Online service design: A socio-technical perspective to engage an ageing population

by
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DECLARATION

I, Vikki du Preez, declare that the contents of this dissertation represent my own unaided work, and that the dissertation has not previously been submitted for academic examination towards any qualification. Furthermore, it represents my own opinions and not necessarily those of the Cape Peninsula University of Technology.

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ABSTRACT

As online environments become more cost effective, allow for more personalisation and often offer faster solutions, numerous service providers have shifted priority to the development of *online* user interactions. Many perceive this trend as positive, and welcome services that can be accessed online, anywhere, anytime. However, not all members of society favour the shift to online services, and resistance to technology and online services have been documented among ageing individuals. In order to design user interactions for ageing users more effectively, it is imperative to understand the normative changes that impact ageing users' interactions with online services. The exploration of user perception and experience links to both physical and emotional involvement - documenting reactions such as frustration, fear, joy and excitement in relation to online services. The study focuses on the exploration of perceived interaction barriers among South African ageing users, as well as those interactions already perceived as appealing, contributing to new theoretical insights and a description of the socio-technical context investigated in this study.

The study is completed using a constructivist grounded theory method, with qualitative methods focused on user participation and co-design. In addition to the emerging substantive theory of Ageing User Decision-Determined Engagement (AUDDE), the study adds value to online service design practice by developing a deeper understanding of user perceptions and experiences, within a socio-technical context. Findings from the participatory research sessions informed a set of practical service design interaction guidelines, which can inform the design of more engaging online services for the ageing community. Methodologically the study explores the grounded theory method, within a design research framework, and establishes it as a suitable methodology to generate theory through design practice.

Keywords: *Ageing, Interface Design, Service Design, Social Actor*, *Online Services*

GLOSSARY

A list of terms and phrases and corresponding definitions, in relation to usage in this research project and dissertation:

Term or Phrase	Definition, or Theoretical Position
Ageing population	As defined by Population Europe an **ageing population** is defined as 'a population in which the number of elderly (65+) is increasing relative to the number of 20-64 year olds.' The concept is linked to *life expectancy at birth,* as the years an individual would live within a population if mortality rates are continuous. *(Source: https://www.population-europe.eu/Library/Glossary.aspx)*
Double Dance of Agency	Explored from the perspective of Rose and Jones (2005:31) the '**double dance of agency**' refers to the model of agency between users (ageing individuals within the context of this project) and machines (online services within the context of this project): The model proposes that: "…that human and machine agency have different properties, but that the outcomes of their operation are emergent from the process of their interaction (rather than being deter- mined by either); and that these interactions take place under conditions that shape outcomes, but may also be transformed by them." (Source: Rose, J. and Jones, M. 2005. The Double Dance of Agency: A Socio-Theoretic Account of How Machines and Humans Interact. *An International Journal on Communication, Information Technology and Work*. 1(1): 19–37
Double Diamond	The Design Council's model for the design process, mapped into a **double diamond** shape with four sectors, or categories: Discover, Define, Develop and Deliver. Each category moves the design process from divergent to convergent thinking and decision-making. *(Source:http://www.designcouncil.org.uk/news-opinion/introducing-design-methods)*
Development	**Development**, as explored in this project, refers to the stages of conceptualisation within the design process, to reach proposed (visualised) design solutions. It does not refer to implementation, or to the development of software solutions.
Gerontology	The scientific field of study that investigates the biological, psychological, and sociological experiences associated with aging.
Interaction Moment	The interaction space refers to the interaction (agency) of a user, taking into account their personal and situational context and an online service. An **interaction moment**, as proposed in this project, refers to the emotional and psychological reaction as experienced in the moment of interaction (with an online service touch point)
Online services	The definition of **online services** is taken from the work by Crossland, Irving, Glaser, Pollock, Prodromu, Sitaker, and Villa (2008) who defines it as: "An online service, also known under the title of Software as a Service

	(SaaS), is a service provided by a software application running online and making its facilities available to users over the Internet via an interface (be that HTML presented by a web-browser such as Firefox, via a web-API or by any other means). With an online-service, in contrast to a traditional software application, users no longer need to 'possess' (own or license) the software to use it. Instead they can simply interact via a standard client (such as web-browser) and pay, where they do pay, for use of the 'service' rather than for 'owning' (or licensing) the application itself." *(Source: http://opendefinition.org/ossd/)*
Participant Context	**Participant context** refers to the unique experiences and reactions that users and participants have, grounded in their personal, cultural and professional contexts. The consideration of these experiences and reactions within the process aims to establish an approach, with greater empathy, to yield more revealing research results.
Service Design	As defined by the Service Design Network (2014): "**Service design** is the activity of planning and organizing people, infrastructure, communication and material components of a service in order to improve its quality and the interaction between service provider and customers. The purpose of service design methodologies is to design according to the needs of customers or participants, so that the service is user-friendly, competitive and relevant to the customers" *(Source: http://www.service-design-network.org/intro/)*
Sociotechnical Systems	**Sociotechnical system** (STS) refers to an approach within organizational structures that acknowledges and explores the interaction between people and technology in workplaces. Within this project STS is used to explore the complex nature of interaction between users and technology. The aim is to understand the human-technology relationship in a more holistic manner, and aid in the exploration of the evolving role of the user within the interaction.
Social Actor	Drawn from King and Lamb's (2003:197) description of users as individuals who use ICT, extensive or limitedly in: "multiple applications, in various roles, and as part of their efforts to produce goods and services while interacting with a variety of other people, and often in multiple social contexts." By considering the user as a **social actor,** the larger context of an individual's actions, behaviours and responses as part of a social entity becomes relevant. This enables us to "more accurately portray the complex and multiple roles that people fulfil while adopting, adapting, and using information systems." *(Source: Lamb, R. and Kling, R. 2003. Reconceptualizing Users as Social Actors in Information Systems Research. MIS Quarterly. 27 (2): 197–236)*
Touchpoints	As a user moves through a service (including online services), they connect in a physical or virtual way with the service. The connection can be an interaction with a human or with an artefact or system. These points of contact between a user and the provider of the service are referred to as **touchpoints.**

Universal Design	As defined by Universal Design: "**Universal Design** involves designing products and spaces so that they can be used by the widest range of people possible. Universal Design evolved from Accessible Design, a design process that addresses the needs of people with disabilities. Universal Design goes further by recognizing that there is a wide spectrum of human abilities. Everyone, even the most able-bodied person, passes through childhood, periods of temporary illness, injury and old age. By designing for this human diversity, we can create things that will be easier for **all people** to use." *(Source: http://www.universaldesign.com/about-universal-design.html)*
User-centred Design	**User-centred Design** (UCD) is a term coined by Donald A. Norman (2013) that refers to a holistic design and development process with user-centred activities. The goal is to create applications and products that are easy to use and are of added value to the lives and experiences of users. *(Source:* Norman, D. 2013. *The Design of Everyday Things*. Revised Edition. New York: Basic Books
User Interface Design	**User interface design** refers to the development and design of online services (websites) with the focus on the user's experience and interaction.

ABBREVIATIONS

AiP	Age-in-place
CoGT	Constructivist Grounded Theory
GT	Grounded Theory
ICT	Information and Communication Technology
SD	Service Design
TC	Theoretical Code (family/ families)
UX	User Experience

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1.1 An Introduction

This thesis explored the design characteristics of online services, as experienced by an ageing South African population (as observed in the Western Cape, South Africa). The project identified user perceptions regarding online services, as well as design barriers to engaged participation. The role of ageing users, as social actors within moments of interaction, was mapped to propose a trajectory of the agency of both future aged users, and future services.

The project was grounded in the understanding that the world is ageing. The Population Reference Bureau (PBR) estimated that the global population of ageing individuals will increase from 1.1 Billion in 2014, to 2.4 Billion in 2050[1]. As a result of longer life expectancy and lower fertility rates the global population under 20 is declining while the population over 60 is increasing (Bai, 2014:231). Although Africa is still a youthful continent in global terms, an emerging ageing population can be noted (Guzmán, Pawliczko, Beales, Till & Voelcker, 2012:21).

	Life Expectancy at Birth (years)			
	Both Sexes 1970	Both Sexes 2013*	Males 2013*	Females 2013*
WORLD	58	71	69	73
MORE DEVELOPED	71	79	75	82
LESS DEVELOPED	55	69	67	71
LESS DEVELOPED (EXCL. CHINA)	51	67	65	69
LEAST DEVELOPED	44	61	60	62
AFRICA	45	59	58	60
SOUTHERN AFRICA	53	59	57	60
Botswana	55	47	48	47
Lesotho	49	44	42	45
Namibia	53	64	62	67
South Africa	53	60	58	61
Swaziland	48	49	50	49

Figure 1.1: Estimated Life Expectancy from 1970 to 2013
Source: Population Reference Bureau, 2014: 13 & 14

Changes noted within the ageing population are both physical and cognitive. Physically, changes can be mapped by examining key indicators including: the cardiovascular status, bones, joints and muscles, digestive system, bladder, skin and urinary tract. Cognitive abilities (as linked to orientation, memory, executive function and language) also begin to deteriorate. Sustained cognitive function, when ageing, can rely on socioeconomic status,

[1] This estimate assumes that birth rates will decline smoothly in all African countries in much the same way as birth rates declined in other regions

illness and health status, social coherence and social contact, as well as overall healthy lifestyle choices (Peltzer & Phaswana-Mafuya, 2012:157). Social isolation and loneliness are serious problems that the ageing population encounters. More people are living by themselves, and online services may offer support for these users to engage with and communicate with society (Independent Age, 2010:4). Physical deterioration can make shopping or standing for longer periods of time uncomfortable, or even impossible.

As technology and online services become more prolific, many basic services, such as offered by banking, municipal and retail institutions, have invested in the development of web-based commerce and interaction. The result for many individuals has been a more convenient and efficient way of exploring and buying services and goods. The convenience of digital social networks and online communication services has also played a role in the way in which many individuals choose to communicate in their professional and personal capacities.

As online environments become more cost effective, online services allow for more personalisation, and technology offers faster and more powerful solutions. Many services have shifted priority to *online* user touchpoints rather than traditional physical touchpoints. The potential of online services moves beyond convenience. Research has shown that those with mobile impairments can more easily use online services (Charness & Boot, 2009:253). Relatives and friends who live far apart now also have access to technology that allows them to communicate. However, not all members of society favour the shift to online services, and resistance to technology and online services has been documented in ageing individuals. Damodaran, Olphert and Phipps (2013:34) describe the ICT challenges they noted among ageing individuals as:

> Typically, these include lack of confidence and fear of using ICT's, the absence of adequate support, varied provision and quality of ICT training, the high cost of training, memory problems, problems with understanding technical jargon and dealing with pop-ups and Spam. Some of these barriers reduce in impact with growing familiarity with ICT's but some persist, for example, problems with updates, viruses, poorly designed software and hardware, inadequate support, and difficulties with finding on-going ICT learning provision (i.e. intermediate courses).

The link to the design of software (visual communication and interaction) plays a significant role in the development of online services. Online services are found in a number of sectors including (but not limited to):

- Communication services: e-mail, instant messaging, Skype.
- Civil Services: governmental, municipal, tax services, etc.
- Social and networking services: Facebook, blogs, etc.
- Commercial services: banking, shopping, etc.
- Information services: news, weather, topic-specific information.

These services allow users the opportunity to connect to, share and participate in social, civic and commercial activities. Given the potential population sector of ageing individuals, online services should consider these individuals in the design process of services. Service Design (SD), as a discipline, is a growing field that encompasses areas of design, organisational theory and practice, ICT and many others. The evolution of SD can be ascribed to many influences, including the rise of services as part of national economies, the rise of user-focused practices in design and development, and an increase in multi-disciplinary, inclusive design practices. The intense experience-focused natures of services have led to the development of service dominant logic (Vargo & Lusch, 2008), which focuses on the role of the user in the development of business practice and public policies.

Service Design shares core values with established design practices, such as User Centred Design practice[2] and Universal Design[3]. Karat (1996:18) described User Centred Design as: "…an iterative process whose goal is the development of usable systems, achieved through involvement of potential users of a system in system design." Even though this is a very basic description it does contain the key influential factors of iteration, system processes and involved users. These factors greatly impact on the design of contemporary products, graphics, ICT solutions and services while highlighting challenges within user diversity (Maunder, Marsden, Gruijters, & Blake, 2007). Universal Design is a design approach that extends the focus on user involvement, and User Centred Design, to create environments, objects, and systems that can be used by as many people as possible. The practice is based on seven guiding principles:

- Equitable Use - The design is useful and marketable to people with diverse abilities.
- Flexibility in Use - The design accommodates a wide range of individual preferences and abilities.
- Simple and Intuitive Use - Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.
- Perceptible Information - The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.
- Tolerance for Error - The design minimizes hazards and the adverse consequences of accidental or unintended actions.
- Low Physical Effort - The design can be used efficiently and comfortably and with a minimum of user fatigue.
- Size and Space for Approach and Use - Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility.

(Centre for Excellence in Universal Design, 2012).

[2] "UCD is a design philosophy that emphasizes the importance of considering the end user's needs, goals, and desires when creating products or services" (Putnam, Rose, Johnson & Kolko, 2009: 51)

[3] The term "Universal Design" has evolved from "Barrier Free Design", "Accessible Design", "Transgenerational Design", and "Adaptable Design". It is now considered to be synonymous with "Design for All" and "Inclusive Design." (Universal Design, 2013)

The user-focus highlighted within User Centred Design is mirrored within Service Design methods, making it appropriate for use in the exploration of contextually relevant interface solutions for an ageing population. Charness and Boot (2009:255) noted:

> …Increasingly, human factors and ergonomics specialists have argued that attention needs to be paid to age-related changes in basic human abilities, to ensure that the demands made by the technology fit the capabilities of the user. Technology redesign and user training are critical tools to ensure a better person–technology fit.

Designing for differently abled users, and potentially ageing users, is a complex process, which can become time consuming and costly. This situation is intensified, the more diverse the user group is. In South Africa, ageing users come from vastly different cultural and ethnic backgrounds, with 11 national languages and ranging literacy levels (Van Niekerk, 2013). Added to this diversity, access to technology is not consistent, and literate users in South Africa display varying levels of information and digital literacy (Statistics South Africa, 2011). Many users who do have access, but feel insecure, show a disinterest in engaging with new technologies. Interest in the potential benefit of using technology is crucial to technological adoption (Ellis & Allaire, 1999; O'Brien, Olson, Charness, Czaja, Fisk, Rogers & Sharit, 2008). Research from the Pew Research Centre (2014) revealed that among American users, aged 65 and above, who have access to technology, two separate groups emerge:

> The first group (which leans toward younger, more highly educated, or more affluent seniors) has relatively substantial technology assets, and also has a positive view toward the benefits of online platforms. The other (which tends to be older and less affluent, often with significant challenges with health or disability) is largely disconnected from the world of digital tools and services, both physically and psychologically.

It is imperative to identify the views of ageing users in relation to online services, and explore potential barriers to engagement and interaction. This exploration also aimed to identify ageing users who already embrace technology and online services to establish their perceptions and identify the elements of interaction that they find engaging. The study took into account not only personal experiences with online services, but also the participants' access to technology and how long they have been active online.

1.2 Statement of Research Problem

In 2012, 6% of the African population was over 60, and that was projected to increase to 10% by 2015 (Barry, McGwire & Porter, 2015). In South America, Asia and America more than 24% of the population would be over 60 by 2015. These numbers reveal a substantial population sector which could benefit from online services. In order to design more engaging interactions for ageing users, it is imperative to understand the normative changes that impact ageing users' interactions with online services (Czaja & Lee, 2007).

The aim of this thesis is to explore user perceptions and cognitive changes experienced by ageing individuals when using online services to identify areas for design development, and to encourage a more user-centred approach when designing user interactions. The exploration of user perception and experience will concentrate on both physical and emotional involvement (documenting reactions such as frustration, fear, joy and excitement in relation to online services). The study will not explore all aspects of cognitive decline, but will rather focus on participants' views on the role of memory within online service interactions. This draws on research done by Buse (2010) and Damodaran et al. (2013), in which memory was a prominent focus area for ageing participants, when discussing potential barriers to ICT participation.

Through the Service Design process the perception of an ageing population in the Western Cape of South Africa will be investigated. Participants will determine the focus areas of the project through collaborative sessions to ensure that the evolution of the process, and research direction, is in line with participant views.

1.3 Objectives of the Research and Research Questions

The research aims to add value to the design research process, as well as the field of gerontology, by developing a deeper understanding of user perceptions and experiences within a socio-technical framework. The identification and exploration of interaction barriers (as well as the exploration of active online interaction of ageing users) contributed new insights and design considerations within the field of Service Design to enable more engaging online services for the ageing population.

The main objective of the research was to understand the perceptions of an ageing South African population regarding online services. The project responded to a knowledge gap in that designers do not have evidence to explain why many ageing individuals do not actively engage with online services, which offer them greater convenience, independence or connectivity. The study developed a substantive theory exploring the key barriers to interaction, through user insights and experiences. It explored the impact that interface design has on the democratisation of online services, whilst encouraging deeper participation. There is a need for service design specific theory (separate from other forms of service theory) in order to allow the body of knowledge to develop. (Keating, Gregor and Theodoulidis, 2013: 751) views service design theory as applicable to the real world and: "…a special case of traditional theory that allows for both explanation, prediction and testing of propositions".

This study addressed three main research questions, which respond to the knowledge gap identified and the need for service design theory. The practice of exploring these questions, and the emerging research findings, are, however, interrelated.

Main Research Questions:

1. What are the constructs, propositions and definitions that explain the online service interaction of an aging individual within a socio-technical context?
    a. What are the online service experiences and perceptions of the ageing population?
    b. How do peers perceive and define an ageing individual using online services?
    c. How can an ageing user be defined within a socio-technical context?
    d. Which design factors influence online service engagement among ageing users?
2. How can theory be constructed through participation of the target group, using a service design thinking approach?
3. What are the characteristics of an online service, designed to include the perceptions of an ageing population?

1.4 Ontological and Epistemological Framework

This project focuses on understanding the perceptions, views and context of users within the ageing population to determine accelerants and inhibitors to online service usage. To generate the data required, to identify and explore patterns of usage, as well as document individual experiences, an interpretivist approach will be used. An interpretivist approach is rooted in the sociologist theories of Max Weber[4], which explore the 'meaning of social action' and the elements, and effects, of human behaviour and meaning-making. Chowdhury (2014) defines interpretivism as a research approach which is based on the concept that "people's knowledge of reality is a social construction by human actors". Chowdhury's reference to *social construction* is critical as it speaks to the 'constructed' nature of the project methodology, Constructivist Grounded Theory. The methodology is introduced and detailed in Chapter Three. From an ontological perspective, it is important to clarify that the method is not in conflict with an interpretivist research approach. Goulding (1998:15) argues that grounded theory, as a methodology, represents an "interpretivist mode of enquiry" which is grounded in human emotion, expression and behaviour. Glaser, one of the original developers of the method, maintained that data gathered through grounded practice represent an objective view. However, Charmaz's (2006) constructivist version of grounded theory holds that an individual's experience helps construct his or her understanding of reality. By doing research in this manner the researcher becomes a part of the analysis of experiences, as well as of the 'sense-making' process. A clearer differentiation between 'truth' and 'reality' in constructivist grounded theory is offered by Charmaz (2014: 272-273):

> The constructivist approach does not seek truth – single, universal, and lasting. Still, it remains realistic because it addresses human realities and assumes the existence of real worlds…the constructivist approach assumes what we take as real, as objective knowledge and truth, is based upon our perspective…thus the grounded theorist constructs an image of reality, not the reality – that is, objective, true, and external.

The goal of this study is thus to gather the real-world experiences of ageing individuals (their perceptions, emotions, needs and challenges) and, through a methodical process of

[4] Explored in *The Nature of Social Action*, 1922

coding and analysis, present a theory to explain the collective experience. By drawing on individuals' real-world experiences, and making sense of them within a social construct, the study reflects Chowdhury's (2014) definition of interpretivism.

Klein and Myers' (1999) principles for interpretive studies within information systems will form an integral part of critically reviewing the nature of data collection and how meaning is made. Niehaves (2007) proposed a broader potential for the concepts behind Klein and Myers' seven principles, as detailed below:

- All human understanding is achieved by iterating between considering the interdependent meaning of parts and the whole that they form.
- Critical reflection of the social and historical background of the research setting is required, so that the intended audience can see how the current situation under investigation emerged.
- Critical reflection is required on how the research materials (or 'data') were socially constructed through the interaction between researchers and participants.
- The idiographic details revealed by the data interpretation need to be related to theoretical and general concepts that describe the nature of human understanding and social action.
- Sensitivity to possible contradictions between the theoretical preconceptions guiding the research design and actual findings is required.
- The researcher must be sensitive to possible differences in interpretations among the participants, as expressed typically in multiple narratives or stories of the same sequence of events under study.
- There must be sensitivity to possible 'bias' and 'systematic distortions' in the narratives collected from the participants.

These principles are not in contradiction with the constructivist grounded theory method, which promotes the iterative process between reviewing the emerging theory, and returning to the original data. Patterns within the data will be identified to investigate whether the individual experiences can be consolidated into a framework for enhanced interaction. These interface characteristics will aim to engage users and allow for active learning and knowledge production. It is my goal to address the individual, as a unique learner and social actor, in this study using an interpretivist method of inquiry that allows for personal narratives to be captured as data. The project will explore the construction of knowledge and meaning of both the participant group, and me.

1.5 The Role of the Design Researcher: Approach and Contribution

Following on from the ontological and epistemological framing, the duality of being a designer-researcher must be established. This section is presented from a more narrative perspective as it reflects the core impetus that drove my topic selected and my approach.

The exploration of theory construction in this study aims to contribute to the service design body of knowledge, as well as uncover practical design considerations. I have always been fascinated by the encounters between individuals and technology, and knew I wanted to contribute insights into a user group that is often excluded from initial research activities when developing online services. Research is a key part of the design process. Seeking information and exploring the problem *context* is crucial throughout the design process to ensure the resulting service or artefact meets the needs of the end-user in a sustainable manner. However, in many design processes the research is focused specifically on the problem at hand, and is aimed towards an applied solution. For the ageing community, this meant that many online service development processes did not include their needs, perceptions and experiences as part of the initial *context* mapping. Design practice should unite the designers, stakeholders and end-users in an explorative activity aimed at bringing to the surface challenges, opportunities and behaviours, towards a clear problem definition and solution (Beck, Weber & Gregory, 2013:646).

Understanding behaviour itself is also a benefit in itself as it reveals patterns and principles that affect possible design solutions. A designer needs to remain open to new ideas and observe behaviour with as little bias as possible, leading to a more nuanced understanding of context. Users should play a decision-making role in the design process (Lee, 2008:33). Observations help designers understand in a more personal, first-hand manner instead of trying to conceptualise service solutions based on assumptions. But observation, and similar qualitative research methods, are time-consuming and resource dependant. The exploration of behaviour offers designers the possibility of gaining empathy through a greater understanding of what motivates individuals. As a designer, I focus on building empathy with individuals who collaborate in the design process, acting as facilitator and guide towards a co-created solution. The process of working in a participatory manner gathers many insights, narratives and stories, yet much of this is lost during the development and prototyping phases if not captured in a methodical manner. This is possibly due to a design process having a specific focus which serves as a guide when establishing relevance of information gathered in order to identify a solution. The ability to extract research from the design process has inspired many, and is imbedded in the act of designing. The opportunity to gain greater understanding, empathy and insights from the design process is realised through practice-based research. The writings of Vaughan (2017:10) provide a clear description of the importance of practice in design research:

> Designer-practitioner-researcher' can be the title or description of an individual, their work role, or their understanding of the integration of these various aspects of their professional work. Like a molecule chain, this title can be read left-to-right or right-to-left, but at the centre of 'designer' and 'researcher' is, in effect, practice.

When engaging with communities and individuals during the design process, I have always found myself thinking of the benefit of capturing information and narratives gathered - building towards a greater understanding that can inform practice and

research in subsequent investigations. How can the theoretical body of knowledge of design be expanded to underpin the mapping and continuous investigation of contexts? This question drove my desire as a designer-researcher to explore methods of theory construction for design, through design. Both theory and applied design solutions are important achievements in research through design (Vaughan, 2017:94). The challenge I experienced while formulating my research objectives was understanding the process of moving from research to inform practice, to research as a process to underpin theory. When seeking different perspectives on production of theory within the design framework, I found inspiration in the work of Zimmerman and Forlizzi (2008:43), who described a *grounded* approach to design research:

> In taking a grounded approach, design researchers focus on real-world problems by making things that force both a concrete framing of the problem and an articulation of a specific, preferred state that is the intended outcome of situating the solution in a context of use.

The grounded nature of design research which they propose could help facilitate a contextual overview of the complexity of a design challenge, whilst also offering insight to the real-world application being proposed (Zimmerman & Forlizzi, 2008:44). Through a grounded design research approach, theories could evolve and offer insight to other designers and researchers, contributing to a design theory discourse (ibid). Grounded theory methods can provide the researcher with the tools and the capacity to gain a clear understanding of a phenomenon through iterative analysis and coding, until categories emerge from the data to reveal insight and an emerging theory (Beck et al., 2013:638). As the approach and theoretical nature of the study became clear, I reflected on the influence that my role as a designer could have within the project, and what the unique contribution of a designer-researcher could be[5].

I established that my role as designer offered me the opportunity to reflect critically on the process of theory construction for design. I was also able to develop, in an iterative manner, the methods and tools used in this project, in order to acknowledge the context and feedback of participants. This project does not represent a traditional research-through- practice approach, as it hopes to contribute, through research, to design theory with respect to service design practice.

1.5.1 The relevance to service design

Within *service design* practice it is crucial to gain insights from end-users to ensure the service meets their needs. Within the field of Human Computer Interaction (HCI), the conceptualisation of services offers end-users exciting opportunities within their everyday lives:

> …researchers not only to focus on evaluating current technology, but also to investigate how future products and services might affect people. This reduces the risks of making new technical systems that fail and increases the likelihood of discovering new

[5] My role as the researcher is further explored in the introduction to Chapter Three.

> opportunities for technology that adds value to people's lives (Zimmerman & Forlizzi, 2008:41-42).

The need to understand how a service will impact an individual's behaviour and everyday activities is critical as it forms the foundation for future service innovation. This study aims to contribute to the field of *service design* theory, practice and findings. The theory contribution relates to ageing individuals' engagement online and the perceptions that shape their willingness to engage. The theory is constructed from data gathered and analysed through a grounded theory methodology which provides the structure and guidelines for theory emergence. The data are generated through collaboration with ageing users in participatory workshops and individual interviews during which they share their experiences and thoughts. The data reflect not only experiential content but also practical design considerations and principles to create more engaging online services for ageing users. The various contributions are detailed and explored in the following sections and chapters:

- Theory contribution (introduced in *Theory of Ageing User Decision-Determined Engagement (AUDDE)* in Chapter Five, concluded in Chapter Seven)
- Contribution of practical interface principles to create engaging online services for ageing users (detailed and concluded in Chapter Six)
- Grounded theory methods and approaches to construct theory from design and *service design* practice (concluded in Chapter Seven)

1.6 Introduction to Research Design

This is a Grounded Theory study[6]. Primary research will be conducted using interviews and participatory workshops to establish a grounded theory, which contributes to a socio-technical perspective of a service experience. The Double Diamond (Figure 1.5) is a design process model that is often associated with service design. The model is similar to design thinking models in that it proposes an iterate progression between divergent and convergent thinking (as well as creative and analytical thinking) to address creatively user needs or a design problem.

The methodological progression of this project, explored in Chapter Three and Four, is based on an adapted version of the Double Diamond (The Design Council, 2015), using three cycles (or diamonds) to move through the discover, define, develop, deliver, discuss and document phases (Figure 1.2).

[6] Grounded Theory is introduced in detail in Chapter Three.

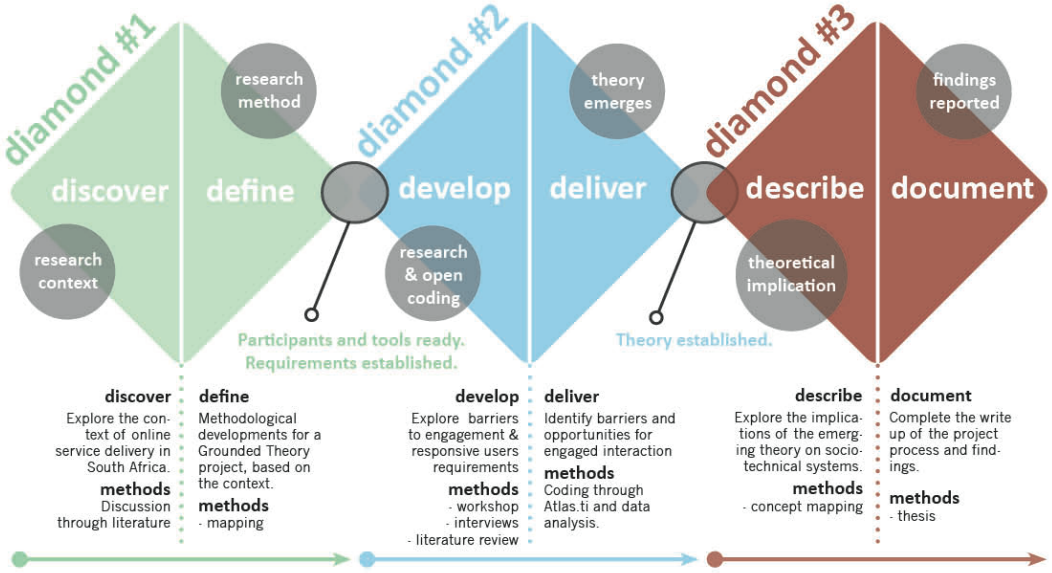

Figure 1.2: The Triple Research Diamond Model
Source: Adapted from the Double Diamond (Design Council, 2015)

Although pre-developed, the methodology was proposed as a departure point and was evaluated and evolved throughout a co-design process with participants, to reflect their experiences and reflective adaptations. A key aspect of grounded theory studies is the requirement to adapt methods based on findings and participants' experiences of the research process. Each phase of the methodological progression in the present project represents either divergent thinking (collaborative activities with users to explore context) or convergent thinking (analysis of data and coding to establish a processed dataset and core code group for the next phase). As part of the conclusion to the study the benefit of viewing grounded theory construction as an iterative process of divergence and convergence is explored as a contribution to the body of knowledge. Data generation and analysis was thus iterative and simultaneous (as is traditional in grounded theory). This allowed for findings to be questioned by users throughout the process, allowing for active participation. This aspect of the proposed model allows for great user input while minimising subjective findings and bias.

1.6.1 Grounded Theory introduction

Grounded theory (GT) is a methodology that supports empirically based theory development. GT was originally introduced by Glaser and Strauss in 1967. Subsequent to this a second variant of GT was presented by Strauss and Corbin in 1990, which caused an acrimonious split between Glaser and Strauss (1998). A third variation was presented by Charmaz, referred to as Constructivist Grounded Theory (CoGT). GT projects rely on an iterative and simultaneous process of data collection, coding, category development and data comparisons. Once core categories emerge from the analysis, key theoretical elements become discernible as well. Charmaz's version of the methodology, emerging in the 21st century, departs from the previous versions in that it puts forward the premise that theory or knowledge cannot take shape in a purely objective manner. Instead, theory

is constructed through the interaction of the researcher and research participant (Charmaz, 2000; 2006; 2008; 2009). A complete introduction to GT and a discussion of the suitability of the methodology in relation to this study is explored in Chapter Three.

1.6.2 Research design and methods

The importance of methods in this project was to explore the socio-cultural contexts of participants, processes, and meanings within cultural systems. In this study the following research methods were used to generate primary data:

- **Interviews:** 13 participants, aged between 65 and 85 years, were interviewed as individuals to establish personal context and attitudes. Interview styles varied from structured discussions to semi-structured interviews (when exploring usage and personal context). Each interview was between 1 hour and 1.5 hours per participant. From interviews transcripts were generated to be analysed.
- **Observations:** During interviews participants were observed and their experiences documented using research memos. Non-verbal cues were noted as well as physical access to devices and the nature of their interaction with their devices. Notes regarding environmental and gesture observation (produced by researcher) were generated to be analysed.
- **Workshops 1:** Two workshops were held as part of the study. The first was conducted with 7 individuals and the second with 8 individuals. Individual workshop groups comprised between 3 and 5 members, with a dedicated group facilitator to guide the process and observe group members' contributions. Groups that have too few members may not yield sufficient discussion and data, while larger groups may intimidate participants, or allow non-contribution by individual members (Finlay, 2013:7). Each group was assisted by a facilitator. From the workshop transcripts of group discussion and physical workshop materials (produced by participants) were generated to be analysed.

To investigate the perceptions and behaviour of participants, in relation to online services, the selected methods offered the researcher an opportunity to observe social systems, and to capture individual users' responses to the physical environment, as well as interactions and responses that have meaning to participants.

Additional material (in the form of memos) were generated throughout the data analysis and theory development process.

1.6.3 Data analysis

Throughout the process of this study, data were generated, patterns identified and findings integrated into the next research activity. Data analysis was conducted in line with the grounded theory methodology. The cyclic nature of this practice aims to eliminate bias or assumptions. Atlas.ti was used as assistive software to enable extensive coding and categorisation of data[7]. Throughout the process of coding, emerging themes were noted and analysed through written memos and voice notes.

[7] Atlas.ti is introduced in Chapter Four

The research process explored how participants 'learn' (or wish to learn) and experience online services. These aspects were viewed through a phenomenographic lens that allowed for an analysis of experiences of others. Through the cyclic analysis of data, and phenomenographic review, a multifaceted account of the data can be described, using a layered analysis process for all methods of qualitative data generation.

1.6.4 Delineation of the research

Access to online services among the ageing community within South Africa is variable; thus the study will focus on literate participants who have direct (personal) or indirect (shared) access to the Internet and online services. As there is limited research available that explores user perceptions of ageing individuals regarding online services, this study will provide a broad exploration of the context, in order to create a foundation from which further, more specific, aspects can be investigated.

The study does not aim to explore problems with connectivity, nor Internet penetration within South Africa, focusing rather on the perceptions and interactions of users who have access but choose not to engage - or do engage. For the purpose of this study participants will range from 65 years of age to 85 years of age. Research will be limited to the Western Cape region (Cape Town and surrounding areas).

An early discussion with one participant identified the range of services that she believed were relevant to ageing users[8]. As the level of adoption among participants would not be known until a research engagement began, the range of services identified were used as a departure point for the development of questions and research materials. The range was not seen as complete or final, and rather provided an initial understanding that evolved throughout research engagements with participants. The initial service types that she identified related to services which allowed her to stay in contact with others (usage of e-mail services, as well as Skype and social media), services which help her do shopping (retail services) and do business (banking services as well as online services that allow for booking of flights and buying of tickets).

Ageing users engage with online services through service touchpoints. These interactions represent agency on the parts of both the user and service side – agency here is defined as acting in a way that produces outcomes. Both the user, as social actor, and the online service shape the interaction. The latter is informed by momentary emotional actions and reactions of the user, his or her interpretation and decision making, as well as the technology enabling the online service. These interaction moments (Figure 1.3) construct the process of agency and are influenced by the properties of agency and the conditions that influence it (double dance of agency) (Rose & Jones, 2005: 28).

[8] The participant was 'Victoria'. Participant details, coding and anonymity of participant is detailed in Chapter Three.

The interaction frame (indicated as a dotted line in Figure 1.3) represents the touchpoints or medium through which a user can engage with the service. A common example of this would be the user-interface design. Behind these touchpoints one finds 'machine' agency which reflects the processing of information and other tasks that the system must complete for the interaction frame to be maintained. These tasks move towards and away from the interaction frame – the system may pull content from a database (a task that may not reflect directly on the interaction frame) in order to update a shopping basket (a task that visually impacts on the interaction frame). However, users also interact with the interface and, as social actors, they will complete tasks that are directly related to the interaction frame (such as selecting a product, or clicking to connect a call), as well as tasks that move them away from the interaction frame (for example, reconsidering whether the item they are purchasing is really needed).

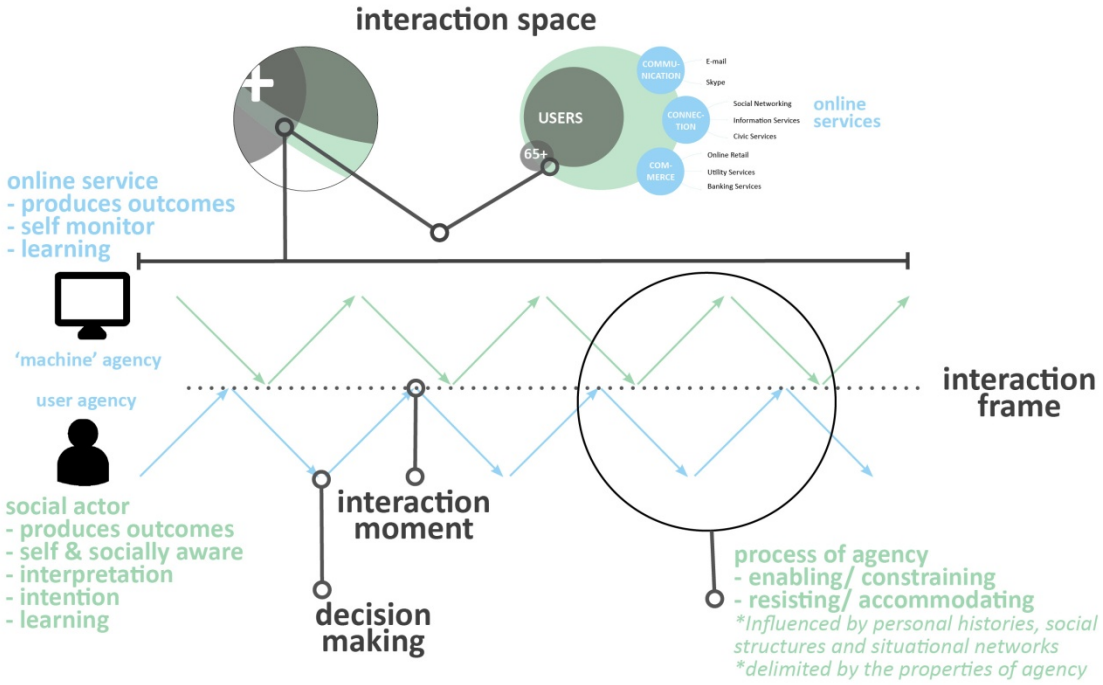

Figure 1.3: Reframed Double Dance of Agency within the Interaction Space
Source: Produced by author, adapted from: Rose and Jones, 2005:28

Both the system and user enact processes of agency which may enable or constrain engagement, or may accommodate or resist action. In order to respond to the better design of online services, through evaluation of touchpoints and possible situations that enable and accommodate rather that constrain, both the practice of online service design and the theory of interaction must be considered.

1.7 Theory and Practice

Friedman (2003:513) describes the difference between science and craft as 'systematic thought organized in theory'. The reference to craft by Friedman is one of application – of

practical experimentation and 'doing', which embodies design practice. In 'doing', however, the knowledge and observations gained are shaped into a single output, often influenced by other contextual factors. It is not always possible to take one instance of applied knowledge and transfer it to another. For this to happen one needs to have considered, analysed and theorised about what was observed and what was learned. Through this process more transferable and generalisable thoughts and results emerge, which contribute to theory. Theory can contribute to the body of knowledge in fields, such as design, by facilitating the development of a foundational understanding of practice, history, legacy and evolution. Within this study theory is developed that contributes to the service design field, as well as to the field related to gerontology. Without a theoretical output, what has been explored, observed and learnt in a design process is not recorded beyond the physical or digital artefact. In the ever-changing world, how one views knowledge is changing. In many fields knowledge is now only relevant for a short period of time. González (2004) comments that:

> One of the most persuasive factors is the shrinking half-life of knowledge. The "half-life of knowledge" is the time span from when knowledge is gained to when it becomes obsolete. Half of what is known today was not known 10 years ago. The amount of knowledge in the world has doubled in the past 10 years and is doubling every 18 months according to the American Society of Training and Documentation (ASTD).

In a world where what one learns and knows changes so rapidly, the contribution of theory to a field is not only as reference to current contexts and knowledge, but also as an archive on which new theories and forms of knowledge can be constructed. It is thus critical for research within fields, such as design, to focus not only on research that impacts process, but also on the development of disciplinary specific theory. Friedman (2003: 514-515) refers to McNeil description of general theory as having eleven characteristics, which aligns with Charmaz's (2005) CoGT criterion of credibility, originality, resonance and usefulness (Table 1.1). The comparison is not indented to imply a direct correlation, rather merely indicating the similarity of grounded theory criterion to those proposed by Friedman with the design research.

Table 1.1: McNeil's Characteristics for Theory

	Description (Friedman, 2003)	**CoGT Criterion** (Charmaz, 2005)
1	A theory has a constitutive core of concepts mutually interrelated.	Credibility.
2	A theory has a mutually productive, generative connection between central concepts and the peripheral concepts where theory merges with practice.	Credibility, Usefulness.
3	The core concepts of a theory are stated in algorithmic compression, parsimonious statements from which the phenomena in the theory can be reproduced.	Credibility.
4	A theory has an irreducible core of concepts, a set of concepts in which no central concept can be removed without altering the scope and productivity of the theory or perhaps destroying it entirely.	Credibility.

5	Two or more of the core concepts in a theory must be complementary to each other.	Credibility.
6	The central concepts of a theory must be well defined and must harmonise as much as possible with similar concepts of enlightened discourse.	Credibility, Originality, Usefulness.
7	The central concepts of a theory must be expressed at a uniform level of discourse. Different levels of discourse must be distinguished and used consistently.	Originality, Resonance.
8	More general theories (higher-level theories) must relate to less general theories (lower-level theories) and to special cases through a principle of correspondence. This principle confirms and guarantees the consistency of the more particular theories and their applications.	Credibility.
9	Explicitly or implicitly, a theory describes dynamic flows with contours that trace relatively closed loops as well as relatively open links.	Credibility, Originality.
10	A theory states invariant entities in its assumptions or formulas that provide standards for measurement.	Credibility.
11	Theories describe phenomena in the context of a conceptual space. This implicitly establishes a relationship between the observer and the phenomena observed.	Originality, Resonance, Usefulness.

