagsten, 2012; Kleine, 2010; Robeyns, 2006).

Contribution: The study is viewed through the lens of Sen's capability approach. The Capability Approach Framework is applied in the research design with inclusion of the agency role (Grobler & De Villiers, 2014; Hatakka & Dé, 2011) with reference to the Choice Framework (Kleine, 2010). The human-centered design of the CSSF includes recommendations from Breytenbach, De Villiers and Jordaan (2013) to reach ICT4D maturity stage faster through adding variables to measure social embeddedness and local ownership; direct and diffused increase in freedom; and social recognition and celebration. Development is recognised if an expansion of freedom has measurably increased (Breytenbach et al., 2013). The expansion of choice and empowerment are also recognised as measurements of development.

- **Out of Africa**: There is a lack of papers with an explicit focus on ICT as strategic developmental enabler in Africa and ICT4D projects that consider unique local requirements with locally based research done by researchers from the developing country (Avgerou, 2008; Mramba et al., 2016; Thompson & Walsham, 2010; Walsham et al., 2007; Walsham & Sahay, 2006).

  Contribution: This research contributes to the ICT4D literature in an African context. The researcher is South African.

- **Women and ICT4D**: Research on the role of women in connection with ICT4D and effective application of ICT to positively influence the lives and livelihoods of poor and marginalised communities are identified as areas for future research (Cummings & O'Neil, 2015; Gillard et al., 2008; Mbarika et al., 2007; Morrell & Sterling, 2006; Unwin, 2009; Walsham et al., 2007).

  Contribution: The focus of this study is on women working as domestic workers as representing of a developing community in an urban context. Through the use of self-documentation and a design thinking workshop the women shared what information is meaningful to them and how they resolve their current information needs as well as identified opportunity areas for solutions that they value.

The resulting artefact of this study, the Community Shaping Solutions Framework, addresses the objective of this study to create a framework to surface information needs of people in developing communities in a more effective way by facilitating a process of submersion with the community to identify what they find of value.

5.5 Suggestions for further research

The study is a qualitative study that is limited to a small research population and to a short duration. Given the limitations of the study and the novelty aspects of the CSSF, further research is suggested to evaluate and evolve the CSSF in the field as an application of DSR in context of ICT4D. The first area for further research is to apply the CSSF to ICT4D projects as a DSR study to design the engagement, discover solutions and deliver ICT4D projects in collaboration with the beneficiary community. By applying the CSSF, it will be evaluated and improved in the field with different developing communities in different geographical locations and sectors as the original 26 women working as domestic workers in South Africa. It will also contribute to the application of DSR in ICT4D and strengthen the relationship between ICT and development as the CSSF measures development as an expansion of choice and agency.

The second area for further research is to apply the CSSF to the opportunity areas identified in this study. The identified opportunity areas are:

- How might I help my children with homework?
- How might I create a better life for my children?
- How might I manage with public transport?
- How might I find transport for my children to school?
- How might I find missing items at work?
- How might I help my friend to find work?

Each of the opportunity areas can be the intent of a CSSF study where the beneficiary community can shape the solution that they value. The application of the CSSF to one of these opportunity areas will also respond to the request by Mramba et al. (2016) for students to work on African problems.

The third area for further research is to understand the effectiveness of self-documentation methods in ICT4D projects to contribute to empowerment and closing the digital divide using different techniques of self-documentation and different developing communities from different geographical locations such as a rural community, seasonal workers in the agricultural sector or women in the corporate cleaning services sector. The CSSF uses self-documentation as a method to understand what information is meaningful to the participating women with empowerment as an unintended consequence of the research study design. The observation of empowerment supports the challenge of the social shaping of technology theory that development is tied to technical advances and factors other than technical design play a major role in with what effect technology is used (Dutton, 2013). Self-documentation provides an alternative to the traditional approach of interviews and questionnaires to determine needs and allows people to "*get inside science and technology themselves*" to shape solutions they value (Latour, 1988; Williams & Edge, 1996).

5.6 Conclusion

This chapter firstly discusses the objectives of the research study in an attempt to answer the primary research question. Secondly, the primary research question "How should the information needs that are meaningful to women working as domestic workers be effectively translated through the use of ICT?" is answered through the CSSF with the five guiding principles:

1. The facilitator has a responsibility towards empowerment.
2. The facilitator creates the space for the community to participate in tandem.
3. The engagement is designed standing in the shoes of the community.
4. Self-discovery is the cornerstone of the framework.
5. The community shapes the solution.

