DESIGNING A MORE EFFECTIVE WAY TO SURFACE THE INFORMATION NEEDS OF PEOPLE IN DEVELOPING COMMUNITIES

Manti Grobler
University of Pretoria
South Africa
manti.grobler@gmail.com

Carina de Villiers
University of Pretoria
South Africa
Carina.DeVilliers@up.ac.za

ABSTRACT
This paper is a reflection on the research design of an information and communication technology for development (ICT4D) research project using design science research (DSR) in the pragmatic tradition. The artefact created and evaluated during the study is the Community Shaping Solutions Framework (CSSF) in response to the problem that this study addresses: 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 (1999) capability approach and to contribute to the success and social value of ICT4D projects.

The study is conducted in Pretoria and Johannesburg, South Africa. A group of women from the domestic cleaning sector represents a developing community in an urban setting and is selected using snowball sampling to participate in the study. Six organisations that have an interest in interacting with developing communities were selected using purposive sampling and participated in the study to provide a perspective on information inclusivity. The study has three phases starting with the group of women using journals to self-document their interactions with information, followed by a design thinking workshop with the women and ending with the organisational interviews.

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.

KEYWORDS
ICT4D, DSR, Participatory Design, Capability Approach, Design Thinking, Information as Development Resource

1. INTRODUCTION

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 et al., 2005; Hatakka & Dé, 2011; Kleine, 2011). Access to information is recognised as a human right and 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).

We designed this study to create and evaluate an emerging framework for community participation in shaping solutions where access to information through ICT as a commodity can contribute to expansion of choice as an indicator of development. The study is shaped by Sen's (1999) capability approach and the social shaping of technology theory in context of the information and communication technology for development (ICT4D) agenda.

This paper is a reflection on the research design of an ICT4D research project using design science research (DSR) in the pragmatic tradition. The paper is organised as follows: the first section is a brief introduction to the study, the second section is the background to the study, the third section is an overview of the theories that direct the study, the fourth section is a brief overview of ICT4D and DSR, the fifth section describes the research design, the sixth section introduces the framework, and the seventh section is the conclusion.

2. BACKGROUND

According to Statistics South Africa, South Africa has a population of 50.59 million with an increasing rate of urbanisation and urban poverty. 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). Poverty is the deprivation of basic capabilities rather than merely the lowness of incomes (Sen, 1999). It is multidimensional with people experiencing economic poverty, time poverty and information poverty (Britz, 2004; Chopra, 2015). 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 et al., 2014).

There are 53 million people employed globally as domestic workers of which 83 per cent is female (Chopra, 2015). In South Africa about a million people, mainly black women, are employed as domestic workers and earning minimum wages (Budlender, 2010). 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 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).

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).

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).

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).

The objective of this paper is to describe the design of the research project and introduce the resulting framework to device a more effective way to surface information needs of people in developing communities through understanding what is meaningful information. Women working as domestic workers in an urban environment represent the developing community.

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.

3. DIRECTED BY THEORY

The study is directed by the social shaping of technology theory (SST) and Sen's (1999) capability approach with the Capability Approach Framework as defined by Hatakka and Dé (2011) and extended by Grobler and De Villiers (2014) applied to the research design.

3.1. Social Shaping of Technology Theory

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 social 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).

3.2. Capability Approach

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. 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). This approach to development as freedom is referred to as Sen's 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 et al., 2012; Hatakka & Dé, 2011; Kleine, 2010; Robeyns, 2006).

We use the Capability Approach Framework to add rigor to the research design 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 distinct 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).

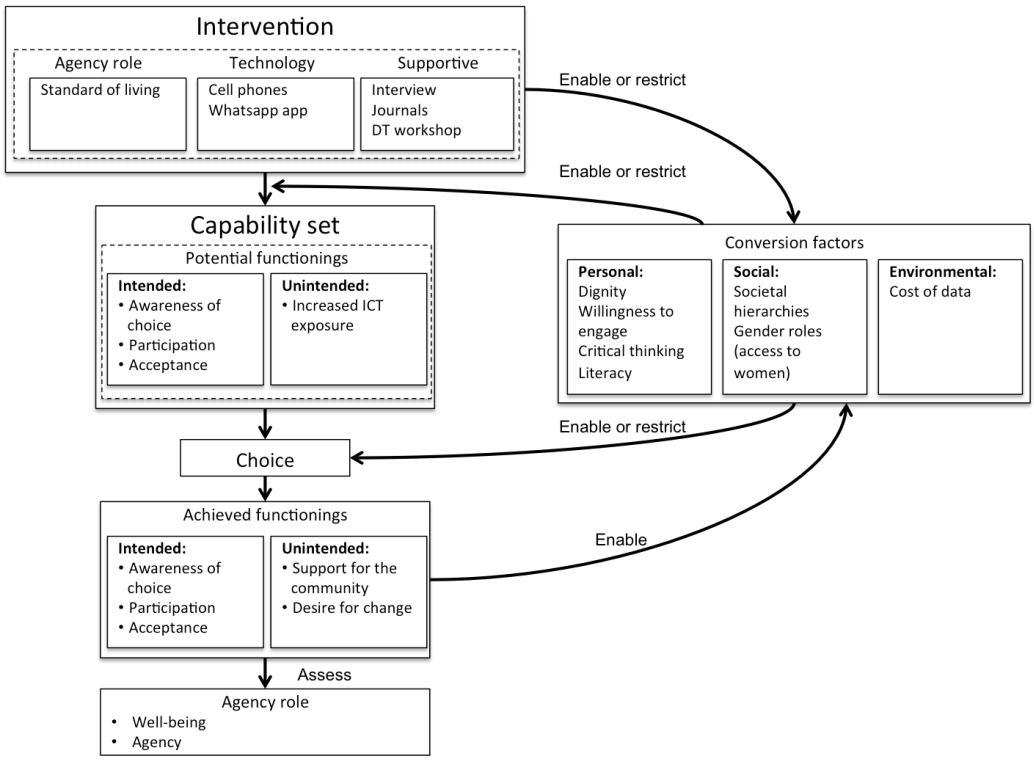

Figure 1: The Study Mapped to the Capability Approach Framework with the Addition of the Agency Role (Grobler & De Villiers, 2014; Hatakka & Dé, 2011)

The extended framework as illustrated in Figure 1 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.