Source: Charmaz, 2005; Friedman, 2003: 514

The development of artefacts (physical and digital) and services in the design process is no longer a sufficient outcome of design research. Design-based research must contribute in the theoretical, as well as in the applied, realms and requires that "…the researcher (move beyond a particular design exemplar to) generate evidence-based claims about learning that address contemporary theoretical issues and further the theoretical knowledge of the field" (Barab & Squire, 2004: 5-6). Friedman (2003:522) shares this view, and highlights the importance of the dual perspective of practice and theory:

> The world's population recently exceeded six billion people for the first time. Many people in today's world live under such constrained conditions that their needs for food, clothing, shelter, and material comfort are entirely unmet. For the rest, most needs can only be met by industrial production. Only when we are able to develop a comprehensive, sustainable industrial practice at cost-effective scale and scope will we be able to meet their needs. Design will never achieve this goal until it rests on all three legs of science, observation, theorizing, and experimenting to sort useful theories from the rest. To do this, design practice—and design research— require theory.

1.7.1 Developing both theory and practice in design

The design process is a complex series of actions, reflections and decisions that aim to address a specific problem context or user concern. There are many design process models, and many design thinking models, and they all share a common stepped progression (Figure 1.4). The production of services and tangible products follows the same basic process. The process begins with an exploration phase during which the main area for investigation, or problem context, is identified. After a thorough investigation of the context, including any restrictions and opportunities, a preliminary design challenge outline is drafted. Once the problem context is defined, the design process facilitates the

creative and systematic exploration of possible solutions to the challenge. The most suitable option is identified and a plan to implement or realise it is developed. The realisation of the selected design or service is followed by a period of reflection and evaluation. The evaluation aims to establish whether the final implemented solution successfully addresses the initial concerns identified. This process can include end-users in many of the steps and phases.

Design approaches that focus on collaborative design practice involving end-users include participatory design and human-centred design. The design process is iterative, allowing the participants in the project to reflect and adjust their actions continuously throughout the process. The goal is not to identify, at the beginning of the process, one ultimately correct avenue to explore, but rather to explore all that is relevant to identify the most suitable avenue (even though it may not be the most obvious). The design process, when viewed in this traditional manner, is a process of practice. The process yields an end result in the form of an artefact or service, which represents the thinking, knowledge, observation and sense-making of the participants (designers, end-users and all other participating stakeholders) throughout the process. The end result of such a design process, however, represents only a fraction of what could be learnt (Disessa & Cobb, 2004).

Figure 1.4: The Design Process
Source: Mapped by author

The ability to move beyond just applied practice to theory development, as part of the process, can help designers develop 'broad explanatory principles' instead of only context specific design solutions (Friedman, 2003:515). Design research and practice should thus aim to contribute to both the applied, as well as the theoretical, realms. The argument is then that "…design-based research requires providing local warrants for the effectiveness

of the design work while simultaneously attempting to contribute to a larger body of theory" (Barab & Squire, 2004: 6). The benefit of theory development within the context of design is that the theory is grounded within 'real-world' experiences and emerges in useful constructs (Disessa & Cobb, 2004:101). This can further be facilitated by design research conducted with grounded theory methods. Additional benefits are that the design process allows for empirical testing throughout the process, and that the resulting constructs are more robust, and applicable across contexts (ibid).

The applied nature of design processes may allow the researcher opportunities to test and refine theory, but it should not be seen as a process of theory development. It is not sufficient to state that practice results in theory, as theory requires a systematic analysis of what was found through modes of inquiry (abductive, inductive and deductive). The process of establishing relevance, when the focus in placed on the development of the practical design solution, is narrower and aims to identify the most suitable solution to the challenge at hand. In order to facilitate a theoretical contribution what has been observed and found must be articulated through a theorising process (Friedman, 2003:519). The theoretical contribution may challenge or support the applied solution, as they are two different forms of contribution.

1.7.2 Influencing Service Design practice and theory

Service design shares core values with established design practices, such as User Centred Design practice[9]. Karat, Atwood, Dray, Rantzer and Wixon (1996:18) describe User Centred Design as: "…an iterative process whose goal is the development of usable systems, achieved through involvement of potential users of a system in system design." Even though this is a very basic description it does contain the key influential factors of iteration, system processes and involved users. These factors greatly impact on the design of contemporary products, graphics, ICT solutions and services while highlighting challenges within user diversity (Maunder et al., 2007). Khambete and Athavankar (2010:12) highlight the dual influence on the design process when they state: "Design activity is immersive, aimed at insights and solutions based on the designer's individualistic understanding of the problem and the context." In their view both users and designers play a role in the construction of a context-specific solution: users, as they are the group that offer insights and requirements for the design, and designers through their response to these insights. The focus on user insights and participation throughout the design process is prominent in various design disciplines, including Service Design.

Designing services for users, and potentially differently abled or ageing users, is a complex process, which can become time consuming and costly. This situation is intensified the more diverse the user group is. In South Africa, ageing users come from vastly different cultural and ethnic backgrounds, with 11 national languages and ranging literacy levels

[9] "UCD is a design philosophy that emphasizes the importance of considering the end- user's needs, goals, and desires when creating products or services" (Putnam et.al., 2009: 51)

(Van Niekerk, 2013). Added to this diversity, access to technology is not consistent, and literate users in South Africa display varying levels of information and digital literacy (Statistics South Africa, 2011). The complexity of truly collaborating with users, and engaging them in the service design process as partners, may be challenging but is necessary to design solutions that add value to peoples' lives (Maunder et. al., 2007). The investment made by both designers and participants in a service design project is immense and can take the form of funded equipment and materials, as well as time and expertise. A vast number of end-users may be interviewed, shadowed, may be asked to complete cultural probes or may take part in workshops. Data from these activities are traditionally channelled into the development of a single, most appropriate solution.[10] Data that did not support the identified conceptual solution may be lost, or deemed irrelevant, as part of the 'design journey' to uncover the real solution. Often a single user-voice is created through methods in which participants identify a collective challenge or solution, or a hierarchy of challenges or solutions. The physical or service solutions that emerge from the experience have significant value, but do not necessarily capture all the knowledge that the process has to offer.

> It is not experience, but our interpretation and understanding of experience that leads to knowledge. Knowledge emerges from critical inquiry. Systematic or scientific knowledge arises from the theories that allow us to question and learn from the world around us. One of the attributes that distinguish the practice of a profession from the practice of an art is systematic knowledge. In exploring the dimensions of design as service, Nelson and Stolterman, distinguish it from art and science both. My view is that art and science both contribute to design. The paradigm of service unites them (Friedman, 2003:521).

By adding a parallel process to Service Design models, such as the Double Diamond, the researcher can identify points for active theory development[11]. The Double Diamond is extensively used within the design of services (Yu, 2017: 29). These points help shape the collection of data throughout the process. This does not exclude the possibility that more data may necessarily be required, or that different methods would need to be used, merely that a more thorough and rigorous process is employed to collect and document data.

In this project the Double Diamond model forms the basis for investigation, with the aim of understanding engaged online participation from this community's perspective as part of a socio-technical context. The focus is placed on the first diamond that represents the *discovery* and *definition* phases (Figure 1.5). The *define* phase, as explored in this project, is seen as an opportunity to develop a theoretical contribution through CoGT. This study will not contribute towards a specific service solution, and instead explores the aspects that could influence the discovery and definition of future service design projects for an

[10] The appropriate solution being identified and verified by end-users, and participants.
[11] The development of theory within this study will respond to this statement and establish a process within the traditional Double Diamond, Service Design models that can inform theory development. The study will investigate only one research process. However, future grounded theory studies could yield alternatives and build towards a range of processes and methods available to design researchers.

ageing population.

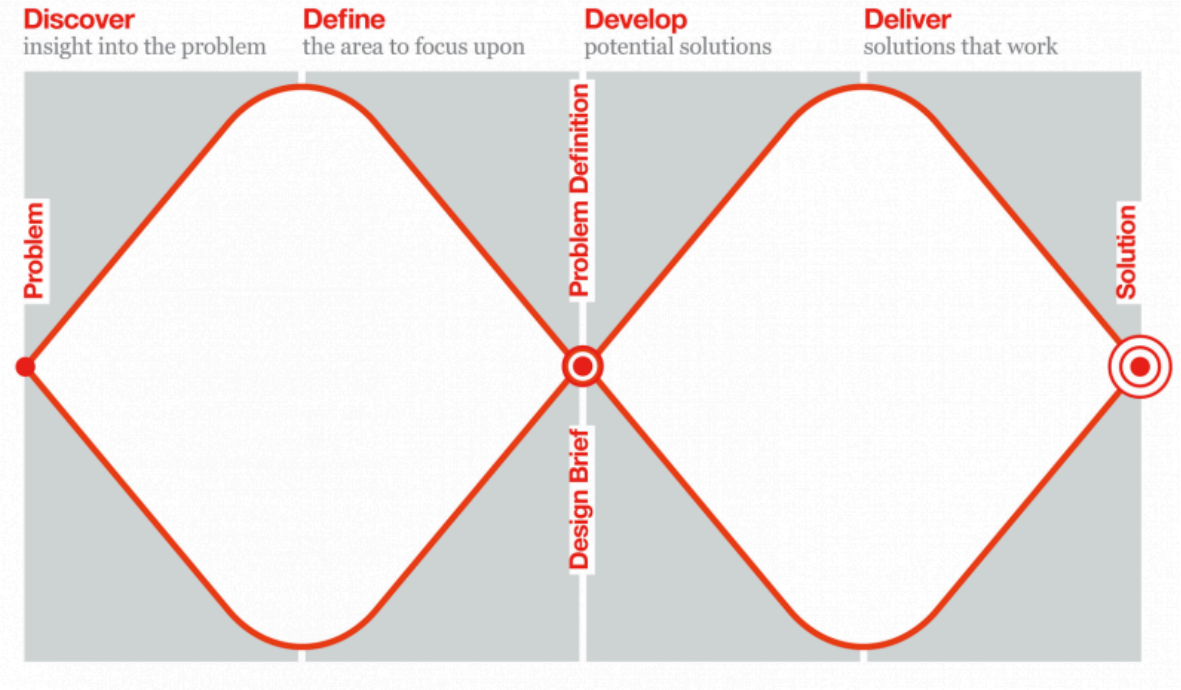

Figure 1.5: Double Diamond Design Model
Source: Design Council, 2015

1.8 Ethical Considerations

This study aims to explore the topic of ageing users' perceptions and experiences with online services. Participants invited to take part in the project had to be willing and able to do so. Commitment could have encompassed the entire project, or been for a single session based on the availability and willingness of the participant. To gain an understanding of vulnerability the topology presented by Lange, Rogers and Dodds (2013) was considered. Three main sources of vulnerability are highlighted: inherent, situational or pathogenic (ibid). In this research project the source that could influence the engagement between the researcher and the ageing user group was inherent vulnerability:

> Inherent sources of vulnerability include our corporeality, our neediness, our dependence on others, and our affective and social natures. These sources of vulnerability are an inescapable element of the human condition. The extent to which inherent sources produce risk of harm or wrongs depends on age, health, gender and disability, as well as the person's capacities for resilience, coping and the social supports she may have (Lange et al., 2013:336).

To ensure that research practices in this project were ethical the research objectives were made clear to participants, informed consent was obtained, voluntary participation stated, and the methods used allowed for diverse engagement (culture, literacy etc). This study conforms to the ethical research guidelines required by CPUT, and is structured on guidelines proposed by the Economic and Social Research Council (ESRC, 2015) and the Research Ethics Guidebook (2015).

The study's ethical protocols and processes are documented in Chapter Three, with reference to specific documents generated for the study.

1.9 Organisation and Contribution of the Research

The research and findings explored as part of this process contribute to theory, methodological development, and the field of knowledge within online service design. The study is significant as there is currently no foundational research on the perceptions and experience of ageing individuals with online services within the South African context. A greater engagement with, and use of, online services could yield financial benefits to suppliers (as the ageing population is increasing), as well as social and supportive benefits to the ageing individual. The experiential findings and perception exploration of an ageing community will contribute to the field of gerontology, and aid in understanding the factors that impact online service use among ageing participants.

Methodologically, the study explores the suitability of traditional design methods to contribute to grounded theory and the traditional Double Diamond process model, often associated with *service design* (Yu, 2017: 29). Theoretically, the study also aims to contribute to the exploration of the socio-technical context, by identifying influences on the engagement of an ageing social actor with online services. The relationship between grounded theory, service design and socio-technical contexts is presented in the following figure (Figure 1.6), which mirrors the divergent and convergent nature of the Double Diamond model:

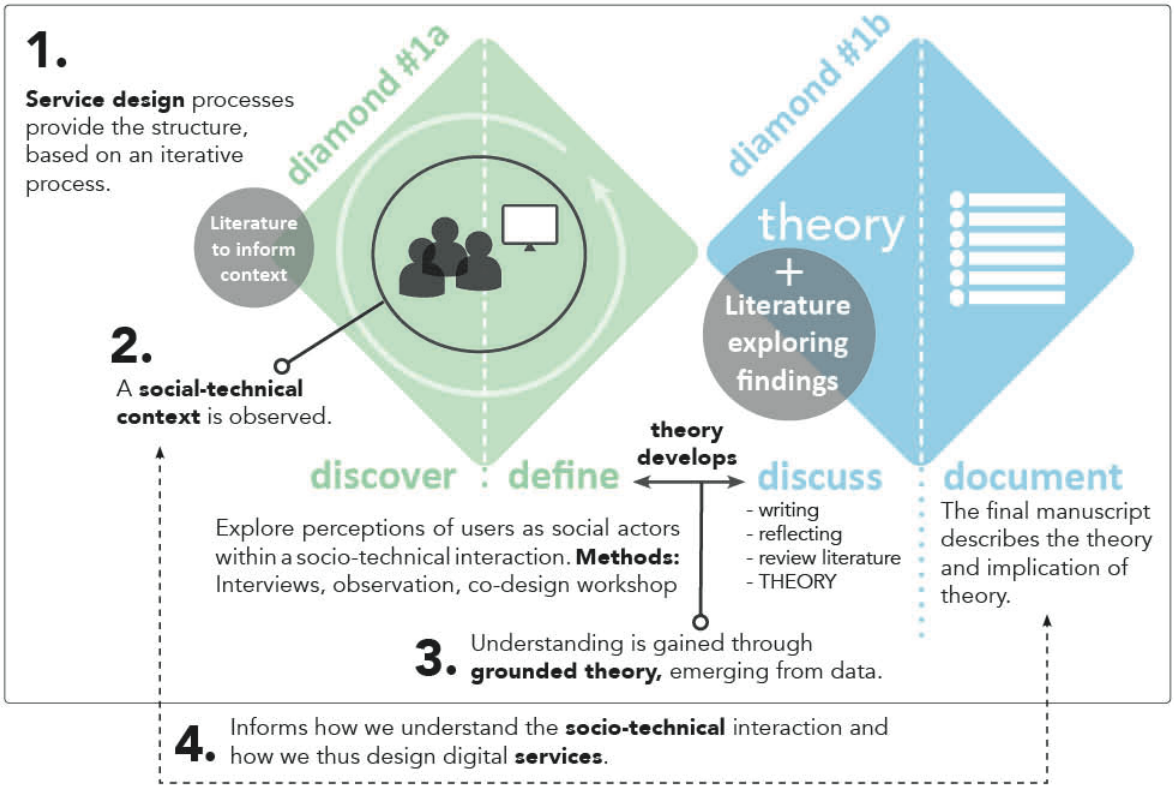

Figure 1.6: Conceptual links: GT, DS and Socio-Technical Context

It is critical to include real user perspectives in the design of services to ensure that they respond to user needs. In the case presented in this study the service context explored is one that reflects socio-technical interactions of an ageing population. In order to engage fully, and design, with this user group a theoretical understanding of their perceptions and engagement is needed. The construction of this theory, through a grounded approach informed by design methods, is documented in this study. The progression of this project, in line with the phases of the Double Diamond model, can be described as follows:

- *Discover:* This phase explores the socio-technical interaction as experienced by ageing users, and the critical need for context appropriate online services for this user group.
- *Define + Discuss:* Through design methods, applying the grounded theory approach, data generated are iteratively reviewed, compared and coded to formulate a theory.
- *Document:* The resulting theory is considered in relation to Service Design practice and the definition of a social actor within a socio-technical context. The exploration defines the ageing user as a social actor through the emergent theory. The strategic implication for service design practice is also discussed.

The contributions made by the study allow one to design online services that engage ageing individuals in a more significant manner. Table 1.2 offers a detailed perspective of the project's original objectives and final contributions in line with the research questions.

Table 1.2: Research Question, Objectives and Contributions

Research Question 1: What are the constructs, propositions and definitions that explain the online service interaction of an ageing individual within a socio-technical context?	
Objectives Completed	**Contribution**
• Plot the evolution of online services in relation to a socio-technical context. • Gather user narratives that reflect their experiences with online services. • Identify and explore barriers to participation experienced (physical and emotional) by users, within various online service environments. • Identify opportunities of online services, as perceived by ageing users. • Review existing literature, projects, cases and initiatives that refer to design and interaction considerations to promote use of online services for ageing individuals. • To compare findings in literature and from cases with views of participants to confirm appropriateness.	1. Contextualisation of the research problem context (discussed in Chapter Two). 2. A grounded theory that explains ageing user engagement with online services (evaluated in Chapter Six).

Research Question 2: How can theory be constructed through participation of the target group using a service design thinking approach?	
Objectives Completed	**Contribution**
• To explore the ageing user context within the design research context. • To document the experiences of users collectively during the process. • Making sense of user perception and experience in a collaborative way. • To produce tangible user-created personas. • To reflect on the process of collaboration in order to define future service design research method opportunities.	1. Exploration of practical use of grounded theory methods and tools within various phases of the Service Design process (discussed throughout Chapter Four, concluded in Chapter Seven)
Research Question 3: What are the characteristics of an online service suitable for an ageing population?	
Objective Completed	**Contribution**
• Identify and explore design barriers to participation experienced by users. • Identify opportunities of online services design, as perceived by ageing users. • Review existing literature and cases referring to design and interaction factors that promote online services engagement among ageing individuals.	1. Description of the challenge in practice (discussed in Chapter Five). 2. Identify applied design factors and principles that encourage engaged participation (discussed throughout Chapter Five, concluded in Chapter Seven). 3. Define design elements that engage an ageing population (discussed in Chapter Six, concluded in Chapter Seven)

The study also aims to explore a complex interplay of concepts and processes observed within service design practice. Applied findings that contribute to service design at a practice level are explored in Chapter Six. The role of the designer in a theoretical study, and the contribution of a service design thinking approach, form part of this discussion.

1.9.1 Summary of chapters

The thesis consists of seven chapters that document the primary research activities, the development of a grounded theory, as well as the application of the gained knowledge to define ageing users as social actors within a socio-technical context.

- Chapter One: *Introduction* - introduces the topic area and outlines the basic principles that guided the study as a whole.
- Chapter Two: *The Setting: A review of literature to contextualise the research problem* - introduces the reader to the wider context in which the study is placed. Although the exploration is based on existing literature, Chapter Two does not review literature directly related to the research question (in line with traditional grounded theory practice). In this chapter's conclusion, the problem context is summarised and discussed. The discussion is a contribution to the body of knowledge of digital and online service design as it frames the current context.
- Chapter Three: *Methodology* - introduces Grounded Theory and explores the focus on Constructivist Grounded Theory. Tools and methods designed for the project are defined and discussed. This study visualises the co-creation spaces within this constructivist grounded study, which highlights methodological developments and contributions. Methodological contributions as a whole are discussed in detail in Chapter Seven.
- Chapter Four: *Data Collection & Analysis* - describes the participants, the collection of data through interviews and workshops, as well as the initial open coding process. The chapter concludes with a review of the focused coding process and the emerging core categories as visual networks.
- Chapter Five: *Grounding the Theory* - explores the theoretical coding of data and the emergence of the grounded theory. The chapter also reviews literature as part of the theoretical coding process to explore current research, findings and emerging concerns relating to ageing users and the technical and digital domains.
- Chapter Six: *Towards Designing for an Ageing Populations: South Africa* - explores the knowledge gained throughout the project and the emerging theory in relation to ageing users as social actors within a socio-technical engagement. This chapter also explores the unique qualities of the emerging theory in relation to established theories in order to explore formal theory relevance. Theories explored include User Experience Definition (Mäkelä & Suri, 2001), Goal-Setting Theory (Locke & Latham, 2002), Unified Theory of Acceptance and Use of Technology (Venkatesh, Morris, Davis and Davic, 2003) and User Experience (Hassenzahl & Tractinsky, 2006).
- Chapter Seven: *Conclusion* - concludes the study by defining the contributions of the project and collating findings in order to answer the original research questions. The final chapter explores both the theoretical and methodological implications of the study towards a strategic view of Service Design.

Chapter Two
The Setting: A Review of Literature to Contextualise the Research Problem

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CHAPTER TWO

2.1 An Introduction

This study focuses on ageing South African[12] users' perceptions regarding online services, and the design factors that impact their use. The investigation aims to develop a theory of online service participation among such users. Once the theory emerges, the role of an ageing user, as a social actor within a socio-technical context, will be constructed. The study uses a Constructivist Grounded Theory (CoGT)[13] methodology to inform theory development. A defining factor of any grounded theory study is refraining from reviewing literature until theory has emerged from the data (Heath, 2006). "More focused reading only occurs when emergent theory is sufficiently developed to allow the literature to be used as additional data" (Heath & Cowley, 2004:143). The following chapter is not in opposition to this characteristic of CoGT, and does not offer literature directly focused on the research area. Instead, this chapter aims to contextualise the research topic by highlighting aspects that influence the current socio-technical milieu of users. A second, more directed, literature review was conducted once the initial theory had emerged; this review forms part of Chapter Five. The present chapter helps the reader to form a holistic perspective of the influencing factors, while not directly referencing literature related to online services and the ageing community. Topics include the changing nature of our networked society, the design of services for our society, including users in the design process to achieve more relevant solutions, and an exploration of access to online services from a South African perspective. The aspects discussed may appear fragmented at first glance, but when viewed holistically they form the foundation of the discussion and research activities to follow.

There are a number of aspects that influence how we react to online services and how we choose to engage with the digital world. These factors range from personal choice to cultural perceptions. Through a study of literature one can explore how we engage in a networked society, as well as elements that influence our access to that society. From this discussion, the research problem can be defined and contextualised. This review focuses on two major sets of contributing factors that influence technology uptake and meaningful digital engagement. The first set focuses on physical access to, and availability of, online services. The second set focuses on the perceived value that online services add to our lives, and our willingness to engage with them in an emotional and psychological context. The two sets of contributing factors are visualised in Figure 2.1. At the top of the figure, elements pertaining to access and availability are noted, and at the bottom, elements that address value perceptions and willingness to engage. As the review progresses topics discussed are seldom located in just one of these sets. It is more likely for a topic discussed to exist in both sets; for example, one is not likely to find value in an online service if one is not able to access the Internet.

[12] Data collection is focused in the Western Cape Province.
[13] An overview of the CGT methodology and research design is offered in Chapter Three.

The chapter begins by briefly exploring our networked society. Through a greater understanding of the digital era in which we live, one can begin to identify the broad nature, or categories, of user groups. The categorisation of users allows one the opportunity to identify unique influences that impact their engagement. Issues around changing communication protocols, and how we engage with one another, can clearly be noted when comparing user groups. Our willingness to engage with online services is, however, dependent on our ability to access them. It is, therefore, crucial to explore briefly the state of connectivity and Internet use within Africa and, more specifically, South Africa.

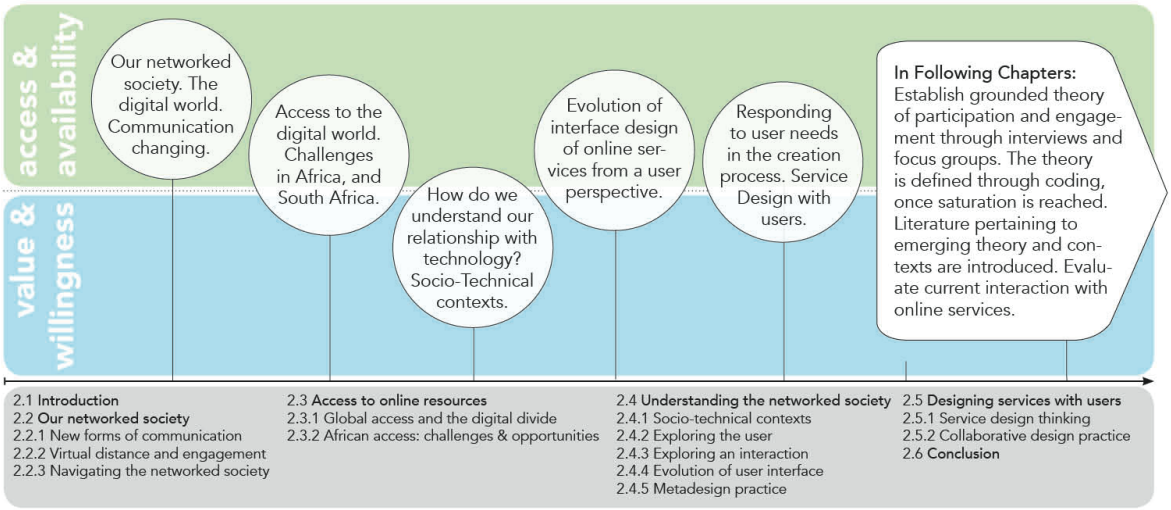


Figure 2.1: Progression of Chapter Two

The relationship between technology and the user is complex (Bano & Zowghi, 2015:149). Technical and social influences may be extracted from accessibility studies and factors that influence a user's engagement, but it is the relationship and effect which these elements have on one another that is significant. In order to investigate the relationship between the technical and the social, the engagement with online services is described from a socio-technical relationship perspective. Literature pertaining to socio-technical contexts will be explored to facilitate an understanding of user roles, as well as of factors that influence online interactions. To explore current user-interface and interaction design characteristics it is beneficial to review briefly the evolution of computer mediated interactions. This is not meant as a complete and comprehensive evolutionary overview, but rather aims to highlight the key changes that occurred in the design of online interaction. Current literature, as well as models and standard evaluation practices pertaining to interface design today, are introduced to establish general design practices within the field. The section aims to track the shift from merely presenting information online to engaging and co-creating with a user.

End-users can be considered one of the main stakeholders in the design of services; however, organisations and other agents, such as policy makers, suppliers, etc., may also

play a role as stakeholders (Stickdorn & Schwarzenberger, 2016:836). In order to create services that speak to the user, as well as acknowledge limitations from an organisational perspective, a clear design process is required. This requirement has become one of the foundational aspects of the service design process. This review briefly traces the development of collaborative design processes, such as user-centred design and participatory design, and elaborates on the origin and relevance of service dominant logic. The nature of services makes the quality of a point of interaction between the service (provider) and user difficult to quantify. Services are often invisible, and consumed as they are being produced. It is possible, however, to investigate the points of interaction between the user and the service. These touchpoints become a crucial bridge between the needs of the user and the offering of the service provider. When developing online services the design of the interface is a tangible element that facilitates interaction between user and service. The review concludes with the focused summary of topics discussed and contributes to the understanding of the problem context.

2.2 Our Networked Society

The evolution and development of technological artefacts and systems have dramatically changed the way society works and lives. Historically, computing power, and access to this power, was isolated in large rooms. This gives context to IBM's chairman Thomas Watson's 1943 statement: "I think there's a world market for maybe five computers." (Weiss, 2007: 18). The impact of, and need, for personal access to computers seemed improbable. Today we are faced with a very different environment – one that is based on a global spider web that connects society with seemingly limitless information, images, news and opportunities to communicate and socialise. Johnson and Johnson (2004:785) acknowledged this over a decade ago, when they noted that individuals need access to a networked, 'information-based' society to foster social and economic development. Since then the expansion of the Internet, and the connectivity that it fosters, has grown exponentially, driving towards the Internet of Things, in which a:

> … myriad everyday objects will become capable of receiving, generating, and sending information… In only a few years, this will be the most complex structure ever created by humankind. There will be billions of nodes able to measure anything measurable, extracting and communicating any form of information; and this information will be used to monitor every aspect of the real world (González, 2014:16).

The world described by González is a space characterised by its connected nature. Society within this space represents a global network, connected and able to communicate, interact, share and trade through both physical and digital means. The challenge, one may argue, is then to ensure that an individual has the means to access this network, and is confident in his or her navigation skills, to benefit from the digitally connected world.

2.2.1 New forms of communication

Communication and language are being shaped by technology and popular platforms. The speed at which these changes are taking place has resulted in both 'utopian and dystopian' perceptions (Castells, 2014:133). Computers and information technology allow users to connect across the globe. They allow collaborative work practice and communication across borders and time zones. Today one can shop, work, communicate and share from the comfort of one's home – the ability to interact and communicate with others is no longer rooted in the physical world (Konsbruck, 2009:5). A mix of web-based and mobile applications ensures that service providers remain attractive to users, as the world continuously shifts to offer more multifunctional and convenient devices, with centralised access and processing of information (such as cloud computing), to facilitate connectivity (Weiss, 2007). Castells (2014:136) attributes the level of connectivity that is experienced today to three key transformations: the transformation of space (referring to an urbanised, condensed lifestyle), transformation of work practice and economic activities (connected and networked work practice and enterprise allows for alternative business and work models), and transformation of culture and communication (from passive content receiving mass media culture, to an active content producing self-governing culture online).

The independent communication that technology allows (often one-sided interaction, mediated by a device), and the sheer abundance of information available, does raise concerns about the critical engagement one has with the world. The sheer amount of information available today could be deemed as *information overload*. Much of that information is unedited and possibly incorrect, forcing users to spend much of their time engaging with irrelevant information, or trying to establish which source is more credible (Konsbruck, 2009:6). Concerns are mounting that "…our ability to reason with rigor and self-discipline is being eroded" and "… thinking may become more reactive and impressionistic." (Postman, 1985, quoted in Johnson & Johnson, 2004: 786). Thirty years after these concerns were first expressed, they are still relevant in the global debate around the impact of information technology and our connected lifestyle. As we become more connected our methods of communicating have changed, and with them language. Not only our written use of language has been influenced, but also our oral communication. Phrases like 'LOL' and 'YOLO'[14] are forms of popular expression, used in verbal and written communication styles, that have their origin in the need to keep a message short when sending it digitally.

Cellular technology and online platforms enable short messages to be sent instantaneously to anyone in the world. The convenience and power of instant messaging has grown exponentially through platforms and applications, such as cellular Short Message Services (SMS), WhatsApp, Twitter, Google Messenger, Facebook, etc. The level

[14] LOL and YOLO are popular acronyms for the phrases, *laugh out loud* and *you only live once*.

and quality of teen writing skills have adversely been affected by technology (Omar, Miah & Belmasrour, 2014:59). With limited characters, these messages can, however, be devoid of context, emotion and implied meaning. To address this a range of characters have been developed to indicate emotion, called *emoji's*. These characters allow the author to insert into a very short message his or her state of mind, current emotion, or one of the other environmental or object icons (Sari, Ratnasari, Mutrofin & Arifi, 2014:18). The accessibility and convenience offered by technologies has impacted our need for face-to-face interactions and communication, which is often seen as time and energy consuming in our modern way of life (Kipnis, 1994:64). The link to the development of language in relation to technology is conceptually referenced by Prensky who refers to *digital natives* as '… "native speakers" of the digital language' while *digital immigrants* have an 'accent', or 'speak an outdated language' (2001:2)[15]. It is vital to understand that communication is not just the sharing of information, but an inter-personal interaction that helps us with the process of 'meaning-making' (De Witt, Siraj & Alias, 2014:91). Besides influencing personal traits, such as language usage, information technology - through social networking - is influencing how we engage, construct and maintain relationships. This represents a significant shift in the use of the Internet (White & Le Cornu, 2011: 4).

2.2.2 Virtual distance and engagement

Today technological advances shape work practice, often introducing new ways of working not experienced before. More than two decades ago, the changes in social behaviour as technology improved and freed people from interpersonal dependence in professional and leisure activities were noted (Kipnis, 1991:62). Modern current society can be described as a 'network society'; one that has been impacted by socio-cultural changes mediated by rapid development and access to new technologies (Castells, 2014:127). Traditional bonds and relationships have been reshaped in our new society to reflect a more self-centred view of society:

> One of these is the rise of the "Me-centered society," marked by an increased focus on individual growth and a decline in community understood in terms of space, work, family, and ascription in general. But individuation does not mean isolation, or the end of community. Instead, social relationships are being reconstructed on the basis of individual interests, values, and projects. Community is formed through individuals' quests for like-minded people in a process that combines online interaction with offline interaction, cyberspace, and the local space (Castells, 2014: 128).

The new network society relies on a number of skills to navigate and establish relationships. Many social media platforms are the foundation for interest or practice-driven communities. These communities are fluid, with participants entering and leaving as their own interest and commitment changes. Although many of these communities are online, the social nature of interaction still exists. Social networking sites contribute

[15] The phenomena are discussed in greater detail in Section 2.2.3

greatly to this interaction but yield a complexity of connecting in multiple dimensions. In contrast to information storing, or gathering sites, social networking sites allow the creation of an online persona via multimedia including text and images (White & Le Cornu, 2011:4). Research has highlighted that the more sociable individuals are, the more they use the Internet, and the more their tendency to engagement in civic activities increases (Rainie & Wellman, 2012). Individuals thus live in both the physical, as well as in the virtual, world. However, one should not consider this as living in a *virtual reality*, but instead as living in a *real virtuality as "*social practices, sharing, mixing, and living in society is facilitated in the virtuality" (Castells, 2014:141). The social element of computing, and the resulting connected existence, has contributed to a significant paradigm shift for many users in favour of digital technologies (White & Le Cornu, 2011:4).

The relevance of digital technologies does come at a price. A study, conducted in 1998, highlighted the impact of the Internet on users during their first two years of use. The study noted a decline in face-to-face interaction within the family structure, the decline of social contact and, associated with this, an increase of depression (Kraut, Patterson, Lundmark, Kiesler, Mukophadhyay & Scherlis, 1998). Even though interaction and communication today are facilitated through technologies, such as social network sites, the concerns noted in early behavioural studies persist. As individuals spend more time online, instead of interacting directly with one another, a sense of detachment can develop – referred to as *virtual distance* (Sobel-Lojeski & Westwell, 2015). Virtual distance can also lead to distrust and a hesitant behaviour when it comes to helping others (ibid). The impact of technology on behaviour and interaction is associated with time spent using the technology and access to the technology. The level of social interaction online has to be viewed through the lenses of accessibility and adoption. Many users who do not have access to a new technology, or feel insecure about using it, show a disinterest in engaging. Interest in the potential benefit of using technology is crucial to technological adoption – the interaction with technology must add perceived value to the user's existence (Ellis & Allaire, 1999; O'Brien et al., 2008).

2.2.3 Navigating the networked society

Our connected existence, and technologies that support this existence, has had an immeasurable impact on every aspect of daily life, including communication, accessing services, maintaining relationships and accessing information. To establish the roles of users it is useful to begin by broadly defining various levels of user groups, based on their interaction with the online world and how easily they adopt new technologies. Adoption of new technologies is shaped by personal, cultural and professional contexts. Early scenarios to help map interaction within a networked society include Prensky's (2001) paper that classified users as either *digital natives* or *digital Immigrants*. The distinction Prensky makes does not remove from digital immigrants the ability to navigate and master this connected, digital world, but rather proposes that these individuals will never

consider technology as an extension of themselves. White and Le Cornu (2011) expand Prensky's definition and propose the use of *visitors* and *residents* as replacements for *digital natives* and *digital immigrants.* This shift is linked to the rise of social media applications post Prensky's definition. In their model, a *visitor* is defined as one who sees the Web as a "garden tool shed" from which a tool can be selected to perform a specific task (White & Le Cornu, 2011). Once completed, the tool is returned to the shed. Residents, on the other hand, interact with the online environment in a more personal and immersed fashion:

> Residents, on the other hand, see the Web as a place, perhaps like a park or a building in which there are clusters of friends and colleagues whom they can approach and with whom they can share information about their life and work. A proportion of their lives is actually lived out online where the distinction between online and off–line is increasingly blurred. Residents are happy to go online simply to spend time with others and they are likely to consider that they 'belong' to a community which is located in the virtual (White & Le Cornu, 2011:6).

Whether as either *natives* and *immigrants*, or *residents* and *visitors*, humans inhabit a new, connected (often wireless) world. In 2013, close to 7 billion wireless devices were accessing the Internet, making the world largely connected (Castell, 2014:132). Technological advancements have altered our social behaviour - as an individual, community and global society (Kipnis, 1991:62). Studies have offered insights into user groups to facilitate a definition of user types (González & Paliwoda, 2006). In a 2011 study[16] that categorised users, based on emotion, four distinct groups were identified. These categories included 'nervous', 'invisible', 'confident but reserved' and 'confident and carefree' users (Christodoulides, Michaelidou & Siamagka, 2011). A more detailed description of the groups is tabled below:

Table 2.1: Emotion-Based User Group Classifications

Nervous User Group	Users within this group exhibited a more reserved perspective towards online engagement. They noted that they felt more confident offline than online, and exhibited feelings of *angst* when online. They seemed to feel more anonymous and invisible offline.
Invisible User Group	Users within this group did not experience the level of *angst* and stress highlighted by the nervous user group, but did acknowledge that they felt more confident and imaginative within an offline environment. These users felt more anonymous online than users from the nervous group.
Confident but Reserved	Within the confident but reserved user group, participants indicated that they felt more comfortable expressing themselves online. They felt more adventurous and more confident online, whilst also feeling freer and more anonymous online than the previous user groups.

[16] The sample consisted of 786 consumers from the United Kingdom, United States of America, Australia and Canada.

Carefree and Confident	Participants from this user group reported the least amount of *angst* and stress when engaging online. The online world allowed them a greater environment to explore and imagine. Users within this group reported that they felt more anonymous online than offline.

Source: Summarised from Christodoulides et al., 2011

The study used demographics (country, age, gender, employment status) and attitudes towards online experiences to differentiate the four groups, and concluded that emotions could provide a cross-cultural marker to segment online user groups. A localised study in England employed similar markers to develop the Internet User Classification (IUC) system. The study analysed both individual variables (survey and lifestyle data) and infrastructure performance indicators to propose a two-tier structure with four super groups and eleven descriptive groups (Table 2.2). The project aimed to contribute to "customer databases, targeted marketing applications, policy delivery and strategic planning" which are influenced by users' Internet usage and engagement (Riddlesden, 2014).

Table 2.2: Internet User Classification (IUC) System

Supergroup	Descriptive Groups	Keywords
E-unengaged	1a: Too Old to Engage 1b: E-marginals: Not a Necessity 1c: E-marginals: Opt Out	Low levels of engagement noted "across all measures including: seeking information online, purchasing online, device ownership, general interest and mobile access." (pg. 5). The general age group within this sector is 60 and above.
E-professionals and students	2a: Next Generation Users Groups 2b: Totally Connected 2c: Students Online	This group shows a very high level of engagement with applications. Users in this group typically use multiple devices, including mobile ones, favouring an 'always online' lifestyle. Information gathering and service access are preferably done online (pg. 6).
Typical Trends Groups	3a: Uncommitted and Casual Users 3b: Young and Mobile	This group displays (and defines) the average level of online engagement. "Use of commercial applications, such as online shopping, online banking and online bill payments, are slightly below the national average and the use of mobile devices for Internet access is above the national average, in part because the younger individuals within this Supergroup favour mobile use" (pg. 7). Users within this group are typically of working age but are not highly qualified.
E-rural and Fringe Groups	4a: E-fringe 4b: Constrained by Infrastructure 4c: Low Density but High Connectivity	Online engagement of users within this group is affected by below-standard infrastructure provision, often as the result of geographical positioning. Users in this group often use online shopping options for products and groceries, online banking, online bill and account payments and price comparisons. Users within this group are typically between 45 – 75 years old and favour fixed line connections (pg. 8).

Source: Summarised from Riddlesden, 2014

The use of age, gender and other demographic markers does contradict the broader analysis framework suggested by White and Le Cornu (2011) whose *visitors* and *residents* paradigm focuses on lived experience of users, understanding user motivation and practice of technological engagement. These factors define a paradigm that

> … transcend[s] issues, such as age, technological 'geekishness', and the development of the brain, while still recognising that individuals may have a greater or less well developed natural aptitude for using technology and that some may never move (we avoid the term 'progress') beyond a low–level engagement of selecting a small range of tools for a limited number of purposes (White & Le Cornu, 2011:6).

The effects of a networked society can be noted in a number of realms. Today subjects related to economic productivity, intellectual property, privacy and access to information are all linked to information technology (Konsbruck, 2009). Access to information and the ability to communicate on multiple platforms instantly have enabled the connected environment in which we live. A succinct description of the networked society defines it as "…constructed around personal and organizational networks powered by digital networks and communicated by the Internet" (Castell, 2014:135). 'Powered by', in this sense, is highly dependent on whether an individual has access to the Internet.

2.3 Access to Online Resources

The convenience, connectedness, support and access to information that being online offers, is dependent on our ability, and wiliness, to engage, as well as our physical ability to access the online world. Today it is becoming virtually impossible to avoid 'technological dependence' (Konsbruck, 2009:6). It is estimated that globally by 2019 there will be three networked devices for every person, with the fastest growing Internet Protocol traffic located in the Middle East and Africa, followed by Asia Pacific (CISCO, 2015:1). Whether for work, or in a personal capacity, the ability to gain access to the World Wide Web is critical to many individuals' everyday choices and activities. Information and online services are accessed daily through an array of devices including mobile phones, tablets and computers. Hilbert (2014:830) estimated that approximately 90% of the global population have access to telecommunication through these devices (yet only 84.6% of the world had access to electricity in 2012, according to the World Bank, 2015).

Depending on this access is not without risk. On an individual level, the inability to access the Internet could disrupt work practices, such as sending and receiving emails and accessing files. On a macro level, the failure of technological infrastructures and connections to critical online services can lead to the breakdown of both economic and social systems, such as banking services and long-distance telephone exchanges (Konsbruck, 2009:6).