Thirdly, the contributions made by this study is discussed as a contribution to theory of design and action, as a DSR and ICT4D study, as a contribution to the "ICT for sustainable development" research focus of the Department of Informatics at the University of Pretoria, and in response to the recommendations for future research in existing literature. Fourthly, recommendations for future research are suggested, building further on the foundation set by this study.

The study is in agreement that hope is a precursor to action and the relationship between hope and ICT4D is relevant (Heeks & Krishna, 2016). Engaging the community in shaping solutions can be a way to realise hope as a capability and enable choice as a way to experience development.

Appendices

1. Ethics clearance
2. Consent form
3. Journal examples
4. Design thinking workshop

A. Ethics clearance

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Engineering,
Built Environment and Information Technology

1956 – 2016
60
years of
Engineering Education

Reference number: EBIT/21/2016 30 May 2016

Ms MS Grobler
Department of Informatics
School of Information Technology
University of Pretoria
Pretoria
0028

Dear Ms Grobler,

FACULTY COMMITTEE FOR RESEARCH ETHICS AND INTEGRITY

Your recent application to the EBIT Research Ethics Committee refers.

Conditional approval is granted.

1. This means that the research project entitled "Understanding the information needs that are meaningful to the lives of women working as domestic workers in context of the developing agenda" is approved under the strict conditions indicated below. If these conditions are not met, approval is withdrawn automatically.

   Conditions

   a) The informed consent form should indicate that interviews will be recorded. The participants should explicitly provide consent to be voice recorded.

2. This approval does not imply that the researcher, student or lecturer is relieved of any accountability in terms of the Code of Ethics for Scholarly Activities of the University of Pretoria, or the Policy and Procedures for Responsible Research of the University of Pretoria. These documents are available on the website of the EBIT Ethics Committee.

3. If action is taken beyond the approved application, approval is withdrawn automatically.

4. According to the regulations, any relevant problem arising from the study or research methodology as well as any amendments or changes, must be brought to the attention of the EBIT Research Ethics Office.

5. The Committee must be notified on completion of the project.

The Committee wishes you every success with the research project.

Prof JJ Hanekom
Chair: Faculty Committee for Research Ethics and Integrity
FACULTY OF ENGINEERING, BUILT ENVIRONMENT AND INFORMATION TECHNOLOGY

EBIT Research Ethics Committee
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Tel +27 (0)12 420 3736
Email mari.ferreira@up.ac.za

B. Consent form

Informed consent form

Please complete and sign this form as confirmation that you agree to participate in this study.

1. Title of research project: Understanding the information needs that are meaningful to the lives of women working as domestic workers in context of the developing agenda
2. I _____hereby voluntarily grant my permission for participation in the project as explained to me by Manti Grobler.
3. The nature, objective, possible safety and health implications have been explained to me and I understand them.
4. I understand my right to choose whether to participate in the project and that the information furnished will be handled confidentially. I am aware that the results of the investigation may be used for the purposes of publication.
5. I give permission that interviews and work sessions may be audio recorded with prior disclosure.
6. Upon signature of this form, you will be provided with a copy.

Signatures:

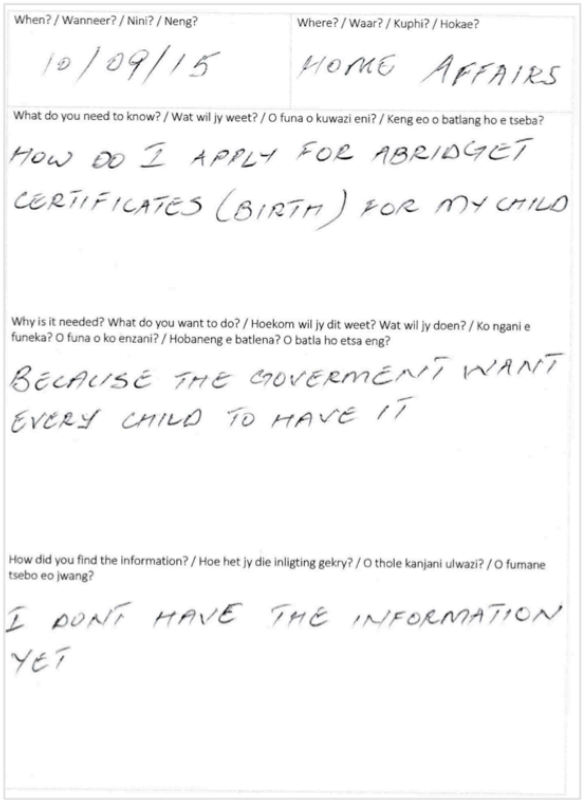
Participant: _____ Date: _____

Witness: _____ Date: _____

Researcher: _____ Date: _____

C. Journal examples

The women used the structured pages to share examples of information that are meaningful to them.