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. ICT4D AND DSR

ICT4D is an interdisciplinary field as an intersection of information systems (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; 2011; Dutton, 2013; Harris, 2016; Heeks, 2008; Kleine & Unwin, 2009; Krauss, 2009; 2013; Maniatopoulos, 2005). Both criticisms have disengagement with the beneficiary community and a lack of understanding their worldview in common (Avgerou, 2011; 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).

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

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, 2012; 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, 2012).

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) (Hookway, 2013). However, the use of DSR in ICT4D research is significantly lacking with ICT4D over focused on evaluating the feasibility of existing technologies than designing new technology solutions (Islam & Grönlund, 2012; Mramba et al., 2016). Examples of ICT4D research where DSR is applied are deploying AMIS, a mobile phone based solution, in rural Bangladesh (Islam & Grönlund, 2012); 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).

5. RESEARCH DESIGN

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). The research design elements are summarised in Table 1.

Table 1: Summary of the Research Design Elements

Ontology	Subjectivism
Research philosophy	Pragmatism
Research approach	Inductive
Theory	Capability approach (Sen, 1999) and the social shaping of technology theory
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
Research question	How should the information needs that are meaningful to women working as domestic workers, be effectively translated through the use of ICT?

DSR and case study research are used as a mixed qualitative 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.

The case study is a research strategy which focuses on understanding the dynamics present within single settings (Eisenhardt, 1989; Myers, 2009). 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 DSR to understand the requirements and evaluate the artefact (Hevner, 2007).

DSR, 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 science methods are used with the research participants to define the information needs they find meaningful and design artefacts following the three DSR cycles namely the relevance cycle, the design cycle and the rigor cycle (Hevner, 2007).

Peffers et al. (2006; 2007) 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.

5.1. Design Thinking

Design thinking methods are used as data collection techniques in the study. 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 in understanding the constraints may lead to unsustainable or unsuitable solutions. The iterative nature of design thinking may also cause challenges when the overall project is a severe time constraint (Brown, 2009).

Additional challenges are identified by Dolak et al. (2013) when they evaluate design thinking against the DSR 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.

The aim of this study's research activities is to apply the guidelines of DSR to the design thinking methods as a contribution to research rigor and quality.

5.2. Research Population

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.

5.1.1. Selection of 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. We selected an urban setting to facilitate regular access to the research participants over the duration of the project. A group of 26 women participated in the study.

Access to participants proved problematic. As an initial tactic, we 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.

5.1.2. 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 is defined as literate women currently working as domestic workers within Region B of the City of Johannesburg. 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.

5.1.3. Selection of the Organisations

A selection of organisations is included in the study to add another perspective to the insights on the current approach to information inclusivity 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.

5.1.4. 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).

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, we used our 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. Ten employees participated in the interviews at the six organisations.

5.3. Research Instruments

This study builds on the foundation of our earlier study working with a group of women in a rural area to determine how to effectively translate the needs of rural women for social support services provided through the use of ICT (Grobler & De Villiers, 2014). The following conclusions are proposed:

- Assess the agency role of the participants at the beginning and conclusion of the study
- Build the appropriate intervention
- Consider the conversion factors
- Define the capabilities applicable to the study and affected through the study

We draw on the findings from the rural study (Grobler & De Villiers, 2014) when we designed this study in an urban context, applied the extended capability approach framework and used the social shaping of technology theory to govern the human-centricity of the resulting framework.

The data collection techniques are design thinking, interviews, self-documentation journals, WhatsApp chat, workshop tools and participant observation. The study aims to discover an effective way of translating information needs of a developing community through ICT following a pragmatist research paradigm.

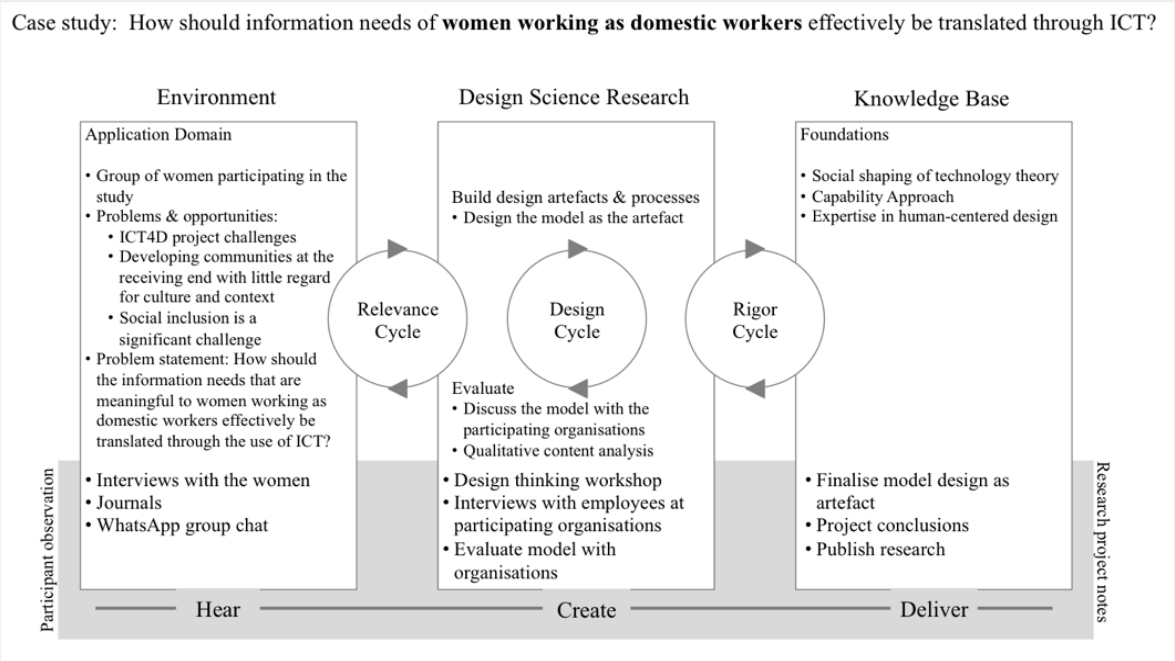

Figure 2: Relationship between Research Design Elements with Reference to Hevner's (2007) **DSR Cycles and the Phases of the Human-Centered Design Toolkit** (IDEO, 2012)