2.3.1 Global access and the digital divide

Since the 1990s the term digital divide has referred to the difference in accessibility experienced across the world, and refers specifically to individuals who do, or do not, have access to the Internet. The term refers to a broad set of factors that affect access to ICT (Information Communication Technology) and media elements. The concept is often viewed from a geographical perspective (one country being more equipped, or enabled, than another). The Middle East and Africa are projected to show the highest compound annual growth rate of IP (Internet Protocol) traffic from 2014 to 2019, at 44%, with North America and Western Europe showing a growth of 20% and 21% respectively (CISCO, 2015:5). Although Africa is showing a significantly higher growth rate, the amount of IP traffic is still significantly lower than that of all other sectors[17]. The growth rate is in part due to initiatives to increase access throughout Africa. Both Google and Facebook have committed to projects focused on increasing access around the globe. In Africa, Google has launched, for example, Project Link that has supplied Ghana (Accra and Kumasi) with 'fiber backbone networks', and Facebook's Internet.org has partnered with French Eutelsat to bring Internet access to sub-Saharan Africa (Akamai, 2015:12).

Factors impacting accessibility have migrated away from referring to availability alone, and now include the quality, speed and cost of access to ICT infrastructure, as well as the user's ability to engage (Miniwatts, 2015). The reference to both technological (including infrastructure) and social factors implies a more holistic view of embedded ICT:

> …it has become common practice among researchers … and practitioners to distinguish among three complementary stages: (1) mere access to the technology, (2) effective usage of the technology, (3) social integration and tangible impact of the technology. These consecutive levels of connectivity differentiate between the level at which the digital divide is considered to be closed (Hilbert, 2014:822).

The benefits of closing the digital divide are numerous (Table 2.3).

Table 2.3: Arguments for Closing the Digital Divide

Arguments presented by Miniwatts, 2015	Arguments presented by Mossberger, Tolbert & McNeal, 2007
1. Economic equality Access to opportunities (professional, social, civic) facilitated by ICT; ability to complete work-based tasks using industry-appropriate ICT; development and consumption of services and products developed through, or presented via online mediums. Access to telephony facilitates engaged civic participation as well as commercial participation.	**1. Economic opportunity** The use of technology at work advances economic development. ICT facilitates the matching of communication and operations in the modern workplace (pg. 45).
2. Democracy ICT may facilitate a more engaged public with open,	**2. Civic engagement** Citizens can actively participate in political

[17] The projected IP traffic for the Middle East & Africa is 9.4 extrabytes (EB) per month 2019, compared to Asia Pacific 54,4EB, North America 49,7EB, Westerm Europe 24,7EB, Central and Eastern Europe 16,9EB, Latin America 12,9EB (CISCO, 2015:5)

accessible forums for critique and debate. Public participation is encouraged through available information and services relating to elections and decision-making processes.	dialogues and decision-making (pg. 67). **3. Political participation** Access to the Internet provides political knowledge enabling individuals to become informed citizens (pg. 46). The Internet facilitates conversation and debate around topics.
3. Economic growth Technology can support education and lifelong learning to yield a more prepared, engaged and innovative workforce (as well as entrepreneurial sector). The utilisation of technologies within industry may yield a competitive advantage. Global GDP is increasingly favouring services, many of which are online. ICT-facilitated retail and consumer products support economic development.	**1. Economic opportunity** Like education, the Internet has the ability to provide information, skills, and networks that enable political and economic participation.
4. Social mobility Social participation and interaction is increasingly being facilitated by ICT. The rise of social network platforms has become an important part of social interaction. Cultural preservation, indigenous knowledge archiving and access to information that supports social development are globally supported and facilitate by ICT. Online platforms allow for the transfer of information as well as collaboration to foster development.	

Source: Miniwatts, 2015; Mossberger, Tolbert & McNeal, 2007

The concept of the divide's geographical orientation is also questionable as the term can be applied within the context of a single country. Access to ICT systems in rural areas has presented a challenge even in countries with sound technology infrastructure and reliable, cost-efficient access to the Internet. Satellite technologies have presented a number of solutions to this challenge (Miniwatts, 2015). By 2019 Internet traffic from wireless and mobile devices will account for approximately 66% of IP traffic, up from 46% in 2014 (CISCO, 2015:2). Barriers to participation are not only limited to physical access points and services, but also to whether one can effectively use the 'information resources' (Hilbert, 2014:822).

Issues relating to an individual's literacy level, confidence and value perceptions all affect whether or not one engages online, and to what extent. "One of the most urgent challenges regarding technology, diversity, and equity is the need to expand digital literacy…" (Watkins, 2012:9). Access to the Internet, the networked society, and the wealth of opportunities that online activities offer is thus dependent on more than just access itself. In order for individuals to gain truly and participate meaningfully, it is necessary to reflect on the their emotional, cognitive and intellectual ability to engage, as well as their level of digital literacy. To address issues relating to the digital divide, digital access is discussed in the following section.

2.3.2 African access: challenges and opportunities

Online services, such as communication services, information finding, retail and civic services, have the potential to improve the lives of South Africans. To explore the potential of online services for a South African market sector, issues relating to both access and adoption, must be considered. Access to online services in Africa (and South Africa) is linked to physical availability and affordability. Among the physical reasons for lagging Internet penetration in Southern Africa is the lack of supporting infrastructure, the inaccessibility of rural locations and out-dated frameworks (Pejovic, Johnson, Zheleva, Belding, Parks & Van Stam, 2012:2469). The shift toward a connected continent is, however, noticeable, and Africa currently has the highest % growth in Internet users from 2000 to 2017 (Figure 2.2a, Figure 2.2b).

WORLD INTERNET USAGE AND POPULATION STATISTICS
MARCH 25, 2017 - Update

World Regions	Population (2017 Est.)	Population % of World	Internet Users 31 Mar 2017	Penetration Rate (% Pop.)	Growth 2000-2017	Users % Table
Africa	1,246,504,865	16.6 %	345,676,501	27.7 %	7,557.2%	9.3 %
Asia	4,148,177,672	55.2 %	1,873,856,654	45.2 %	1,539.4%	50.2 %
Europe	822,710,362	10.9 %	636,971,824	77.4 %	506.1%	17.1 %
Latin America / Caribbean	647,604,645	8.6 %	385,919,382	59.6 %	2,035.8%	10.3 %
Middle East	250,327,574	3.3 %	141,931,765	56.7 %	4,220.9%	3.8 %
North America	363,224,006	4.8 %	320,068,243	88.1 %	196.1%	8.6 %
Oceania / Australia	40,479,846	0.5 %	27,549,054	68.1 %	261.5%	0.7 %
WORLD TOTAL	7,519,028,970	100.0 %	3,731,973,423	49.6 %	933.8%	100.0 %

NOTES: (1) Internet Usage and World Population Statistics updated as of March 30, 2017. (2) CLICK on each world region name for detailed regional usage information. (3) Demographic (Population) numbers are based on data from the United Nations - Population Division. (4) Internet usage information comes from data published by Nielsen Online, by ITU, the International Telecommunications Union, by GfK, by local ICT Regulators and other reliable sources. (5) For definitions, navigation help and disclaimers, please refer to the Site Surfing Guide. (6) Information in this site may be cited, giving the due credit and placing a link back to www.internetworldstats.com. Copyright © 2017, Miniwatts Marketing Group. All rights reserved worldwide.

Figure 2.2a: World Internet Usage and Population Statistics
Source: Internet World Stats, 2017

Internet Usage Statistics for Africa
(Africa Internet Usage and 2017 Population Stats)

INTERNET USERS AND POPULATION STATISTICS FOR AFRICA

AFRICA REGION	Population (2017 Est.)	Pop. % of World	Internet Users, Latest	Penetration (% Population)	Internet % Users	Facebook 30-Jun-2016
Total for Africa	1,246,504,865	16.6 %	345,676,501	27.7 %	9.3 %	146,637,000
Rest of World	6,272,524,105	83.4 %	3,386,296,922	54.0 %	90.7 %	1,532,796,530
WORLD TOTAL	7,519,028,970	100.0 %	3,731,973,423	49.6 %	100.0 %	1,679,433,530

NOTES: (1) Africa Population data are 2017 mid-year estimates. (2) Africa Internet Usage Statistics in this table are in March 31, 2017. (3) The Facebook subscriber data are in June 30, 2016, the last available from FB. (4) CLICK on each region or country name for details for each individual location. (5) For methology, help and definitions please see the site surfing guide. (6) Population 2017 estimates are based mainly on figures from the United Nations - Population Division and local sources. (7) The Internet usage numbers come mainly from data published by WWW , ITU , the Nielsen Company, Facebook, and other trustworthy sources. (8) Data from this table may be cited, giving the due credit and establishing an active link back to Internet World Stats. Copyright © 2017, Miniwatts Marketing Group. All rights reserved worldwide.

Figure 2.2b: World Internet Usage and Population Statistics
Source: Internet World Stats, 2017

The concept of '% growth' of users in South Africa must also be considered in relation to population growth (Figure 2.3). The African continent represents the disparity experienced with regard to Internet access and the digital literacy divide. Although Africa as a whole shows a 28.6% population penetration, the difference from one country to another is significant, and penetration in countries, such as the Democratic Republic of Congo, Liberia, Niger and Ethiopia, is significantly lower than the continental averages (Pejovic et al., 2012:2468; ITU, 2016).

Year	Internet Users**	Penetration (% of Pop)	Total Population	Non-Users (Internetless)	1Y User Change
2016*	**28,580,290**	52 %	54,978,907	26,398,617	3.9 %
2015*	**27,501,308**	50.5 %	54,490,406	26,989,098	4 %
2014	**26,444,836**	49 %	53,969,054	27,524,218	6.5 %
2013	**24,838,723**	46.5 %	53,416,609	28,577,886	14.7 %
2012	**21,663,282**	41 %	52,837,274	31,173,992	22.1 %
2011	**17,745,001**	34 %	52,237,272	34,492,271	43.2 %
2010	**12,389,183**	24 %	51,621,594	39,232,411	143 %
2009	**5,099,203**	10 %	50,992,034	45,892,831	20.1 %
2008	**4,244,405**	8.4 %	50,348,811	46,104,406	5.9 %
2007	**4,007,974**	8.1 %	49,693,580	45,685,606	7.5 %
2006	**3,729,614**	7.6 %	49,027,805	45,298,191	3 %
2005	**3,620,931**	7.5 %	48,352,951	44,732,020	-9.8 %
2004	**4,016,014**	8.4 %	47,667,150	43,651,136	22 %
2003	**3,291,600**	7 %	46,971,250	43,679,650	6 %
2002	**3,105,015**	6.7 %	46,272,223	43,167,208	7.3 %
2001	**2,892,736**	6.3 %	45,579,161	42,686,425	20.5 %
2000	**2,401,335**	5.3 %	44,896,856	42,495,521	31.9 %

Figure 2.3: South African Internet Statistics
Source: Internet Live Stats, 2015[18]

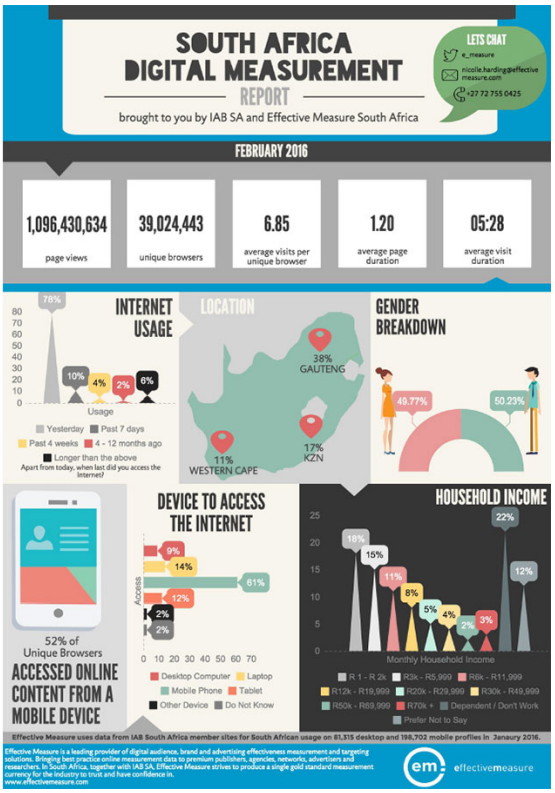


Figure 2.4: South African Digital Measurement
Source: Effective Measure Report, 2016[19]

Many Internet users in Africa are restricted to public access points, or access at school or work. The point of access can heavily influence the type of activity which users complete. Points of access are traditionally from work, at public service facilitates and commercial services (such as Internet cafes) or at homes where a stronger emphasis on social networking can be noted (Johnson et al., 2012:2469). In South Africa, approximately 42.4% of Internet users visit the social networking site Facebook as of April 2017, whereas global usage reached 45.3% (Figure 2.2b). The demographics of South African users

[18] Current statistics may vary from those represented, as data are updated continuously. To view current statistics visit: http://www.internetlivestats.com/internet-users/south-africa/
[19] Effective Measure is the official traffic measurement partner of the IAB South Africa, and provides accurate traffic and demographics statistics for SA's top websites. Monthly and annual reports are available as infographics. This Infographic can be viewed at http://www.effectivemeasure.com/wp-content/uploads/2016/03/monthly-measurement-feb-2016.png.

reflect an almost equal gender split (49.77% female, 50.23% male) and prevalent use across income groups (Effective Measure, 2016).

Since January 2015, the number of mobile users in Africa has increased by 9% (indicator measured January 2016), bringing the total number of subscriptions to 986 million (Kemp, 2016:10).

> In the history of Africa, the mobile phone arguably ranks well ahead of other communications technologies, such as the landline, telegraph, radio, television, or the newspapers, in terms of its reach and impact... In contrast to landline usage, which has been severely limited by inadequate infrastructure, poverty, and widespread corruption in the telecommunications sector, the pace of adoption of mobile telephony is remarkable. Africa's first mobile phone call was only made in 1987, yet the World Bank's 2012–13 Africa Development Indicators report suggests that over 80 percent of urban people in Africa now have access to cell phones. This may be an underestimate. Subscription figures do not equate with phone access, since phones are shared regularly and widely with family, friends, and neighbors (Porter, 2015:81).

The economic benefits of a more connected Africa are dependent on motivating individuals to adopt technology once access points have been established. A 'local champion' from within the community can play an integral role in facilitating adoption at community level (Pejovic et al., 2012: 2483). Many novice users fall victim to online scams as it can be difficult to differentiate between actual and fake (criminal) activities without experience (ibid). This highlights the importance of closing the digital literacy divide, and the need to understand the relationship between the user and the technology, the social and the technical.

2.4 Understanding the Networked Society

Investigation into the larger contextual application of socio-technical systems is based on a common understanding: that a 'technical society' is difficult to comprehend, and that what influences such a society constantly evolves (Ropohl, 1991:66). Whitworth (2006:533) visualised the complexity of a socio-technical system into a hierarchy of 'overlapping views of the same system' (Table 2.4). In this view, higher levels of the system are dependent on lower levels. To encourage productivity the system must support higher system levels[20]. Within the context of this project the social and cognitive levels will be explored, and not the information and mechanical ones. This is due to the nature of the project – focusing on users and their perceptions (linking to both social and cognitive levels). The complexity of socio-technical systems can be addressed through integration of the technical and social systems – a meta-design[21] approach to socio-technical interactions as defined by Fischer and Herrmann (2011).

[20] Whitworth (2006:533) gives the example of social systems being dependent on lower levels for productivity: "usability drops when software design contradicts users' cognitive needs"
[21] The concept of meta-design is further explored in Section 2.4.3

Table 2.4: Information System Levels

Level	Examples	Discipline
Social	Norms, culture, laws, *zeitgeist*, sanctions, roles	Sociology
Cognitive	Semantics, attitudes, beliefs, opinions, ideas, morals	Psychology
Information	Software programs, data, bandwidth, memory, processing	Computing
Mechanical	Hardware, computer, telephone, fax, physical space	Engineering

Source: Whitworth, 2006:533

The meta-design approach provides a description of each system component: "*technical systems* which are engineered to provide anticipatable and reliable interactions between users and systems, and *social systems* which are contingent in their interactions and a subject of evolution" (Fischer & Herrmann, 2011:1). To establish a more embedded view of the role of technology within the social realm a two-pronged investigation style is proposed by Nascimento and Pólvora (2013). This approach includes a focus on social- and technology-driven researchers (and professionals), as well as a focus on civil and stakeholder participation. By combining the two approaches 'technological openings' that draw from both the social and technological perspective can be established. This can potentially impact the greatest number of stakeholders, and in the most sustainable way (Nascimento & Pólvora, 2013:32). The complexity that underpins human-technology interaction must be addressed openly to ensure design and development focusses on avenues that offer authentic social benefits. As new technologies facilitate evolving and changing ways for us to engage and work, new socio-technical situations emerge that need to be considered (Maguire, 2014:169).

2.4.1 Socio-technical contexts

The origin of socio-technical systems (STS) can be found in post-war (1949) industry rejuvenation projects and policies at the Travistock Institute. The institute, based within the British mining industry, took on a number of projects that evaluated traditional organisational theory and working methods. A key project that highlighted this change in mindset was the innovative and change management at the Haighmoor mining seam (Trist, 1981:8). Work practice at the seam represented a new paradigm of work, one that merged the requirements of both technical and social systems. Although the original studies and discussions around socio-technical systems referred to industry and productivity, the core concepts could be transferred to a greater understanding of the role and relationships between humans and technological systems. Ropohl (1991:59) characterised the early theoretical concepts as follows:

> The concept of the socio-technical system was established to stress the reciprocal interrelationship between humans and machines and to foster the program of shaping both the technical and the social conditions of work in such a way that efficiency and humanity would not contradict each other any longer.

In simpler terms, a socio-technical interaction refers to a network of technical and social factors that interact to achieve a shared goal. Mumford (2006)[22] offers an extensive history of socio-technical systems and design, with Baxter and Sommerville (2011) contributing additional approaches. From Mumford's review the mayor contribution of socio-technical system design is its 'value system' (in which the rights and needs to human contributors must be seen as at least equal to those of non-human system elements) and democratisation (through which humans can participate in activities and decision making) (Mumford, 2006:338). The importance of understanding to role, and influence, of human contributors is echoed in Baxter and Sommerville's (2011:7) proposal that human-centred design (HDC) could benefit the development of socio-technical interactions. HDC, in research and practice, offers a contextually driven understanding of users, their environments, cultures and perceptions, and how they interact with the world around them. The role of human participants can form an integral part of understanding the system itself, such as Social Residence STS (in health-care), which is grounded in the roles of patients, their relatives, doctors, nurses and how they collaborate with software systems to support patients' lives (Perini, Qureshi, Sabatucci, Siena & Susi, 2011:440).

The study of STS has resulted in a number of research fields, institutes and approaches that aim to explore the human context, often developing in isolation from one another. Notable research areas include those focused on: workplace and practice, information systems, cognitive systems engineering, human-computer interaction (HCI) and computer-supported cooperative work (CSCW) (Baxter & Sommerville, 2011). Research focused on work practice and work environments related to the origin of STS at the Travistock Institute. Contributions to the field encouraged more human-centred work practice, and improved manufacturing systems (Mumford, 1983; Eason, 1988; Rupohl, 1999; Owen, Wackers & Beguin, 2009). As computers, and supportive technologies, became common-place in work environments, research facilitated a greater understanding of user-computer systems (Eason, 1997; Whitworth, 2009; Kelkar, 2015). The need to understand, support and optimise work processes that include computers, and larger information systems, has remained significant. An understanding of how people work can directly influence the design of technology-facilitated work practice, and the resulting work systems. Research focused on computer-supported cooperative work (CSCW) aims to explore the socio-technical relationship - often through ethnographic exploration (Suchman, 1987; Bowker, Star, Gasser & Turner, 2014). Socio-technical perspectives on the interaction between users (and organisations) and technologies have aided in mapping the influences that affect the larger system. Human-computer

[22] Mumford's paper traces the history of socio-technical design (1960-2000's), "emphasizing the set of values it embraces, the people espousing its theory and the organizations that practise it. Its role in the implementation of computer systems and its impact in a number of different countries are stressed."

interaction studies focus on more specific designed interactions, including usability (Krug, 2005; Kelkar, 2015). Research into the specific application of socio-technical findings with regard to the practical design of software interfaces will contribute significant understanding of both design practice and socio-technical systems (Baster & Sommerville, 2011:5). Design offers socio-technical development an opportunity to "…reconstruct technologies more wisely and fairly" (Nascimento & Pólvora, 2013:33). The need to reconstruct can be influenced by a number of factors, broadly grouped as changes in: the operational environment (e.g. new ways of engaging with technology, or newer technologies), any changes within the system's organisation, and changes in the user's needs (Perini et al., 2011:440). Nascimento and Pólvora's (2013:33) references to *wisely* and *fairly*, represent a key focus on social influence and application. Through design, socio-technical interactions find a process to open up technologies, and to make technology find appropriate and user-focused applications:

> Views such as universal design, participatory design, ecological design, feminist design, socially responsible design, and appropriate design, with roots in the appropriate technology movement, have been deemed as essential inquiries in this domain, particularly regarding the social inequalities embodied in design practice and products (ibid).

Navigating social complexity is a strength of design processing and thinking. Traditional design skills, such as material mastery, have evolved to address the changing user needs of the 21st Century and beyond. New skills required to address the complex challenges experienced today include observational skills, research skills, empathy, problem-finding and more (Norman & Stappers, 2015:86). Nine properties characterise these complex challenges (Table 2.5), referred to as DesignX challenges:

Table 2.5: DesignX Characteristics

Category	Properties
The Psychology of Human Behaviour and Cognition	1. System design that does not take into account human psychology. 2. Human cognition: the human tendency to want simple answers, decomposable systems, and straightforward linear causality.
The Social, Political, and Economic Framework of Complex Socio-technical Systems	3. Multiple disciplines and perspectives. 4. Mutually incompatible constraints.
The Technical Issues that Contribute to the Complexity of DesignX Problems	5. Non-independence of elements. 6. Non-linear causal relations: feedback. 7. Long and unpredictable latencies. 8. Multiple scale sizes. 9. Dynamically changing operating characteristics.

Source: Norman and Stappers, 2015

Technological challenges, and opportunities, that the ageing population face will be

explored in following chapters in order to define a theory of online service engagement. The need to understand the context of ageing users as part of socio-technical systems is crucial when one considers:

> The challenge that follows from an STS-inspired reflection on the role of older users in design and technology development is whether we are prepared to focus on social change and power relations rather than individual products and aging as a discourse. If we do not take such a reflection on board, we will repeat both mistakes and opportunities without really understanding why. Older people will continue to participate in the form of constructed hopes of technical solutions and a range of products will land randomly in our everyday lives, some as innovations, others as failures (Östlund, Olander, Jonsson & Frennert, 2015:89).

Through the lens of DesignX challenges, online services - and the significance of these to an ageing user - can be analysed as progressive steps towards a contextually relevant design.

2.4.2 The user as social actor

In design, attitudes that support a 'bottom-up' approach to design and development are gaining ground. This approach helps empower users to become 'technical innovators' as they contribute to problem-framing and making decisions about developmental needs (Nascimento & Pólvora, 2013:37). The field of Social Informatics (SI) has contributed significantly to the inclusion of cultural (social) user contexts in the design of information technology. Four main phases have been identified: "an early period of *foundational work* which grounds SI (Pre-1990s), a period of *development and expansion* (1990s), a robust period of *coherence and influence* by Rob Kling (2000-2005), and a period of *diversification* from 2006 onwards" (Sanfillippo & Fichman, 2014:19). Research within SI, since 2006, reflects an interdisciplinary nature, within which the role of social phenomena is a key driver (Fichman, Sanfilippo & Rosenbaum, 2015:75).

Two approaches have advanced SI since 2006: the first is Socio-Technical Interaction Networks (STIN)[23], and the second an approach which views the user as a social actor. STIN maintains that there is a mutual shaping of both the technology and social practice within a socio-technical system, through the definition of resource dependencies, as well as other symbiotic processes (Lessard, 2014:145). STIN does not place technology and humans on opposing sides, but rather explores their relationship as co-developers and co-creators of the experience. When one considers the larger conceptual view of technology use, as a means to enable, as well as restrict, the ICT user becomes a more holistic (and complex) entity in the system. Our understanding of a modern user is thus multi-dimensional, as the user represents both a point of 'consumption' of the service or technology, as well as a point of 'origin' (ideas and content). The ability to reframe our understanding of socio-technical contexts allows for an alternative view of the ICT user - as a *social actor*, and as co-creator.

[23] STIN gained prominence from Kling, McKim and Lamb, 2003.

The user as a social actor is "characterized by four main dimensions: affiliations, environments, interactions, and identities" (Lamb & Kling, 2003:204). Temporality was later added as a fifth dimension. The dimensions described by Lamb and Kling (2003) allow for a structured evaluation of the social actor (user) and his or her interaction with the technological system (Table 2.6).

Table 2.6: Multidimensional View of a Social Actor

Social Actor Dimension	**Characteristics and Behaviours of Connected and Situated Individuals**	**Empirical Examples in the Study Data Presentation**
Affiliations (Definition: organisational and professional relationships that connect organisation members to industry, national and international networks)	Social actor relationships are shaped by networks of organisational affiliations	Affiliations: client demands
	Relationships are dynamic, and related informational exchanges change with flows of capital, labour and other resources	Affiliations: load shifting arrangements
	Relationships are multilevel, multivalent, multi-network (i.e., global/local, local/global, group, organisation, intergroup, interorganisation, culture)	Affiliations: full service
	As relationships change, interaction practices migrate within and across organisations	Affiliations: changing jobs
Environments (Definition: stabilised, regulated and/or institutionalised practices, associations, and locations that circumscribe organisational action)	Organisational environments exert technical and institutional pressures on firms and their members	Environments: global financial/fiduciary practices
	Environmental dynamics vary among industries	Environments: industry or organisational field
	ICTs are part of the organisational environment	Environments: organisational ICT investment
	ICTs are part of the industry, national, and/or global environment	Environments: infrastructural richness
Interactions (Definition: information, resources, and media of exchange which organisation members mobilise as they engage with members of affiliated organisations)	Organisation members seek to communicate in legitimate ways	Interactions: documentation
	Organisation members build, design, and develop interactions that facilitate flow changes	Interactions: making information actionable
	ICTs become part of the interaction process, as people transform and embed available informational resources into connections and interactions	Interactions: design in use
	As organisation members, people perform socially embedded (role-based), highly specified actions on behalf of the organisation	Interactions: organisation members
Identities	Social actor identities have an ICT use component	Identities: presentation

(Definition: avowed presentations of the self and ascribed profiles of organisation members as individual and collective entities)	ICT-enhanced networks heighten ethnic and multiple other identities (global and/or local tension)	Identities: multilevel identities Identities: expert/novice
	ICT-enhanced connections among organisation members transcend roles (project-based)	Identities: hybrid
	Social actors use ICTs to construct identities and control perceptions	Identities: profiling Identities: self-monitoring
Temporalities (Definition: socially constructed segmentations of time that shape interactions of an organisation member in response to the expectations of networked affiliates.)	Social actor interactions are responsive to relational time constraints	Temporalities: time constraint
	Project-based time segmentations transcend organisation and network structures	Temporalities: prominence
	ICTs reinforce (i.e. speed up) existing time constraints and precipitate interaction	Temporalities: timeframe

Source: Lamb and Kling, 2003: 213, with *Temporality* addition by Lamb, 2006

When viewing users as social actors, and as equal contributors to the STS, they become co-creators of the solution and engage with both technical and social experts. Dimensions relating to affiliations and environments are greatly focused on the role, decisions and practices of the 'organisation', the reference being drawn mainly from work practice and how socio-technical systems can support these. When reflecting on the use of technology by an individual user in a more private capacity, *affiliation* can refer to activities that link the user to communities or other individuals, using a technology that is deemed appropriate by both parties. The use of these technologies within a system that both parties accept as appropriate creates an *environment* of use grounded in predefined interactions between affiliates (Lamb & Kling, 2003:215).

A major dimension concerning private use of technologies within socio-technical systems refers to how individuals (actors) interact with one another within the system, and factors that support or place strain on those interactions, or exchange of information. The context of time, in relation to usage and perception, also influences the interaction (Lamb, 2006). Through interactions with other social actors, actors form online identities. These could be singular, or multiple, depending on the affiliate or interaction at hand. Formation of, and the effect of users' online identities on social media sites, for example, is currently a critical research area (Page, 2013; Van Dijck, 2013; Seargeant & Tagg, 2014). To explore the concept of a social actor as contributor (and creator) of his or her own experiences online, a meta-design approach may be considered.

2.4.3 Meta-design practice: designing together

The earliest reference to meta-design is by designer and theorist Andries van Onck, but it is Henri van Lier's work in the 1970's that explored the system in which people's everyday actions were linked to larger networks through design (Busbea, 2009:113). Van Lier also noted the application and implication of meta-design within information design. More

recently, the core concept behind meta-design has been the collaborative creation of socio-technical environments that motivate end-users to learn and use them in their everyday lives (Fischer, Giaccardi, Ye, Sutcliffe & Mehandjiev, 2004). Meta-design, as an approach, focused on "objectives, techniques and processes to allow users to act as designers" (Fischer & Herrmann, 2011:1). The approach thus facilitates a process through which complexity can be addressed. It does not offer fixed solutions, but rather an opportunity for stakeholders to collaborate and develop contextually relevant solutions.

The meta-design framework in which STS can develop, aims to allow users to play a more active role in the planning and conceptualising of technologies. The role of users in the creation, and conceptualisation, of products and services has evolved from being driven by a design team (which may include professionals from a number of fields) to a more collaborative process (Figure 2.5). The consideration of input from users has developed significantly as originally software projects considered user feedback only at the final stages of the design process – the user acceptance testing (UAT) approach. This approach could potentially invest research into a solution that does not address user needs, but only surmise this after the fait accompli:

> When we set up a UAT exercise we are testing a system and not just a piece of software, which means we are really interested in knowing whether the overall IS works. If this system does not work as we expect, there could be a number of reasons, and among these is the possibility that the software does not do what it should. But the software could be working perfectly and some other aspect of the system could be at fault (Hambing & Van Goathem, 2013:4).

Participatory design (PD) practice seeks to address the lack of user involvement throughout the process by encouraging continuous collaboration between users and those involved in the process (Winograd, 1996). The role of users in the participatory design process should not only influence the development of solutions, but also the identification of needs, or 'problems', that underpin the development of new technologies and products (Winschiers, 2006:76). How users engage, and the level to which their views are acknowledged within the final design, varies.

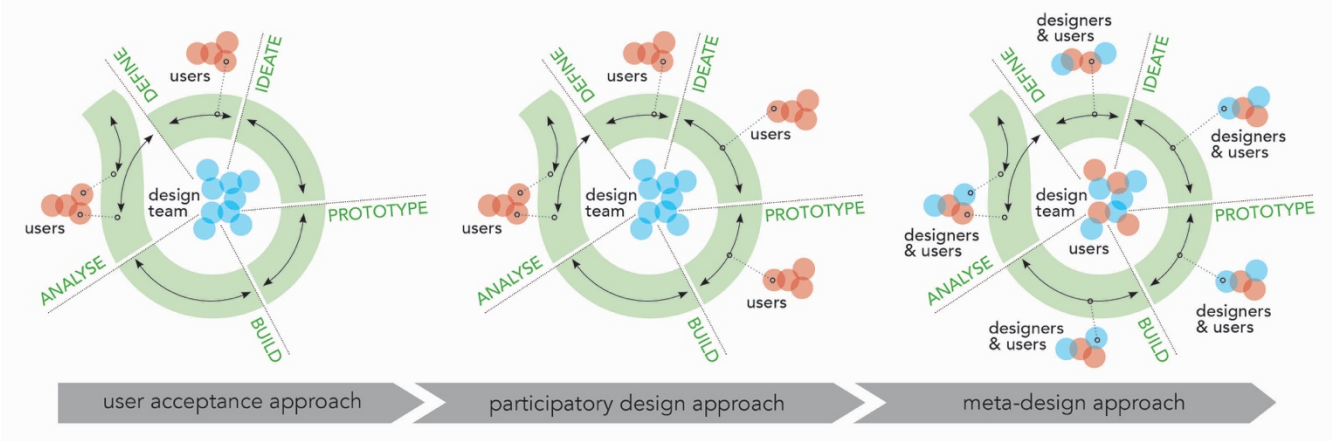


Figure 2.5: Towards a Meta-Design Approach

In order to encourage deeper engagement, with tangible user impact in the final solution, a framework that supports collaboration could be considered. The meta-design approach focuses on co-creation with users throughout the process (Figure 2.5). This approach shares an aim and focus with human-centred design, which is based upon an explicit understanding of users, their tasks, and the environments in which those tasks are carried out (Baxter & Sommerville, 2011:7). Five principles relating to meta-designed STS are presented by Fischer and Herrmann (2011:2):

1. The cultures of participation "…that put the owners of problems in charge and give them control of how technical systems are used and which functionality is underlying the usage" (ibid);
2. Empowerment for adaptation and evolution "…by offering functionality for tailorability, customization, and user-driven adaptability" (Mørch, 1997:53);
3. Seeding and evolutionary growth, "…in which the seed represents a result of under-design—it represents basic structures and is in accordance with the relevant standards but it leaves space and options for the development of concrete details" (Fisher & Ostwald, 2002:138);
4. Under-design of models of socio-technical processes to "…support and accompany the communication during the evolution of a socio-technical system" (Fisher, 2003:89);
5. Structuring of communication "…supports the integration of various perspectives, the negotiation of design decisions, the building of commitments about how technology will be used and adapted, and the evaluation of prototypes" (Fischer & Herrmann, 2011:2).

Meta-design focuses on iterative cycles of improvement and adjustment of STS (Fischer & Herrmann, 2011:7). This perspective allows for continuous and imbedded user input in the design process, helping to ensure a contextual user-fit. Through the development of theory regarding participation and engagement, it is possible to gain a greater understanding of users within a socio-technical interaction.

2.4.4 Exploring an interaction

Ignoring the social and system contexts in which an innovation, or product, will exist could have disastrous implications. In Lamb and Kling's (2003) description, an online interaction is merely one dimension within the STS. A user with a distinct online identity initiates the time-based interaction with various affiliates in a specific interaction environment. In order to understand the intersection one should consider all aspects and define the point of exchange between user and technology, such as the user-interface. It is important to reflect on the design of user-interfaces, since user morale may decrease and users may become less efficient if the interface is inadequately designed (Maguire, 2014:165).

The focus should be on objectives, processes and techniques in which users become co-designers of their experiences (Fischer & Herrmann, 2011). This allows users the ability to create frameworks of interaction and learning (adaptable), instead of solutions (fixed). Yet, the creation of frameworks and interaction with technology may lead to a sense of alienation felt by users:

> Utilizing technical products means making use of alien abilities and knowledge, sometimes even to be overwhelmed by alien goals, which may be incorporated in the artifacts as well. So the venerable concept of alienation takes on its proper sense. Humans in socio-technical systems are alienated by the transindividual power of artifacts, in principle and regardless of the relations of property. I think this is an important reason for the uneasiness of many people towards the utilization of modern technology (Ropohl, 1999:70).

User feedback and input[24] during the development process is important to design solutions that speak directly to user requirements, and encourages user commitment and ownership of the process (Maguire, 2014:165). The acknowledgement of user feedback is aligned with the meta-design approach. One's understanding of STS and approaches should be evolving and flexible, allowing for testing, and questioning of existing principles and practice (Davis, Challenger, Jayewardene & Clegg, 2014:172). The flexibility and openness required to facilitate a greater understanding on STS is at the core of the Internet's growth and success. Tim Berners-Lee, who invented the World Wide Web, believed in an open development context and distributed his original source code to encourage a community of global users to contribute (Castells, 2014:133). The structure of modern online culture and social behaviour, as facilitated by the network society, remains focused on individualisation and 'the culture of autonomy' (ibid). This has supported a paradigm shift towards a social dimension of computing and connected digital technologies (White & Le Cornu, 2011:4).

A critical realist perspective of STIN, and viewing users as social actors, brings into focus the need for an existing socio-technical network to facilitate analysis (Lessard, 2014:145). It is through the analysis of users' interaction within a socio-technical system that new understanding emerges. If the understanding is gained through a rigorous research process, such as *grounded theory*, what has been discovered can lead to theoretical development (such as the theory developed within this study). When analysing a system using Lamb and Kling's dimensions a clearer image of usage, opportunities and challenges can be identified.[25] One can also analyse the interaction in STS through a capability perspective. When discussing capability, it is crucial to note that, even though a user may have no prior experience or knowledge of the technology, he or she has the capability to develop. Manzini (2006:13) defines capability within design as the "...possibility of a

[24] The reference to user feedback and input is associated with the nature of this study – exploring the online service experiences of ageing users.

[25] A clear use of Lamb and Kling's (2003) dimensions in the analysis on primary and secondary user scenarios can be found in Ferneley and Light's (2008) case analysis based on studies at the UK Fire Brigade. Their work also brings into play the role of the 'bystander', as an unintended participant in the system.

person to achieve a result using his/her own personal resources and the set of solutions he/she has access to…". The most interesting aspect of this concept is that it leads us to talk about people's well-being, moving our attention away "from goods to what goods enable human beings to achieve"[26]. The user's freedom to choose whether he or she wants to engage must also be considered. Through this perspective technological innovation must provide real opportunities for the user (social actor) to engage in the process, and benefit from the final solution (Nascimento & Pólvora, 2013:33). In design the capability perspective is linked to participatory design practice grounded in social development (Manzini, 2006; Oosterlaken, 2009). The evolution of interface design and 'design for user-friendliness' reflects a shift towards a heightened level of user contribution and engagement.

2.4.5 Evolution of the user interface to support interaction

Technology, and the systems that developed as a result, opened doors to global information sharing, collaboration without proximity, evolving work practice, digital modes of service delivery, entire new industries, as well as new opportunities to engage socially. The plethora of opportunities that technology offers is, however, grounded in one's ability to understand and navigate the digital world; the term *digital literacy* emerged as a descriptor of this ability. White and Le Cornu (2011:4) briefly explain the development of digital literacy within a work context, in which we are:

> … witnessing the social appropriation of new computing technologies. Microsoft's Office suite is an excellent example of this, as well as of the skills that people needed to use the applications effectively. Each application had — and has — a specific purpose that enabled users to do something. It functioned as a tool, a means to an end; users learned and practised skills, developing varying degrees of competence and confidence in achieving their desired ends. Despite numerous iterations of these platforms and of computing operating systems, a set of generally accepted principles of good practice emerged relating to what users needed and how they could access this most effectively, with the result that users could develop a set of transferable skills applicable across a range of platforms and become computer literate.

Digital literacy, and the ability to engage online, is facilitated through a touchpoint[27] between the human and service facilitated by technology (in the case of online services). White and Le Cornu's (2011) definition of digital literacy reflects on practice within a work context, but as participation on social platforms becomes more prolific, digital literacy enables activities beyond the workplace. Web 1.0 refers to the early phases on Web development when content was provided through static websites. As web content became more interactive, Web 2.0 came into being (O'Reilly, 2006). Web 2.0 allowed users to interact with content and facilitate a shift from consuming information and services online, to contributing and shaping those interactions (Fischer & Herrmann,

[26] Manzini's concept of 'capability' is taken from Nussbaum and Sen's (2003) theories.

[27] The term 'touchpoint' is used in Service Design to refer to an interaction, or moment of contact, between a customer and a service provider. Touchpoints can be designed as part of a holistic service, or can develop as a service provider evolves. Service Design is explored in more detail in 2.5 Designing services with users.

2011:11). The interface of an application represents a point of access for the user. As the nature of the Web changed, so did the design and features of interfaces.

An evolution of user-interface design can be established by highlighting the key developments in each decade. Foundational technologies, including Teletext[28], are not the focus of the review. Instead, focus in placed on how interaction between the user and online service provider developed, and how this was facilitated through design.

2.4.5.1 The 1980's: The year of the machine

The modern Internet was a project funded by the Department of Defence (USA) to connect research institutions across America. The proposed network was named ARPAnet after the department's Advanced Research Projects Agency (ARPA). By the end of the 1970's, Apple had released the Apple II (the first computer with colour graphics), software programmes (such as WordStar and VisiCalc) were changing everyday work practice (Carlson, 2009), and ARPAnet connected institutions across America and Europe (Kessler, 2014). The 1980's represent a significant period in the development of the computer. In 1983 Time Magazine named the computer 'Machine of the Year', instead of selecting their traditional 'Man of the Year'. In the Time Magazine article Rosenblatt (1983) writes: "Inventions arise when they're needed. This here screen and keyboard might have come along any old decade, but it happened to pop up when it did, right now, at this point in time, like the politicians call it, because we were getting hungry to be ourselves again". In 1980, IBM contracted Microsoft to begin the development of an operating system for the personal computer. Microsoft demonstrated 'Interface Manager' in 1983, which would later be renamed Windows. Windows 1.0 was launched in 1985, and had sold a million copies by 1987 (Delonix, 2016). The design was basic, text-driven and with many tasks 'hidden' behind command codes. For Apple, the 1980's brought the Apple III, and the Macintosh with built-in monitor - marketed for the first time during the 1984 Superbowl (Rawlinson, 2016).

The importance of creating services and products that acknowledge the user's needs during this period is highlighted by early user testing and usability concerns. The introduction of 'Tutorials for the First-Time Computer User', published in 1981, suggests that software development would benefit from observing a small group of users in situ to measure suitability and user concerns (Chapanis, 1981). Gould and Lewis (1985) continued building on this premise and highlighted the need for iterative design development with continuous user input.

2.4.5.2 The 1990's: Online becomes graphic

The expansion and development of the Internet and personal computers in the 1980's

[28] Teletext represents the first communication service of news and information through graphics and text. The service was offered via spare television channels through a receiver on the user-end.

formed the foundation of the modern online world. As personal computers became more affordable access to the Internet became more commonplace in the 1990's. The World, a Boston (USA) based service provider, became the first commercial provider of dial-up access to the Internet in 1989. As the use of online services became more popular a search mechanism was required. Universities and research facilities played a major role in this development with the 1992 Lynx system developed by the University of Kansas, and the 1993 Mosaic system developed at the University of Illinois. Mosaic (Figure 2.6) was the first graphic web browser for Windows and facilitated an explosive growth of web traffic at an annual rate of 341,634% (Carlson, 2016). The graphic interface of Mosaic represented a focus on 'accessible' interaction, which can also be noted in the design of Windows 95 (Figure 2.7). The interface was significantly different from previous versions and included Windows Explorer – a native browser (Delonix, 2016). A focus on the experience of websites, and the design of positive user interactions, became a key driver in online development (Fleming and Koman, 1998).