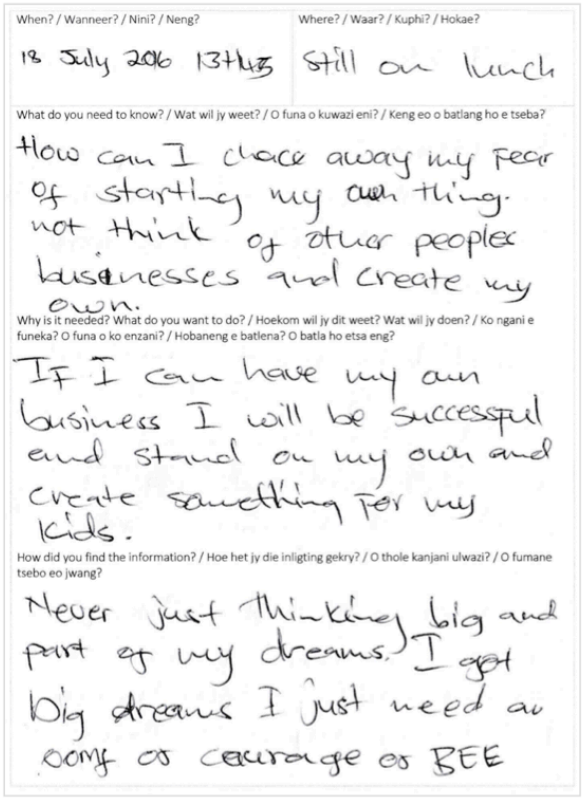
When? / Wanneer? / Nini? / Neng?: 10/09/15

Where? / Waar? / Kuphi? / Hokae?: HOME AFFAIRS

What do you need to know? / Wat wil jy weet? / O funa o kuwazi eni? / Keng eo o batlang ho e tseba?: HOW DO I APPLY FOR ABRIDGET CERTIFICATES (BIRTH) FOR MY CHILD

Why is it needed? What do you want to do? / Hoekom wil jy dit weet? Wat wil jy doen? / Ko ngani e funeka? O funa o ko enzani? / Hobaneng e batlena? O batla ho etsa eng?: BECAUSE THE GOVERMENT WANT EVERY CHILD TO HAVE IT

How did you find the information? / Hoe het jy die inligting gekry? / O thole kanjani ulwazi? / O fumane tsebo eo jwang?: I DONT HAVE THE INFORMATION YET



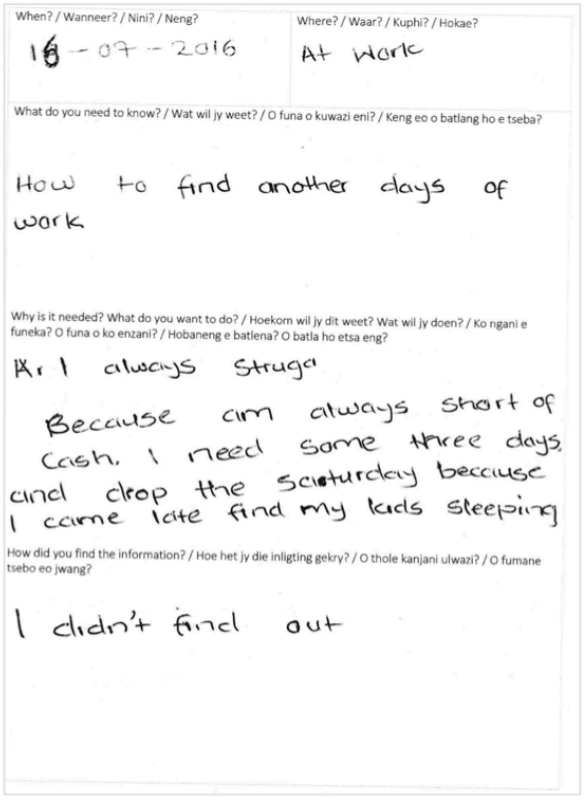
When? / Wanneer? / Nini? / Neng?: 18 July 2016 13Hrs

Where? / Waar? / Kuphi? / Hokae?: Still on lunch

What do you need to know? / Wat wil jy weet? / O funa o kuwazi eni? / Keng eo o batlang ho e tseba?: How can I chase away my fear of starting my own thing. not think of other peoples businesses and create my own.