The relationship between the research elements is illustrated in Figure 2 with reference to Hevner's (2007) DSR cycles and the phases described in IDEO's (2012) Human-Centered Design toolkit. The study has three phases and is located in Pretoria and Johannesburg, South Africa, over a period of four months.

The first phase starts with the enrolment of participants from women working as domestic workers using a snowball sampling strategy, aligning on the purpose of the study and directing the participants to self-document their interactions with information in journals. The location of the first phase varies between the homes and workplaces of the participating women. The second phase is the design thinking workshop with the participating group of women. The workshop is at a community venue in Johannesburg centrally located to the workplaces of most of the participating women. The third phase is the interviews with participating organisations selected by using purposive sampling. The interviews focus on their views about information inclusivity, their vision for future interactions with developing communities as represented by the participating women and to test the concept of the framework used in the research project. The interviews are conducted at the employees' offices in Pretoria and Johannesburg. All the interactions and data gathered in the three phases are synthesised to form the outcome of the study.

In addition to the physical locations, a digital meeting place is used through mobile phones using the communication application, WhatsApp, and SMS. We 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. SMS messages are used to communicate to those participants who do not use WhatsApp.

The study participants are the cultural interpreter who assists us, the women working as domestic workers, employees from the participating organisations and us. We explained the roles of the researcher and the participants at the start of the study and lead the discussions supported by the cultural 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. We encouraged active participation and language inclusivity. We rely on our experience as South Africans and our relationship with the cultural interpreter for guidance on the various interactions and for acceptance by the community. An important characteristic of design thinking is observation by the facilitator, in this instant, the researchers. We have to be active listeners and observers, in other words, become the audience, for a successful workshop.

The research instruments are carefully designed to guide the participants in their various roles in the three phases of the study following the principles of the Human-Centered Design toolkit (IDEO, 2012) as aligned with the DSR cycles (Hevner, 2007). The goal is to collect data to support the formulation of answers to the research question of the study applying a human-centered 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.

5.3.1. Hear

The Hear phase (preparation, interviews and observation) guides the researcher through the process of preparing for the research and maps to Hevner's (2007) DSR relevance cycle and the first two steps of the DSR process created by Peffers et al. (2006) namely problem identification and motivation, and objectives of a solution. The Hear phase includes six steps and are fulfilled in the study (IDEO, 2012):

1. **Identify a design challenge**: The primary research question is the design challenge.
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**: Self-documentation and individual interviews are selected as the HCD toolkit methods (IDEO, 2012).
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 first phase of the study is part of the Hear phase. In the first phase, the participants are the group of women working as domestic workers. The research instrument is journals for self-documentation. 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 that the data is accessible 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 will be needed (Calandro et al., 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.

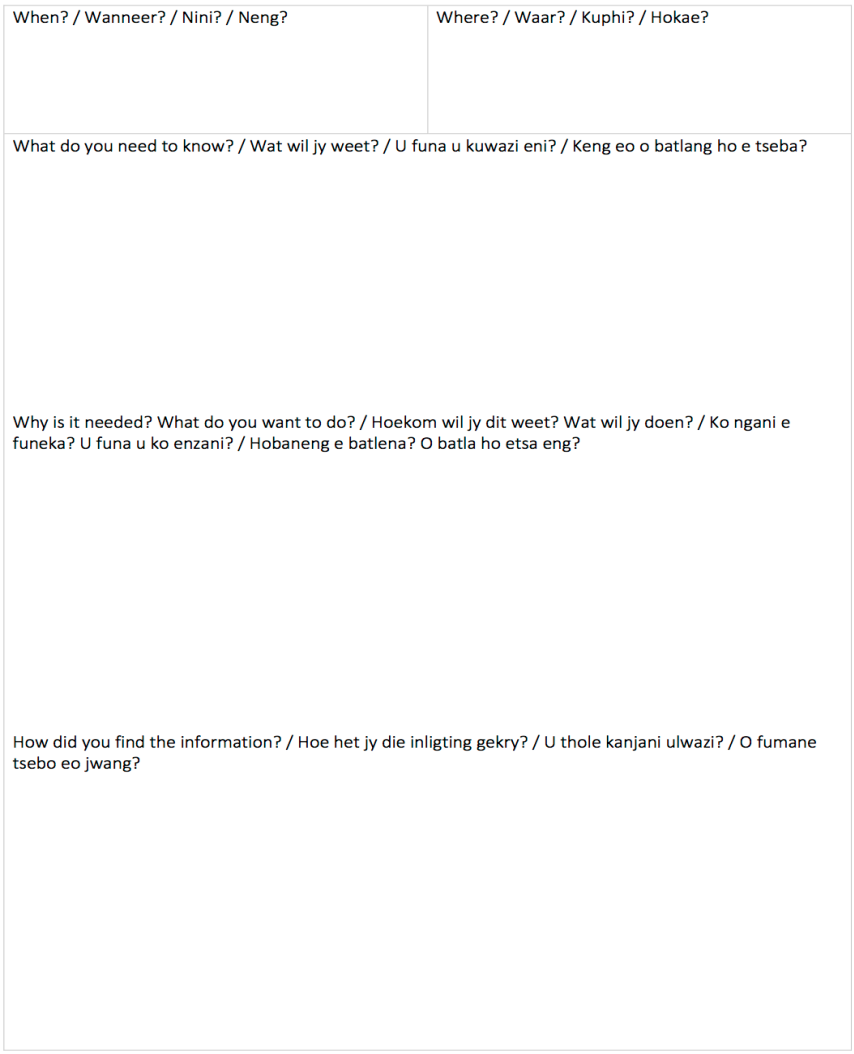

Figure 3: Example of the Guided Journal Pages to Record Interactions with Information