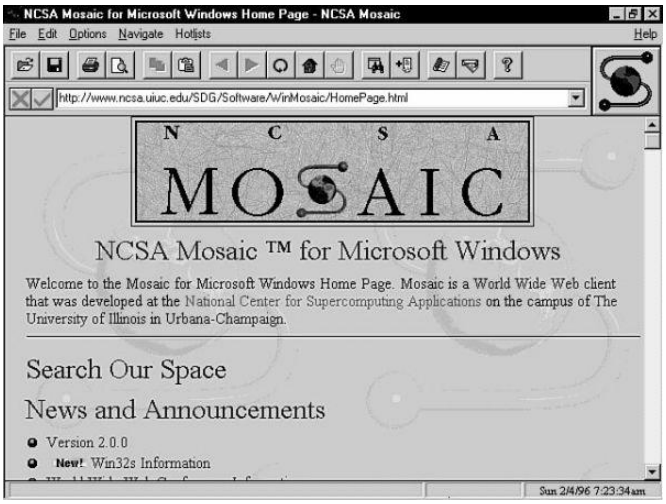


Figure 2.6: Mosaic Web Browser, designed by Marc Andreessen and Eric Bina
Source: Delonix, 2016

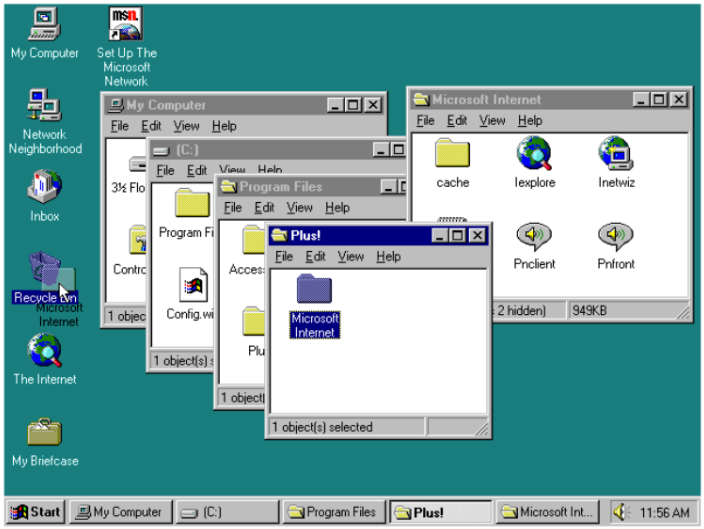


Figure 2.7: Windows 95 Graphic User Interface, Released 1995
Source: Delonix, 2016

The Internet, as a new platform for communication and information sharing, created new ways for users to access services. From the early 1990's onwards organisations began to make news available online, and service providers, such as Delphi (1992), started offering comprehensive access to Internet mail, groups, web searching and file sharing (Carlson, 2016). Organisations and developers began to focus on how people used the Internet and how their activities could be streamlined, supported and facilitated. One such development was Google, which launched for the first time in 1996 (Battelle, 2005).

Navigation of the Internet was not the only form of navigation that experienced change. The Simon Personal Communicator, the first cell phone with touchscreen technology, was launched by BellSouth and IBM in 1993 (Power, 2013:6). The phone featured e-mail applications, as well as a calendar, appointment schedule, address book and a calculator. The concept behind the device and application was to make the user's daily tasks more accessible and streamlined. Touchscreen technology allowed users to engage physically with technology - and allowed gesture navigation to flourish.

As accessibility and usability of platforms improved, opportunities for more direct engagements online became achievable. Social network sites are a key feature of our modern networked society, but the earliest recognisable site of this nature, SixDegrees.com, was launched in 1997. The site allowed users to "create profiles, list their Friends and, beginning in 1998, surf the Friends lists" (Boyd & Ellison, 2007:213). The features that SixDegrees.com offered were not unique (as all were present in older sites), but SixDegrees.com was the first to bring these elements together in a site focused on social engagement online.

2.4.5.3 The 2000's: Rise of social networks

The Wall Street Journal reported in 2001 that more than 461 million individuals worldwide were connected to the Internet (Kawamoto, 2003: 54). In November 2015, nearly 3.4 billion people had access to the Internet (Miniwatts, 2016). The growth of the Internet has been astounding. Today almost half of the global population communicate, share, work and interact using technology. One of the defining aspects of technological development in the 2000's is the facilitation of social engagement through enabling online platforms.

From 2003 onwards many social network sites were launched; some focused on socially-organised broad audiences and others on professional networks. As social networking became more popular existing online services began to include elements of SNS to encourage usage; for example, Flickr and YouTube (Boyd & Ellison, 2007:217). Facebook emerged as a closed Harvard student platform in 2003, but became globally accessible in 2006 (ibid). The popularity of SNS has resulted in a shift in personal interaction styles and has led to a re-evaluation of identity formation and culture:

> In the abrupt cultural shift towards the construction of social networks, we argue that the analogies of language and age cease to function and believe that a metaphor of place is more fit for the purpose of understanding different behaviours and potentially aptitudes…However, our definition of place does not make a hard distinction between the virtual and the physical; on the contrary, we are proposing that place is primarily a sense of being present with others (White & Le Cornu, 2011:4).

The rise of SNS is but one example of the changing nature of society and interaction in the networked society. Within the virtual realm new forms of engagement and community development can be noted. The level to which one can interact, however, is still limited by the design of the platform, or service. In 2003 it was found that the United Kingdom's ten most read online newspapers failed "to meet accessibility standards for users with visual impairment, dyslexia or physical disability" (Carlson, 2016). The consideration of users in the design of online services is vital to their success, and as a result there is a greater focus on usability (often from a more technical perspective) and on the design of engagements and interactions (a user-centred focus indicative of a design approach, such as *service design*).

2.5 Designing Services with Users

Services are a significant part of modern life, from being one's own travel agent to online banking services, and from mobile connectivity to virtual classrooms. The value of the service economy can clearly be noted when one considers the rise of the service sector in the global gross domestic product (GDP). The estimated contribution of the service sector to the world's GDP in 2015 was 62.4% and in South Africa, 67.4% (CIA, 2016). The importance of services within the South African economy is not a new concept:

> The Services sector has become one of the most important sectors in the South African economy as it has grown double the rate of manufacturing over the last three decades. There is a noticeable absence of serious economic analysis of the importance of the South African Services sector both to employment and export revenue (Hodge, 1997:1).

The South African service sector has mainly focused on the economic impact and exportable potential of services, as well as the relationship between services and manufacturing economies (Obinyeluaku & Sako, 2013). Today the development and delivery of services in South Africa are being reviewed from both an economic and design perspective. The goal is to review the suitability and quality of service delivery (both in the physical realm and digitally) through design, placing the human stakeholders at the centre of the design process (Miettinen & Valtonen, 2013). *Service design*, as an approach, is a growing field that encompasses many different areas of design, organisational theory and practice, information and communication technology (ICT) and many others.

Service design has been practised and researched in Europe since the early 1990's, with earlier references to the approach from a marketing perspective emerging since the 1980's (Moritz, 2005:66). The evolution of *service design* can be ascribed to many influences; most notably the revolutionary impact of new technologies. Other influences include the role of services in economic profits, the rise of user-focused practices in design and development, and an increase in multi-disciplinary, inclusive design practices. It is important to note that a design focus that relies on *technology push* runs the risk of alienating users by "creating products or services that people cannot or do not want to use" (Steen, 2012:72). *Service design* projects are often characterised as multi-disciplinary and holistic, aiming to either innovate or improve services for both the end user and the stakeholder or organisation providing the service (Moritz, 2005:7). Maffei (2005:7, quoted in Blomkvist & Holmlid, 2009:22-23) is referred to when trying to understand the complex, and often abstract, nature of a service encounter and concept:

> …the general description of the offering and the elements which communicate the service itself (service brand, identity and mood); these elements are translated in the particular aesthetic of the interaction stream (service encounters) and in the peculiar characteristics of the service evidences, like tools, environments, etc. or in the proprietary script of the interaction/dialogue with the service operators.

In some cases, service delivery may require human interaction, and in others, the stakeholders' behavioural change and learning could be initiated without face-to-face interaction (Moritz, 2005:27). The points of contact between the user and the service provider are referred to as *touchpoints*. These can be designed to facilitate a positive user experience. The role of the user within the service experience cannot be overstated. The intense experience-focused nature of services has led to the development of service design thinking approaches and *service dominant logic*, which focuses on the role of the user in the development of business practice and public policies.

The Double Diamond (Figure 2.8) is a design process model that is often associated with *service design*. The model is similar to design thinking models in that it proposes an iterate progression between divergent and convergent thinking (as well as creative and analytical thinking) to address user needs or a design problem creatively. The Design Council (2015) describes the four phases of the Double Diamond model as follows:

- *Discover:* "The start of a project is a period of discovery, gathering inspiration and insights, identifying user needs and developing initial ideas."
- *Define:* "The second quarter represents the definition phase, in which designers try to make sense of all the possibilities identified in the Discover phase."
- *Develop:* "The third quarter marks a period of development where solutions are created, prototyped, tested and iterated. This process of trial and error helps designers to improve and refine their ideas."
- *Deliver:* "The final quarter of the double diamond model is the Deliver phase, where the resulting product or service is finalised and launched. The key activities and

objectives during this stage are: final testing, approval and launch, targets, evaluation and feedback loops."

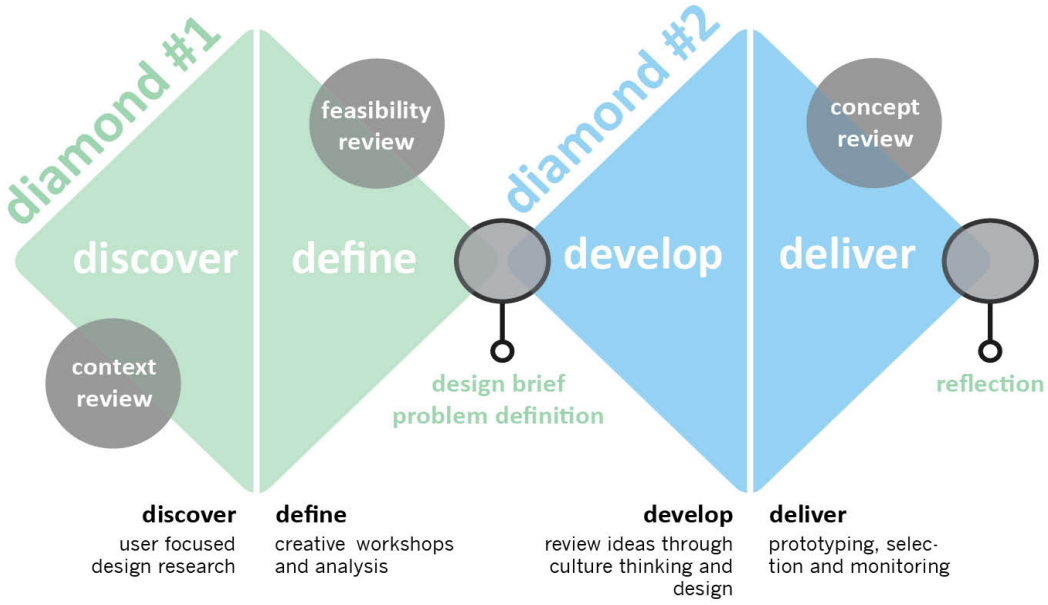


Figure 2.8: The Double Diamond Design Model from the Design Council UK

During the first phase, *Discover*, the design problem is explored through investigation of the topic. Following this investigation, a design brief is defined and created. These steps form the first of the two process diamonds. Collaboration and group activities during this phase are often linked to a designer exploring the problem and context with various users in participatory scenarios. The second diamond refers to the prototyping, production, implementation and final validation of the proposed design solution or intervention. In terms of learning theory, this phase of the model corresponds to the social learning and constructivist learning theories in that the learner (the user and designer) evaluates which information and past experiences are relevant to understanding new knowledge by testing it in a group setting (Johnson & Johnson, 2004). In social constructivist theory, dialogue and interaction (through collaborative interaction throughout the process) internalise learning and facilitate a sense of ownership among participants (De Witt et al., 2014:91). The present study is not presenting the double diamond process as the only suitable model. Instead it is offered as a procedural example of the phased nature of the *service design* process (and design in general).

2.5.1 Service design thinking

Service design thinking refers to a manner of thinking and problem-solving associated with the iterative and process-driven approach of designing services. The process is not dissimilar to design thinking, but allows for agile and complex investigation that may lead to non-discipline specific outcomes. This reflects *service design's* characteristic of variable, and possibly multiple, design outcomes within a single project. Five key principles of *service design* thinking, according to Strickdorn and Schneider (2013:34), include:

- User-Centeredness: services should be experienced through the customer's eyes.
- Co-creation: all stakeholders should be included in the service design process.
- Sequencing: the service should be visualised as a sequence of interrelated actions.
- Evidence: intangible services should be visualised in terms of physical artefacts.
- Holism: the entire environment of a service should be considered.

Stakeholders considered within the *service design* thinking approach include customers, service providers (at all levels of service delivery), organisational stakeholders and service designers (as well as other professionals required by the specific context of the project). The reference to user-centeredness, co-creation and holism as key components of *service design* thinking resonates with *service-dominant* (S-D) logic.

Reflecting on the suitability of goods-based marketing can be considered a turning point in marketing logic (Vargo & Lusch, 2004). As a result, the marketing mindset transformed to one that is "… a unified understanding of the purpose and nature of organizations, markets and society" (Vargo & Lusch, 2016). A key focus within the shift from goods-dominant logic to service-dominant logic is the role of the customers in the process – shifting from receiver to co-creator of value perceptions. The foundational premises (FPs) that underpin S-D logic are summarised in Table 2.7.

Table 2.7: Foundational Premises of S-D Logic

Code	Foundational Premise	Comments
FP 1	Service is the fundamental basis of exchange.	The application of operant resources (knowledge and skills) and 'service' (as defined in S-D logic) are the basis for all exchange. Service is exchanged for service.
FP 2	Indirect exchange masks the fundamental basis of exchange.	Because service is provided through complex combinations of goods, money and institutions, the service basis of exchange is not always apparent.
FP 3	Goods are a distribution mechanism for service provision.	Goods (both durable and non-durable) derive their value through use – the service they provide.
FP 4	Operant resources are the fundamental source of competitive advantage.	The comparative ability to cause desired change drives competition.
FP 5	All economies are service economies.	Service (singular) is only now becoming more apparent with increased specialisation and outsourcing.
FP 6	The customer is always a co-creator of value.	Implies that value creation is interactional.
FP 7	The enterprise cannot deliver value, but only offer value propositions.	Enterprises can offer their applied resources for value creation and collaboratively (interactively) create value following acceptance of value propositions, but cannot create and/or deliver value independently.
FP 8	A service-centred view is inherently customer-oriented and relational.	Because service is defined in terms of customer-determined benefit and is co-created, it is inherently customer-oriented and relational.

FP 9	All social and economic actors are resource integrators.	Implies that the context of value creation is networks of networks (resource integrators).
FP 10	Value is always uniquely and phenomenologically determined by the beneficiary.	Value is idiosyncratic, experiential, contextual, and meaning-laden.

Source: adapted from Vargo & Lusch, 2004

Although ten foundational premises are stated, four main premises were highlighted as highly important, with the other premises forming subsidiaries of these. The four main premises referred to are FP1 *Service is the fundamental basis of exchange*, FP6 *The customer is always a co-creator of value*, FP9 *All social and economic actors are resource integrators* and FP10 *Value is always uniquely and phenomenologically determined by the beneficiary* (Vargo, 2013:8). At the core of these premises is the role of the user (customer) and the relationship between all stakeholders and the organisation.

The dichotomous nature of user-centred co-creation is highlighted by Plé (2010) who defined the concept of 'co-destruction'. An example of a vehicle sale is offered. The user failed to maintain the vehicle, which leads to a decrease in its value. Beyond the physical value decrease the user may feel unhappy and "…blame the firm for the problems they experience with the car and damage the image of the firm by communicating their adverse opinion of the firm's value proposition to other people through negative word-of-mouth" (Gannage, 2014:5). The concept of service value in this case is, however, linked to a user's action after the service encounter, a situation beyond the control of the service provider. *Service design* can facilitate the co-creation of the interaction between user and service provider and product, but cannot control human behaviour pre or post interaction. The delivery of services, in the physical and digital realm, is a complex process that often includes multiple processes and multiple stakeholders in a service network:

> Traditionally, design has been taken to refer to design of products or spaces, but more levels have emerged as the shift from product-based thinking to service thinking has taken place. The wider view includes also the design of customer experience, processes, and systems as well as strategy, philosophy, policy, or ideology. S-D logic's transcending conceptualisation of service provides a good perspective for designing service as an entirety consisting of several service systems (Wallin, 2013:123).

To make services systems more accessible and desirable a focus on collaborative development, such as co-creation, can tailor services to specific user-needs. *Service design* thinking places this user-centric perspective at the centre of service solution conceptualisation. User orientation, contextualisation and other service development challenges are the foundation of *service design* practice (Holmlid, 2005; Moritz, 2005; Holmlid, 2007). The focus on collaborative service conceptualisation allows for marginalised users and non-traditional target groups to be acknowledged in the development of services and artefacts (Nascimento & Pólvora, 2013:38).

2.5.2 Collaborative design practice

Tools and methods alone cannot ensure that a designer or stakeholder actively includes the views of users in the *service design* process. The design process must be human-centred in a holistic manner and focus on the inclusion of user perspectives, needs and requirements in logistical, practical and contextual ways (Akama, 2009:4). This implies that the designer, project and discipline intrinsically value the input of users – as can be noted in a meta-design approach. This is a very complex space, as collaborative work practice must mediate the needs of many different stakeholders, including designers, manufacturers, clients, end users, etc. (Klein, Sayama, Faratin & Bar-Yam, 2003:201). To address this complexity the nature of collaborative design processes can be classified according to dimensions of *participation* and *governance*.

Pisano and Verganti (2008) define the dimensions of participation as being either open or closed, and governance as being either flat or hierarchical. Open participation arises when the design challenge is opened to receive comments or contributions from anyone, whereas closed participation refers to a selected group of participants, often selected by a designer, project manager or group leader. Flat governance structures reflect a democratic decision making process in which all participants have an equal say, and project goals and decisions must be made unanimously. Hierarchical governance places the final decision-making responsibility in the hands of a single person (or small group of participants) selected by the project initiator. When viewed in relation to one another, the classifications of participation and governance define four main modes of collaboration in design projects (Figure 2.9).

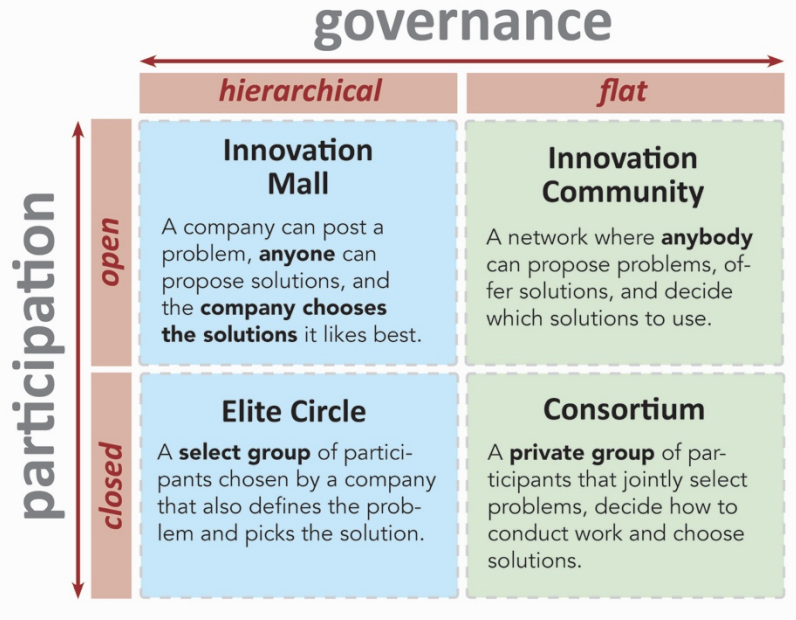


Figure 2.9: Modes of Collaborative Design
Source: Adapted from Pisano & Verganti, 2008

The move to user-centred design practice focuses on the open mode of participation. Incorporating the views of users within the design and innovation process cultivates

positive user perceptions, beyond the group who actively participates in the process:

> Companies are increasingly drawing on their user communities to generate promising ideas for new products, which are then marketed as user-designed products to the broader consumer market… observing consumers prefer to buy from user- rather than designer-driven firms because of an increased identification with the firm. We demonstrate that a firm sees a significant and often substantial increase in preference if the firm is portrayed as pursuing a user- versus designer-driven market philosophy (Dahl, Fuchs & Schreier, 2014:1987.

The implied commercial gains of maintaining a user-driven focus is a financial benefit. In addition to the perceptions of consumers, a more user-driven approach also yields products and services that address user-needs in a more contextually relevant way. Including user feedback and ideas during the design process is crucial in design, resulting in approaches, such as meta-design, and more specifically user-centred design, participatory design and co-operative design (co-design). User-centred design (UCD) is a process through which products and services are created from the perspective of the end-user. As a process, UDC is defined through ISO 13407, revised to ISO 9241 (Figure 2.10). A key development to the standard was that the term 'user-centred design' be replaced by 'human-centred design' in order to acknowledge the impact of all stakeholders, not just users (ISO, 2010). The UCD process does pose challenges to design teams and does not necessarily save money, however "…in the long run, applying UCD saves development time and money by reducing the amount of rework needed" (Mao, Vredenburg, Smith & Carey, 2005:107).

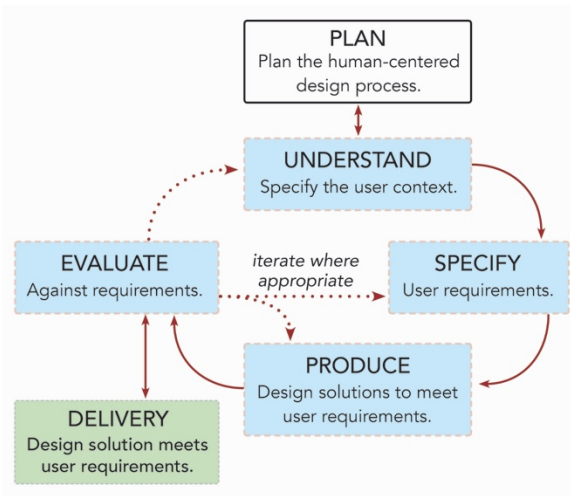


Figure 2.10: User-Centred Design Process

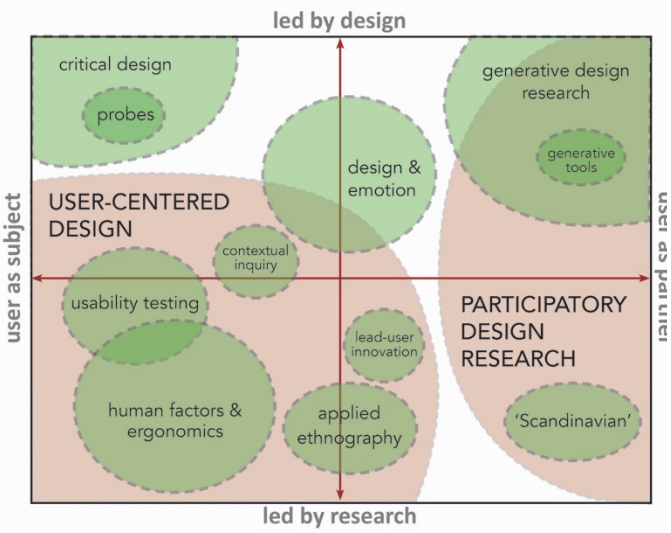


Figure 2.11: Human Centrered Design
Source: Adapted from Sanders & Stappers, 2008:6

Although similar, participatory design and co-creation processes have different origins and perspectives on user input (Figure 2.11). Participatory design emerged in Scandinavia to address transformation of workplaces after the introduction of computers in the 1970's (Simonsen & Robertson, 2012:2). Participatory design focuses on the shaping of future products, spaces, services and interactions to ensure future scenarios that reflect

real user engagement (and user-centred processes). Co-design refers to the practical process of involving users throughout the whole design process (Sanders & Stappers, 2008:6). Co-creation moves beyond user input and feedback to collaboration in the physical manifestation of the design, and reflects the meta-design approach.

The meta-design approach shares traits with user-centred design, participatory design and co-design, and aims to create solutions grounded in an understanding of users, as well as factors that holistically influence their interaction with technology (Baxter & Sommerville, 2011:7). From a technology perspective, the realisation of a truly co-created solution may be costly and physically problematic to code, but without user input the solution may be unappealing to end-users (Martin, 2002).

2.7 Conclusion and Contribution

This chapter aimed to explore key elements that influence the problem context. It is not a complete review of all literature pertaining to the topics identified, but rather provides the reader with a concise exploration of the larger problem setting. Elements discussed are taken from various fields of study, but have at their core a similar focus: the relationship between humans and technology, as well as factors that influence this relationship.

The aptitude and skills required to navigate the networked society are crucial in order to access all that the online world has to offer. González's (2014) description of an *Internet of Things* as society's future highlights not only the possibilities of a connected society, but also the need for access to this network to ensure prosperity. Individuals, of all ages, will need to acquired skill sets to engage fully with, and benefit from, a networked society. The shift towards the future which González describes can already be noticed in our modern world through changes in communication and the perception of distance. Today we can connect instantly with other users across the world, changing how we communicate and work, and evolving standard views on location-based collaboration (Castells, 2014). Teams can collaborate and communicate across countries and time zones. Individuals can connect with friends and families abroad impacting social connections and relationships. It is also prudent to acknowledge that a decline in face-to-face interaction and the willingness to engage physically has been noted among networking individuals (Kraut et al., 1998; Sobel-Lojeski & Westwell, 2015). When considering the impact of a networked society, both positive and negative, it is crucial to consider the lens through which the nature of interaction is viewed. As individuals, we perceive phenomena through the lens of our own assumptions and constructed reality[29]. Our own willingness to engage online and adopt new technologies shapes how we critique the influence of these technologies on individuals and society as a whole. As a user, we may exhibit a 'carefree and confident' nature when engaging online, or we may

[29] The ontological perspective of the researcher and study is explored in Chapter One.

feel nervous, or we may locate ourselves somewhere between these two points (Christodoulides et al., 2011). Irrespective of our personal perception of engaging online and the networked society, it is becoming very difficult to avoid 'technological dependence' as many retail, civic and social services move into this space – in some cases lessening or removing the ability to engage physically when needing specific services (Konsbruck, 2009)[30]. Engaging within a more connected society does, however, require access to global infrastructure and the ability to navigate the systems.

Literature shows that connectivity within Africa is not yet constant or widespread. Although this continent represents the fastest growing market for IP networked devices and shows the highest growth in Internet users from 2000 to 2017, many areas in Africa still struggle with broad-based access (CISCO, 2015; Internet World Statistics, 2017). Within an African context, access is often obtained through a mobile device (sometimes a shared device), especially in areas where infrastructure is lacking or old (Effective Measure Report, 2016). Limitations to accessing the Internet can be linked to both infrastructure and socio-economic limitations, as well as social issues pertaining to the ability or willingness to engage. The world today is shaped by technology, and much of our daily engagement with services, our work practice and our ability to communicate is mediated through technology. When access is not available, or when access is expensive and/or unpredictable, this greatly impacts the development of an individual and community. In order to foster economic equality, democracy, economic growth and social mobility the digital divide must be closed, granting cost-effective and reliable access to all (Mossberger et al., 2007; Miniwatts, 2015).

Access alone, however, does not fully describe perceived lack of engagement. An individual's literacy level, values, peer perception and confidence may all impact his or her willingness and choice to engage online (Watkins, 2012). One way to engage individuals is to take their concerns into consideration when conceptualising a service or online experience. By incorporating users' lived experiences, and acknowledging their fears, desires and restrictions a more holistic understanding of the socio-technical interaction emerges. To ensure that online services speak to real user requirements it is preferential to include users throughout the design process. Although this collaborative method of designing artefacts and services has become more commonplace, not every possible user groups is always included in traditional co-design practices. The need to include human contributors in the conceptualisation and design of a socio-technical interaction cannot be over-stated, and allows for the creation of more 'wisely and fairly' constructed technological solutions (Nascimento & Pólvora, 2013:33). The exploration of these concepts in this chapter contributes a clear description of the problem context under discussion.

[30] Examples of this include banking practices in South Africa where some free actions online will incur a cost when completed in a physical bank branch, or service providers no longer providing printed invoices (instead relying on sending customers invoices electronically).

Designing with users allows for the exploration of complex challenges, and leads to design interventions that speak directly to the end-user. DesignX challenges, as framed by Norman and Stappers (2015), include a specific link to technical issues that contribute to complexity and interaction difficulties. These include a lack of clear feedback to the user (or confusing feedback), changes noted in the same service across devices or operating platforms, lack of consistency across services and long or unpredictable latencies. Within the socio-technical framework, these elements represent points of contact between the technical system and the human user. Within the context of *service design*, the technical DesignX characteristics represent opportunities for the development of service-user touchpoints. Users today are not only consumers of an online service, but are also active contributors and content generators through service-user touchpoints. As key participants in the design process of technical solutions and services, users are active agents and co-designers. Fischer and Herrmann (2011) refer to the process of enabling users to become active co-designers of their own technical service solutions as *meta-design practice*. Meta-design shares a focus on human agency within the design process with other design approaches, such as user-centred design and participatory design. Moving forward it is crucial to understand the needs of comprehensive user groups, as technological solutions that do not meet their needs may fall short of being appropriate or viable. From the literature explored in this chapter the following key points emerge as critical when exploring engagement with, and the development of, online services within a South African context:

- South Africa has experienced substantial growth in IP connected devices from 2000 to 2017. However, infrastructure and cost of access to online services is problematic in many contexts (rural areas facing the most significant challenge).
- Access to online services within South Africa often happens through a mobile device as the infrastructure is more expansive.
- Access often happens through shared devices, or shared spaces (such as libraries and internet cafes) which impacts the level of user comfort and confidence to engage.
- How individuals engage online cannot be understood exclusively from the human, or machine, perspective but must be considered as an interconnected relationship (socio-technical interaction).
- It is important to consider the complexity involved in designing the interaction and interface as part of the development of an online service, as this represents the touchpoint between the technology and the user (DesignX).
- Access alone is not the only challenge to online engagement as individual assumptions, preferences and literacy also influence one's decision to engage.
- Technological solution designs must actively include in the process the end-user as a co-creator of the solution (for example, meta-design approaches, service-dominant logic, service design approach).
- Solutions must relate to real-world needs and lived experiences of end-users.

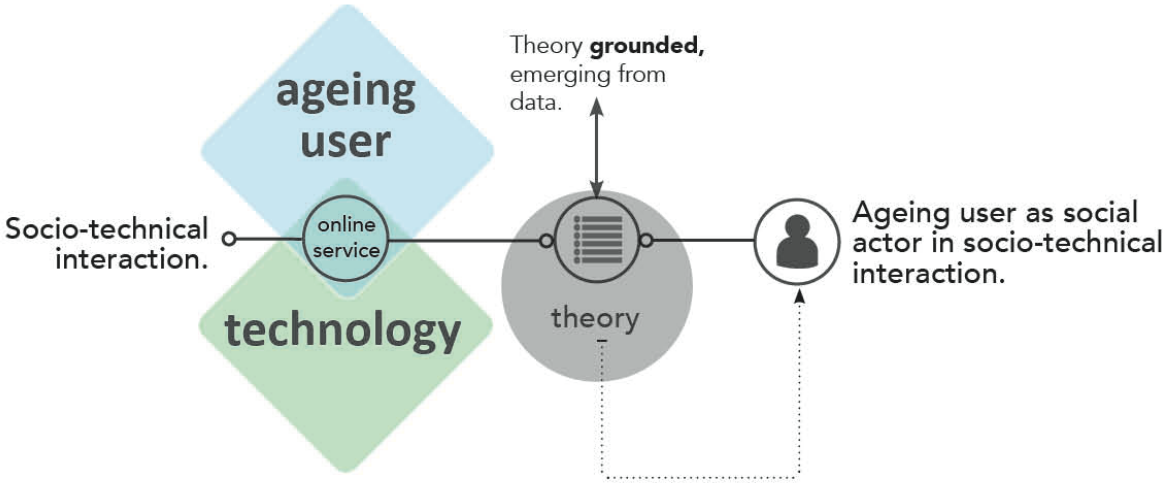


Figure 2.12: Proposed Project Scope

The ageing user group also expect technological solutions, such as online services, to respond to their specific requirements. If not, the proposed solutions merely contribute to their "constructed hopes of technical solutions…" (Östlund, Olander, Jonsson & Frennert 2015:89). In order to understand what impacts online participation of elderly users one needs to frame their participation within a socio-technical context through phenomenographic [31] exploration. In this study this exploration forms part of the grounded construction of theory (Figure 2.12). By defining a theory with respect to ageing engagement, the foundation for future theoretical analysis, review and contribution is established. A greater understanding of the ageing user can impact future service and artefact design projects, as well as the methods used to facilitate the design process.

Chapter Three will introduce *grounded theory* as this project's methodology. The development of a *grounded theory of engagement* will contribute to the definition of an ageing user as a social actor within a socio-technical context. It is not the focus of this project to complete a design process and yield an online service aimed at ageing users, but rather to define the ageing user group. It is hoped that the emergent theory will contribute to both design practice and a theoretical understanding of this user group within a design context. Literature pertaining to the development of design theory is explored in Chapter Three. The role that technology can play in improving the lives of elderly users, as well as challenges noted in literature, is explored in Chapter Four and Chapter Five.

[31] Phenomenography as a method is focused on investigating the different ways participants experience or think about phenomena, and is not to be confused with phenomenology.

Chapter Three
Methodology

Chapter Content

3.1 Introduction

The present study uses a *grounded theory* approach to develop a theory with regard to ageing community engagement with online services. The goal is to develop theory that can contribute to a greater understanding of an ageing online service user as a social actor (within a socio-technical system). Understanding the user within these terms will benefit the process of designing online services. Models that support the design of online services include the Double Diamond (Design Council, 2015). Each diamond phase represents either divergent thinking (collaborative activities with users to explore context) or convergent thinking (analysis and coding of data). It should be acknowledged that, although presented in a linear manner, divergent and convergent thinking often occur in parallels. Data generation and analysis are thus cyclical and progressive, which allows formative findings to be checked and questioned throughout the process. The exploration diamond phase refers to methods and activities that establish the context of use among ageing users. In order to explore possible barriers to interaction with online services, it was important to explore which types of services are most relevant to users, how they are used, and to map the users' journeys throughout the interaction.

It is hoped that this study will facilitate the development of theoretical insight as part of service design processes, such as the Double Diamond (Design Council, 2015). The process would, in such a scenario, yield both an applied solution (or improvement) to the context explored, as well as design theory. The focus of this study is not on yielding an applied design solution, but rather to develop theory as part of the first diamond phase (Figure 3.1).

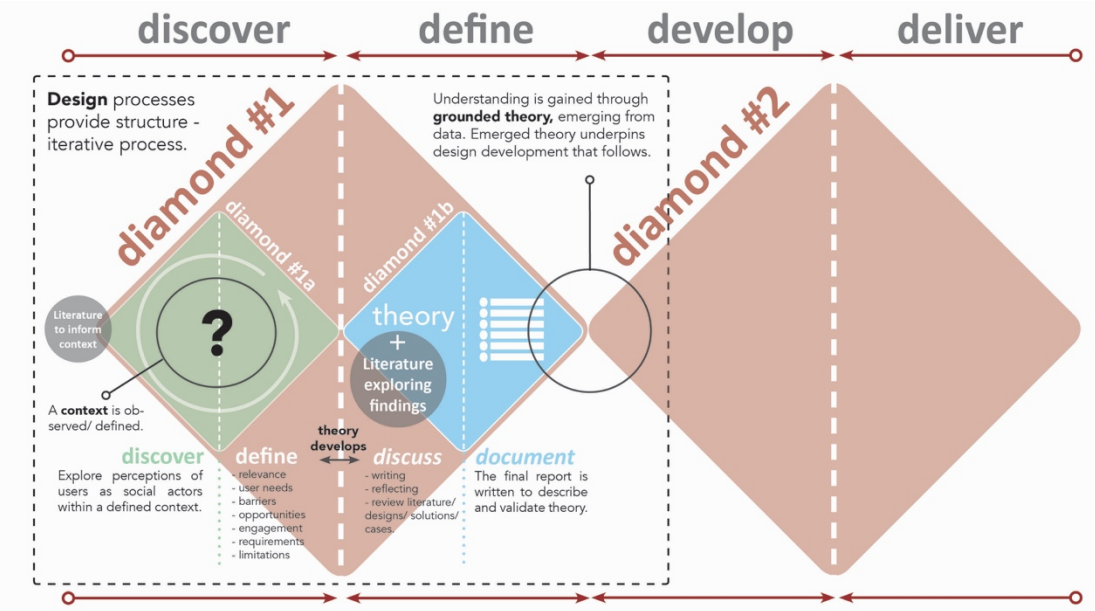


Figure 3.1: The Research Diamond Model

The study will contribute theory, and demonstrate the suitability of *grounded theory* as

an approach to cultivate theory developed in the Double Diamond process. Both the importance of developing theory through practice, and the selection of *grounded theory* as a methodology, are explored in this chapter. Although pre-developed, the adaption of the Double Diamond model was proposed as a departure point and it is evaluated throughout the process, to reflect on experiences.

This chapter details the selection and nature of *Grounded Theory* (GT). The stages of a GT project are generally sequential, but once research began data coding and data collecting happened simultaneously. Phases of the research project included a preparation phase, data collection phase, analysis phase, memo writing phase and, finally, theory development. To ensure that any preconceptions were minimised a complete review of literature linked to the area of investigation was delayed until theory began to emerge. Literature relating to the context of the study area was, however, explored in Chapter Two. The research process, through data collection, analysis, memo writing and coding is described in this chapter. Ethical considerations and the process for selecting the sample group of participants are also explored.

3.1.1 The role of the researcher

As this study uses a qualitative approach it is necessary to define my[32] role in the project. Objectivity is crucial if one is to arrive at findings that are impartial and not grounded in one's own assumptions. Being sensitive to the process and data allows the researcher to "perceive the subtle nuances and meanings in data" (Strauss & Corbin, 1998:42). In my academic position, I am both a designer and researcher. The two roles have complimentary characteristics that encourage open-ended exploration of situations, contextually aware actions and critical reflection on my process, beliefs and assumptions. Within the context of theory construction, I will be acting from the perspective of a researcher[33]. This is not to say that the designer within me will not influence my perspective or actions, but rather that my goal is not to arrive at a solution, or alternative, to the challenges that participants may experience. My role is thus to gain an understanding of the user-perspective and offer a *grounded theory* that may be taken forward in the work of others – both in an applied manner, thought design activities, and a future theoretical framework to evolve, critique and develop the emerging theory. As a researcher, I will play a role in the research process and this influence must be considered[34]. *Grounded theory* does offer the researcher the opportunity to compare findings in an on-going process and to test all assumptions and data against what has been found before, but my presence in the research is unavoidable, and as researchers we "construct our grounded theories through both our past and our present involvements and interactions with people, perspectives and research practices"

[32] This section is presented in the first person as it directly positions the author within the research, and aims to establish her context within the study.
[33] The dual perspective of researcher and designer, and its impact on this study, is described in more detail in Chapter One.
[34] The section considers the physical and practical influence that a researcher's presence brings into the research space. The ontological perspective of the research is described in Chapter One.

(Charmaz 2006:10).

The study aims to collaborate with an ageing population to define a theory regarding engaged participation with online services, and ageing users as social actors. I am not part of the ageing community, yet I have a number of relatives who are. Adler and Adler (1987) described three distinct "membership" roles within qualitative research. These include peripheral member researchers (who do not form part of, nor take part in, the key defining factors of the researched group), active member researchers (who to an extent are, or become, involved as the key defining factor of the group but do not necessarily share their values, morals or goals) and, lastly, the complete member researchers, who are, or become, fully embedded members of the group. Within this context I would be a peripheral member of the research group. There is no consistent benefit to being an embedded part of the research group. It is not necessary to be part of a community to be able to understand and describe the experiences of the community (Fay, 1996:20). I remained aware of my placement within the group, not as a positive or negative aspect, but rather as a consciousness so that individual participants may respond to me differently because of my 'outsider' status (Dwyer & Buckle, 2009:57).

The desire to complete my studies within this field of research is grounded in my own belief that the design of online services should take into account a broad range of potential users. Within the ageing community there are active users of online services, as well as individuals who find the idea of communicating or engaging online daunting. In truth, this could be said of all user groups – engagement is not a dichotomous, static state but rather a sliding scale of acceptance and use. It is important to consider the possible impact of design on activities in order to engage the ageing community. Services that may be conceptualised as convenience-driven (for example, online retail such as grocery shopping, or paying bills online) have the capacity to support independent living for ageing users with limited mobility.

My personal learning process links closely to a constructivist approach. Within a *personal constructivist* framework, the learner actively constructs knowledge (often in a social environment), whilst *radical constructivism* acknowledges the subjective nature of learning through interpretation and adaptation based on experience (Von Glasersfeld, 1990).

It is my goal to address the individual, as a unique participant and social actor, constructing meaning through interaction. This perspective speaks to a personal ontological and epistemological stance of interpretivism and allows for a method of inquiry that invites personal narratives and perspectives. Urquhart (2001:134) reminds the researcher that GT should be considered a method, and as such can be applied to research projects grounded in a number of ontological perspectives. The project will explore the construction of knowledge and meaning regarding both the participant group and me. Bryman's (2001) description of interpretivism (referred to as either social

constructionism or interpretivism by Bryman) notes that social interaction continually shapes and changes our perception of the world and phenomena observed.

In this project, I reflected on my own understanding of phenomena but focused on capturing the experiences of participants. The goal was a 'let the participants' voices' dictate the project's progression and findings. It can be challenging to keep one's own perspective in the background as we experience new situations through a lens grounded in our own world context and past experiences (Tokacs, 2003:27). As a peripheral member of the research group, my status allowed me adequate distance to reflect on the experiences being shared (Dwyer & Buckle, 2009:59). The 'distance' supported a phenomenographic view of the experiences of others. Booth (1997:138) describes the process of phenomenographic analysis as

> … identifying a small number of qualitatively distinct descriptive categories of the ways in which the subjects experience (or understand, or conceptualise) the phenomena of interest.