Why is it needed? What do you want to do? / Hoekom wil jy dit weet? Wat wil jy doen? / Ko ngani e funeka? O funa o ko enzani? / Hobaneng e batlena? O batla ho etsa eng?: If I can have my own business I will be successful and stand on my own and create something for my kids.

How did you find the information? / Hoe het jy die inligting gekry? / O thole kanjani ulwazi? / O fumane tsebo eo jwang?: Never just thinking big and part of my dreams. I got big dreams I just need an oomf of courage or BEE



When? / Wanneer? / Nini? / Neng?: 18-07-2016

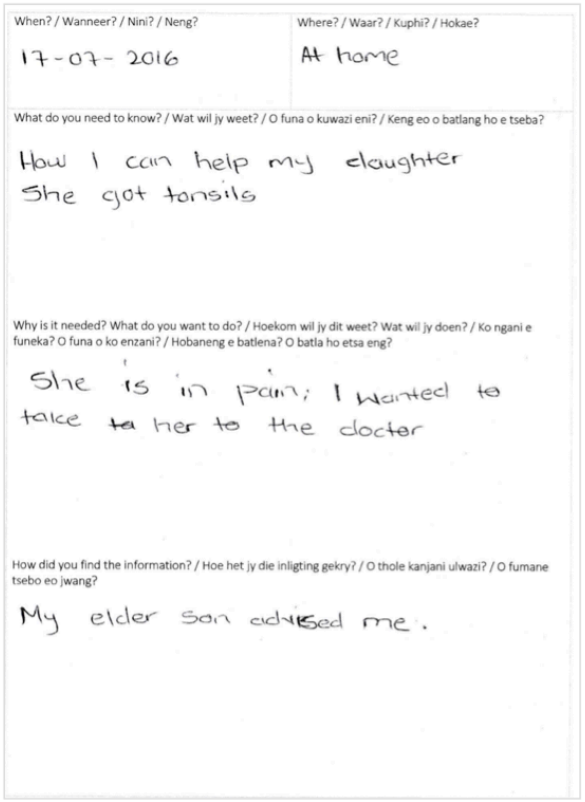
Where? / Waar? / Kuphi? / Hokae?: At Work

What do you need to know? / Wat wil jy weet? / O funa o kuwazi eni? / Keng eo o batlang ho e tseba?: How to find another days of work

Why is it needed? What do you want to do? / Hoekom wil jy dit weet? Wat wil jy doen? / Ko ngani e funeka? O funa o ko enzani? / Hobaneng e batlena? O batla ho etsa eng?: Ar I always Struga

Because am always short of cash. I need some three days and drop the saturday because I came late find my kids sleeping

How did you find the information? / Hoe het jy die inligting gekry? / O thole kanjani ulwazi? / O fumane tsebo eo jwang?: I didn't find out