We 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 as an introduction to us and the intention of the research, the participation consent form in duplicate to be signed us, the participant and a witness, notes pages and guided pages as shown in Figure 3 with space to write about what information is needed, why it is needed and how it was resolved. 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. The journal is an A5 size and is given to the participants in a protective sleeve with a pen.

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.

At the beginning of the project during the initial interview, we 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.

The participants used the journals for three to five weeks depending on when the participant joined the project. The journals were returned to us at the design thinking workshop. During the workshop, we asked the participants their thoughts on using the journals. 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".

Some of the participants shared personal details in the journals giving us 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. We reflected about the thin line between researcher and rescuer and are touched deeply by the stories shared in the journals. We experienced the subjectivity of the qualitative researcher.

5.3.2. Create

The next phase of the human-centered design process is the Create phase (workshop and framework prototype). In the Create phase, we facilitate the research participants to distil the collected learning and observations and collaborate in a design thinking workshop in the second phase of the study to co-create frameworks, solutions, opportunities and prototypes (IDEO, 2012) with the resulted prototype evaluated with participating organisations in the third phase of the study. The Create phase maps to the design cycle and the rigor cycle of Hevner's (2007) DSR cycles and steps three to six of the DSR process model as defined by Peffers et al. (2006) namely design and development, demonstration, evaluation and communication.

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 et al., 2014). The seven steps of the Create phase are fulfilled by the study as follows:

1. **Develop the approach**: The design thinking workshop is a co-design workshop that is facilitated by us 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, follow 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) and generate ideas 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.

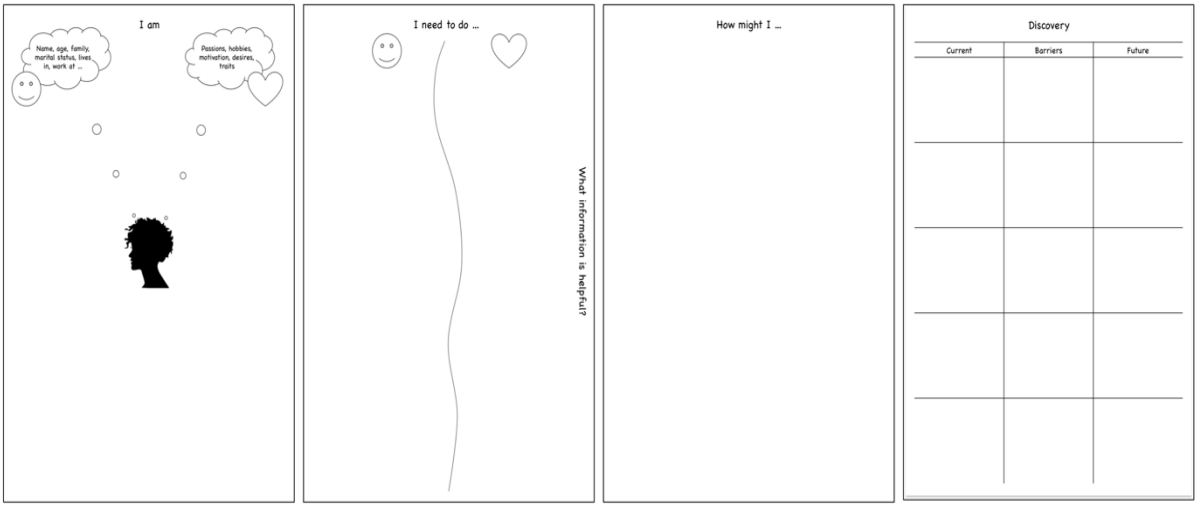

Figure 4: Design Thinking Templates Used in the Workshop

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 4. The opportunity areas identified in the workshop and drawing on the journal content, 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?

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 to use journals.

The research instrument for the third phase of the study is a set of questions to guide semi-structured interviews with the employees of the participating organisations. 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 research project. Reflecting on our experience working with corporate organisations, we know 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, we want 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 purpose of the interviews is to gain insights on the organisations' current approach to information inclusivity and to test the artefact resulted from the engagement with the group of women. 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).

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.

- **Similarity**
  The financial services organisations and the telecommunications organisation apply some of the elements such as running client focus groups to receive feedback about products and services. One of the financial services organisations 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, one of the public sector organisations commented that they feel disconnected from communities. We shared stories from the journals and workshop about the experiences of a low-income person working and staying with her employer in a more affluent area and finding that she cannot afford shopping in the area. She 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 financial services' interviewees commented on the importance of trust and credibility when a new product or service is launched. He mentioned that it is one thing to understand the needs, but quite another thing to help people across the adoption chasm. He saw the framework with the continuous participation of the community playing a role.

The second public sector organisation found 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 expressed interest in the framework and that it will be valuable to them.

Although some of the organisations 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 us that we are working with a hidden population.

5.3.3. Deliver

The third phase of the Human Centered Design process is the Deliver phase (finalise the framework). The Deliver phase maps to the rigor cycle of Hevner's (2007) DSR cycles and step six, communication, of the DSR 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 DSR rigor cycle and communication step of the DSR process model, the framework is completed and documented (Hevner, 2007; Peffers et al., 2006). The steps defined by IDEO's Deliver phase are not relevant for delivering the study's artefact, because the artefact is a framework to improve ICT4D information requirement definition and relevance and delivered through publication.