Through the development of categories, and thorough coding of qualitative findings, a theory grounded in data can emerge.

> Therefore, if the researcher's goal is to develop substantive theory, particularly, in areas where existing knowledge is limited, or to provide a fresh perspective to the existing knowledge about the phenomenon being studied, Grounded Theory is a suitable approach (Khambete & Athavankar, 2010:11).

My peripheral status does not indicate a lack of passion for or interest in the research area. Instead, these emotions strengthened my ability as a researcher, accentuating the role of personal experiences in qualitative studies and the need for intense interest in the study area (Patton, 1999). Guba and Lincoln (2005:196) refer to the inquirer in this context as being a 'passionate participant'. The researcher and participant share an experience when interacting, and the resulting data (and knowledge) are shaped by their interaction. The research findings are thus co-constructed through these experiences, influenced by both "inquirer and inquired into" (Guba, 1990:26). The constructed dimension of interaction acted as a catalyst for the selection of a methodology that supports the development of *grounded theory* (in a manner that acknowledges the constructed nature of research findings).

3.2 Grounded Theory

Grounded theory (GT) is a methodology that supports empirically-based theory development. The methodology was originally developed by Glaser and Strauss (1967), with a second variant presented by Strauss and Corbin (1998). Both of these versions of GT rely on a strict process of data collection, coding, category development and data comparisons. Through comparative analysis and understanding key theoretical elements

emerge. A third version of the methodology, emerging in the 21st century, links GT to a constructivist perspective. The premise of constructivist based GT is that the theory or knowledge cannot emerge in a purely objective manner, but is rather constructed by the researcher, based on the interaction between researcher and participant (Charmaz, 2000; 2006; 2008; 2014). This research project employed a constructivist approach to GT – based on the original premise of Glaserian *grounded theory*, with an awareness of constructed meaning-making and relativism. These aspects of the selected methodology are explored further in this section.

3.2.1 A brief overview

Grounded Theory emerged from the research and practice of Glaser and Strauss in 1967 (Glaser & Strauss, 1967). Since then three main streams of GT have developed. The first represents the original ideals of Glaser (often referred to as Glaserian GT), the second a variation of the first conceptualised by Strauss and Corbin (referred to as Straussian), and, finally, Charmaz's Constuctivist GT (Khambete & Athavankar, 2010:13). At the heart of each GT stream is the exploration of real-world situations through rigid analysis and documentation to gain insights, and not based on preconceived ideas or assumptions (Allan, 2003:1). Types of data collection tools vary but qualitative methods, such as in-depth interviews, are prominent. The information gained is analysed through coding processes, making sense of the complex and finally coming to a cohesive theory, imbedded in the data. The 'philosophical underpinnings' of the three streams of GT differ, and as such the procedures do, too (Khambete & Athavankar, 2010:13).

GT is a methodology that systematically supports the generation of theory, grounded in data. Within GT 'all is data', a key characteristic of the methodology that allows the researcher to consider any relevant material, or interaction, as data. The process aims to explain conceptually how participants respond to a certain concept, phenomena or challenges (Giske & Artinian, 2007:68). Through a GT study a core category is defined that drives theory development and supersedes other emerging data categories. The development of theory is based on three foundations: constant data analysis (where data collection can happen simultaneously), theoretical saturation (data are collected and analysed until nothing new is discovered) and theoretical sampling, which facilitates the emergence of theory (Strauss, 1987:21). Holton provides the researcher with a clear summary of these stages, as described by Glaser and Holton (2004). The process is detailed in Table 3.1.

Table 3.1: Core Grounded Theory Process Components

Component	Summary
Theoretical Sampling	The researcher simultaneously collects, codes and analyses the data and decides what data to collect next and where to find them, in order to develop the theory as it emerges. The process: • is controlled by the emerging theory, • allows for the discovery of codes and tries to saturate them by looking for comparable data,

	• enables one to identify emerging gaps in the theory, which is the impetus for the following data collection activity, • is dependent on which groups or subgroups require additional data collection—and for what theoretical purpose?
Open Coding	Generate codes and find relevance. The process: • uses line-by-line open coding of the data to identify substantive codes emergent within the data, • forces the researcher to focus on patterns among incidents that yield codes and to transcend conceptually the detailed description of these incidents, • allows the researcher to see the direction in which to take the study, • allows the researcher the full range of theoretical sensitivity by encouraging the generation of codes that fit and work.
Constant Comparison	The constant comparative method enables the generation of theory through systematic and explicit coding and analytic procedures. The process involves three types of comparison: • Incidents are compared to incidents to establish underlying uniformity and varying conditions. The uniformity and the conditions become generated concepts and hypotheses. • Concepts are compared to more incidents to generate new theoretical properties of the concepts and more hypotheses. The purpose is theoretical elaboration, saturation and verification of concepts, densification of concepts by developing their properties and generation of further concepts. • Concepts are compared to concepts. The purpose is to establish the best fit of many choices of concepts to a set of indicators, the conceptual levels between the concepts that refer to the same set of indicators, and the integration into hypotheses between the concepts, which becomes the theory.
Core Category	A core category emerges when one compares incident to incident in the data, then incidents to categories. • This core variable, which appears to account for most of the variation around the concern or problem that is the focus of the study, becomes the focus of further selective data collection and coding efforts.
Selective Coding	The researcher ceases open coding and delimits coding to only those variables that relate to the core variable.
Memo Writing	Memos are theoretical notes about the data and the conceptual connections between categories. Initially, memos arise from constant comparison of indicators to indicators, then indicators to concepts. Later memos generate new memos. Writing of memos facilitates: • linking the data to a conceptual level and developing the properties of each category, • further data collection, coding and analysis, • the development of a description to the theoretical level through the conceptual rendering of the material.
Theoretical Coding	Incidents articulated in the data are analysed and coded, using the constant comparative method, to generate initially substantive, and later theoretical, categories. The essential relationship between data and theory is a conceptual code, which: • gives the researcher a condensed, abstract view of the data, • gives integrative scope, broad pictures and a new perspective.

Source: Horn, 2008; Glaser & Holton, 2004.

The integrity of a GT is linked to four criteria: fit, workability, relevance and modifiability. 'Fit' refers to a theory being valid, and that categories were systematically generated as data were analysed (Glaser, 1978:4; Lomborg & Kirkevold, 2003:191). For a theory to be workable it must explain participants' responses to the context, situation or action. It

should provide an explanation of the activity within the study context (Glaser, 1978:5; Lomborg & Kirkevold, 2003:191). A relevant theory is beneficial to associated fields and addresses a core concern that was highlighted through the research process (Glaser, 1978:5; Giske & Artinian, 2007:69). And, finally, a theory must be modular and able to evolve when new data emerge to add qualification to the theory (Glaser, 1978:6; Lomborg & Kirkevold, 2003:191). Glaser (1999: 836) described GT as:

> …a specific methodology on how to get from systematically collecting data to producing a multivariate conceptual theory. It is a total methodological package. It provides a series of systematic, exact methods that start with collecting data and take the researcher to a theoretical piece that is publishable."

In practice, the Glaserian approach was found to be difficult to apply, and many researchers were overwhelmed by the complexity of the exploration, whereas Strauss and Corbin's version offered practical guidelines (Khambete & Athavankar, 2010:13). Straussian GT is driven by a relativist ontological perspective, in which the experiences and knowledge are interpreted, a shift from Glaser's critical realist perspective (Sengstock, 2008:24). Strauss and Corbin, in their version of GT, propose a more rigid coding system than Glaser and recommend microanalysis of data (coding word for word, or small groups of words). Strauss and Corbin's (1990) coding process comprises four steps: open, axial, selective and process. In Glaser's original GT design, the process focused on only three steps: open, selective and theoretical coding. Another departure was a single coding paradigm suggested by Strauss and Corbin, in opposition to the several highlighted by Glaser who maintained that the data should dictate the coding process (Glaser, 1978). Glaser criticised Strauss and Corbin's version of GT as being too prescriptive (Glaser, 1992: 123, in Urquhart 2001):

> If you torture the data long enough, it will give up! ...the data is not allowed to speak for itself as in grounded theory, and to be heard from infrequently it has to scream. Forcing by preconception constantly derails it from relevance.

Microanalysis has been criticised as the coding method is time consuming and can be challenging given the amount of data generated through qualitative inquiry. Coding interviews one word, or phrase at a time, can lead to a very complex result (Allan, 2003:2). The complexity of working in this manner is often exacerbated by the methodology's criteria that researchers refrain from preliminary studies and literature reviews.

Reviewing literature as a point of departure is part of a traditional dissertation or research project. In Glaserian GT, however, reviewing the literature is left until the theory has begun to emerge, after data analysis (Glaser, 1978). The delay in reviewing literature is believed to allow the researcher a clear mind when analysing the data and formulating early theoretical assumptions. This is not to say that literature is not consulted throughout the stages of a GT study, merely that an exhaustive literature review before exploring the data is discouraged (Giske & Artinian, 2007:78). McCallin and Martin (2003;

2006, in Urquhart and Fernandez, 2013) refer to the importance of 'phasing' the review of literature with a grounded theory study. During the early phases of a project a review of literature can help define the research challenge and context. In Straussian GT, the professional, academic and theoretical experiences of the researcher prior to the project are acknowledged, and these are considered a benefit in the research process (Strauss & Corbin, 1998:48). The influence of past experiences and knowledge, of both the researcher and participant, bring into question the effect that these may have on the process and final grounded theory. This links to Giles, King and De Lacey's (2013:34) reflection of an 'open mind rather than an empty head'.

Glaserian GT maintained a critical realist ontological perspective in which the researcher is considered independent from the research process (Charmaz, 2000:513). From this perspective, the world exists as an independent entity, separated from the researcher's or participant's belief, morale or knowledge (Annells, 1996). From a design perspective, the interaction space is a complex construct, dependant on the willingness of participants to engage. The design interaction recognises the multiple influences on the participants (such as culture, motivation, etc.) as well as the dynamics of the interaction moment (Figure 3.2). The objective of a design interaction (whether it is a product, service, policy or conceptual discovery) is constructed by the participants, and their response to the interaction context. Both the researcher and the participants play an integral role in design research to 'frame the interaction' and discover the meaning that can be constructed because of it (Charmaz, 2000:524).

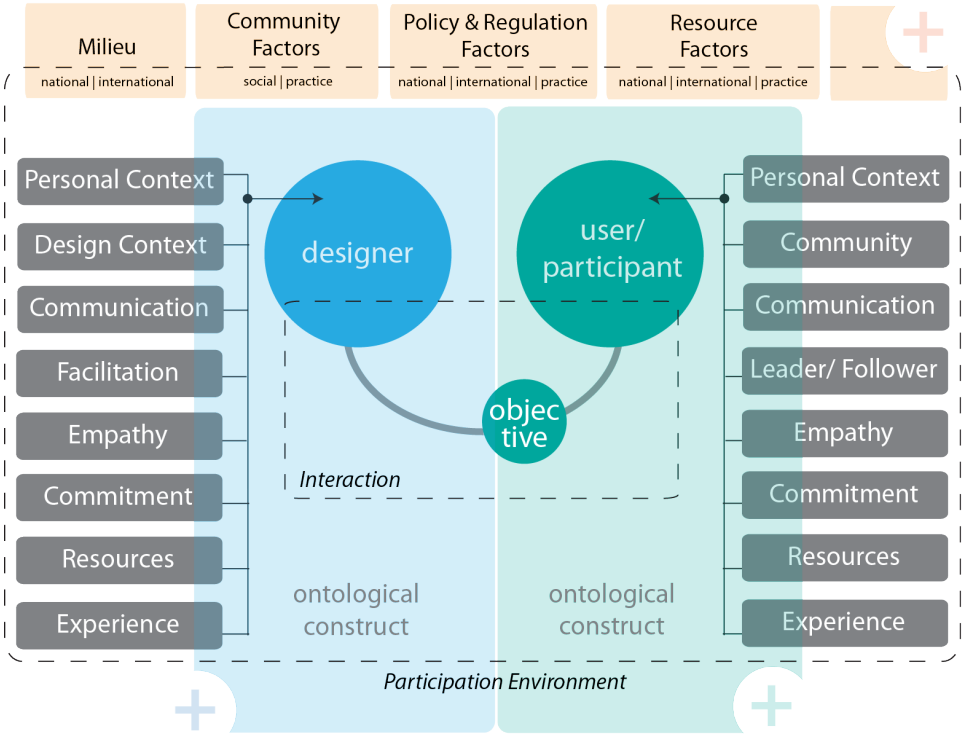


Figure 3.2: The Complex Realm of Designer/User Interaction
Source: Du Preez, 2014

3.2.2 Constructed Grounded Theory

The Constructivist version of *grounded theory* (CoGT)[35] was originally linked to a relativist ontology (Sengstock, 2008:24). Although Straussian GT shares this perspective with the constructivist version of the methodology, CoGT focuses on the 'empirical realities' of an individual's experiences and existence, and how his or her understanding of reality is constructed within their experience (Charmaz, 2005). For Glaser, the use of GT is reliant on the researcher's ability to compare emergent concepts and categories in a methodical manner. From the iterative comparison and analysis of data a theory emerges. Straussian GT maintains this view as well, but prescribes a more technical and procedural analysis and comparative process, rather than free comparisons. CoGT embraces Glaser's more flexible approach to data analysis and comparison, in part due to the relativist nature of CoGT. Knowledge and theory that are developed within the social or cultural context are grounded in human interaction, understanding and meaning-making. Glaser has, however, raised concerns regarding the manner in which Charmaz conceptualised CoGT. In a 2002 paper, he highlights a number of key concerns, to which constructivist authors responded (Table 3.2):

Table 3.2: Glaser's Response to Constructed Grounded Theory

Glaser's Concerns:	Constructivists' Response:
Selective method usage and limited data types: CoGT constructivist position draws heavily from in-depth interviews as specific method. In true GT, all is data and the "…data is what it is and the researcher collects, codes and analyses exactly what he has whether baseline data, proper line data, interpreted data or vague data" (Glaser, 2002).	**How are data discovered?** "The constructivist position, like all those emanating from an understanding of the profound weakness of classic positivism, cannot accept anything along the lines of data as it is characterized by the original texts of GTM, and in particular by GLASER in his response. GLASER again sidesteps the issue with some complex and often strangely ungrammatical convolutions—thus he states that 'data is discovered'; but by whom?" (Bryant, 2003). How is it possible for data to be 'discovered' in any other way than by a person or persons?
Addressing researcher bias. "It appears that constructivism is an effort to dignify the data and to avoid the work of confronting researcher bias". In GT, the constant comparative process reveals researcher biases. "Constructionism is used to legitimate forcing. It is like saying that if the researcher is going to be part of constructing the data, then he/she may as well construct it his/her way." (Glaser, 2002).	**Focus on the participants' voices.** Charmaz's constructivist GT method supports researchers in a structured way to engage meaningfully with participants. Vital to the coding and memo writing within CoGT is the inclusion of raw data into memos. Although this practice does increase the complexity of the participant's voice, meaning is always present in the analysis and subsequent theoretical outcome (Charmaz, 2006).
Abstracting analysis instead of description. "GT is about concepts not accurate descriptions…" In CoGT researchers finds themselves in a "subjective, immersion" which tends to "…produce description for intense interaction, in contrast to producing an abstraction or conceptualization of it." (Glaser, 2002).	**When description informs analysis, and complexities.** The complexity of the social act can be constructed through the meaning that an object carries. The 'meaning' is the result of interaction and interpretation in a situation. Thus, through description of interaction and meaning, concepts can

[35] Constructivist Grounded Theory (CoGT), as proposed and developed by Charmaz 1990, 2000, 2003, 2005 2006; Charmaz & Mitchell 2001

	emerge. “Situational maps and analyses resituate grounded theory… to better grasp the complexities of social life even if ultimately we ‘cannot pin them down’” (Clarke, 2003: 572).
Objective meaning through comparison. “The latent patterns—categories—hold as objective if the GT researcher carefully compares much data from many different participants.” GT is based on a constant comparative method that discovers the latent patterns in multiple participants' words. In the case of CoGT: “…the participant not only tells what is going on, but tells the researcher how to view it correctly—his/her way.” (Glaser, 2002).	**Meaning without interaction?** Glaser fails to quantify or describe how the process of pattern discovery (categories) happens. Instead, his response focuses on giving agency to the data or pattern, instead of the person, leaving the question of ‘how’ unanswered. “The constructivist position would argue that there is a dialogue between the researcher and the research subject—in both senses of the word "subject"—i.e. the person who is the concern of the research, as well as the research area” (Bryant, 2003)
Focused on accuracy. CoGT is, instead, a form of QDA (Qualitative Data Analysis) during which “...interview data yields the construction of data that represents the mutual interpretation of the interviewer and of the interviewee as the interview proceeds”. Thus, the goal is accuracy. It is stated that in CoCT the researcher does not take “…the data as it comes, but to be sure it is accurate, so she gets to mutual interpretation as the answer”. (Glaser, 2002).	**What is fit and relevance without accuracy?** Bryant (2003) raises concerns that Glaser seems to indicate that the researcher ‘need not bother about accuracy’. This is in contrast to established GT considerations of *fit* and *relevance*. “It seems that GLASER uses the concept of *worrisome accuracy* simply in order to be able to drive a conceptual wedge between GTM and QDA—a category forced on the reader by GLASER purely to act as a contrast to GTM” (ibid).
The person and the process “GT is a perspective-based methodology and people's perspectives vary.” The CoGT researcher “…uses constructivism to discount the participant's main concern, which is always relevant to ongoing resolving behavior, in favor of the researcher's professional concern, which is most often irrelevant to behavior in the substantive area.” (Glaser, 2002).	**The person is part of the process** The social world is a complex “…we cannot assume directionalities of influence; boundaries are open and porous; negotiations are fluid and usually ongoing. Negotiations of many kinds from coercion to bargaining are the basic social processes that construct and constantly destabilize the social world.” (Clark, 2003:560)

Source: Glaser, 2002; Bryant, 2003; Clark, 2003; Charmaz, 2006

Concerns raised by Glaser have been addressed in both direct responses and applied studies and dissertations, which used a CoGT approach (Sengstock, 2008). It is safe to say that Glaser, Strauss, Corbin and Charmaz may differ on the philosophical departure points for their interpretation of the original *grounded theory* methodology, but they share a common understanding of the aim of GT – to inductively develop a theory from data through constant analysis and comparison. The data should be generated through contextually relevant research methods that allow participants to engage meaningfully (Glaser & Strauss, 1967).

For me, as a researcher in design, the nature of CoGT aligned more with my own philosophical and epistemological views than the prescriptive Straussian approach, or the original Glaserian GT. Throughout the design process one collaborates with participants in an iterative manner to ensure that their voice in the final artefact or service is genuine. The importance of collaborating with end-users throughout the design process is highlighted by the contemporary focus on participatory design practices, including Co-

Design, Human- Centred Design, User-Centred Design and Participatory Design. Today, many of these terms are used interchangeably but each has unique roots and evolutionary projections. Important to the success of these design approaches is the ability to adapt to situations as they arise, and to adjust methods and tools to bridge complex interactions. CoGT shares this view in that research methods are not concrete and prescribed (as often found in the Straussian approach) but are rather a set of guidelines and principles imbedded in the contextual relevance of the project (Charmaz, 2006).

The research process is viewed as consisting of four distinct phases, relating to those described by Indrees, Vasconcelos and Cox (2001:191). The first phase is referred to as 'the uncertainty stage' during which the primary focus emerges. In the present project, this phase is characterised by a thorough investigation of literature that defines the 'world' of the research (or the context of the research challenge), as well as a critical review of methodological implications. This phase also includes the initial research activities during which data collection begins. The second phase is the 'emergence stage' during which concepts and core categories emerge through continues comparison and analysis. From the initial categorisation early theoretical implications are noted. During the third phase, the 'ambiguity resolution stage', inconsistencies and 'grey areas in the emerging theory' are explored and clarified. The final phase includes a review of appropriate literature and presents the theoretical findings and implications. Through the systematic analysis of qualitative data, a theory is defined.

3.3 Research Design

The project followed a systematic process with regard to the collection and analysis of data. Following initial and focused coding, a literature review was concluded prior to the final theoretical coding process. Throughout the research process data were reviewed and analysed in an iterative manner. The process diagram (Figure 3.3) represents only two data activities at the source level. However, a much larger number of initial data sourcing activities were concluded. The research process was initiated with an open discussion with participants, during which the goals of the project were introduced, along with research activities. Participants had the opportunity to discuss their concerns or excitement, from which comments were noted down on the *Participant Coding and Information Form*. Once the participants had indicated that they were happy to take part in the study they were allocated a participant code (PR), which was used from this point onwards to identify them. In order to quote participants directly in an anonymous manner, they were asked to select their own pseudonym. This allowed participants to select the name they wanted to be known by, and shifted participant identification protocols associated with anonymity and research ethics, into a more human-centred realm. The study generated various types of data, including interview transcripts, field observations, workshop transcripts, workshop materials (generated by participants in

collaborative activities) and memos throughout the research engagements (Table 3.3).

Table 3.3: Research Engagements and Primary Data Sources

Research Engagement	No. of Participants	Resulting Evidence	Data to Code
Interviews: Participants, aged between 65 and 85 years, were interviewed as individuals to establish personal context and attitudes. Interview styles varied from structured discussions to semi-structured interviews (when exploring usage and personal context). Each interview was between 1 hour and 1.5 hours per participant.	13	Recordings of interviews.	Transcripts of recordings.
Observations: During interviews participants were observed and their experiences documented using research memos. Non-verbal cues were noted as well as physical access to devices and the nature of their interaction with their devices.	13	Observation template completed during, or directly following interview. Observational voice recorded memos, completed directly after the interview	Observational template included as physical artefact. Transcripts of voice memos.
Workshops 1: The workshop was facilitated by the principle researcher, one assistant and a technical advisor. Individual workshop groups comprised between 3 and 5 members, with a dedicated group facilitator to guide the process and observe group members' contributions. Groups that have too few members may not yield sufficient discussion and data, while larger groups may intimidate participants, or allow non-contribution by individual members (Finlay, 2013:7).	7	A collaborative persona tool developed during the workshops (Served as catalyst for discussion) Recording of every group's discussion. Observational discussion with group facilitators following workshop.	Persona template as physical artefact. Transcripts of recordings. Transcripts of observational discussion with facilitators.
Workshops 2: The workshop was facilitated by the principle researcher, two assistants and a technical advisor. Individual workshop groups comprised between 3 and 5 members, with a dedicated group facilitator to guide the process and observe group members' contributions.	8	A collaborative persona tool developed during the workshops (Served as catalyst for discussion) Recording of every group's discussion. Observations from group facilitator.	Persona template as physical artefact. Transcripts of recordings. Transcripts of observational discussion with facilitators.

Once data had been collected, the coding process began. Transcripts of interviews and workshops were analysed by reviewing findings line by line, and assigning a code to the emerging concepts. Both *in vivo* and more abstracted codes were allocated. The initial codes that emerged from interview transcripts were shared with participants during workshops. Findings from the workshops were then encoded in another cycle of open coding. Emerging from the open coding process were initial categories. These initial categories were reviewed and, through more selective and focused coding processes, core categories emerged. Both written and voice-recorded memos supported the process.

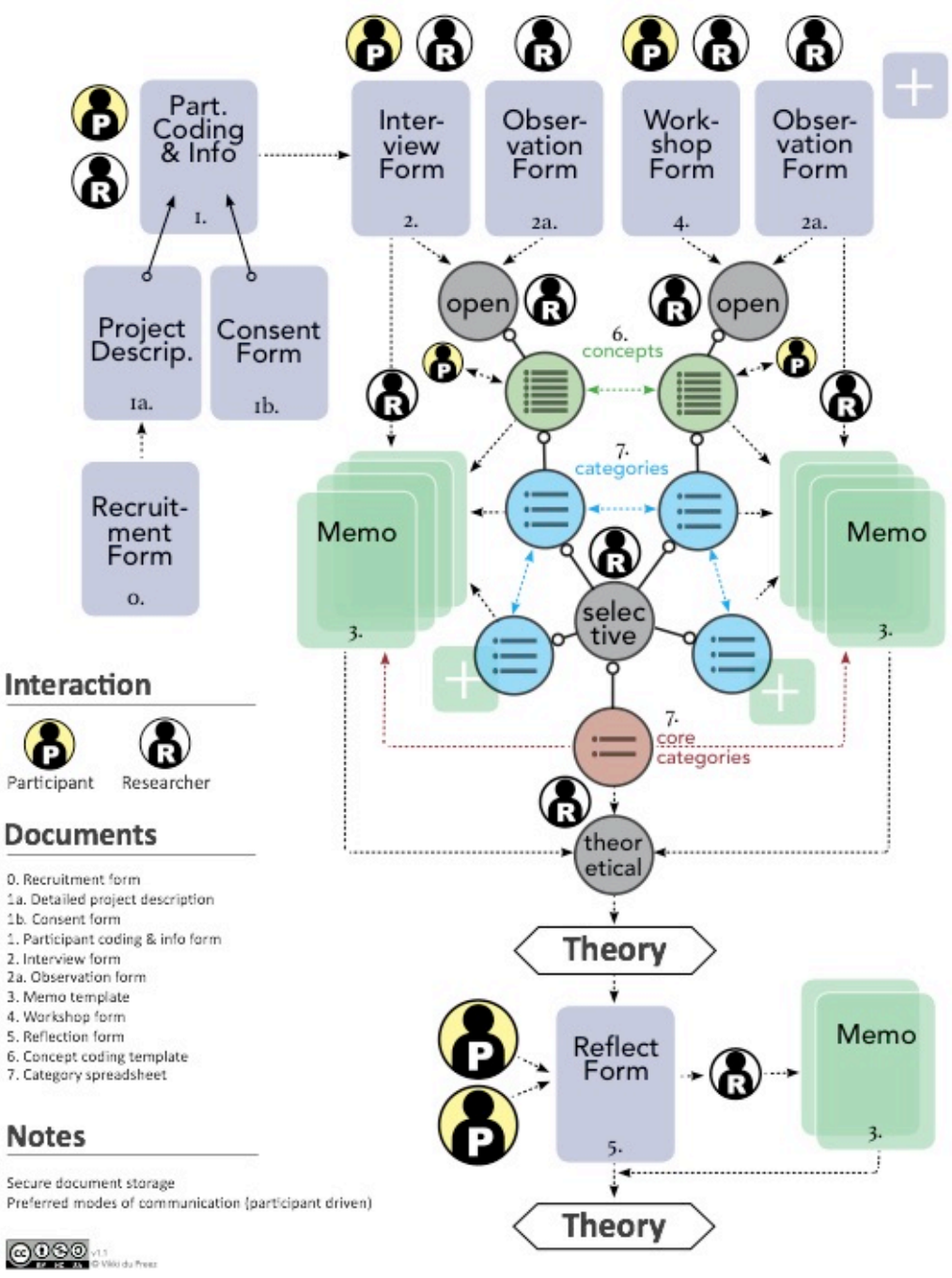


Figure 3.3: Research Design: Data Collection & Coding

Once pertinent literature had been reviewed, the core categories gave way to an emerging theory. The early theoretical constructs were shared with individual participants who took part in workshops, or interviews, to gather their views on the emerging theory. Once the participants' reflections and resulting memos had been considered, the final theory was established.

3.3.1 Participant selection and organisational stakeholder

The research methods directly link to two sampling approaches found in *grounded theory*. The first is *convenience* sampling, which was used when recruiting participants for interviews (Morse, 2007:235). As the recruitment of participants was linked to their willingness to engage and interest in participating, the resulting sampling system was grounded in convenience. There was, however, a theoretical sampling aspect to this iteration, as all participants who engaged with the project had been involved in the phenomena being investigated (Corbin & Strauss, 1990:8). Following the interviews, group workshops were hosted, which reflects a *theoretical group interview* sampling approach. In this sampling process, participants who had been interviewed returned for a further discussion of the phenomena, as well as to contribute to the evaluation and exploration of concepts that had emerged from the initial interviews (Morse 2007:235).

As I myself am not part of the ageing community, I had to move beyond members of my family, to establish important relationships with organisations that promote the wellbeing of the ageing community. The organisation would act as gatekeeper into this community, would contribute to the participant recruitment process and thus lessen potential bias by selecting participants not known, or related, to me (Seidman, 2013:47; Eriksson & Kovalainen, 2015).

Limited resources and lack of capacity are challenges experienced by many non-profit organisations. A number of potential organisations were considered as entry points into the ageing community, including Age in Action and the Albertina and Walter Sisulu Institute of Ageing in Africa. In order to establish the suitability of the proposed study in an informal and under-resourced community, a site visit to the Khayelitsha NOAH (Neighbourhood Old Age Home) centre was undertaken, as well as discussions with key stakeholders at the centre. The centre offers social, wellness and financial support to the ageing community in the informal settlement[36]. Stakeholders at the centre highlighted the lack of online personal, and shared, devices that could be used by the ageing community. Although the benefit of various online support services to ageing members of the community in Khayelitsha was noted throughout the discussion, the resulting study would not fit within the parameters of this project[37].

[36] For more information visit www.noah.org.za
[37] It is noted that a study into the perceptions of ageing users, in lower resourced communities is critical to establish a holistic view of constraints and opportunities experienced in South Africa. This exploration is noted in the final chapter, as an area for future research.

The South African Seniors Fitness Association (SAFSA) was finally selected as a participant recruitment partner and stakeholder. The association has a broad reach throughout the Western Cape, and South Africa, and attracts individuals from varying ethnic and socio-economic backgrounds. Focus is on fitness and exercise, but the organisation also supports workshops and activities that promote social engagement and holistic wellbeing. The association aims to offer support and a sense of belonging:

> Many negative patterns of behaviour associated with the elderly are either the result of bereavement, the loss of friends and loved ones, or the selling of a home and possessions. The result may be a reluctance to become involved with people, neglect of self and belongings, irritability and bitterness, or even suicide. Older people often find themselves losing a certain amount of independence, with others (or society) regarding them as incapable of making their own decisions.
>
> Society would do well to concentrate on trying to relate to the elderly as normal. The term "the aged" has become a label. Each of us is an individual with their own personality, hopes and fears, likes and dislikes, whims and habits. It is no longer acceptable to say "what can you expect at your age" or "act your age" as some 70-year olds are fitter than some 50-year olds.
>
> More and more people are living to be 70 and over, so there are going to be increasing numbers of senior citizens contemplating the prospect of 10, 15 or more years of retirement. What are they going to do with those years? (SAFSA, 2016)

The project was introduced at two separate presentations to SAFSA members at events organised by the organisation. Besides a presentation, individuals were given a project information page (Appendix E) and time was set aside for questions and answers. Individuals were requested to make contact with my supervisor or me if they had any questions, or if they would like to participate. Additional hand-outs were provided in case individuals wanted to share the project with non-SAFSA members in their circles. A second meeting was also scheduled with the groups should individuals want to sign up in person for the study. The second meeting was arranged to follow a SAFSA social event. From these interaction points participants were identified and the initial set of interviews arranged. A key consideration regarding the recruitment of participants was to recognise that it is not the individual that will become the research focus, but rather the activities and perceptions of individuals[38]. As Corbin and Strauss (1990:8) explain, if one were to identify nurses as a research group, one would not, in fact,

> …be sampling nurses as such, but sampling the incidents, events, and happenings that denote the work that the nurses do, the conditions that facilitate, interrupt, or prevent their work, the action/interaction by which it is expressed, and the consequences." The focus when capturing data, through notes, recordings or memos, must place the experience of the individual at the centre of the exploration.

[38] The participant demographics are introduced in Chapter Four as part of research method descriptions and data analysis.

3.3.2 Memo writing

Throughout the research process memos allow for the documenting of ideas, concerns and emerging concepts. In the early stages of the research process, memos provide a space for the researcher to document his or her assumptions, process and reflection on the development of research tools. Throughout the coding phases, memos provide the researcher with a platform to document decisions, record his or her thoughts and again reflect on the research approach and tools.

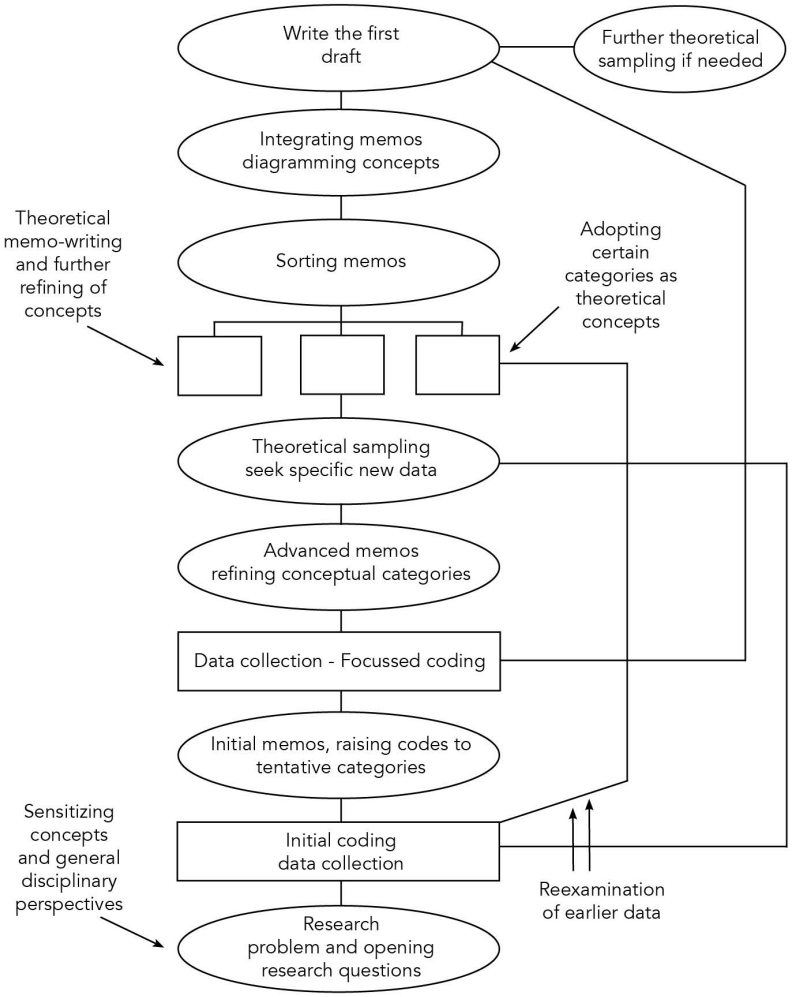


Figure 3.4: Grounded Theory Process (re-imaged)
Source: Charmaz, 2006:11

During the theoretical coding process memos aid in the constructing of theoretical concepts by allowing the researcher to keep track of considerations and decisions. The writing up of memos also provides for a structured moment to pause and reflect on the process, encouraging holistic reflective practice. During this process researchers 'distance' themselves from the data for a period of time to focus on the larger context, and view the data through an analytical lens - not merely as a descriptive exercise (Böhm, 2004:271).

> The importance of this activity cannot be overemphasised – while writing memos on the possible relationships between codes, one is developing possible theory. Memos can be seen as a private diarising that the researcher engages in, where the researcher is also

> freed from constraints, such as the need to write in a polished fashion. Memos also enable the researcher to concentrate on creatively generating ideas about the data (Urquhart, 2001:130).

The use of memos is critical to all parts of the *grounded theory* process, as highlighted in Charmaz' *grounded theory* process outline (Figure 3.4).

In this project, memos took the form of traditional written documents, as well as voice recordings that allowed for a more immediate capture of ideas and comments. Urquhart (2001:130) comments on the use of integrative diagrams to explain relationships that emerge in a visual manner, and notes that it "was a way of breaking out of the necessarily linear nature of written theoretical memos". As data collection and analysis was iterative, memos created as part of this project evolved over the course of the research process. As more became known dated entries were added to existing memos (Figure 3.5) and new memos were created.

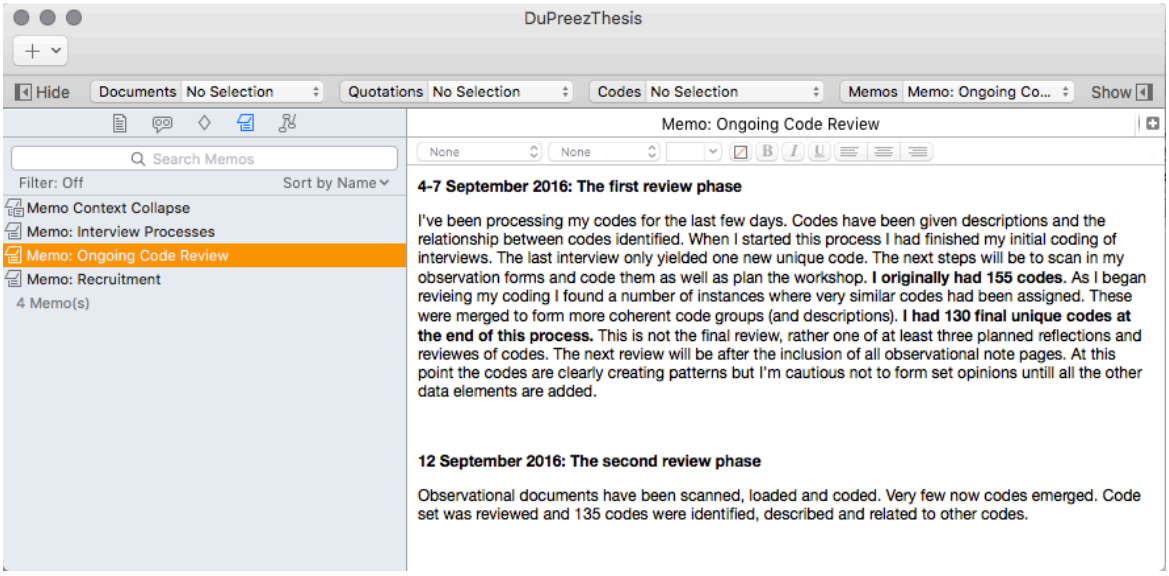


Figure 3.5: Coding Review Memo: Updating Process as Part of a Single Memo
Source: Screenshot by author, 2016

The writing of memos during the process helped document questions that the researcher had throughout the process, and became a repository of the evolution of thought. In this project two main memo types were kept: electronic memos as part of the digital Atlas.ti[39] project and repository, and written memos that were created throughout the process and 'in the moment'. Written memos (Figure 3.6) were captured during and directly after interviews and workshops, often sitting in the car after the interview or as soon as the researcher returned to a working space. Alemu, Stevens, Ross and Chandler (2015:535) defined the benefit of memos in their work as follows:

> These memos helped the researcher to think aloud, explore what lies beneath the responses of interviewees, relate and compare various responses, and discover

[39] The use of Atlas.ti is further explored later in this chapter.

> conceptual themes. Written memos serve as enabling tools, allowing the researcher to reflect on the whole research process, including during data collection, analysis and write-up. They also help in maintaining rigour.

Memo writing began at the initial stages of data collection in this project. The first project memo captured digitally thoughts about demographics observed during participant recruitment (Figure 3.7). Memo writing continued throughout the writing of the thesis as a reflection tool. Charmaz (2006:72) describes memos as analytical tools that help the researcher to reflect.

During the focused coding processes, memo writing became a method to conceptualise, review and describe the patterns noted. The sorting of memos regarding theoretical concepts initiates the final theoretical development. As open coding practices gave way to more theoretical coding the use of voice memos became more prevalent in this study. Voice memos were recorded while the researcher analysed, interrogated and reflected on the data and emerging patterns. The voice memos were included in Atlas.ti and coded alongside text- based memos.

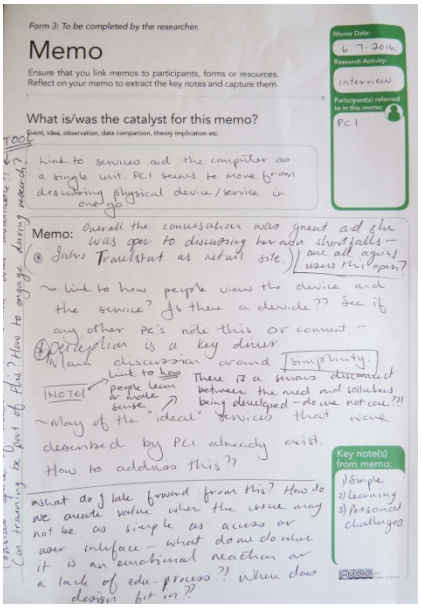


Figure 3.6: Written Memo: *In Situ*

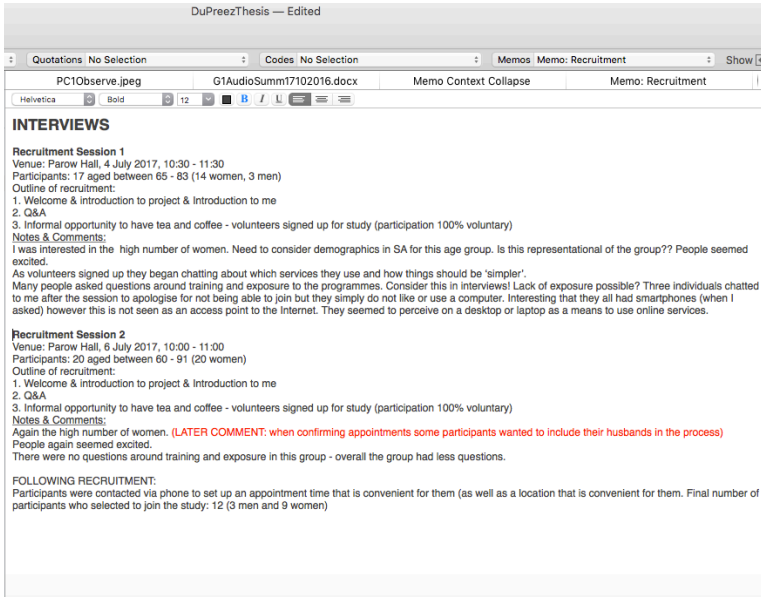


Figure 3.7: Recruitment Memo
Source: Screenshot by author, 2017

3.3.3 Formation of theory through human-centred methods

The importance of human-centred methods in this project is to explore the experiences of ageing users with online activities and then use the emergent theory to define these users as social actors in a socio-cultural system. Khambete and Athavankar (2010:12) note the suitability of qualitative methods when one intends to explore contextual issues, or interactions. This is similar to the design process during which an examination of stakeholder context is crucial. To investigate the perceptions and behaviour of participants, in relation to online services, qualitative methods offer the researcher an opportunity to observe social systems, capture individual users' responses to the physical

environment, as well as interactions and responses that have meaning to participants. In this study the following qualitative methods were used:

- **In-depth interviews:** Interviews are commonly used in qualitative research methods (Finlay, 2013:6). Participants were interviewed as individuals to establish personal context and attitudes. Interview styles varied from structured (when discussing specific user requirements) to semi-structured and unstructured (when exploring usage and personal context). All aspects of the interview space were documented. In order to capture the setting, participant details and comments, an interview tool was designed to support audio recordings.
- **Workshop:** The co-design workshops were captured through photographs, project specific recording sheets (observed by an independent research assistant) and the prototypes/conceptual maps produced by participants.
- **Observations:** During interviews and co-design workshops, participants were observed by means of photographs and project specific field notes.