When? / Wanneer? / Nini? / Neng?: 17-07-2016

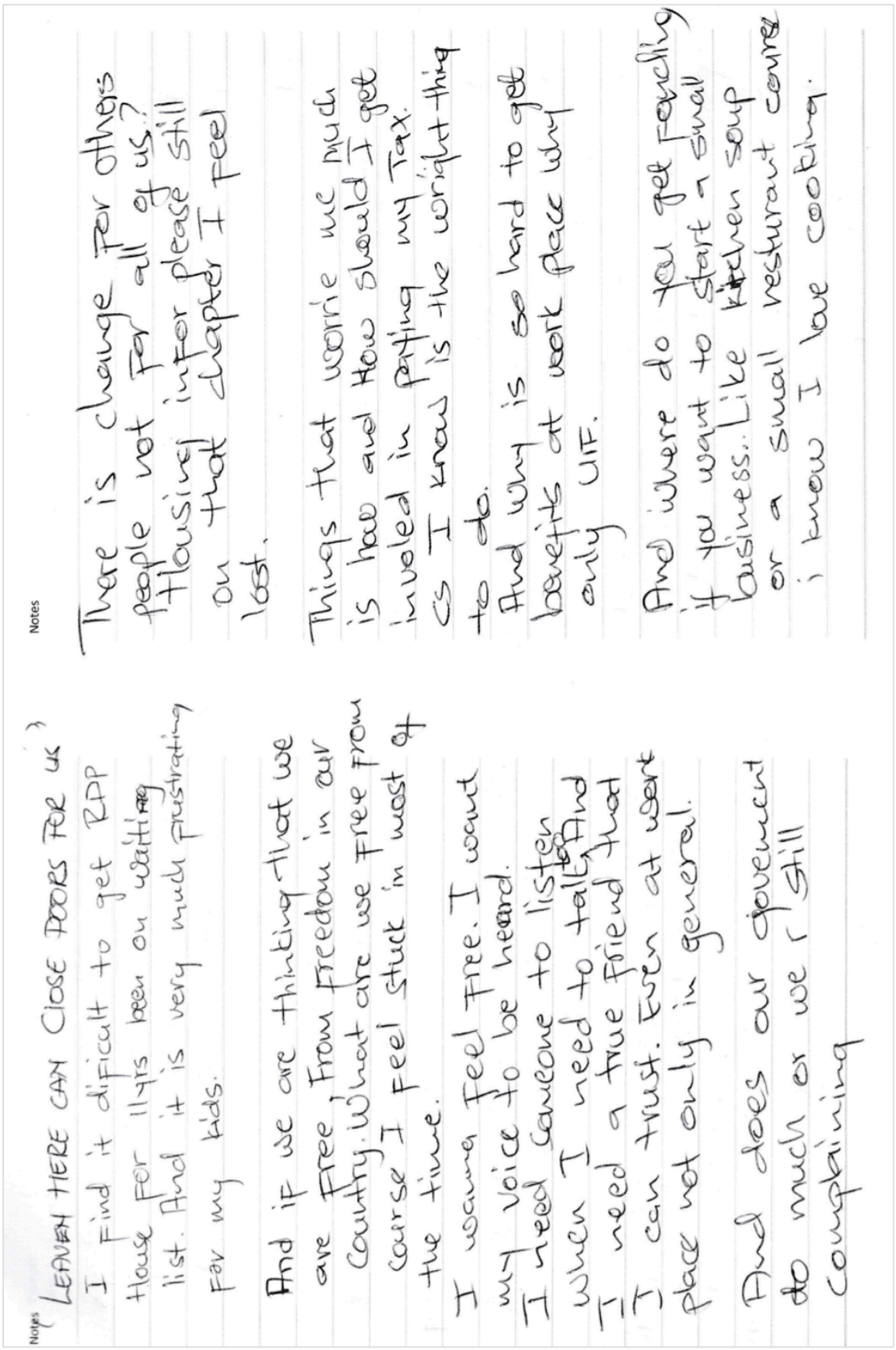
Where? / Waar? / Kuphi? / Hokae?: At home

What do you need to know? / Wat wil jy weet? / O funa o kuwazi eni? / Keng eo o batlang ho e tseba?: How I can help my daughter She got tonsils

Why is it needed? What do you want to do? / Hoekom wil jy dit weet? Wat wil jy doen? / Ko ngani e funeka? O funa o ko enzani? / Hobaneng e batlena? O batla ho etsa eng?: She is in pain; I wanted to take her to the docter

How did you find the information? / Hoe het jy die inligting gekry? / O thole kanjani ulwazi? / O fumane tsebo eo jwang?: My elder son advised me.

The women used the notes pages to share personal information, thoughts and opinions. They received no instructions or prompts as guidance as to the content shared, only an invitation to use the pages.



7-07-2016

Notes

Rising up of the prices in the shops,

Noticing that the prices of groceries are topped up more often, especialy in chain stores like pick n pay and Spar which are my local shops,
I'm wondering what can be done to solve this problem since in many surbbian places like Melvin we only have these expensive shops though we try to compare the prices,

And we can find that as domestic workers most of us are paid less and we are single Mothers.

I understand you can go to

Notes

the city centre where they are many comparison shops which are selling the needs which we are running away from ^ the espensive shops,

But the money which you use for transport will still add up to the price which you left from the local shop.

I bone the farm vel noek My family move there whe I was 5years old I whened primary school village called Paeng and my Secondary school, When I was at standard 7 I falle second year fell pregnent. I passed 7 breast feeding my first born is a boy I called him kabelo. he born when 17 years. ~~I started to w~~ I passed my matric in 1992 I stater to ~~work~~ when my Son was five. After nine year I have onther Son he died whe he five days old he dint have even a name.