6. COMMUNITY SHAPING SOLUTIONS FRAMEWORK

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; 2011; Dutton, 2013; Heeks, 2008; Kleine & Unwin, 2009; Krauss, 2009; 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.

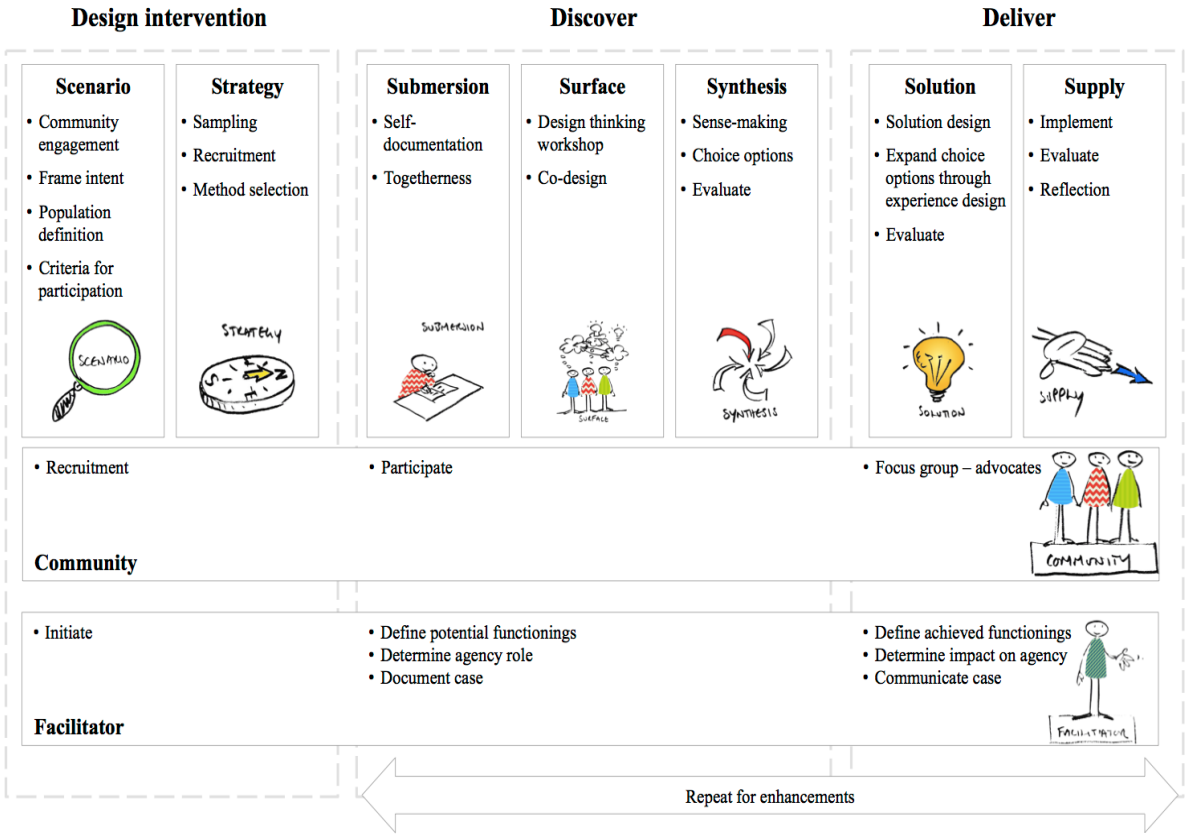

Figure 5: Community Shaping Solutions Framework (CSSF)

The resulting artefact of this project as illustrated in Figure 5 is a social shaping of technology framework inspired by the capability approach, namely the Community Shaping Solutions Framework (CSSF) in answer to the research question: "How should the information needs that are meaningful to women working as domestic workers be effectively translated through the use of ICT?" 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.

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. The narrative of the application of the CSSF is illustrated in Figure 6.

The women participating in the study defined the types of information that they value in the journals as reflected in the opportunity areas, 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 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 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. (2011) 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.