The experience of gathering data from co-design workshops and observations, and including these forms of data in a grounded study, offers the researcher a broader range of qualitative methods than those traditionally used. The active inclusion of participants in the process is the cornerstone of design methods development. This study aims to contribute to GT practice the exploration of these design methods as suitable modes of enquiry. Design methods, and the process of design, can be viewed as a process for knowledge creation. The procedural nature of design links it to prescriptive knowledge. An example of this is Bunge's discussion on his *technological rule concept, in which he* defines such a rule as an "…instruction to perform a finite number of acts in a given order and with a given aim" (Bunge, 1967:132). The prescriptive nature then draws from the logical sequence that, to obtain a result in a certain way, one must know the objective and the setting. Van Aken (2005) postulates that descriptive knowledge within design "refers to empirical, descriptive research on the actual practice of design" which aims to establish a more holistic understanding of the practice and field of design. The difference between prescriptive and descriptive knowledge in design can be viewed through the lens of *research into design practice* and *research for design* (Cross, 1993; Cross, 1995). Design methods can be used to investigate phenomena within both a prescriptive and descriptive framework. It is ultimately the nature of the inquiry and the level of scientific rigour within methods, data analysis and discussion that inform the nature of knowledge produced.

All elements, including interviews, artefacts and all forms of observations, were considered to be data within the *grounded theory* approach. When data are analysed categories are generated (induction) and then compared to other data to establish the relationship (deduction). Deductive reasoning begins with a rule, and proceeds to a conclusion that must be true if the original rule was true - and thus explaining the necessary consequences of a rule (Hansen, 2008). Inductive reasoning begins with

observation that can lead only to a generalised conclusion, as the observations are contextual and limited to a scope or time. Induction is characterised by seeking patterns in what has been found, and making sense of it through the formation of a theory or hypothesis. This characteristic makes induction central to GT (Glaser & Strauss, 1967; Glaser, 1978; Strauss & Corbin, 1998; Charmaz, 2006). Hansen explores the relationship of deduction and induction to theory (Figure 3.8):

Inference	Process	Relationship to theory	Examples based on this approach
Abduction	Creates tentative explanations to make sense of observations for which there is no appropriate explanation or rule in the existing store of knowledge	Does not start with explanations but instead links things together to generate an order that fits the surprising facts - the beginning of theory-building	Lean start up, grounded theory, ethnomethodology, machine learning, hypothesis-free a-b testing, design thinking, constructive design research, prototyping, cultural probes
Having developed a guess, explore the consequences via deduction			
Deduction	Taking a general rule and seeing what follows in particular cases	Top down: Explores the necessary consequences of a rule	Randomised control trials, experiments in the natural and physical sciences
Now make observations to see if the rule and the consequences hold via induction			
Induction	Looking across cases and data to produce a rule or pattern	Ground up: Has a theory in mind and seeks confirmation across cases	Surveys, cases, interviews

Figure 3.8: Abduction, Deduction and Induction as Process and Relationship to Theory
Source: Peirce cited in Hansen, 2008:456

Less documented in the original GT text is the concept of abductive reasoning. Abductive reasoning often begins with an 'incomplete' set of observations. Kimbell (2015:36) …

> …proposed the idea of abduction as the logic of discovery. As a kind of reasoning, abduction produces plausible provisional results - insights, guesses and concepts that link things together in new ways. Abduction shows something may be, but does not prove it, whereas deduction shows something is true in a particular case.

Within the context of abductive reasoning one makes informed 'imaginative leaps' towards a theory, or understanding, while not all parts of the research puzzle are known or understood (Ezzy, 2002:14). In design research, where a physical artefact or service is produced, abductive reasoning allows for agile development of 'insights and ideas that are plausible but provisional' (Kimbell, 2015:37). The abductive process offers insight into the progression of GT and ultimate theory development. When a finding from an abductive process is validated through deduction and induction one arrives at Glaser's hypotheses and Strauss and Corbin's 'plausible relationships' that are the cornerstone of

an emerging theory (Sengstock, 2008:28). The ability to trace back the development of the resulting theory is crucial to ensure transparency of data use (and justify findings within an objective framework). This process requires the researcher to reflect on coding practices (from open coding, to selective and theoretical coding, memo writing and theory development).

As discussed earlier in this chapter, four elements are considered when evaluating the rigour and success of GT: fit, workability, relevance and modifiability (Glaser, 1992:116-117). CoGT proposes a different set of criteria to evaluate the *grounded theory*: credibility, originality, resonance and usefulness (Charmaz, 2005). The criteria proposed by CoGT share a purpose and aim with that of Glaserian GT. Aspects pertaining to resonance and usefulness relate to the principle of relevance that speaks to the practical value of the theory - and the novel contribution to the field (Patton, 2002:588). Credibility is linked to the quality of the research process, the integrity of the coding, and that saturation was reached before a theory was developed. Originality challenges the researcher to discover something unique or new. This characteristic does not support unsubstantiated creative claims, but rather invites the researcher to search deeper and to uncover those unique elements that exist in the data (Eriksson & Kovalainen, 2015:213). Once a theory has emerged from the qualitative data, it will be evaluated against these criteria. The emerging theory is additionally validated through an exploration of relevant literature, which further grounds the theory.

3.3.3.1 Interviews

The participants who agreed to be interviewed were able to select a venue and date/time that was convenient for them. Locations could be either at a SAFSA venue, or could be at their homes. Some individuals preferred to meet in a public café. As one of the drivers of the engagement was to encourage participants to feel empowered during the research process, their preferred venue was accommodated in every instance. The participants, who were interviewed individually and in small groups, represent the following profile (Table 3.4):

Table 3.4: Participant Profiles and Digital Interaction Scores for Interviewed Users Only

			Level of Digital Confidence: Self Assigned by Participant					
Participant Code	Age	Gender	I feel confident using a computer.	I feel confident accessing information on the Internet.	I feel confident communicating via the Internet (email).	I feel confident communicating via the Internet (video).	I feel confident buying items or services over the Internet.	Selected Pseudonym
PC1	76	F	3	3	4	3	2	Victoria
PC2	72	F	3	4	4	3	2	Marie
PC3	85	M	4	4	5	3	2	Convict1
PC4	82	F	4	4	5	4	2	Cordelia
PC5	74	F	4	4	4	3	2	Susan
PC6	82	F	3	3	3	3	2	Ina

PC7	65	F	5	4	5	5	1	Doll
PC8	78	F	3	4	4	4	1	Hellet
PC9	76	F	4	4	5	3	2	Cody
PC10	69	F	4	4	4	4	2	Diana
PC11	71	F	5	5	5	5	2	Leonie
PC12	69	M	4	3	5	3	2	Dick
PC13	74	F	5	5	5	5	2	Taffy

Participants completed the 'Level of Digital Confidence' questionnaire before being interviewed, but after the project had been introduced and ethical concerns addressed. Levels of digital confidence and accessibility concerns were not the focus of this study, but helped define participants' level of self-assessed digital confidence and their physical ability to engage with online services. The score was assigned by the individual, using a standard 5 point Likert scale (Appendix F). The scale points were assigned numerical values: 1 for 'disagreeing strongly', 3 if 'unsure' and 5 for 'strongly agreeing'. Digital interaction was investigated by asking about the types of activities participants completed online and how confident they felt about their interactions. Perceived accessibility was only gauged by their ability to read information on the screen easily, and how easy it was to use smaller buttons. These findings did not impact on the activities of the participants during the workshops, nor the interview questions, and were not considered as part of the original open coding process. The questions helped gauge the participants' own view of their ability and perceptions prior to any engagement with the research activities. The relationship between these questions and the findings from research activities are discussed in Chapter Five, especially relating to online financial and retail services. Geographically, participants represent both the Northern and Southern regions of Cape Town. The locations of home-based interview and workshop sites are mapped in Figure 3.9. Multiple interviews were located at the same venue – for example, at the retirement village where several participants resided.

Figure 3.9: Geographic Mapping of Interview and Workshops Venues
Source: Produced by author, 2017 from Google Maps

As the study aimed to establish a *grounded theory* the interview was constructed around only three questions to allow for discussion and deeper engagement. The questions were:

1. What role does the Internet play in your everyday life?
2. Would you consider yourself an engaged online service user?
3. How could online services engage you more?

The driver of each engagement was a developing narrative around the participants' perceptions and experiences, and thus the questions were not considered as fixed. The interviewer remained open to conversational shifts as participants shared relevant stories. After each interview probing questions were added to the interview questions. The probing questions were linked to either a positive or negative response from the interviewee in situ and developed as an evolution to the on-going conversation. When a participant responded in either the positive or negative, the probing questions could be asked to gain a deeper understanding. In following interviews the emerging probing questions (Figure 3.10) could be used. In this manner, the research instrument developed, and was co-created by each participant interviewed.

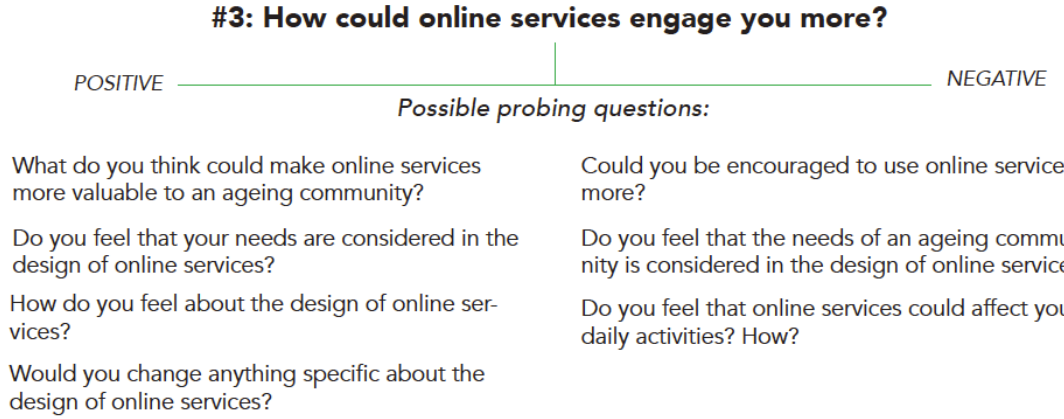


Figure 3.10: Probing questions that evolved around interview Question #3

Interviews were recorded using the Smart Recorder application. Following each interview, initial perceptions and observations were recorded. Interviews were transcribed within two days of each interview happening, to ensure that the conversation was still fresh in the mind of the researcher. Each interviewee gave consent to be recorded[40]. The transcripts were not fastidiously checked for spelling or grammar, rather capturing the actual flow and content of the conversation. Once in Atlas.ti, the conversations were coded line-by-line. While coding the second transcript, findings were compared to codes from the first analysed interview. This process of coding and continuous comparison continued through thirteen interviews.

[40] The consent template used in this study is included as Appendix C.

3.3.3.2 Workshops

Two workshops were hosted with ageing participants, facilitated with the help of two research assistants and one technical advisor[41]. Transcripts resulting from discussions during the workshops, as well as resulting workshop material, was coded as part of the data sets to inform the emerging grounded theory. Workshops were grounded in findings from interviews, during which participants noted that they would like to discuss the role of online services with others. The need to gain meaningful insights during such a session prompted the exploration of a method to allow for the capturing of user discussion, and collective decision making. This collaborative design approach would offer users the ability to synthesis the views of individuals themselves, into practical design instruments through negotiation. A driving question during interviews was: 'How should we engage older individuals when we want to design online services that have real value and use?' In order to develop a tool to facilitate meaningful engagement a co-creation session was hosted with two of the ageing individuals who were interviewed. The service design process was introduced to them and a range of methods and interaction styles were discussed. Participants took the opportunity to look through existing toolkits and were offered the freedom to be inspired by what was available, or to imagine a new way of interacting. The service design toolkits presented to participants included: the Service Design Toolkit[42] (developed by Namahn and Flanders DC), Service Design Tools[43] (developed by Roberta Tassi) and the Social Design Methods (developed by Lucy Kimbell and Joe Julier). There are a number of additional design and design thinking toolkits thus the selection of toolkits for this co-creation session was based on the explicit identification of the toolkit as being appropriate for service design. The *persona* and *character profile* (from the Service Design Tools[44] toolkit) were used by participants as a departure point for their own design.

A persona is one of many service design tools that assist designers and developers by bringing the experiences and perceptions of real users into the design and development process. A persona is a hypothetical user, constructed from the real-world experiences, perceptions and narratives of a large group of users. In this way, the views and needs of a large group of participants may be captured in a more synthesised character. The persona template developed for this project drew from the persona component framework described by Idoughi, Seffah and Kolski (2012:289) (Figure 3.11).

[41] The research assistants were fellow doctoral candidates who functioned as scribes and observers during the sessions. The technical advisor, was a professional software developer from a Woodstock, Cape Town based firm who assisted with technical set-up, assistance and observation.
[42] Available at http://namahn.com/share/service-design-toolkit/
[43] Available at http://www.servicedesigntools.org/
[44] Available at http://www.lucykimbell.com/stuff/Fieldstudio_SocialDesignMethodsMenu.pdf

Persona components	Description
Identity	Include a first and last name and a picture. It may include a short statement describing the overall life goal. We use also a code of colour to distinguish whether the user is a primary, secondary, tertiary or anti-user of the application. Typically, only primary and in some cases, secondary users are included.
General profile	A detailed description of basic demographic information including age, location, job and education degrees, etc.
Goals	Besides goals related to the application, it includes personal and professional goals as well.
Scenarios	Three to four scenarios detailed the key tasks including frequency, importance and duration. Such scenarios are described in a second stage after the validation of the key personas. Latter on scenarios are reformulated in terms of specifics needs (meaning usability requirements), features and interaction schema.
Knowledge and experience	Knowledge and experience including education, training, and specialised skills. This should not be limited only to the application.
Relationships	Include information about user associates, since this could give insight on other stakeholders.
Psychological profile and needs	Include information about cognitive and learning styles, as well as needs such as guidance and validation of decisions.
Attitude and motivation	Include information about the user's attitude to information technology and level of motivation to use the system.
Expectations	Information about how the user perceives the system works, and how the user organises information related to his or her task, domain or job.
Special needs	Such as disabilities including colour-blindness, related to mobility, eyesight (wears contacts), etc.

Figure 3.11: Persona Components
Source: Courage & Baxter (2005), extracted verbatim from source

What emerged from the session was a collaborative approach to the traditional persona method, conceptualised not only as a physical template, but rather as a structured participant workshop (Figure 3.12) supported with a physical template.

Figure 3.12: Invite to the Workshop

Participants who had been interviewed were invited to join. In addition, the one workshop was advertised on the notice board of the ageing gated community where it was going to be held. The first workshop was hosted in October 2016 at the Belmont Conference Centre in Rondebosch, Cape Town. The second was hosted in November 2016 at the Tyger Villas Residents Centre, Bellville, Cape Town. The theme of both workshops was "*Making online services work for me*" (Appendix G - programmes). A total of 15 participants took part in the collaborative sessions (Table 3.5).

A key driver of the workshop planning was ensuring that participants would find value in the session, beyond merely the participation. It was essential that they were able to 'take something away' from the session. This focus aimed to achieve *dynamic reciprocity* during the research process, in that both the academic team and community research partners found the engagement beneficial. In defining dynamic reciprocity Diver and Higgins (2014) aim to highlight the fluid nature of this process, as well as its importance. The view is shared by Ybarra (2014) who builds on Pulido's[45] work to define reciprocity as a way of 'paying it forward', instead of just ensuring ethical practice through accountability, or 'paying it back'.

Table 3.5: Workshop Participant Profiles

Participant Code	Age	Gender	Workshop Attended	Selected Pseudonym *(if selected during interview)*	Group Number	Participant Code	Age	Gender	Workshop Attended	Selected Pseudonym *(if selected during interview)*	Group Number
PC13	74	F	Rondebosch	Taffy	1	PC1	76	F	Bellville	Victoria	1
PC12	69	M	Rondebosch	Dick	1	PC5	74	F	Bellville	Susan	1
PC14	68	F	Rondebosch	n/a	1	PC8	78	F	Bellville	Hellet	1
PC15	66	F	Rondebosch	n/a	2	PC19	71	F	Bellville	n/a	1
PC16	83	F	Rondebosch	n/a	2	PC20	77	F	Bellville	n/a	2
PC17	65	F	Rondebosch	n/a	2	PC21	70	F	Bellville	n/a	2
PC18	67	F	Rondebosch	n/a	2	PC22	77	M	Bellville	n/a	2
						PC23	69	F	Bellville	n/a	2

The structure of the workshops thus took on a layered nature, in which three bands of activities were located. The initial session of activities focused on introducing the participants to a range of online services, accessed through different devices. Mobile access was not included in the initial exploration. Rather the session focused on laptop access (both Apple and Windows OS), as well as tablet access (both Apple and Android

[45] Refers to Pulido, L. 2008. FAQs: Frequently (un)asked questions about being a scholar activist. In C. R. Hale (ed.), *Engaging contradictions: Theory, politics, and methods of activist scholarship*. Berkeley, CA: University of California Press: 341-366.

OS)[46]. Participants were guided through the service experience and then had the opportunity to engage with the devices personally. Group facilitators were on hand to assist and reassure participants who felt nervous to engage with device and those who wanted to experiment (Figure 3.13). Online services were presented, after which participants could access the services themselves. Participants dictated their own level of participation. From comments made during interviews a local online retailer was selected as an example of online commerce, mainly as it offered a payment option via EFT[47]. Google was introduced as a search engine for content (text-based information, as well as images and videos). A travel service was introduced to reflect on the process of booking online, as well as the concept of live chat support. The difference between an application and access through a browser was highlighted through the example of YouTube. During the interactive session, participants shared their own experiences. The session focused on not only introducing the different services but also on addressing questions and concerns noted in previous conversations and interviews. Topics discussed included safety online, phishing scams, social media and using services without a credit card. Participants were given an easy reference glossary to take home with them and presentation notes to enable them to take physical notes should they so wish.

Figure 3.13: Participants Engaging with Devices

The second set of activities focused on the creation of an collaborative persona,. The persona acted as a catalyst for discussion in the groups[48]. The collaborative persona template (Figure 3.14) served as a discussion catalyst, probing the groups of participants to respond collaboratively.

[46] Each group of 4 participants was allocated a Macbook Pro running the newest version of Safari (used to access Takealot.com), a Lenovo/Dell Microsoft OS laptop running the newest version of Edge (used to access Travelstart.com), a Samsung tablet running Chrome (used to access Google) and an iPad2 used to access the YouTube application.
[47] During interviews, a number of participants noted feelings of *angst*, fear and nervousness when discussing the use of credit cards online.
[48] Group discussions were recorded and transcribed for coding. Informed consent was obtained.

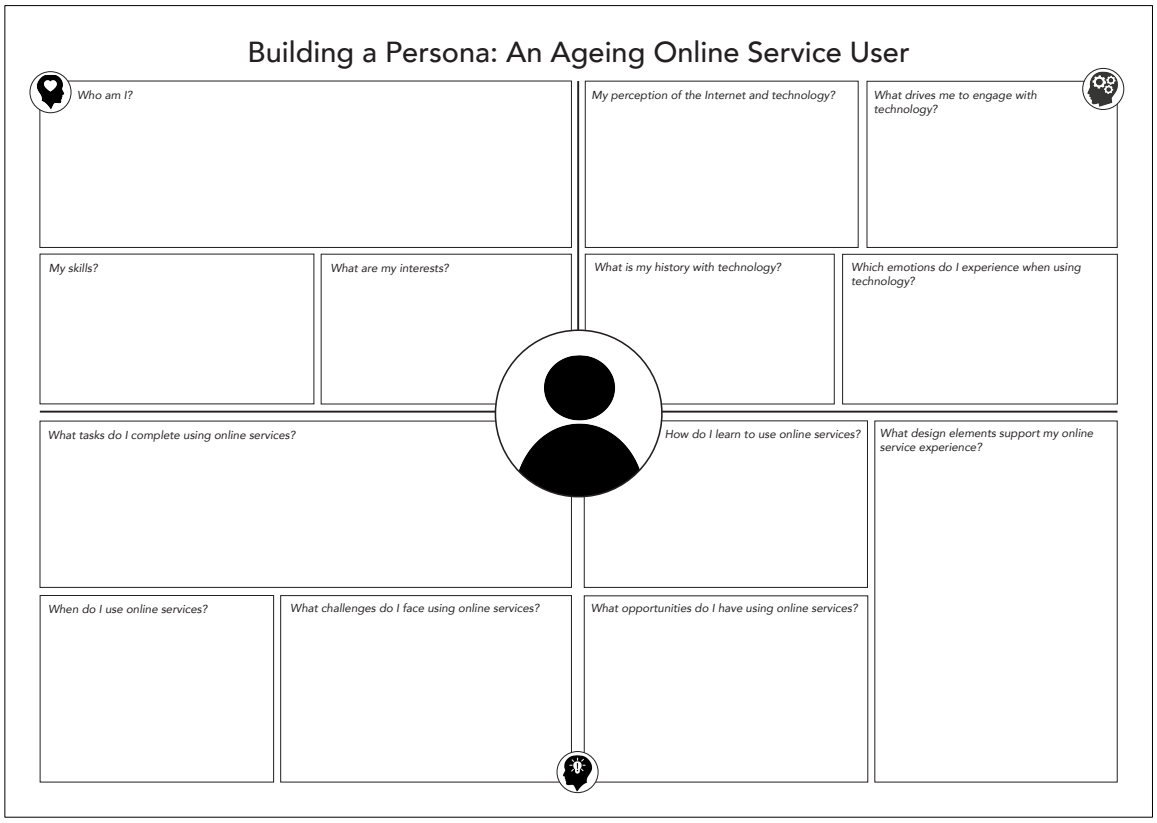


Figure 3.14: Persona Template

Through the activity a number of key factors were highlighted. The discussions were recorded for transcription and analysis after having used both thematic reflection and coding in Atlas.ti. Each group had a facilitator to help map out ideas and offer probing questions when discussion became stagnant. Each facilitator was given a set of possible trigger questions to use, if necessary, during the discussions. These trigger questions were based on the category descriptions from Courage and Baxter (2005), and on questions that users highlighted during the interviews. These included questions around the personal attributes of the persona, perceptions that the persona may have, as well as possible learning scenarios, including:

- *Consider the persona's life, children, personality, employment history (status), name, etc.*
- *What key skills does the persona have? These could be professional or personal skills.*
- *What does the person think about the Internet, technology and the digital world?*
- *Did the person use technology in their past? For their profession or for fun? What did they do? What types of technologies did they use?*
- *With what types of technologies does the person engage, and what makes them engage with these?*
- *What types of emotions do interactions with technology illicit? Consider different types of engagement and the person's response.*
- *What tasks do I complete using online services?*
- *What time of the day does the person engage with online services? How regularly? Do they use some services more regularly?*

- *How does the person learn to use online services? Who assists them? How do they discover new online services?*
- *What challenges do I face using online services?*
- *What opportunities do I have using online services?*

Through the various sections and probing questions the template gathered experiences and perceptions from three distinct contexts: the person, the person and technology, as well as the person and online services. The persona construction activity was allocated approximately an hour. However, as discussion and engagement was the key concern, flexible workshop timeframes allowed the groups to work for a longer period (Figure 3.15, 3.16). Following the persona activity, participants continued the conversation over lunch. Facilitators and a technical consultant joined the conversation to answer any questions, demonstrate various services and assist with troubleshooting.

Figure 3.15: Working on the Persona: Workshop 1

Figure 3.16: Working on the Persona: Workshop 2

The final phase of the workshop focused purely on the participants' needs. All facilitators and technical support worked with individual participants to answer questions regarding

online experiences, set up access where needed or offer device support where possible. The final stage coincided with refreshments, which lent a more relaxed atmosphere to the interactions. The sharing of knowledge at this level speaks to a process of "seeking reciprocal relationships based on empathy and mutual respect" (England, 1994:82).

The group facilitator, using the Smart Recorder application, recorded group discussions during the persona creation. Following each workshop, initial perceptions and observation of facilitators were noted. Recordings of group discussions were transcribed within 4 days of each workshop. Each workshop participant gave consent to be recorded.

3.3.3.3 Observations

Observations were crucial to the study, helping form the early grounding for memos. They were not considered as a separate research method (as one would expect from an ethnographic study) but rather supported what participants shared, or discussed during interviews and workshops. Observations also assisted in noting down key questions or insightful comments that were shared, in order to support the transcription process. Observations took the shape of in situ written comments and short recordings. The coding of these observations was included in the process. Charmaz (2006:70) suggests:

> … a dictum for interviewers: Code your observations of the setting, scene, and participants, as well as your interviews. Revealing data resides in such observations.

An observation template (Figure 3.17) allowed for quick comments to be added in relation to the person being interviewed, the interview place, the research tool, as well as any comments the researcher had on her own actions, perceptions or reflections. The template was seen as a supportive instrument and was thus adapted mid-use to the context experienced. The researcher might, for example, not have comments relating to the interview space but rather a separate topic. In this case the title would simple be crossed out and another one substituted. The observational pages were considered 'working documents', and not fixed templates. Ideas, questions and comments were noted down as the process and conversation unfolded with no regard for neatness or spelling.

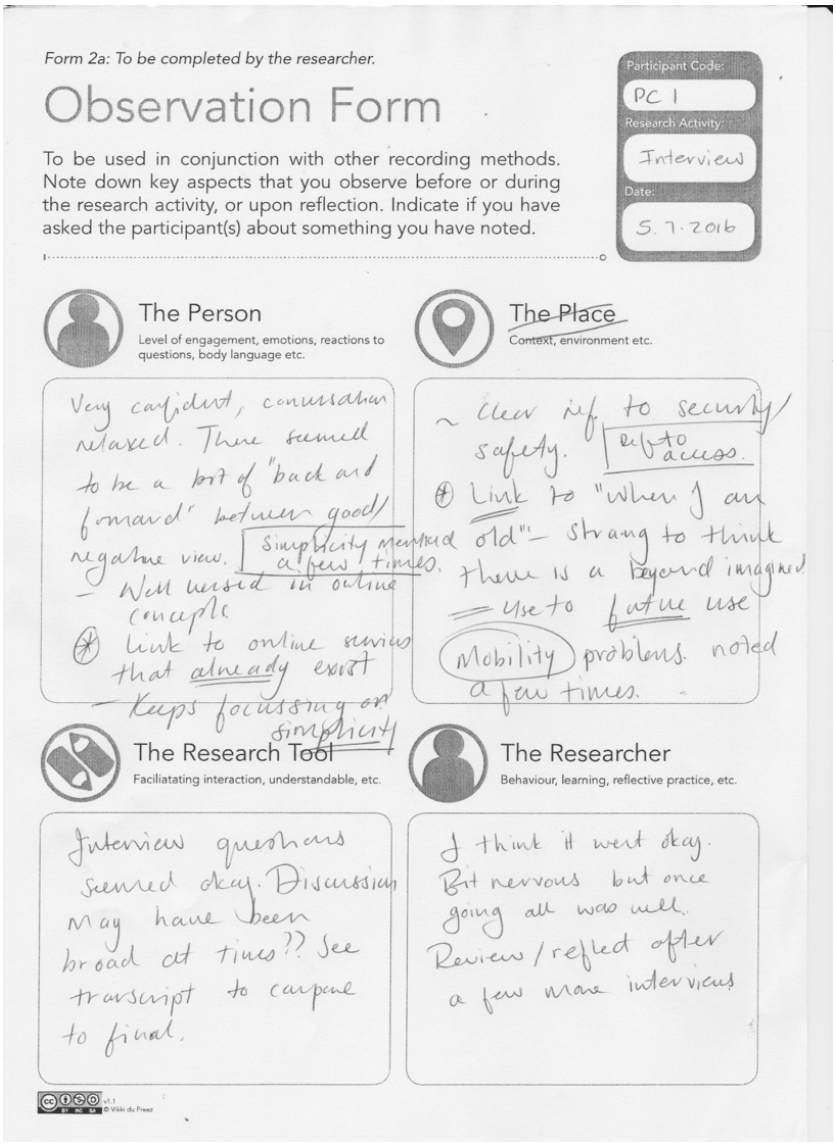


Figure 3.17: Example of Observation Template

3.4 Qualitative Data Analysis Software (CAQDAS)

The analysis of data was driven by the need to produce traceable findings, which were generated through transparent processes (of collection and analysis). *Traceable* here refers to a clear, rational progression through the iterative research process from the identification of participants, collection of data and analysis to the construction of the research argument. The iterative nature of GT allows for the discovery of new ideas and theory as the process moves backwards and forwards, between categorisation and meaning-making (Goldkuhl & Cronholm, 2003:2). Charmaz (2006:54) supports the views of Glaser and Strauss (1967) in that constant comparison is vital to *grounded theory* to encourage analytical engagement. A qualitative data analysis software (CAQDAS)[49] supported data management and analysis. It may seem abnormal to introduce the

[49] The term CAQDAS was first used by Fielding and Lee (1991)

software used to support coding and data analysis before describing data collection; however, the nature of *grounded theory* is such that much of the research process happens simultaneously. As soon as data collection began, software assisted in the organising, coding and comparison. The selection and role of assistive software need thus be noted as collected data were imported shortly after transcription.

Weitzman (2000) highlights a number of CAQDAS functions including assistance with storing and retrieval of data, coding and analysis, mapping of concepts, and writing up of the final document. He warns, though, that using software does not imply a better data analysis or final result, and that it is the role of the researcher to conduct the analysis and establish meaning (Weitzman, 2000:805). Some of the more popular CAQDAS packages, such as Atlas/ti, NVivo and WinMAX, fulfil multiple research tasks and function as text retrievers, text-base managers, code and retrieve programs that allow you to label or 'tag' passages of text that can later be retrieved according to the codes applied, code-based theory builders, and conceptual network builders[50]. Data analysis in this project commenced with an initial coding of interview and workshop transcripts after which observation memos and other materials were included. The use of software allowed for constant comparison of data, continuous evolution of codes and ultimately the emergence of theoretical concepts.

3.4.1 Atlas.ti

Atlas.ti was selected for this project as it is the Cape Peninsula University of Technology's supported CAQDAS, and a review of its functionality proved it to be suitable. In order to use the software proficiently the researcher attended training with a certified Atlas.ti trainer. Through the initial data collection and code allocation, using Atlas.ti, the research tools and process could be reviewed and insights gained (Khambete & Athavankar, 2010:14).

A key aspect of the software that assisted in the analysis of the data was its ability to code both abstractly, as well as *in vivo*. Using *in vivo* codes helps preserve participants' reactions and the meanings of their views and comments. The *in vivo* codes used as part of the coding process in this study were abstracted and included in the theoretical construct once patterns emerged in the data. In this way, the voices of participants could remain intact while the researcher explored and made sense of the emerging 'narrative' from within the data. Charmaz (2014:54) identifies three types of *in vivo* codes:

> Although the terms may be catchy, in vivo codes do not stand on their own in a robust grounded theory; these codes need to be integrated into the theory. When you scrutinize them carefully, three kinds of in vivo codes prove to be useful:
> Those general terms everyone 'knows' that flag condensed but significant meanings,
> A participant's innovative term that captures meanings or experience,
> Insider shorthand terms specific to a particular group that reflect their perspective.

[50] For a complete description of the various CAQDAS types see Richie and Lewis (2003:207-8).

Atlas.ti also allowed for alternative data sources to be analysed. These include scans of workshop material generated during collaborative sessions, voice memos when analysing data and images.

Fielding (2000:10) notes the impact of time constraints on the level of interrogation that can be achieved using CAQDAS, and that many use it as a valuable "…electronic filing cabinet". Time was noted as a key indicator in this project to ensure that a thorough analysis could be completed within the given timeframe. Another concern highlighted is that a researcher may limit his or her analysis technique and theoretical perspectives, when using CAQDAS, to the capabilities of the software (Bringer, Johnston & Ackenridge, 2004:249). Programmes (such as Atlas.ti) have, however, been identified as suitable for specifically *grounded theory* analysis (Lonkila, 1995). Even though software identified as suitable for *grounded theory* was used in this project, an awareness of the possible constraints on analysis was maintained.

3.5 Data Analysis

Data analysis was an iterative process, which coincided with data collection. Throughout the process identified codes would be compared to codes already identified as well as the data set as a whole. During the initial coding phases, all sources of data were open coded use line-by-line review. Once no more new codes emerged the open codes were analysed for emerging themes and relationships during a process of focussed coding. The focussed coding process yielded a set of core categories which were interrogated to establish relationships between the categories. Finally, through theoretical coding a substantive theory emerged, grounded in the data.

3.5.1 Initial coding

Initial coding was initiated through a line-by-line review of transcripts, audio comments and physical comments (observation templates). The process of initial coding was iterative, in that new data were compared with reviewed and previously coded data. The emerging codes were seen as 'provisional' as they changed and evolved as more data were coded and compared.

> Fresh data and line-by-line coding prompt you to remain open to the data and to see nuances in it. When you code early in-depth interview data, you gain a close look at what participants say and, likely, struggle with. This type of coding can help you to identify implicit concerns as well as explicit statements. Engaging in line-by-line coding helps you to refocus later interviews (Charmaz, 2006:50).

The evolution of codes did not imply that the coding was incomplete or inappropriate at the time, but rather that greater understanding was reached as the researcher reviewed and analysed more data. A fuller picture of the research context emerged. In situations

where the voice of the participant needed to be retained an *in vivo*[51] code was applied. Through these codes participants' meanings and nuances were captured. In line with suggestions by Charmaz (2006) the initial coding process aimed to maintain an energetic pace throughout the process to encourage spontaneity. New codes were considered in line with existing ones, and if they did not match and fit, a new code was generated.

In the initial coding phase, the emphasis was on extracting from interviews, comments and observations the core meanings and ideas. To maintain a sense of action within the codes many were captured as gerunds. Glaser (1978) explores the use of *gerunds* as a mechanism to ground codes efficiently in the data and consider codes as actions and processes. Thus, when coding, the phrase 'feels afraid' was used rather than "frightened", ensuring that the connection to the participant was maintained in the initial code. The underpinning concept throughout the initial coding process was that the emerging codes should fit the data, and not that the data should fit the codes. The following guidelines were considered throughout the initial coding process (Table 3.6):

Table 3.6 Initial Coding Guidelines and Implication for This Study

Charmaz's Guideline	Realisation in Study
Remain open.	Every transcript, observation or other data source was considered as a personal shared experience. Focus was placed on not imposing the researcher's view on the emerging codes. When the researcher identified that she was 'interpreting' the data, coding stopped and the interview was listen to again. This enabled the researcher to go back to the conversation, instead of fixating on the transcript. In this way nuances in speech and small details perhaps not captured in the transcripts were revisited.
Stay close to the data.	The researcher aimed to stay emerged in the process by scheduling interviews and workshops during shorter time frames. Phases of primary research action and reflection thus emerged.
Keep your codes simple and precise.	The researcher focused on producing codes that were simple and, where possible, action based.
Construct short codes.	Codes were meant to capture the essence of the comment.
Preserve actions.	The researcher focused on producing codes that were simple and, where possible action based.
Compare data with data.	During initial coding the focus was placed on the emerging findings and codes. As data were analysed they were reviewed through the lens of existing codes but also through the lens of existing data. It was not the aim to compare data to codes and make 'it fit at any cost', but rather to compare data to data and extract the key concept.
Move quickly through the data.	The researcher aimed to transcribe and complete initial coding of interviews and workshops within two days of the event happening.

Source: From 'a code for coding', Charmaz (2006:49)

Part of the initial coding process was the reflective review of codes throughout the process. During initial coding two code reviews occurred. Code reviews aimed to establish a more abstracted level of codes in which initial codes were aligned to key themes

[51] In *grounded theory*, a code that refers to a participant's special terms, or actual statement, is called an *in vivo* code. This specialised term or phrase draws on personal markers of the participants that provide a point of departure for future analysis.

emerging from the data. As line-by-line coding began to yield fewer and fewer codes, a review of codes assisted in a reflective analysis of what had been identified. As part of the code review, original transcripts were consulted, and in some cases original interviews were listened to once again to establish whether the abstracted code groups reflected participants' views and perceptions. Although the process of moving backwards and forwards through codes, to data and back again, added significantly more time to the analysis process, the resulting code groups represent a critical reflection of what had been found. The critical review of codes, and coding practice, was driven by a series of questions highlighted by Charmaz (2006:51, 69), including:

- What process(es) is an issue here? How can I define it?
- How does this process develop?
- How does the research participant(s) act while involved in this process?
- What does the research participant(s) profess to think and feel while involved in this process? What might his or her observed behaviour indicate?
- When, why, and how does the process change?
- What are the consequences of the process?
- How does my coding reflect the incident or described experience?
- Do my analytical constructions begin from this point?
- Have I created clear, evident connections between the data and my codes?
- Have I guarded against rewriting – and, therefore, recasting - the studied experience into a lifeless language that better fits our academic and bureaucratic worlds than those of our participants?

The initial coding process was concluded when no new codes emerged from either the analysis or line-by-line coding of new data, or from the comprised analysis and critical review of coding practice and code groups. The initial code groups represented participants' experiences and views and provided the foundation for further focused coding and eventual theory development.

3.5.2 Focused coding

The focused coding process was greatly assisted by the ability to construct networks using qualitative analytical software[52]. Focused coding allowed for the review and further synthesis of initial code groups, which emerged from the open coding process. The focused coding process critically reviewed each code group in relation to the main themes identified throughout the data gathering process. When code groups were reviewed a number of codes were shifted to more appropriate groups. The emerging code groups were constructed around a simple, prominent code. The process was time consuming, as it required the researcher to make decisions about the initial codes and the categorisation paths.

[52] In this study Atlas.ti is used. The software and general concerns about using software to explore qualitative data is explored in Chapter Four.

To ensure that assumptions regarding findings did not drive the focused coding process, the researcher maintained contact with colleagues who had facilitated workshop sessions. Through discussion, and continuous reflection on initial findings, the focused coding process resulted in a set of core categories constructed from initial code groups. The core categories that emerged from focused coding are more conceptual and directed (Glaser, 1978). The focused coding process did not depart completely from original data, as in a number of cases the researcher had to return to the data to understand fully the concept that was emerging. When core categories required a 'critical dance' between data, code and category, the focused coding process proved nerve wrecking. It was reassuring to note that the focused coding process is not necessarily linear, and that a return to the data is sometimes needed in order to establish fit and relevance (Charmaz, 2006:57).

From the focused coding process a series of core categories emerged that informed visual networks. The visual networks aimed to show the construction of core categories from open codes and preliminary analysis. When reflecting on the structure, and elements that formed each core category, the mapping process allowed the researcher to allude to the process of thinking that informed category development. Open code groups were colour-coded with the networked views to reflect visually the various streams of cognisance that contributed to each category.

3.5.3 Theoretical coding

In this study, theoretical coding was completed after a review of literature that addressed ideas, issues and academic findings in relation to an ageing population engaging with technology - and specifically online services (Chapter Five). The review of literature served to inform and expand the researcher's understanding of the context prior to theoretical coding and evaluating theoretical saturation. Glaser and Strauss (1967:45) in their early writings on *grounded theory* warned against reviewing literature before data collection, and advised researchers to "… ignore the literature of theory and fact on the area under study, in order to ensure that the emergence of categories will not be contaminated". This view, and the general timing and impact of a literature review during a *grounded theory* study, has been debated for decades (Giles, King & de Lacey, 2013:29).

3.5.4 Considering literature

The decision to review literature prior to final theoretical coding was influenced by the nature of meaning-making within constructivist *grounded theory*. Glaserian and Straussian *grounded theory*, both allude to the researcher having to be an objective interpreter of data. However, Charmaz states that constructivist *grounded theory* acknowledges the role of the researcher. The 'groundedness' of theory is thus not merely the result of an objective, impersonal review, but rather "results from these researchers' commitment to analyse what they actually observe in the field or in their data" (Charmaz, 1990:1162). It was then not beneficial to the researchers to remain ignorant of key

knowledge and literature, but rather to remain open-minded when reviewing and analysing what was found. Dey (1993:63) highlights this point when he comments that "…there is a difference between an open mind and an empty head". It is then not a question of whether literature should be reviewed, but rather a question of *how* literature is considered, and how the researcher safeguards the emerging theory from outside perspectives. The delay in reviewing literature until after data collection and focused coding processes, encouraged the evolution of in-depth analysis from within the data and resulted in the researcher having to rely on personal, grounded meaning-making (Charmaz, 2006:166; Giles, King & De Lacey 2013:32).

The review of literature prior to theoretical coding allowed for a further review of core categories that emerged during the focused coding process. The literature also enabled the researcher to observe current perspectives and knowledge relating to the field. In this process the researcher empowered herself to fulfil the role of theoretical analyst with a holistic understanding of the context, as well as the findings from primary exploration and resulting core categories. The concerns of Glaser (1978), as well as Strauss and Corbin (1998), that literature may 'contaminate' the emergence of a *grounded theory* was acknowledged throughout the process of theoretical coding by openly acknowledging and documenting the influence of literature, as well as returning to the data (and not relying on literature) to resolve any questions that emerged from the theoretical review. In order to include actively strategies to contain the influence of literature on the theory development process, *reflexivity* was practised. Ramalho, Adams, Huggard and Hoare (2015) draw from a number of sources to recommend the following guidelines to inform reflection throughout theoretical coding, in order to ensure that data drove the theory construction and not literature:

- *The constant comparative method:* constantly comparing the data, codes, categories, and memos among themselves and with each other.
- *The analytical strategy:* comparing the literature with the data, codes, categories and memos written during the study validates, or rejects, the literature as useful for the research. During this process, the data should be constantly and actively put first over any literature.
- *Reflexive use of interviews, or self-interviews*: enables the researcher to identify his or her own assumptions brought to the research process, but also serves as data to be used in the research.
- *The focus on interview observations and analysis:* interviews, usually perceived only as data collection tools, can also help the researcher to practise reflexivity, and analysis should include verbal content, as well as non-verbal interactions and transference. By paying attention to the contributions of the interviewer, as well as to the accounts of the interviewees, can further provide information about the researcher's assumptions and his or her impact on the research process.
- *Encourages dialogical interaction:* setting up the relationship as a peer partnership where every encounter starts with a check-in exercise, and the relationship itself is

continuously mapped and reflected upon.