AS A WOMAN, MOTHER AND A WIFE I BELIEVE WHATEVER I HAVE AND STILL PASSING THROUGH IS GOD'S WILL TO EITHER TEACH ME A CERTAIN LESSON OR TO REMIND ME THAT NO MATTER WHAT HAPPENS IN LIFE AS LONG AS I BREATH HIS STILL WITH ME AND HAS BIGGER PLANS FOR ME THOUGH SOMETIMES I LOOSE IT AND BLAME HIM FOR THE RAPE, DIVORCE AND SOME OTHER THINGS IN MY LIFE BUT I TRY VERY HARD TO REMEMBER MORE POSITIVE THINGS THAN NEGATIVE ONES.

D. Design thinking workshop

The participants shared the photos of the workshop on the WhatsApp group. The photos show the participants using the different worksheets, giving feedback after each exercise and sharing lunch at the end of the workshop, as well as examples of some of the completed worksheets.

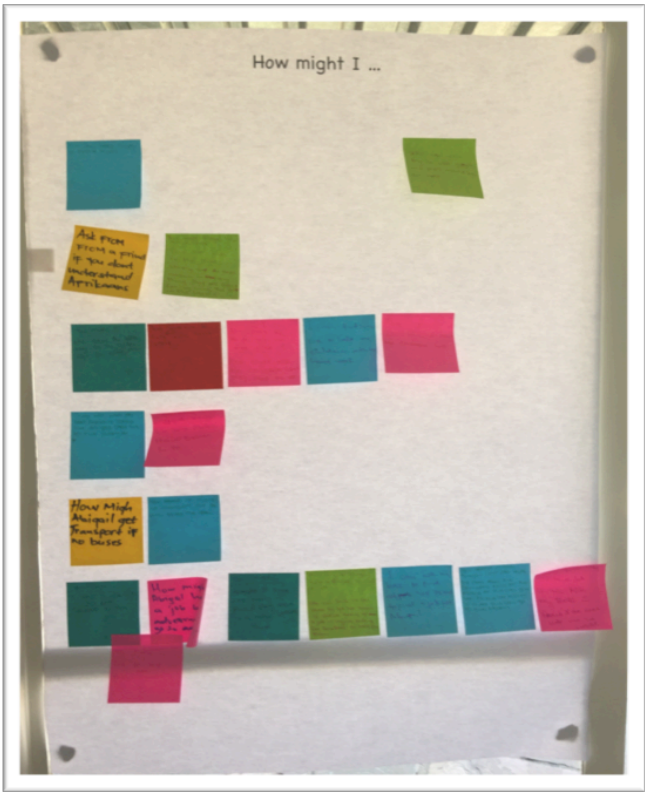


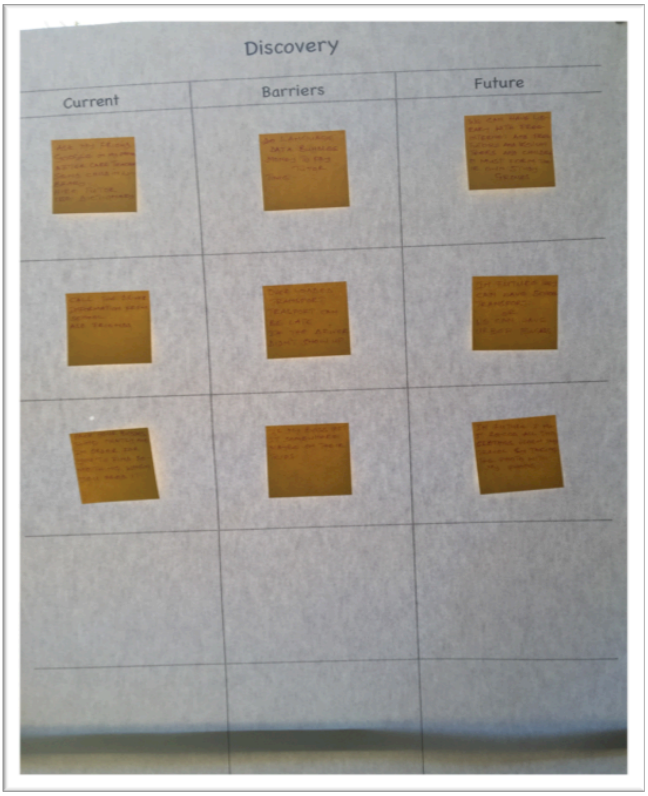




The original worksheets completed at the workshop: persona and jobs to be done.

The original worksheets completed at the workshop: how might I and current/future/barriers.





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