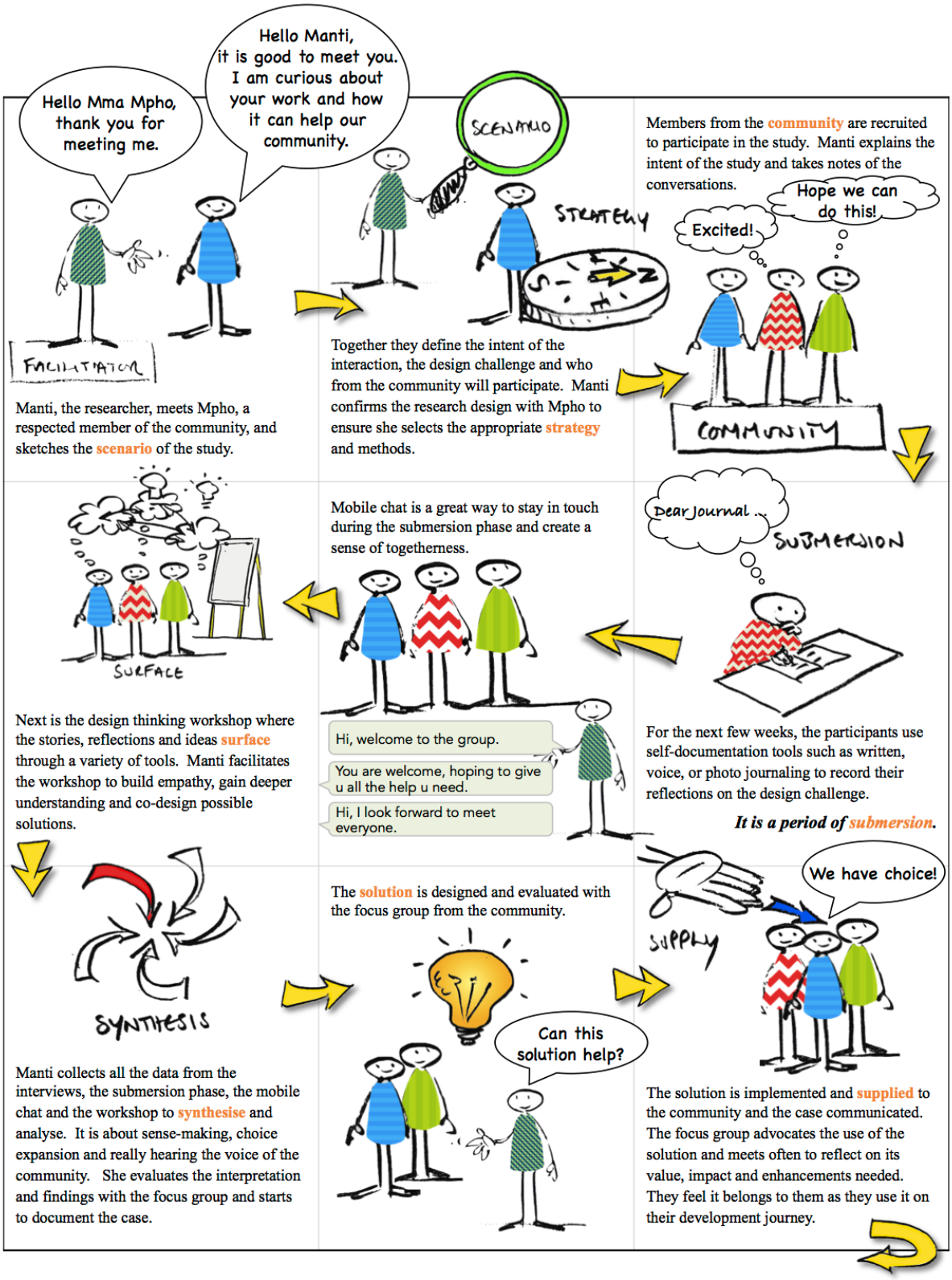

Figure 6: The Narrative of The CSSF

7. CONCLUSION

The research design is directed by the criticism of ICT4D projects as technology determinism and explanatory theories. 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 with the five guiding principles 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; 2011; Kleine & Unwin, 2009; Krauss, 2009; 2013).

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.

Another 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).

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 and the design thinking workshop 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.

8. REFERENCES

Alampay, E.A. (2006). Beyond Access to ICTs: Measuring Capabilities in the Information Society. *International Journal of Education and Development Using Information and Communication Technology*, 2, 3, 4-22.

Alsop, R., Bertelsen, M. & Holland, J. (2005). *Empowerment in Practice: From Analysis to Implementation*. Washington: The World Bank.

Andersson, A., Grönlund, Å. & Wicander, G. (2012). Development as Freedom: How the Capability Approach Can Be Used in ICT4D Research and Practice. *Information Technology for Development*, 18, 1, 1-4.

Atkinson, R. & Flint, J. (2001). Accessing Hidden and Hard-to-Reach Populations: Snowball Research Strategies. *Social Research Update*, 33.

Avgerou, C. (2008). Information Systems in Developing Countries: A Critical Research Review. *Journal of Information Technology*, 23, 3, 133-146.

Avgerou, C. (2011). Discourses on Innovation and Development in Information Systems in Developing Countries Research. In Galliers, R.D. & Currie, W.L. (Eds.). *The Oxford Handbook of Management Information Systems: Critical Perspectives and New Directions* (Chapter 25). New York: Oxford University Press.

Beacham, C. & Shambaugh, N. (2010). Translating Design Thinking for Scientists. In Contreras, D.A. (Ed.). *Psychology of Thinking* (1-15). Hauppauge: NOVA Science Publishers.

Bhorat, H., Goga, S. & Stanwix, B. (2014). Skills-Biased Labour Demand and the Pursuit of Inclusive Growth in South Africa (WIDER Working Paper, No. 2014/130). United Nations University.

Bijker, W.E. (1997). *Of Bicycles, Bakelites, and Bulbs: Toward a Theory of Sociotechnical Change*. Cambridge: The MIT Press.

Britz, J.J. (2004). To Know or Not to Know: A Moral Reflection on Information Poverty. *Journal of Information Science*, 30, 3, 192-204.

Brown, T. (2009). *Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation*, New York: HarperCollins.

Brown, T. & Wyatt, J. (2010). Design Thinking for Social Innovation. *Development Outreach*, 12, 1, 29-43.

Budlender, D. (2010). Decent Work for Domestic Workers (Researched for SERVICES Sector Education and Training Authority).

Calandro, E., Gillwald, A. & Rademan, B. (2014). SA Broadband Quality Drops But Prices R emain High. http://www.researchictafrica.net/polbrf/Research_ICT_Africa_Policy_Briefs/2014_Policy_Brief_4_SA_broadband_quality_drops_but_prices_remain_high.pdf

Chopra, D. (2015). Balancing Paid Work and Unpaid Care Work to Achieve Women's Economic Empowerment. *IDS Policy Briefing*, 83, 1-4.

City of Johannesburg. (2015). About Region B. http://www.joburg.org.za/index.php?option=com_content&view=article&id=172%253Aregion-b&catid=47&Itemid=117&limitstart=1

D'Souza, A. (2010). Moving towards Decent Work for Domestic Workers: An Overview of the ILO's Work (ILO Bureau for Gender Equality Working Paper). International Labour Organization.

De la Harpe, R. (2014). The Level of Participation during the Development of a Mobile Application for Home-Based Healthcare Data in a Developing Context: An Actor-Network Theory Perspective. *South African Computer Journal*, 54, 20-33.