- *Acknowledgment of the multiple levels that inter-cross*: recognise the influence that differences in power and knowledge can play in any relationship.
- *Supervisor-supervisee relationship framed in reflexivity:* the researcher should be encouraged to reflect on his or her assumptions, emotions, perspectives and expectations.

These guidelines were observed during the planning of research activities, but became especially important during the theoretical coding process, once literature had been reviewed. Through careful planning and reflective practice it is possible to minimise - or even negate - the influence of preconceived ideas from literature (Giles et al., 2013:33).

3.5.5 Theory construction

The process of theoretical coding undertaken, responded to the two coding aims stated by Flick (2009:436). Firstly, the process aims to understand clearly and explore the research context or question and, secondly, to identify the relationships between categories or components extracted from what was found. The focused coding process informed the emergence of a set of core categories, grounded in data. During the theoretical coding process the emergent core categories were reviewed from a structural perspective to understand the relationships between categories, and the nuances at play when considering core categories as part of a whole and not individual sectors. Glaser offered assistance during the theoretical coding process by providing the researcher with a suggested set of relationships that one can look for - his theoretical coding families (Glaser, 1978:72):

> Without substantive codes, theoretical codes are empty abstractions. But substantive codes could be related without theoretical codes, but the result is usually confused, unclear theoretically, and/or typically connected by descriptive topics but going nowhere theoretically (Glaser, 1998:164).

The theoretical coding process enables the researcher to interlace the concepts identified during focused coding into a cohesive whole. Glaser notes that through theoretical coding one can "weave the fractured story back together" (Glaser, 1978:72). Where anomalies are noted the researcher must go back to the data to explore the possible reason why, and acknowledge this within the theory construction process. Glaser continued adding to his coding families throughout his career, reflecting in many ways the evolving nature of *grounded theory* methods (Table 3.7). Glaser has, however, been clear that the coding families presented in his work are not a set and exhaustive list (Hernandez, 2009:55). Coding families overlap, and in some cases one family may be an offspring of another.

Table 3.7: Glaser's Theoretical Coding Families

Glaser 1979	Glaser 1998	Glaser 2005
The 6 Cs Causes		**Causal Family** Conjunctural causation TC(*)

Contingencies Consequences Covariance Contexts Conditions		Amplifying causal looping Perpetual compounding Bias random walk Equifinality Reciprocal causation Social Arena TC, (Social Worlds TC, Social Constraints TC) Social constraints TC (boundary maintaining conditions)
Process Family Stages, Staging, Phases, Phasing Progressions, Passages, Transitions, Trajectories Gradations, Steps, Shaping Ranks, Ordering, Chains Sequencing, Temporaling, Cycling	**The Basics Family** Basic social process Basic social structural process Basic social structural conditions Basic social psychological process Basic psychological process	**Temporal Family** Timelines Pacing of action (self, others) Pacing growing conditions Cycling TCs: Temporal ordering of work, etc, Organisational cycling of productions
Degree Family Ranks, Grades, Continuum, Levels Limit, Range, Intensity, Extent, Amount, Cutting points, Critical juncture Statistical averages, Standard deviation Probability, Possibility, Polarity	**Average Family** Mathematical actions (mean, median, mode) Cutting points, Confidence limits Structural norms Probabilities of Occurrence	**Levels TC** (e.g., social stratification, authority structures, spirituality)
Dimension Family Dimensions, Elements, Divisions, Piece of, Properties of, Facet Sector, Portion, Segment, Part, Aspect, Section		
Type Family Type, Form, Kinds, Styles, Classes, Genre		**Ideal Type TC** (Constructed types, Paradigms, Pattern variables)
Strategy Family Strategies, Tactics, Mechanisms, Ways, Techniques Manipulation, Manoeuvring, Ploys, Dominating Dealing with, Handling, Arrangements, Managed goals, Means, Positioning		**Cross Pressures TC** (External Conflict) Moment capture TC (essential opportunistic action)
Interactive Family Mutual efforts, Reciprocity, Mutual trajectory Mutual dependency, Interdependence Interaction of effects, Covariance	**Interactive Family** Traffic interaction Asymmetrical interaction (off-balance power equilibriums or power relations)	**Systems Parts TC** (e.g., functional reciprocity)
Cutting Point Family Boundary, Benchmark, Division Critical juncture, Cutting point, Turning point, Breaking point Cleavage, Tolerance levels, Deviance Dichotomy, Trichotomy, Psychotomy In-out, Intra-extra, Point of no return	**Boundary Family** Limits, Outer limits, Confidence limits, Front line, Deviance Boundary maintaining mechanisms Tolerance zones, Transition zones	**Outer limits TC** (e.g. legal, moral, security, safety, breaking or moving boundaries)
Means-Goal Family End, Purpose, Goal Anticipated consequences, Product		**Asymptote TC** (getting as close as possible) Fractals TC

		Autopoiesis TC (e.g. structural coupling)
Cultural Family Social norms, Social values, Social beliefs Social sentiment	**Representation Family** (Cultural Representation) Descriptive (e.g. conceptualising, baselining, vaguing) Proscriptive (e.g., proper-lining) Prescriptive (e.g., interpreting) Sentimental, Evaluative	**Frames TC** (political, religious, ideological, cultural)
Consensus Family Clusters, Agreement, Contracts, Cooperation Definitions of the situation Uniformities, Opinion, Homogeneity-Heterogeneity, Conformity, Conflict, Dicensus, Differential perception, Non- Conformity Mutual Expectation		
Mainline Family Social control, Socialisation, Social organisation Social order, Social Mobility, Status Passage Recruitment, Stratification Social institutions, Social Interaction, Social World		
Theoretical Family Parsimony, Scope, Integration, Density, Clarity Fit, Relevance, Modifiability, Utility, Condensability Conceptual level, Inductive-Deductive balance Multivariate structure.		
Ordering or Elaboration Family Structural ordering Temporal ordering Generality (Conceptual ordering)		
Unit Family (Structural Units) Collective, Group, Organisation, Aggregate Nation, Social world, Territorial units, Society Situation, Context, Arena Behavioural pattern, Family Positional units (status, role, role relationship, status set, role-set, person-set, role partners)	**Structural-Functional Family** Reference groups, Structural change, Authority structure, Functional requirements of structure	**Action TC** (variation in types of action for each unit) Social constraints TC
Reading Family Concepts, Problems, Hypotheses		
Models Linear model, Property space		**Isomorphism TC** (theory model)
	Paired Opposite Family Dichotomies, Polar opposites	**Paired Opposite Family** Symmetry-asymmetry TC,

	Paired alternatives	Binary TC, Micro-macro TC, Balancing TC
	Scales Family Likert, Guttman, Cumulative, Funnelling down, Delimiting, Random walk	

Source: Discussed and collated by Hernandez (2009:62-66), *TC = Theoretical Code

One of the fundamentals in *grounded theory* is that theory must emerge from the data. The researcher is thus cautioned not to form an attachment to one or more specific coding families and review his or her work through those alone. If done in this way, the data will not inform the theory but are manipulated to inform an assumption. The application of a 'pet code' results in focused codes being forced into a resolution that does not represent the original concerns, perceptions and knowledge shared by participants (Glaser, 2005:42). Charmaz (2006:64) defines the benefit of working with coding families as follows:

> If you use them skilfully, theoretical codes may hone your work with a sharp analytic edge. They can add precision and clarity - as long as they fit your data and substantive analysis. They can aid in making your analysis coherent and comprehensible. Depending on the data you have and on what you learn about them, you may find that your analysis takes into account several coding families.

The use of *grounded theory* coding families is not encouraged without a note of caution, as a number of theoretical relationships and structures are still considered absent from Glaser's (ever growing) list. Added to this some theoretical concepts are stated as subordinates within a larger coding family, even though they can be unique theoretical constructs within themselves:

> Several conceptual families are noticeably absent in Glaser's list, including those that focus on agency and action, power, networks, and narrative and biography. Others, such as inequality, remain buried in a larger unit. Conflict is relegated to the larger family of consensus, indicating a subordination that conflict theorists would rightfully and vigorously contest (Charmaz, 2006: 66).

In the theoretical coding process for this study, Glaser's coding families were reviewed as a departure point. By means of a critical review, the emerging focused codes were explored through the lens of the proposed coding families, which assisted in identifying relationships among the emergent core categories. The theoretical coding process was seen as iterative and not as a single linear approach. In this way, the coding process allowed for progressive analysis, an increase in complexity, yet still allowing opportunities to go back to the data for clarification. Where emerging theory construction diverted from the presented coding families, the researcher ensured that the data and core categories were not forced into a theory. Theoretical coding represents the final 'reflexive phase' during which final theoretical categories emerge and one can establish theoretical saturation (Flick, 2009:440).

Urquhart, Lehmann and Myers (2010:366) present an accessible framework for analysing *grounded theory* studies (Figure 3.18). From an *information systems* perspective, the framework clearly visualises the trajectory of theory development within *grounded theory* studies.

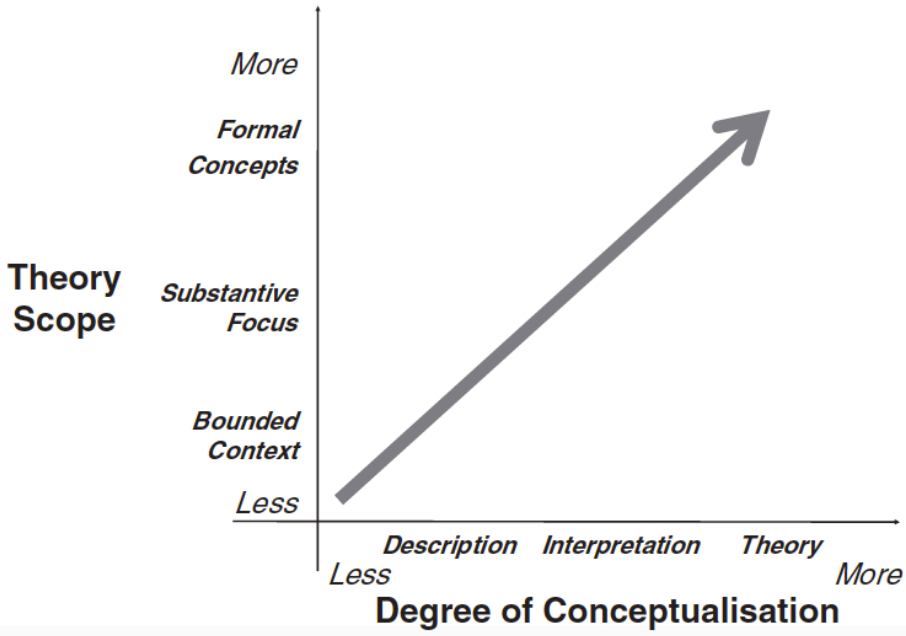


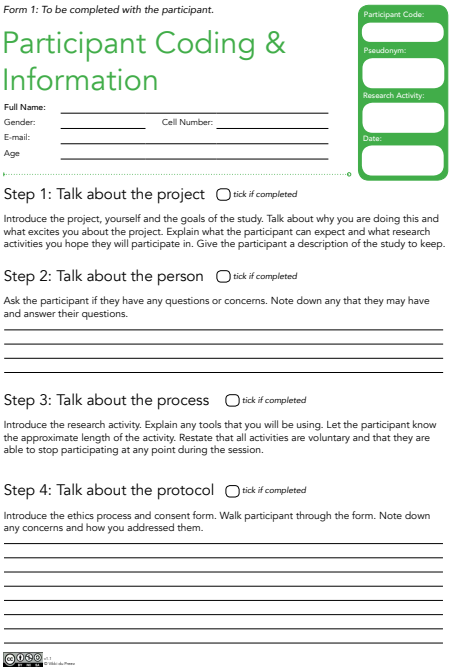
Figure 3.18: Framework for Analysing Grounded Theory Studies
Source: Urquhart, et al., 2010:366

In order to generate meaningful theory, *grounded theory* practitioners should aim to produce theory that has a large scope and high level of conceptualisation (relates to the top right-hand corner of the figure). The degrees of conceptualisation focus on the analysis of data and promote theory that stipulates "explicit relationships between individual interpretive constructs" and moves beyond mere descriptions (Urquhart et al., 2010:367). The scope of the developed theory indicates in how narrow a context, or wide a context, the theory will remain valid. A very narrow scope implies that the theory applies only to a specific context; whereas formal concepts explain phenomena in various settings, contexts and situations.

This research project aims to produce a theoretical contribution with a substantive focus. The nature of the investigation, focusing on ageing participants within a set geographic area with access to specified resources, limits the scope. There is, however, a focus on empirical substantiation of findings to inform theory. The emerging theory, and its relation to literature, is noted in Chapter Four, while the final discussion of the theory's impact on socio-technical interactions, and the perceptions of an ageing user group in South Africa towards online services, is explored in Chapter Five.

3.6 Ethical Considerations

To ensure that research practices were ethical, and that no physical, psychological or emotional harm came to participants, the following aspects were considered as part of the project: making research objectives clear to participants, informed consent, voluntary participation, as well as methods that allowed for diversity (culture, literacy, etc). Commitment to participate could be for the project as a whole, or for a single session based on the availability and willingness of the participant. Participants signed an informed consent form (Appendix C). The consent form was introduced through a verbal discussion to ensure participants understood the document. Forms were produced in larger typefaces. During the initial discussion phase, the researcher used the Participant Information and Coding form (Figure 3.19) to underpin the conversation and note down any questions, or concerns that the participant had. The participant was also given an information page explaining the project, process and aims with contact details for both the researcher and the project supervisor (Figure 3.20). The 'Four Ps' of the project were used as a theme for the form, facilitating the discussion around the *project, person, process* and *protocol*. The coding form is the only document that contains participant information and is stored securely in digital format in a password protected file system, along with all other project data (photographs, videos, audio recordings and memos). This form will not be used in any publication related to this project. The form allowed the participant to select a pseudonym, which is used in text when they are quoted directly. This meant that participants' own words are associated with a name that they have selected.



Form 1: To be completed with the participant.

Participant Coding & Information

Full Name:
Gender: Cell Number:
E-mail:
Age

Participant Code:
Pseudonym:
Research Activity:
Date:

Step 1: Talk about the project ☐ *tick if completed*

Introduce the project, yourself and the goals of the study. Talk about why you are doing this and what excites you about the project. Explain what the participant can expect and what research activities you hope they will participate in. Give the participant a description of the study to keep.

Step 2: Talk about the person ☐ *tick if completed*

Ask the participant if they have any questions or concerns. Note down any that they may have and answer their questions.

Step 3: Talk about the process ☐ *tick if completed*

Introduce the research activity. Explain any tools that you will be using. Let the participant know the approximate length of the activity. Restate that all activities are voluntary and that they are able to stop participating at any point during the session.

Step 4: Talk about the protocol ☐ *tick if completed*

Introduce the ethics process and consent form. Walk participant through the form. Note down any concerns and how you addressed them.

Figure 3.19: Participant Information and Coding Form[53]

Project Description:

How do we make online services more accessible?

AIM OF THE STUDY

The aim of this study is to explore the perceptions of ageing individuals with regards to online services, to identify

COSTS & RISKS

There are no costs involved. Participants will not be reimbursed for activities or their participation. The study poses no danger, and there is no risk in taking part.

ACTIVITIES

Interviews & User Diary - I would love to hear about your experiences with online services, and talk about how these services may affect your every day activities. For interviews I will meet you where you are most comfortable.
A workshop (if you would like to join) - analysing design elements of online services, and imagining services that would work for you!

My name is Vikki du Preez, and I am currently registered for a DTech qualification at the Cape Peninsula University of Technology. The study is titled: *Online service design: A socio-technical perspective to engage an ageing population.*

CONTACT DETAILS
Email: servicedesignforall@gmail.com
Cell: 079 874 1593

The study: *Online service design: A socio-technical perspective to engage an ageing population*, is registered at the Cape Peninsula University of Technology and is supervised by Prof R. de la Harpe (delaharper@cput.ac.za)

Figure 3.20: Project Information Page[54]

[53] A larger version of the form is included as Appendix D.
[54] A larger version of the form is included as Appendix E.

This study conforms to the ethical research guidelines required by CPUT, but draws its practical structure of ethical considerations from the framework for research ethics as defined by the Economic and Social Research Council (ESRC). The framework was developed in 2006, with a revised version becoming available in January 2015. The council, and revised framework, proposes a more holistic view on ethical practice:

> The revised framework includes necessary revisions but also encourages researchers to think ethically and emphasises the importance of identifying potential ethical issues throughout the research lifecycle of a project, and expresses our expectation that researchers should ensure the maximum benefit of their research whilst minimising actual or potential risk of harm to participants or others affected by the research (Economic and Social Research Council, 2015).

As part of the framework six guiding principles were considered while planning and conducting research activities. The Research Ethics Guidebook (2015) offers a more colloquial view on the six principles, converting them into actionable questions. Table 3.8 reflects the guidelines as proposed by the ESRC, as well as how these are realised in this study.

Table 3.8: Ethical Considerations

ESRC Framework for Research Ethics (ESRC, 2015)	**Research Ethics Guidebook** (Research Ethics Guidebook, 2015)	**Ethical Considerations within this Study**
Research participants should take part voluntarily, free from any coercion or undue influence, and their rights, dignity and (when possible) autonomy should be respected and appropriately protected.	*Can you guarantee that your participant's involvement in the research is truly voluntary?*	In this study, participants were introduced to the objectives of the study, as well as all planned activities, in a preliminary session. A week later they were asked whether they were keen to take part in the study. All participation was voluntary, and participants could leave the session whenever they needed/wanted to.
Research should be worthwhile and provide value that outweighs any risk or harm. Researchers should aim to maximise the benefit of the research and minimise potential risk of harm to participants and researchers. All potential risk and harm should be mitigated by robust precautions.	*Can the research guarantee the absence of harm to the research participants? Remember that in social science research, 'harm' is taken to mean more than just physical harm, and can refer to emotional harm and risk of upset, as well as to reputational damage.*	Research activities posed no physical harm to participants. All activities and objectives were fully discussed in the introductory session, prior to the actual research activities, to ensure that all participants were confident and comfortable with respect to participating.

Research staff and participants should be given appropriate information about the purpose, methods and intended uses of the research, what their participation in the research entails and what risks and benefits there are, if any.	*Can you ensure that any potential participants will be fully informed of the purpose, methods and intended possible uses of the research?*	The roles and level of participation were clearly communicated in the introductory sessions, preceding research activities. These sessions, based on dialogue and conversation, aimed to clarify all aspects of the research, including expected outcomes and intended uses of data.
Individual research participant and group preferences regarding anonymity should be respected and participant requirements concerning the confidential nature of information and personal data should be respected.	*Is it possible to maintain participant confidentiality and anonymity within the study?*	Findings were documented in the form of research notes, videos, photographs, audio recordings and physical materials/artefacts generated during sessions. Findings were coded to allow for anonymity. Informed consent forms specified whether images and video footage might be used. The researcher transcribed interviews. It was not possible to ensure confidentiality of experiences shared in the co-design session, as the researcher had no control over participants once they had left the session (Smith 1995).
Research should be designed, reviewed and undertaken to ensure that recognised standards of integrity are met, and quality and transparency are assured.	*Is the research study worth doing? Can you ensure the integrity and quality of the research?*	The study explores an under-researched field within the South African context and could potentially assist in the development of online services that engage an ageing community. The effects of this could include longer independent living through online retail and payment, as well as greater social connection with family, friends and interest groups.
The independence of research should be clear, and any conflicts of interest or partiality should be explicit.	*Will the research design enable the researchers to remain independent throughout the process? Are there any conflicts of interest?*	No conflict of interest exists. The research is completed as part of an academic exploration and no professional/commercial entity is involved in the research process.

Source: Collated and produced by author, 2015

3.6.1 Working with an ageing research group

The end-user group that will participate in this study are individuals, over 65, who have access to online services. For the purpose of this study, that access could be personal or shared. Past research projects and experiments have highlighted common misconceptions that many researchers and practitioners may have when working with the elderly. Holstein and Mitzen (2001:100) highlight three assumptions that a researcher should acknowledge. The first is that older adults are often perceived to be helpless, rejected by both their family and society. Elderly individuals do not need to be rescued. The second assumption is that, since their time with us may be limited, it would not be wise to invest in them. The third is that they are incapable, or unwilling, to change or adapt their behaviour (ibid).

Ethical standards and guidelines are not sufficiently clear when working with individuals who are cognitively impaired (Schwiebert, Myers & Dice, 2000:124). This is not solely the domain of the elderly, but cognitive decline is more common among this group. This project does not seek to address or explore the perceptions of ageing individuals who are cognitively impaired. Although it is a worthy field of research, it falls outside the scope of this study. It is hoped that the theoretical contributions of this project can benefit other studies that explore active ageing, as well as other gerontological investigations. In order to contribute in this study, the participant must be able to give informed consent. Three aspects contribute to informed consent: that participation is voluntary, that the nature of the project (including all benefits and risks) is explained prior to commencement of the research activities, and that the participant is intellectually sound. Rattan (1980:35) proposes an additional condition for informed consent to be valid: "…I therefore propose the following fourth condition: that the elderly research subject's actual understanding of the experiment be accurate and complete…". Ethical consideration in research activities and collaborations of this project aimed to move beyond compliance, to *practice*: establishing an empathetic grounding for interaction and placing the participant at the centre of any consideration or project decision.

3.7 Methodological Concerns and Considerations

As with any other methodology, CoCT (and *grounded theory* in general) has a number of limitations. The complex nature of data collection and analysis, often in an iterative manner, makes the process very time consuming (Bartlett & Payne, 1997). This study acknowledged the time implications and allowed for multiple engagements with participants. In order to streamline the process of data coding and emerging pattern identification, specialised software, Atlas.ti, was used[55].

The emergence of theory through a grounded research approach should not be limited by a pre-existing framework. The impact of established theories introduced early in the process may impact on how data are collected, analysed and interpreted. This could potentially influence how the new theory is formulated, not purely from data, but rather from data as viewed through a particular lens. Charmaz (2006:68) urges the researcher to consider the following questions before integrating existing theories or frameworks into a grounded study:

- Do these concepts help you understand what the data indicate?
- If so, how do they help?
- Can you explicate what is happening in this line or segment of data with these concepts?
- Can you adequately interpret this segment of data without these concepts?
- What do they add?

[55] The use and limitations of Atlas.ti are described in Chapter Four.

Following on from this it is suggested that, if existing concepts do not contribute to the fundamental exploration and understanding of what is found, they should be considered only after coding is complete and the researcher should "...define what is happening in your data first" (ibid). In this study, the explored experiences and phenomena that are being observed form part of a large socio-technical context, which has produced a number of existing theories. Glaser (1992:4) highlights the fact that, in *grounded theory*, the asking of pre-conceived questions or comparing the evolving theory to established frameworks may influence the developing theory. In order to allow the theory from this study to emerge directly from the data, any discussions concerning the link to, or impact on, socio-technical contexts will be investigated only once the theory has been formulated (in Chapter Six).

Another consideration is the generalisation of the theory that emerges from a grounded study. Glaser and Strauss (1967:58) highlight the role of the researcher as an "…active sampler of theoretically relevant data, not an ethnographer trying to get the fullest data on a group". The implication is thus that theory should emerge from patterns within the data and not fixate on giving voice to the beliefs, reactions and perspectives of individual participants in the study. This view can be reviewed in light of the two types of *grounded theory* proposed by Glaser and Strauss, namely formal theory and substantive theory (1967). While formal theory (macro) aims to represent a more generalised view of a common experience or phenomenon, substantive theory (micro) draws from a smaller group of participants and focuses on a more specific research objective, or focus area. Dwivedi (2009:55) describes a substantive theory as a:

> …theoretical model that provides a 'working theory' of action for a specific context. A substantive theory is considered transferable, rather than generalizable, in the sense that elements of the context can be transferred to contexts of action with similar characteristics to the context under study… This contrasts with Formal Theory, which is based upon validated, generalizable conclusions across multiple studies that represent the research population as a whole, or upon deductive logic that uses validated empirical theories as its basic axioms.

This project focuses on a specific group of geriatric participants[56] and aims to establish their experiences with online services. The research thus aims to produce a substantive theory. Charmaz offers the following advice to *grounded theory* researchers to reduce problems when coding. Firstly, she advocates that the researcher must be honest about any preconceived ideas or assumptions on the topic being researched, and that every '…researcher holds preconceptions that influence, but may not determine, what we attend to and how we make sense of it' (Charmaz, 2006:67). This perspective is shared by Glaser who urges researchers to consider the suitability of each concept they encounter, and that ideas should 'earn' their place within the analysis (Glaser 1978:8). Secondly, Charmaz offers insights when transforming data into codes. She advocates for the coding

[56] As previously described, the study focused on participants above 65 years of age, who already have access to online services through either a personal or shared device.

of full transcripts instead of notes, and that one will reach a "…deeper level of understanding" through the process (Charmaz, 2006:70). A careful analysis and coding of all material (transcripts, interviews and observations) is encouraged to give the researcher a richer data set that may yield several analyses (ibid).

3.8 Conclusion

The selected methodology, *grounded theory*, is presented in this chapter in relation to the iterative and human-centred nature of design. The selection of CoGT is justified, as the research process required a methodology that allows for understanding and knowledge to emerge from engagement with participants, and for the emerging theory to be grounded in their experiences and emotive reactions. As a deeper understanding of the human reaction to socio-technical systems is needed, it is imperative to engage with methods that place human exploration and engagement central in the research approach. The focus on user exploration and the human experience highlights the need for a defined ethical framework and code of ethical behaviour. Both of these have been highlighted in this chapter. Chapter Four describes the actual research process, which has been introduced in this present chapter. The research process is described as it unfolded and moved through the coding phases. In many ways Chapter Four is a continuation of Chapter Three, in that it further explains the process of analysis that characterises CoGT.

Chapter Four
Data Collection & Analysis

Chapter Content

4.1 Introduction to Practical Research Design

At its core, design is an activity that unites individuals in a process of solution conceptualisation and realisation. Before research activities began, a review of literature related to the field of study was conducted (Chapter Two). The study did not focus on the problem context as such (as this would contradict much of the GT literature) but rather on aspects that support, or may influence, the problem context. This exploration served as a description of the 'problem space'. Further to this was a review of personal experiences and knowledge that one brings to the research.

> The researcher does not go blank or give up his knowledge. He goes sensitive with his learning which makes him alert to [the] possibility of emergence and how to formulate it conceptually (Glaser, 1998:123).

As the process of research commenced, the separation of methodological description and actual research reporting became very challenging. To address this the more applied phases of the data collection and analysis process of CoGT are discussed in this chapter, using actual data to describe the process and theoretical progression. This approach was adopted to respond to CoGT requirements so that the process of data collection and analysis be clear and transparent.

As a new set of data was created, it was immediately analysed through an open coding (initial coding) process. This process aimed to code data using a line-by-line approach[57] (Glaser, 1978). Charmaz (2006:46)[58] urges the researcher in this phase to "…remain open to all possible theoretical directions indicated by your readings of the data". The initial coding of interview transcripts, workshop transcripts and workshop material happened within 24 hours of gathering to ensure that the initial coding was fresh and not viewed through layers of interpretation.

Following the interviews two co-creation workshops were hosted. Workshop participants included individuals who had been interviewed and participants new to the study. Workshop discussion transcriptions and workshop material were initially coded, and compared to existing findings. These comparisons considered data with data, aimed at highlighting similarities and anomalies that formed the catalyst for coding review and development (Glaser & Straus, 1967).

Through analysis and constant comparison, patterns in the data emerged and informed the creation of core categories. The process was evolutionary with screen shots of previous data groupings functioning as historic records of code groups. All activities

[57] Through coding each line of data, you gain insights about what kinds of data to collect next. Thus, you distil data and direct (Charmaz, 2006:51).
[58] The work of Charmaz is referred to extensively in this section as the project focused on a CoGT, explored in Chapter Three.

relating to the comparison, review and forming of categories were documented in a reflective memo. The structured approach to analysis and documentation of reflection aimed to support the emergence of patterns in the data rather than interpretation of the data by the researcher.

4.2 Initial Coding

Interviews generated the largest amount of data, supported by in situ observations and co-design activities during workshops. During interviews, a mixture of open and specific questions were included as they elicit different levels of responses. Open questions promoted reflection and thoughts about experiences and perceptions, while specific questions contributed to the exploration of specific behaviours, experiences and design elements (Giske & Artinian, 2007:71). Keeping with the CoGT approach, data were collected and analysed in an iterative process. The concurrent collection and processing of data supports the research process as a whole. "…It helps to find key words and key persons, to outline the research phenomenon and to recognize the process in an attempt to control the study" (Backman & Kyngas, 1999:149). The project followed a systematic process with regard to the collection and analysis of data.

4.2.1 Data from interviews

The first interview transcript was coded line-by-line in a provisional manner, and was reviewed as the additional data sets were analysed and compared. An evolutionary process of initial coding emerged with multiple iterations of coding review, every time new information was added. The language of the initial coding process built on Charmaz' view of 'coding to reflect action':

> Initial coding should stick closely to the data. Try to see actions in each segment of data rather than applying pre-existing categories to the data. Attempt to code with words that reflect action. At first, invoking a language of action rather than of topics may feel strange. Look closely at actions and, to the degree possible, code data as actions (Charmaz, 2006:47-48).

After the eighth interview, the number of unique additional codes began to decline and all initial codes were reviewed. The following is an excerpt from a personal memo, recording the process:

> *4-7 September 2016: The first review phase: I've been processing my codes for the last few days. Codes have been given descriptions and the relationship between codes identified. When I started this process I had finished my initial coding of interviews. The last interview only yielded one new unique code. The next steps will be to scan in my observation forms and code them as well as plan the workshop. I originally had 155 codes. As I began reviewing my codes I found a number of instances where very similar codes had been assigned. These were merged to form more coherent code groups (and descriptions). I had 130 final unique codes at the end of this process.*

The original codes referred to in this memo contained a number of *in vivo* codes (Diana commented: "Sometimes I just don't understand why everything needs to update all of the time! What is that!"). The same content was referred to by multiple codes as the focus of the process was to capture a code which represented the content. The original process did not focus on conforming to preestablished titles of groups, keeping the coding process grounded in the data. Table 4.1 indicates the comments from participants and the open code *Fearful and Nervous of Cyber Crime,* assigned to them.

Table 4.1: Example of Open Codes in Relation to Participant Comments

Open Code	Participant Comment (Participant Pseudonym)
Fearful and Nervous of Cyber Crime	• No, because there are such absolute horrific stories about hackers and people hacking into your computer. (Victoria) • If you are secure in your own knowledge that your stuff is safe, then by all means but just how safe are we. (Victoria) • What security is that. Now that there needs to be so many numbers and letters, It has become so complicated. (Connie1) • That I'm really scared of. (Connie1) • You know people can get into your banking details. (Hellet) • I don't think so. I think that's something that in me, I just don't trust that they can do anything to keep me safe. (Hellet) • I suppose it's not necessary to be so on your guard, but when you are alone you have no one looking out for you. (Hellet) • I think it is good to be cautions. Very good, because today we can be very irresponsible. (Hellet) • I agree, I think that more and more if you look at some of the documentaries that are coming out, I'm scared. (Doll) • So, using the computer at home may be a safer option, but you still don't know with the hacking. (Doll) • But you still hear about fraud. Look, if they do anything that is fraud free I will go for it. (Susan) • Fear of doing the wrong thing. Like this message that came through. At this time we know to delete it already. (Susan) • Sometimes I am asked for my identity number. But I never give it. (Susan) • They are so many scams. (Ina) • And this is what scares us. You can't always discern whether it's a scam or whether it's genuine. (Ina) • That is so dangerous! (Ina) • Especially when you are dealing with banking, you don't want things to get mixed up. (Dick) • Well, I believe our main worry would be security. We worry, I would say. (Dick) • I mean, quite a few people are worried about it, so I hope that means that are looking into it. (Dick) • I was quite frightened of the fraud situation. (Fred) • The banks are trying their best to make it pretty secure but I'm still aware. (Fred) • We are both with FNB. When I go on to Internet banking, all of a sudden, my name and pin number is filled in! Why? (Diane) It's so dangerous. All of my accounts and investments are linked to that account. If they get in to that, I just can't imagine! (Leonie) • Oh yes the tax information and the bank information must be safe. (Leonie) • Recently my computer CD had for viruses so I downloaded a small program, I'm not sure if I did the right thing. It is scary. (Leonie)

After 12 interviews, no new unique codes were identified during line-by-line coding. At this point in the process all codes were reconsidered and compared to each other to create the first more abstracted level of codes. Much of this process was a combination of digital and manual code analysis. The codebook for the project was printed and the unique codes cut into a set of individual codes. This allowed the researcher to have a static overview of the emerging code groups on screen, while cross-checking and allocating physically printed codes to the groups. The process allowed for the development of a more defined list of codes from participants' comment and initial codes (Figure 4.1).

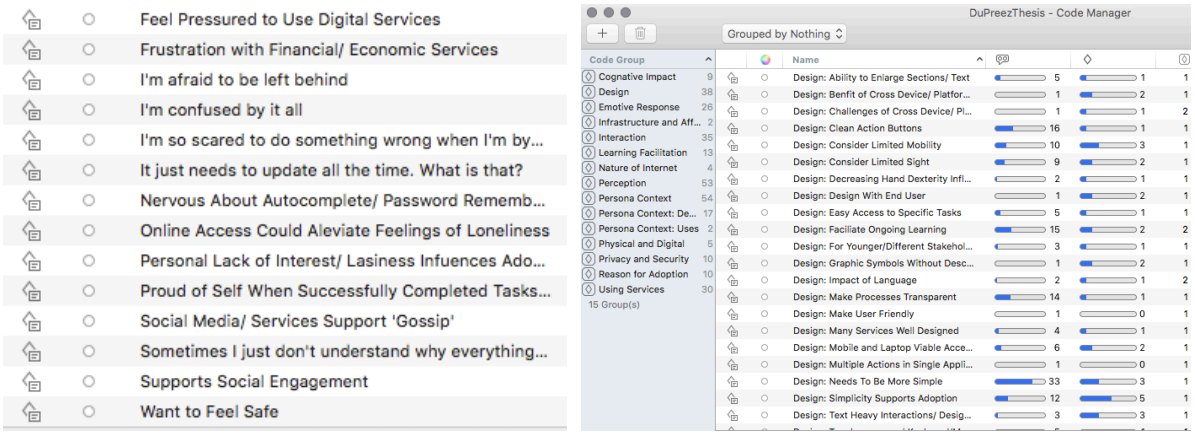


Figure 4.1: First Code Review: Mix of Codes Prior to Review (Left); 'Design' Focus Area After Review (Right)
Source: Screenshot by author, 2016

During this code analysis (review) each code was given an introductory word, which identified the larger focus area of which the code was a part. Emerging areas of emphasis identified were: *Design, Digital, Interaction, Internet, Perception and Service*. All codes were identified with one or more of the focus areas. This was merely the first level of analysis, with more in-depth comparisons and analysis to follow. From this first coding review, a number of code groups emerged, containing codes from various focus areas. The resulting code groups (Table 4.2) were:

Table 4.2: Code Groups Resulting from First Code Review

Code Group	Description	Open Codes which Constitute the Group
Cognitive Impact	Codes relating to the positive and negative impact of using technology and online services on cognitive functions.	**9 Codes in Group:** ○ Design: Facilitate Ongoing Learning ○ Design: Impact of Language ○ Digital and Manual: Digital Keeps Brain Active ○ Digital and Manual: Manual Keeps Brain Active ○ Perception: Device Considered a Tool ○ Perception: Digital Decreases Ability to Write ○ Perception: Supporting User Memories ○ Services: Challenging User Memories ○ Services: New Way of Thinking
Design	Codes relating to the impact of design and interface on the user experience of online services.	**38 Codes in Group:** ○ Design: Ability to Enlarge Sections/ Text ○ Design: Benefit of Cross Device/ Platform Services ○ Design: Challenges of Cross Device/ Platform Services ○ Design: Clean Action Buttons ○ Design: Consider Limited Mobility ○ Design: Consider Limited Sight ○ Design: Decreasing Hand Dexterity Influences Ease of

		Use ○ Design: Design With End User ○ Design: Easy Access to Specific Tasks ○ Design: Facilitate Ongoing Learning ○ Design: For Younger/Different Stakeholders ○ Design: Graphic Symbols Without Description Confusing ○ Design: Impact of Language ○ Design: Make Processes Transparent ○ Design: Make User Friendly ○ Design: Many Services Well Designed ○ Design: Mobile and Laptop Viable Access Points ○ Design: Multiple Actions in Single Application ○ Design: Needs To Be More Simple ○ Design: Simplicity Supports Adoption ○ Design: Text Heavy Interactions/ Designs Challenging ○ Design: Touchscreen and Keyboard/Mouse Fine ○ Design: Touchscreen Offers Less Feedback to User ○ Design: Updates Create Confusion ○ Design: Work with What is Familiar ○ Persona Context: Design: Con: Advertisements ○ Persona Context: Design: Con: Constant Interface Changes ○ Persona Context: Design: Con: Steps in Process Not Clear ○ Persona Context: Design: Con: Too Little/ No Feedback After Action ○ Persona Context: Design: Con: Updates ○ Persona Context: Design: Con: Viruses ○ Persona Context: Design: Con: Visual Clutter ○ Persona Context: Design: Pro: Allow for Physical Artefact (Printing) ○ Persona Context: Design: Pro: Audio Feedback ○ Persona Context: Design: Pro: Consistency ○ Services: Service Should Easy to Define, Navigate and Access ○ Services: Use of Voice/ Audio Elements Adds to the Experience ○ Services: Visual/ Graphic Support
Emotive Response	Codes relating to both positive and negative emotions experienced by participants when engaging with online services.	**26 Codes in Group:** ○ Design: Updates Create Confusion ○ Interaction: Can be Confusing ○ Interaction: Can Lead to Panic/ Fear ○ Interaction: Can Make User Nervous ○ Interaction: Nervous About Autocomplete/ Password Remembered ○ Perception: Concerned About Shared/ Public Computers ○ Perception: Device Considered a Tool ○ Perception: Device Considered Special ○ Perception: Disappointed in Self When Failing to Complete an Online Task ○ Perception: Fear of the New Keeps Older Users Offline ○ Perception: Fearful and Nervous of Cyber Crime ○ Perception: Fearful of Deleting ○ Perception: Fearful of Own Lack of Knowledge ○ Perception: Feel Pressured to Use Digital Services ○ Perception: Lack of Confidence to Explore Independently ○ Perception: Lack of Engagement Will Result in "Being Left Behind" ○ Perception: Online Access Could Alleviate Feelings of Loneliness ○ Perception: Personal Lack of Interest/ Laziness Influences Adoption ○ Perception: Proud of Self When Successfully Completed Tasks Online ○ Perception: Social Media/ Services Support 'Gossip' ○ Perception: Supports Social Engagement ○ Perception: Want to Feel Safe ○ Services: Advertisements/ Pop Ups Annoyance ○ Services: Design Changing/Updating Challenging ○ Services: Distrust of Online Financial/Economic Services ○ Services: Frustration with Financial/ Economic Services
Infrastructure and Affordability	Codes relating to the affordability of online access, and the infrastructure that supports it in South Africa.	**2 Codes in Group:** ○ Internet: Affordability in SA Can Be Challenging ○ Internet: Infrastructure in SA Can Be Challenging
Learning Facilitation	Codes relating to the method, nature and process of learning as experienced by the users.	**13 Codes in Group:** ○ Interaction: Learning Mediated by External Individual ○ Interaction: Learning Mediated by Family Member ○ Interaction: Learning Mediated by Own Exploration/ Agent ○ Interaction: Practice Increases Ease of Use ○ Interaction: Process Detailed ○ Perception: Does Not Need to Engage Beyond Basic Services ○ Perception: Engagement Will Eventually Be Needed. ○ Perception: Often Family Provides Device With No Support ○ Perception: Supporting User Memories ○ Perception: Users Must Make an Effort ○ Perception: Willingness to Engage Online A Personal Choice/ Personality Trait ○ Persona Context: Content with Limited Knowledge ○ Services: Challenging at First
Nature of the Internet	Codes relating to the scope and nature of the Internet	**4 Codes in Group:** ○ Internet: Access to Information ○ Internet: Convenience ○ Internet: Tool ○ Internet: Vast
Perception	Codes relating to how users perceive online services: the benefit, value, challenges and expectations.	**53 Codes in Group:** ○ Interaction: Need to Play Personal Role in Online Security ○ Perception: Advertising Makes Technology Seems Less Accessible ○ Perception: Computer Literacy Generational ○ Perception: Concerned About Shared/ Public Computers ○ Perception: Device Considered a Tool ○ Perception: Device Considered Special ○ Perception: Digital Decreases Ability to Write ○ Perception: Digital Interaction Affects Real Word Social Interaction ○ Perception: Disappointed in Self When Failing to Complete an Online Task ○ Perception: Does Not Need to Engage Beyond Basic Services ○ Perception: Easier to Get Someone Else/ Family Member To Do It For Me ○ Perception: Engagement Will Eventually Be Needed. ○