Devitt, F. & Robbins, P. (2013). Design, Thinking and Science. In Helfert, M. & Donnellan, B. (Eds.), *Design Science: Perspectives from Europe* (38-48). Cham: Springer International Publishing.

Dolak, F., Uebernickel, F. & Brenner, W. (2013). Design Thinking and Design Science Research (Working Paper). University of St. Gallen.

Dutton, W.H. (2013). The Social Shaping of Digital Research. *International Journal of Social Research Methodology*, 16, 3, 177-195.

Eisenhardt, K.M. (1989). Building Theories from Case Study Research. *Academy of Management Review*, 14, 4, 532-550.

Goldkuhl, G. (2004). Meanings of Pragmatism: Ways to Conduct Information Systems Research. Paper Presented at the 2004 Action in Language, Organisations and Information Systems Workshop, March 17-18, Linköping, Sweden.

Goldkuhl, G. (2007). What Does It Mean to Serve the Citizen in E-Services? - Towards a

Practical Theory Founded in Socio-Instrumental Pragmatism. *International Journal of Public Information Systems*, 3, 3, 135-159.

Goldkuhl, G. (2012). Pragmatism vs Interpretivism in Qualitative Information Systems Research. *European Journal of Information Systems*, 21, 2, 135-146.

Gregor, S. & Hevner, A.R. (2013). Positioning and Presenting Design Science Research for Maximum Impact. *MIS Quarterly*, 37, 2, 337-355.

Grobler, M. & De Villiers, C. (2014). The Needs of Rural Women for Social Support Services Delivered through ICT: A Field Study in Limpopo Province. In *Proceedings of the 8th International Development Informatics Association Conference* (1-18). Ruimsig: Monash South Africa.

Gurstein, M. (2013). Community Innovation and Community Informatics. *The Journal of Community Informatics*, 9, 3, 1-3.

Harris, R.W. (2004). *Information and Communication Technologies for Poverty Alleviation*. Kuala Lumpur: UNDP-APDIP.

Harris, R.W. (2016). How ICT4D Research Fails the Poor. *Information Technology for Development*, 22, 1, 177-192.

Hatakka, M. & Dé, R. (2011). Development, Capabilities and Technology: An Evaluative Framework. In *Proceedings of the 11th IFIP WG 9.4 International Conference on Social Implications of Computers in Developing Countries*, Kathmandu, Nepal.

Hatakka, M. & Lagsten, J. (2012). The Capability Approach as a Tool for Development Evaluation: Analyzing Students' Use of Internet Resources. *Information Technology for Development*, 18, 1, 23-41.

Heeks, R. (2008). ICT4D 2.0: The Next Phase of Applying ICT for International Development. *Computer*, 41, 6, 26-33.

Heeks, R. (2010). Do Information and Communication Technologies (ICTs) Contribute to Development? *Journal of International Development*, 22, 5, 625-640.

Heeks, R. & Krishna, S. (2016). ICTs and Hope for Development: A Theoretical Framework. *Electronic Journal of Information Systems in Developing Countries*, 77, 4, 1-19.

Herselman, M. & Botha, A. (Eds.). (2014). *Designing and Implementing an Information Communication Technology for Rural Education Development (ICT4RED) Initiative in a Resource Constraint Environment: Nciba School District, Eastern Cape, South Africa*. Pretoria: CSIR Meraka.

Hevner, A.R. (2007). A Three Cycle View of Design Science Research. *Scandinavian Journal of Information Systems*, 19, 2, 87-92.

Hevner, A.R., March, S.T., Park, J. & Ram, S. (2004). Design Science in Information Systems Research. *MIS Quarterly*, 28, 1, 75-105.

Hookway, C. (2013). Pragmatism. http://plato.stanford.edu/entries/pragmatism/

Howcroft, D., Mitev, N. & Wilson, M. (2004). What We May Learn from the Social Shaping of Technology Approach. In Mingers, J. & Willcocks, L. (Eds.), *Social Theory and Philosophy for Information Systems* (329-371), Chichester: John Wiley & Son, Ltd.

IDEO. (2012). Human Centered Design Toolkit (2nd ed.). https://yali.state.gov/wp-content/uploads/sites/4/2015/07/IDEO_HCD_ToolKit.pdf

Islam, M.S. & Grönlund, Å. (2012). Applying Design Science Approach in ICT4D Research: Mobile Phone Based Agriculture Market Information Service (AMIS) in Bangladesh. In Helfert, M. & Donnellan, B. (Eds.). *Practical Aspects of Design Science* (132-143), Berlin: Springer Berlin Heidelberg.

Joseph, M.K. & Andrew, T.N. (2009). Information and Communication Technology Policy Imperatives for Rural Women Empowerment: Focus on South Africa. Presented at the AFRICON 2009, September 23-25, Nairobi, Kenya.

Kleine, D. (2010). ICT4WHAT? Using the Choice Framework to Operationalise the

Capability Approach to Development. *Journal of International Development*, 22, 5, 674-692.

Kleine, D. (2011). The Capability Approach and the 'Medium of Choice': Steps towards Conceptualising Information and Communication Technologies for Development. *Ethics and Information Technology*, 13, 2, 119-130.

Kleine, D. & Unwin, T. (2009). Technological Revolution, Evolution and New Dependencies: What's New About ICT4D? *Third World Quarterly*, 30, 5, 1045-1067.

Krauss, K. (2009). Ethical Research Practice for Community Entry: Using ICT4D in a Deep Rural Context. In *Proceedings of the 3rd International IDIA Development Informatics Conference* (227-243). Ruimsig: Monash South Africa.

Krauss, K. (2013). Collisions between the Worldviews of International ICT Policy-Makers and a Deep Rural Community in South Africa: Assumptions, Interpretation, Implementation, and Reality. *Information Technology for Development*, 19, 4, 296-318.

Latour, B. (1988). How to Write 'The Prince' for Machines as Well as for Machinations. In Elliott, B. (Ed.). *Technology and Social Process* (20-43). Edinburgh: Edinburgh University Press.

Liedtka, J., Ogilvie, T. & Brozenske, R. (2014). *The Designing for Growth Field Book*. New York: Columbia University Press.

Macgregor, G. (2005). The Nature of Information in the Twenty-First Century: Conundrums for the Informatic Community. *Library Review*, 54, 1, 10-23.

MacKenzie, D.A. & Wajcman, J. (Eds.) (1999). *The Social Shaping of Technology* (2nd ed.). Buckingham: Open University Press.

Maniatopoulos, G. (2005). E-Government Movements of Organizational Change: A Social Shaping Approach. Paper Presented at the 4th International Critical Management Studies Conference, July 4-6, Cambridge, UK.

Maree, K. (Ed.) (2007). *First Steps in Research*. Pretoria: Van Schaik.

Meyer, H.W.J. (2002). Information as a Resource for Rural Development. *Mousaion*, 20, 1, 93-108.

Mramba, N., Apiola, M., Kolog, E.A. & Sutinen, E. (2016). Technology for Street Traders in Tanzania: A Design Science Research Approach. *African Journal of Science, Technology, Innovation and Development*, 8, 1, 121-133.

Myers, M.D. (2009). *Qualitative Research in Business & Management*, Thousand Oaks: SAGE Publications.

Noy, C. (2008). Sampling Knowledge: The Hermeneutics of Snowball Sampling in Qualitative Research. *International Journal of Social Research Methodology*, 11, 4, 327-344.

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

Österle, H., Becker, J., Frank, U., Hess, T., Karagiannis, D., Krcmar, H. & Loos, P. (2011). Memorandum on Design-oriented Information Systems Research. *European Journal of Information Systems*, 20, 1, 7-10.

Peffers, K., Tuunanen, T., Gengler, C.E., Rossi, M., Hui, W., Virtanen, V. & Bragge, J. (2006). The Design Science Research Process: A Model for Producing and Presenting Information Systems Research. In *Proceedings of the 1st International Conference on Design Science Research in Information Systems and Technology* (83-106). Armonk: ME Sharpe, Inc.

Peffers, K., Tuunanen, T., Rothenberger, M.A. & Chatterjee, S. (2007). A Design Science Research Methodology for Information Systems Research. *Journal of Management Information Systems*, 24, 3, 45-77.

Rammert, W. (1999). Relations That Constitute Technology and Media That Make a Difference: Toward a Social Pragmatic Theory of Technicization. *Techné: Research in Philosophy and Technology*, 4, 3, 165-177.

RIA. (2016). UPDATE: State of Prepaid Market in South Africa Submission to the Parliament of South Africa on "The Cost to Communicate in South Africa". http://researchictafrica.net/publications/Other_publications/2016_South Africa_Cost to Communicate Submission_RIA .pdf

Robeyns, I. (2003). The Capabilities Approach: An Interdisciplinary Introduction. Paper for the Training Course Preceding the 3rd International Conference on the Capability Approach, September 6, Pavia, Italy.

Robeyns, I. (2006). The Capability Approach in Practice. *Journal of Political Philosophy*, 14, 3, 351-376.

Robinson, O.C. (2014). Sampling in Interview-Based Qualitative Research: A Theoretical and Practical Guide. *Qualitative Research in Psychology*, 11, 1, 25-41.

Roman, R. & Colle, R.D. (2003). Content Creation for ICT Development Projects: Integrating Normative Approaches and Community Demand. *Information Technology for Development*, 10, 2, 85-94.

Sen, A. (1999). *Development as Freedom*. Oxford: Oxford University Press.

Simon, H.A. (1996). *The Sciences of the Artificial* (3rd ed.). Cambridge: The MIT Press.

Sturges, R.P. & Neill, R. (1998). *The Quiet Struggle: Information and Libraries for the People of Africa* (2nd ed.). London: Mansell.

Suri, H. (2011). Purposeful Sampling in Qualitative Research Synthesis. *Qualitative Research Journal*, 11, 2, 63-75.

Tariffic. (2016). The Tariffic Perfect Package Tracker - Q3 2016: #Datamustfall Edition. https://www.tariffic.com/blog/the-tariffic-perfect-package-tracker-q3-2016

The Presidency. (1996). Constitution of the Republic of South Africa Act 108 of 1996. http://www.gov.za/sites/www.gov.za/files/images/a108-96.pdf.

The Presidency. (2000). Promotion of Access to Information Act 2 of 2000. http://www.justice.gov.za/legislation/acts/2000-002.pdf.

The Presidency. (2013). Protection of Personal Information Act 4 of 2013. http://www.gov.za /sites/www.gov.za/files/37067_26-11_Act4of2013ProtectionOfPersonalInfor_correct. pdf.

UN-Habitat. (2016). Urbanization and Development: Emerging Futures (World Cities Report). https://unhabitat.org/wp-content/uploads/2014/03/WCR-%20Full-Report-2016.pdf

United Nations Human Rights Council. (1948). The Universal Declaration of Human Rights. http://www.ohchr.org/EN/UDHR/Pages/UDHRIndex.aspx

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

van Stam, G. & van Greunen, D. (2014). Review of an African Rural Internet Network and Related Academic Interventions. *The Journal of Community Informatics*, 10, 2, 1-16.

Walsham, G. (2012). Are We Making a Better World With ICTs? Reflections on a Future Agenda for the IS Field. *Journal of Information Technology*, 27, 2, 87-93.

Wardoyo, R.J. & Mahmud, N. (2013). Benefits and Barriers of Learning and Using ICTs at Open University: A Case Study of Indonesian Domestic Workers in Singapore. In *Proceedings of the 6th International Conference on Information and Communication Technologies and Development* (215-226), New York: ACM.

Williams, R. & Edge, D. (1996). The Social Shaping of Technology. *Research Policy*, 25, 6, 865-899.