		Perception: Fear of the New Keeps Older Users Offline ○ Perception: Fearful and Nervous of Cyber Crime ○ Perception: Fearful of Consequences (Everything online, what happens when lines go down?) ○ Perception: Fearful of Deleting ○ Perception: Fearful of Own Lack of Knowledge ○ Perception: Feel Pressured to Use Digital Services ○ Perception: Lack of Confidence to Explore Independently ○ Perception: Lack of Engagement Will Result in "Being Left Behind" ○ Perception: Lack of Understanding Modern 'Online Social' Reality ○ Perception: Laptop Allows Access from Anywhere (Convenient) ○ Perception: Limited room for digital exploration ○ Perception: Need to Communicate will Initiate Interaction ○ Perception: Often Family Provides Device With No Support ○ Perception: Older Individuals are Not Interested in Technology ○ Perception: Older individuals Associate with Manual Methods ○ Perception: Older Individuals Have the Time to Learn/ Explore ○ Perception: Older Individuals Need To Explore Online World Themselves ○ Perception: Older Individuals Not Technically Minded ○ Perception: Older Individuals Will Attend Training/Classes if Offered ○ Perception: Once Something is Online It Can't be Deleted. ○ Perception: Online Access Benefits Those with Limited Mobility ○ Perception: Online Access Could Alleviate Feelings of Loneliness ○ Perception: Online Access Important to get Help in Emergencies ○ Perception: Online Service Considered a Tool ○ Perception: Online Services have Value ○ Perception: Online Services Offer Affordable Communication Methods ○ Perception: Personal Lack of Interest/ Laziness Influences Adoption ○ Perception: Prefer Physical Interaction to Digital Interaction ○ Perception: Printed Information Better/ More Accessible ○ Perception: Proud of Self When Successfully Completed Tasks Online ○ Perception: Real Users Not Consulted in Updates ○ Perception: Social Media/ Services Support 'Gossip' ○ Perception: Supporting User Memories ○ Perception: Supports Social Engagement ○ Perception: Use for Specific Purpose ○ Perception: Users Must Make an Effort ○ Perception: Varied Levels of Concern Regarding Online Security ○ Perception: Want to Feel Safe ○ Perception: Willingness to Engage Online A Personal Choice/ Personality Trait ○ Persona Context: Content with Limited Knowledge
Physical and Digital	Codes relating to the intersection of the physical and digital space, and when participants identified actual comparisons between the two.	**5 Codes in Group:** ○ Digital and Manual: Digital Keeps Brain Active ○ Digital and Manual: Manual Keeps Brain Active ○ Perception: Digital Interaction Affects Real Word Social Interaction ○ Perception: Prefer Physical Interaction to Digital Interaction ○ Perception: Printed Information Better/ More Accessible
Privacy and Security	Codes relating to concepts of safety online, online threats and privacy.	**10 Codes in Group:** ○ Interaction: Nervous About Autocomplete/ Password Remembered ○ Interaction: Unsure about Personalized/ Targeted ads/info (Social Media) ○ Perception: Concerned About Shared/ Public Computers ○ Perception: Fearful and Nervous of Cyber Crime ○ Perception: Once Something is Online It Can't be Deleted. ○ Perception: Varied Levels of Concern Regarding Online Security ○ Service: Context Collapse ○ Services: All Your Information Is Online Already ○ Services: Distrust of Online Financial/Economic Services ○ Services: Security Requires Multiple Pins
Reason for Adoption	Codes relating to reasons for adoption of online services. For example:	**10 Codes in Group:** ○ Perception: Lack of Engagement Will Result in "Being Left Behind" ○ Perception: Need to Communicate will Initiate Interaction ○ Perception: Often Family Provides Device With No Support ○ Perception: Older Individuals Have the Time to Learn/ Explore ○ Perception: Online Access Benefits Those with Limited Mobility ○ Perception: Online Access Could Alleviate Feelings of Loneliness ○ Perception: Online Access Important to get Help in Emergencies ○ Perception: Online Service Considered a Tool ○ Perception: Online Services have Value ○ Services: Self-Guided/ Individualization
Using Services	Codes relating to actual services being used and the experience of specific service elements.	**30 Codes in Group:** ○ Perception: Online Service Considered a Tool ○ Perception: Supporting User Memories ○ Service: Accessible ○ Service: Context Collapse ○ Services: Advertisements/ Pop Ups Annoyance ○ Services: All Your Information Is Online Already ○ Services: Allow Information Overload (Not Relevant Information) ○ Services: Avoided ○ Services: Challenging at First ○ Services: Challenging User Memories ○ Services: Clearly Explain Changed Made During Updates ○ Services: Convenient ○ Services: Design Changing/Updating Challenging ○ Services: Difficult to Narrow Down Presented Information/ Information Overload ○ Services: Distrust of Online Financial/Economic Services ○ Services: Face-to-Face more expensive (banking) ○ Services: Facilitate Communication ○ Services: Frustration with Financial/ Economic Services ○ Services: Need to Take Time to

		Learn ○ Services: New Way of Thinking ○ Services: Online offers ○ Services: Products Online not Tangible ○ Services: Security Requires Multiple Pins ○ Services: Self-Guided/ Individualization ○ Services: Service Should Easy to Define, Navigate and Access ○ Services: Unique Nature of Services Can Be Challenging ○ Services: Updates/ Changes Add Value ○ Services: Use of Voice/ Audio Elements Adds to the Experience ○ Services: Used ○ Services: Visual/ Graphic Support
Interaction	Codes relating to all aspects of user interaction with online services from both a positive and negative perspective.	**35 Codes in Group:** ○ Design: Challenges of Cross Device/ Platform Services ○ Interaction: Accessing Service from Multiple Devices Challenging (Interaction Not Constant) ○ Interaction: Can be Confusing ○ Interaction: Can Be to Detailed ○ Interaction: Can Lead to Panic/ Fear ○ Interaction: Can Make User Nervous ○ Interaction: Clear and Transparent ○ Interaction: Clearly Explain Changed Made During Updates ○ Interaction: Desktop, Laptop or Tablet ○ Interaction: Dislike 3rd Party Information Overload ○ Interaction: Facilitate Practical (Everyday) Activities ○ Interaction: Find Help Online ○ Interaction: Help Function/Menu Can Be Confusing ○ Interaction: If Unsure, Find a 'Work-a-round' ○ Interaction: Influenced by Lack of Troubleshooting Confidence ○ Interaction: Information Overload (Not Relevant Information) ○ Interaction: Learning Mediated by External Individual ○ Interaction: Learning Mediated by Family Member ○ Interaction: Learning Mediated by Own Exploration/ Agent ○ Interaction: Mainly with Family & Friends ○ Interaction: Mobile Navigation & Use Challenging (Online Services) ○ Interaction: Need to Play Personal Role in Online Security ○ Interaction: Negative Effect on Personal Interaction Skills ○ Interaction: Nervous About Autocomplete/ Password Remembered ○ Interaction: Practice Increases Ease of Use ○ Interaction: Problematic if Too Time Consuming ○ Interaction: Process Detailed ○ Interaction: Process Detailed in Printed (Physical) Medium ○ Interaction: Struggling with Basic Task (view, print, open) ○ Interaction: Text Heavy Interactions/ Designs Challenging ○ Interaction: Unsure about Personalized/ Targeted ads/info (Social Media) ○ Interaction: Working with Keyboard and/or Mouse More Enjoyable ○ Services: Avoided ○ Services: Challenging at First ○ Services: Self-Guided/ Individualization

The initial code review included a reflection on the underpinning meaning and definition of emerging code groups. A number of codes were allocated to multiple groups as appropriate, and code groups were linked through basic relationships: contradiction, support of, property of, contribution, linking to and association. The initial review provided a 'traceable' opportunity for the initial steps towards theoretical conceptualisation and theory development, grounded in data. As Goldkuhl and Cronhom (2003:3) explain:

> One of the most important strengths in GT is that building theory from data "automatically" grounds the theory in empirical data. This implies that there is a good traceability between data, categorization and theory (e.g. Pries-Heje, 1992). This also means that there are good possibilities for a transparent process. A transparent process increases the credibility of the study.

The emerging code groups and initial emerging concepts provided the foundation for the further development of the research tool. In order to establish whether new patterns could emerge from the research tool, a series of workshops were facilitated.

4.2.2 Data from workshops

The outline of workshop activities is introduced in Chapter Three. Workshop data were generated through recordings of group discussions, the physical workshop materials and resulting personas, as well as observations from the researcher and group facilitators. Both the group discussions during persona development, and the persona worksheets

themselves (Figure 4.2), were imported and coded in Atlas.ti to contribute to the final analysis.

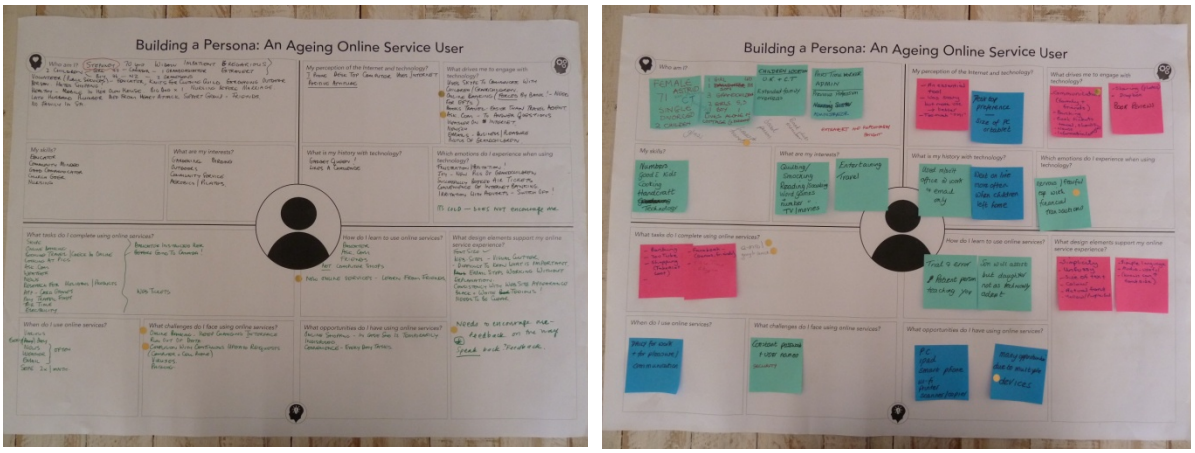


Figure 4.2: Examples of User Created Personas

The final personas (two of the four included as Figure 4.3) reveal four unique characters that share attributes across the user-technology-service spectrum. The personal traits, skills and background of developed personas are unique but highlight a number of shared emotional triggers. The development of personas was not associated with the construction of a framework for service development, but rather an open exploration of user needs to contribute to the construction of theory (Hosono et al., 2009:547). This focus builds on the foundation that personas are useful as information gathering exercises and that they assist in "expanding the scope of ideas" (Idoughi et al., 2012:301).

Figures 4.3: Final User Personas
Source: Collated from co-created persona templates, 2016

Personas shared a dispersed family structure, with relatives often being located in different national or international regions. This was highlighted specifically in relation to children and grandchildren. A key driver to engage with technology was the need to communicate with family members who were far away. Video conferencing platforms were identified as crucial to this exchange; however, file sharing (for example photos) was also mentioned. Personas also shared a strong dichotomous emotional response to the use of technology. Terms like 'frustrated', 'forced to use', 'it's cold' and 'irritation' were captured on the persona tool when referring to online activities, yet 'joy' was noted when receiving images of grandchildren or when an online booking was successfully completed. The persona data were converted in four final personas[59]. The final personas were created with little to no interpretation of the original research in order to maintain the original voices of participants. The personas also provided a clear user perspective on emerging socio-technical interactions.[60]

The emerging data set from workshop group discussions was transcribed as a summary of comments and coded line-by-line. When workshop discussions were coded, the original audio files were reviewed to ensure that the assignment of a code to a summarised item was reflecting the original meaning. For example, the following comment was made at 40:10min into the discussion regarding the persona being created: "She does know that if she breaks a leg, she could phone… she could shop online, and they could even stack it in her cupboard if needs be. She knows that." The resulting summarised comment on the transcript reads: *If she does break a leg (mobility problems "temporarily indisposed") she could shop online.* During the coding process, both the audio file and summary were consulted and the following codes assigned: *perception*; *online access can benefit those with limited mobility; services used for a specific purpose; online services considered a tool,* and *online services can facilitate getting help in an emergency.* Referring to both the audio file and summary during the coding process proved critical to ensure the voice and meaning of participants were correctly coded.

From the initial analysis, it was found that emerging concepts contributed more codes to the existing code groups; however, they did not highlight additional code groups. Once findings from the workshops (workshop materials and transcripts) were coded, and saturation of concepts identified, the process of focused coding began.

4.3 Focused Coding

The focused coding process was partially started towards the final cycles of open coding, in that categories were identified following interview data coding. To begin reviewing the level of concept saturation, transcripts from workshop discussions were open coded and

[59] The final personas have also been included as Appendix H to make viewing and reading more convenient.
[60] This concept is further explored in Chapter Seven.

no new code groups emerged. The next process, *focused* coding, facilitates the establishment of higher-level categories - emerging from the data and resulting from open coding (Alemu et al., 2015:534). In order to review the resulting higher-level categories, network views of code groups were produced in Atlas.ti. The network views are a visual interpretation of the code groups and how they relate to each other.

The production of network views provided the researcher with an opportunity to review the data, codes and resulting relationships in an iterative process, moving closer to confirming saturation. Throughout the focused coding process key quotes from participants were reconsidered to ensure the perceptions and experiences noted were still grounded in the real-world voices of participants. The focused coding process established the foundation for literature to be reviewed, and for ultimately establishing saturation and an emerging theoretical contribution. The networks presented do not represent final theoretical considerations, but rather serve as a progression from open coding towards a final theory.

Original code groups identified during initial coding were expanded upon, and in some cases collapsed as emerging insights presented a more holistic view. The emerging core categories represent perceptions and interactions relating to: *Digital Context, Cognition and Learning, Emotive Response to Online Interaction, User Context, Perceived Benefits, Nature of User Interaction* and *Service Design to Support Use* (Table 4.3).

Table 4.3: Core Categories and Their Underpinning Codes

Core Category	Emerging from Groups	Constructed from Open Codes
Digital Context	– Digital Context	Internet: Tool; Internet: Vast; Internet: Affordability in SA Can Be Challenging; Internet: Infrastructure in SA Can Be Challenging; Internet: Access to Information; Internet: Convenience
Cognition and Learning	– Cognition and Learning – User Context – Service Design to Support Use – Emotive Response to Online Interaction – Nature of User Interaction	Perception: Printed Information Better/ More Accessible; Perception: Prefer Physical Interaction to Digital Interaction; Perception: Willingness to Engage Online A Personal Choice/ Personality Trait; Perception: Does Not Need to Engage Beyond Basic Services; Persona Context: Content with Limited Knowledge; Perception: Engagement Will Eventually Be Needed; Perception: Users Must Make an Effort; Perception: Need to Communicate will Initiate Interaction; Perception: Often Family Provides Device With No Support; Interaction: Learning Mediated by External Individual; Interaction: Learning Mediated by Family Member; Interaction: Learning Mediated by Own Exploration/ Agent; Perception: Device Considered a Tool; Interaction: Practice Increases Ease of Use; Services: Challenging at First; Perception: Digital Decreases Ability to Write; Design: Impact of Language; Perception: Digital Interaction Affects Real World Social Interaction; Design: Facilitate Ongoing Learning; Digital and Manual: Manual Keeps Brain Active; Digital and Manual: Digital Keeps Brain Active; Services: Challenging User Memories; Perception: Supporting User Memories; Services: New Way of Thinking
Emotive Response to Online Interaction	– Emotive Response to Online Interaction – User Context – Service Design to Support Use – Nature of User	Services: All Your Information Is Online Already; Perception: Once Something is Online It Can't be Deleted.; Perception: Social Media/ Services Support 'Gossip'; Unsure about Personalised/ Targeted ads/info (Social Media); Perception: Supports Social Engagement; Online Access Could Alleviate Feelings of Loneliness; Proud of Self When Successfully Completed Tasks Online; Perception: Disappointed in Self When Failing to Complete an Online Task; Perception: Lack of Confidence to Explore Independently;

	Interaction	Perception: Fearful of Own Lack of Knowledge; Perception: Personal Lack of Interest/ Laziness Influences Adoption; Services: Distrust of Online Financial/Economic Services; Services: Frustration with Financial/ Economic Services; Interaction: Can be Confusing; Perception: Feel Pressured to Use Digital Services; Perception: Lack of Engagement Will Result in "Being Left Behind"; Perception: Fearful and Nervous of Cyber Crime; Perception: Fearful of Deleting; Concerned About Shared/ Public Computers; Perception: Varied Levels of Concern Regarding Online Security; Services: Security Requires Multiple Pins; Perception: Want to Feel Safe; Interaction: Nervous About Autocomplete/ Password Remembered; Interaction: Can Lead to Panic/ Fear, Perception: Fearful of Consequences; Perception: Fear of the New Keeps Older Users Offline
User Context	– Cognition and Learning – User Context – Service Design to Support Use – Emotive Response to Online Interaction – Nature of User Interaction	Perception: Digital Interaction Affects Real Word Social Interaction; Perception: Advertising Makes Technology Seems Less Accessible; Perception: Older Individuals are Not Interested in Technology; Perception: Older individuals Associate with Manual Methods; Perception: Prefer Physical Interaction to Digital Interaction; Perception: Printed Information Better/ More Accessible; Perception: Older Individuals Have the Time to Learn/ Explore; Perception: Older Individuals Need To Explore Online World Themselves; Perception: Older Individuals Will Attend Training/Classes if Offered; Perception: Lack of Understanding Modern 'Online Social' Reality; Perception: Online Access Important to get Help in Emergencies; Perception: Supports Social Engagement; Perception: Online Access Could Alleviate Feelings of Loneliness; Perception: Online Services Offer Affordable Communication Methods; Perception: Need to Communicate will Initiate Interaction; Perception: Device Considered a Tool; Perception: Device Considered Special; Perception: Computer Literacy Generational; Perception: Older Individuals Not Technically Minded; Perception: Users Must Make an Effort; Perception: Willingness to Engage Online A Personal Choice/ Personality Trait; Interaction: Need to Play Personal Role in Online Security; Perception: Does Not Need to Engage Beyond Basic Services; Perception: Online Service Considered a Tool; Perception: Fearful of Own Lack of Knowledge; Perception: Engagement Will Eventually Be Needed; Perception: Lack of Engagement Will Result in "Being Left Behind"; Perception: Fear of the New Keeps Older Users Offline; Perception: Often Family Provides Device With No Support; Perception: Easier to Get Someone Else/ Family Member To Do It For Me; Perception: Lack of Confidence to Explore Independently; Perception: Fearful of Own Lack of Knowledge
Perceived Benefits	– Perceived Benefits – Service Design to Support Use – User Context	Perception: Older Individuals Have the Time to Learn/ Explore; Perception: Online Service Considered a Tool; Services: Self-Guided/ Individualisation; Perception: Online Services have Value; Perception: Online Access Important to get Help in Emergencies; Perception: Online Access Benefits Those with Limited Mobility; Perception: Online Access Could Alleviate Feelings of Loneliness
Nature of User Interaction	– Emotive Response to Online Interaction – User Context – Nature of User Interaction – Cognition and Learning – Service Design to Support Use	Interaction: Need to Play Personal Role in Online Security; Interaction: Nervous About Autocomplete/ Password Remembered; Interaction: Information Overload (Not Relevant Information); Interaction: Dislike 3rd Party Information Overload; Interaction: If Unsure, Find a 'Work-a-round'; Interaction: Influenced by Lack of Troubleshooting Confidence; Interaction: Help Function/Menu Can Be Confusing; Interaction: Struggling with Basic Task (view, print, open); Interaction: Find Help Online; Interaction: Mainly with Family & Friends; Interaction: Facilitate Practical (Everyday) Activities; Services: Challenging at First; Interaction: Practice Increases Ease of Use; Interaction: Can be Confusing; Interaction: Can Lead to Panic/ Fear; Interaction: Can Make User Nervous; Interaction: Negative Effect on Personal Interaction Skills; Interaction: Learning Mediated by External Individual; Interaction: Learning Mediated by Family Member; Interaction: Learning Mediated by Own Exploration/ Agent; Design: Challenges of Cross Device/ Platform Services; Interaction: Accessing Service from Multiple Devices Challenging (Interaction Not Constant); Challenges of Cross Device/ Platform Services; Interaction: Desktop, Laptop or Tablet; Interaction: Mobile Navigation & Use Challenging (Online Services); Interaction: Working with Keyboard and/or Mouse More Enjoyable
Service Design to Support Use	– Nature of User Interaction – Service Design to	Services: Advertisements/ Pop Ups Annoyance; Services: Allow Information Overload (Not Relevant Information); Design: Graphic Symbols Without Description Confusing; Design: Text Heavy

	Support Use - Cognition and Learning - Emotive Response to Online Interaction - User Context	Interactions/ Designs Challenging; Design: Clean Action Buttons; Services: Visual/ Graphic Support; Design: Simplicity Supports Adoption; Services: Use of Voice/ Audio Elements Adds to the Experience; Design: Impact of Language; Design: Updates Create Confusion; Services: Clearly Explain Changes Made During Updates; Services: Online offers; Services: Products Online not Tangible; Services: Facilitate Communication; Services: New Way of Thinking; Services: Challenging User Memories; Perception: Supporting User Memories; Design: Facilitate Ongoing Learning; Design: Mobile and Laptop Viable Access Points; Design: Touchscreen and Keyboard/Mouse Fine; Design: Touchscreen Offers Less Feedback to User; Design: Benefit of Cross Device/ Platform Services; Design: Ability to Enlarge Sections/ Text; Design: Consider Limited Mobility; Design: Consider Limited Sight; Design: Decreasing Hand Dexterity Influences Ease of Use; Services: Service Should Be Easy to Define, Navigate and Access; Design: Easy Access to Specific Tasks; Design: Needs To Be Simpler; Design: Design With End User; Service: Accessible; Design: Make Processes Transparent; Perception: Online Service Considered a Tool; Services: Convenient; Services: Unique Nature of Services Can Be Challenging; Design: Make User Friendly; Design: Work with What is Familiar; Design: For Younger/Different Stakeholders

The emerging core categories are the result of continuous review and analysis. Categories that reflect codes specifically relating to the generation of personas were not included in the focused coding process. The transcripts of group discussions whilst constructing personas were, however, included. This resulted in the key findings, perceptions and participant views being included in the analysis, without the data being 'muddied' by persona elements that represent negotiated opinions (not necessarily uniformly agreed to).

4.4 Emerging Core Category Description

In the process of making sense of concepts within each category, colour was applied to identify code groups that build towards higher-level concepts (Alemu et al., 2015:535). The colour specifically does not carry meaning, but acts as a visual method to represent a complex range of interconnected elements. The allocation of colour within the network views also represents an iteration of code and category analysis. Each network view was considered in detail, each code group and category compared and analysed. The network views enable the emerging core categories to move from descriptive and observational, to conceptual and theoretical.

4.4.1 Digital context

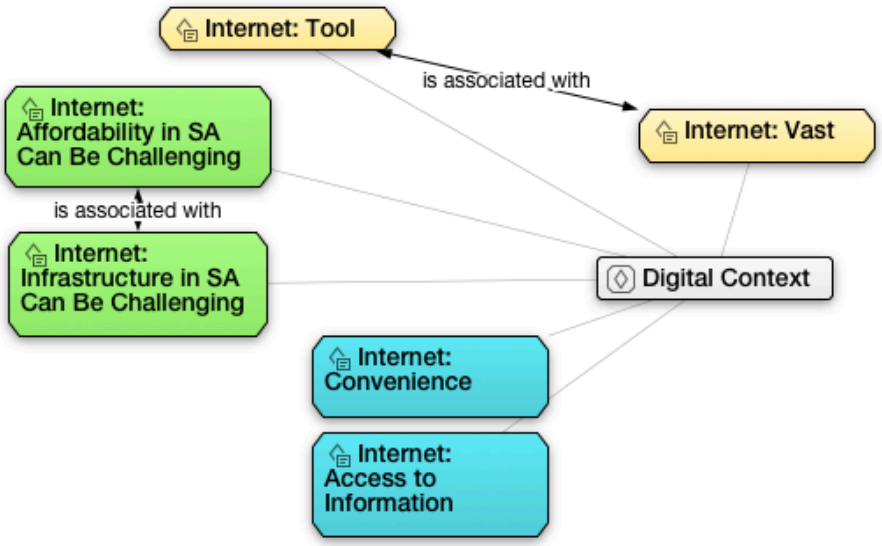


Figure 4.4: Digital Context Network[61]

The overall perception that ageing users have regarding the Internet is that it is a vast tool that allows access to both convenience and information from a variety of sources. When discussing the use of digital services, challenges around access and affordability were noted by a number of participants. Continuous access is limited as participants noted mostly capped data accounts. Data costs are not considered an essential cost. The quality of Internet access and speed of connections were highlighted as challenging and support findings within the field that reference the lack of supporting infrastructure, rural locations and out-dated frameworks at impacting Internet penetration in Southern Africa (Pejovic et al., 2012:2469).

4.4.2 Cognition and learning

The impact of digital services on cognitive behaviour and resulting learning networks is influenced by a number of key factors. Online services are perceived by participants as requiring a new way of thinking. Participants commented that continuous online activity negatively affected the ability to write, as well as real-world social interaction, and impacted on the use of language. Conflicting views were noted around the benefit of digital methods in supporting cognitive abilities, with some participants preferring manual methods to learn and 'keep the brain active', and others finding that digital interaction provided exactly that. Conflicting views were also noted regarding the role of memory in engaging with online services. While some found the process strenuous, others found that digital engagement encouraged focused memory. A shared perspective was that online engagement must support ongoing learning as part of its design.

[61] A larger version of the network view is included as Appendix I

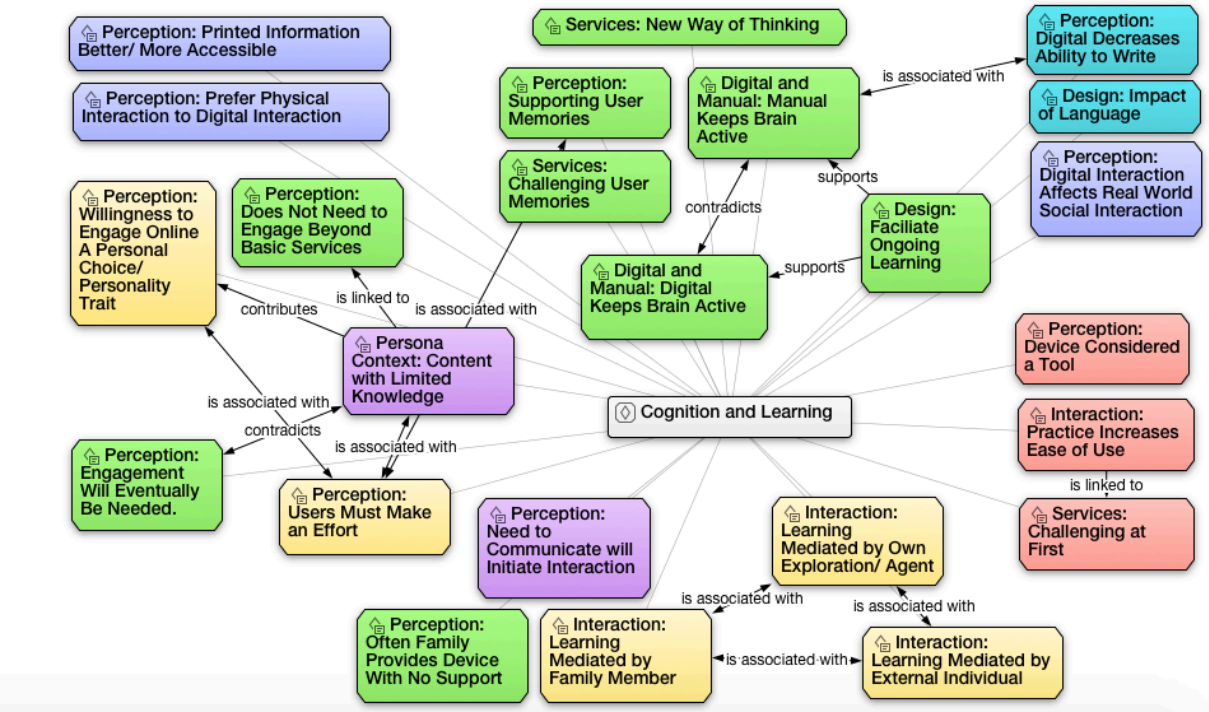


Figure 4.5: Cognition and Learning Network[62]

Learning is supported by continuous practice, and participants noted that even though the engagement was challenging at first it became easier with use. A number of learning mediators were identified, including family members, external individuals (such as technical assistants in shops) and independent exploration. A key factor that emerged was that individuals must make an effort to extend their digital knowledge. A willingness to engage must be a personal choice, and some participants indicated that they were not interested in participating beyond basic services. The need to communicate, however, in an emergency or merely as part of social engagement, was identified as a possible catalyst for engagement with online services. Individuals interviewed admitted that they felt they would eventually need to engage online and that the idea was often frightening.

4.4.3 Emotive response to online interaction

Experiences and perceptions relating to both positive and negative emotions were noted when participants discussed engaging with online services. Participants noted that they felt pressurised to use digital services and that they often felt confused when engaging with online services. The lack of engagement also made them feel as though they would be 'left behind'. Ageing users feel that society views their lack of engagement as a fear of new technology and that this fear keeps them from engaging. Participants did highlight that they were fearful of their own lack of knowledge, which negatively affected the confidence to explore online services independently:

[62] A larger version of the network view is included as Appendix J.

"And this is what scares us. You can't always discern whether it's a scam or whether it's genuine. I think this is why people are fearful." – Susan

"Proud when I get something right!" "Disgusted when I did something wrong and it is so small I feel stupid!" - Participant 21

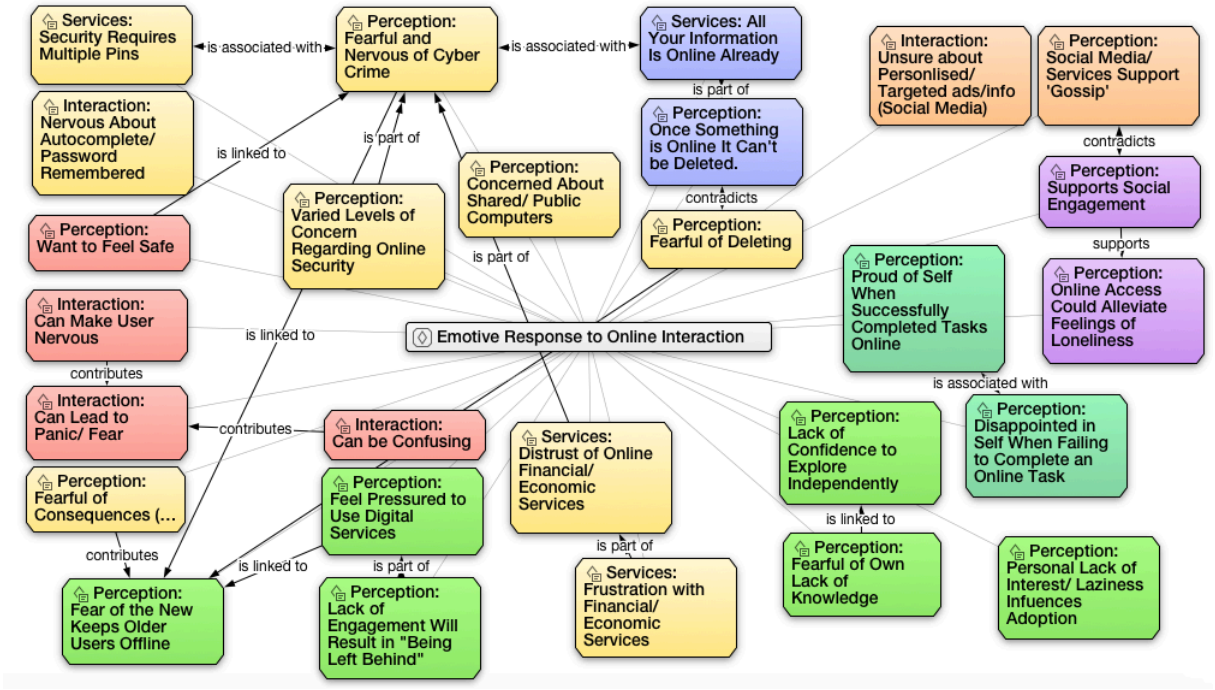


Figure 4.6: Emotive Response to Online Interaction Network[63]

Participants felt disappointed when they struggled with an online action or failed to complete an activity successfully. On the other hand, participants noted a feeling of pride when they successfully completed the task online. The positive impact of engaging online was noted as possibly alleviating feelings of loneliness and supporting social engagement beyond the physical space.

"It can probably open up the world to you so much. Where as some people just come to a retirement place to die, to sit down, and to wait for their time. But being connected actually opens your field - your vision. But you have to want to do it, and I'm also not, as I mentioned before, using it enough. But I think it will keep you less from isolation. So you have more interests" - Doll

Although social media speak to these types of activities, participants viewed engagement on these platforms as 'gossip' and not necessarily meaningful interactions.

Safety online was a major concern among the ageing participants. They were fearful and nervous of cybercrime, fuelled by a lack of understanding of how online services work.

[63] A larger version of the network view is included as Appendix K.

Often participants were nervous that they would 'delete everything', or that all their information would be easily accessible online (especially on shared or public access points). Particularly financial and retail services were viewed with distrust. Participants who engaged with financial services, such as online banking, noted frustration with constant updates to design. Browsers' autocomplete function and remembering passwords and usernames also caused concern.

4.4.4 User context

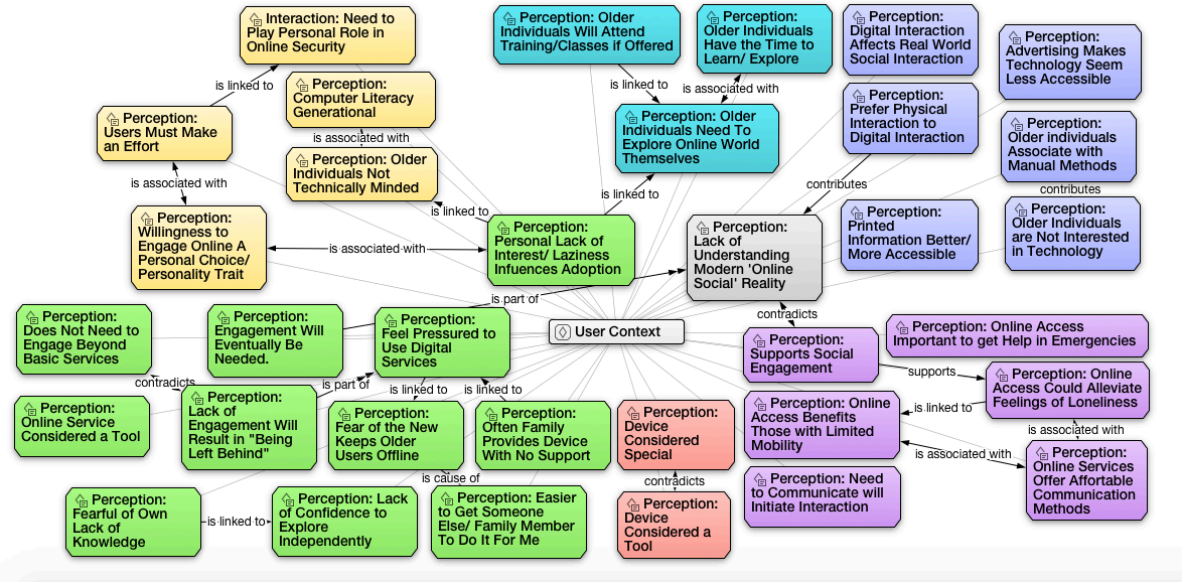


Figure 4.7: User Context Network[64]

Ageing users commented that they need to play a role in their own computer illiteracy. Some noted that the younger generation seemed automatically more computer literate, as a result of the modern technology driven world. They admitted that the willingness to engage in online services is a personal choice, and that some older individuals were simply not technically minded (or interested). The eventual need to explore online services was acknowledged, and participants identified personal exploration as a key learning method. Overall engagement relies on personal interest and a willingness to participate. Participants conceded that they would eventually need to engage in order to respond to a changing world, and to benefit from the access that online services provide (including access in emergencies and social engagement). Individuals who are keen to have their ageing family members online often provide a device (such as a laptop or tablet) - but without support or additional time spent on assisting the ageing individual in using the device.

> *"You know what… my children put me on Facebook, and they gave me the tablet, and there you go! I ask my daughter to sit with me for half an hour that you can show me how things work but that half an hour never*

[64] A larger version of the network view is included as Appendix L.

comes. Your kids are always so busy… It was just never time to help me figure it out. So how am I supposed to learn? How do you learn?" - Susan

Participants indicated that they would attend training classes if offered, but often felt alienated by the digital world. Some participants admitted that they did not understand the modern online social reality and acknowledged that fear has kept them off-line. Manual methods and physical interactions were seen by most as better, or easier, to engage with. The benefits of online services were, however, clear to participants, many of whom persuaded a family member or someone else to complete the task for them.

4.4.5 Perceived benefits

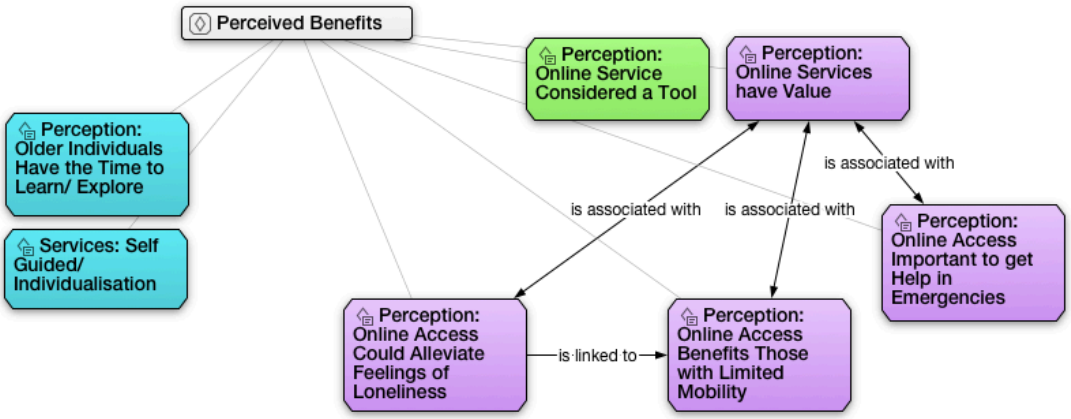


Figure 4.8: Perceived Benefits Network[65]

Online services were viewed by participants as tools to support everyday activities.

"I usually try things with the purpose, linked to an action, like going away, or needing to transfer money, pay an account. Yes! It is a tool." – Fred

In the context of everyday tools online, services offered users a clear value proposition. Participants noted that online access allows users to gain assistance in emergencies, could alleviate feelings of loneliness and could benefit those with limited mobility. Users admitted that they would need to explore online services by themselves, and that they generally had the time to do so. The ability to personalise services offered added value. In general, online services were perceived as a 'toolkit' that was there to support existing activities in the physical space, and not as a replacement for physical activity.

4.4.6 Nature of user interaction

The emotional impact of interacting with online services has been recorded in previous networks, and includes feelings of confusion, nervousness, fear and panic (often in relation to passwords and personal security online).

[65] A larger version of the network view is included as Appendix M.

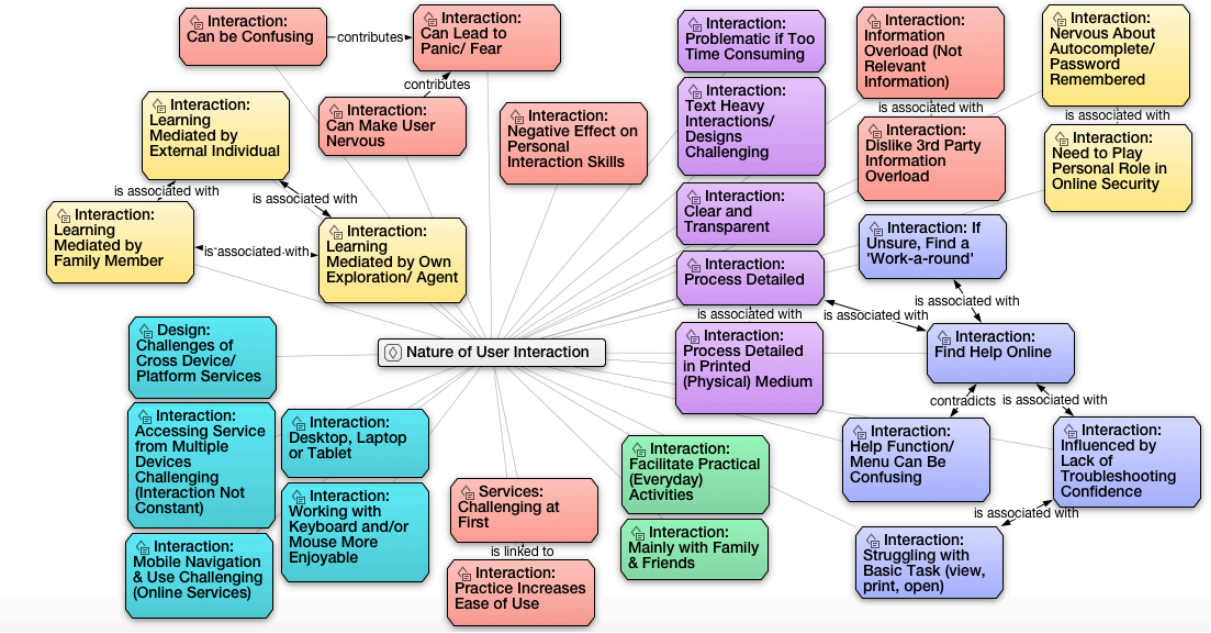


Figure 4.9: Nature of User Interaction Network[66]

A sense of pride in one's own achievement was also noted in relation to completing online activities successfully and independently. Learning how to use online services is vital in empowering ageing users. Currently, three main methods of learning to support interaction have been established. These include learning mediated by family member, learning mediated by an individual external to the family, as well as personal exploration.

One of the identified challenges to successful interaction is the difference in services offered across platforms. Other challenges come in the form of physical elements (including preference for keyboard and mouse rather than touch-screen), as well as challenges around information overload and the experience of negative emotions in relation to online service usage.

> *"Many people say it's too difficult. I think this is nonsense; anyone can learn. People can't afford to make a mistake, that's the other side of the story; do you know what I mean? What do you need is step-by-step information." - Cordelia*

Elements that impact interaction include frustration with processes that take too long, interactions that rely on heavy text, interaction that is not clear and transparent, as well as interaction processes that are not well detailed. Traditionally, one may consult the *Help* function when struggling online. Participants noted that the help function is often too complex to navigate and they lack confidence with traditional troubleshooting. In most cases, ageing participants seek a work-around when they struggle with basic tasks.

[66] A larger version of the network view is included as Appendix N.

4.4.7 Service Design to support use

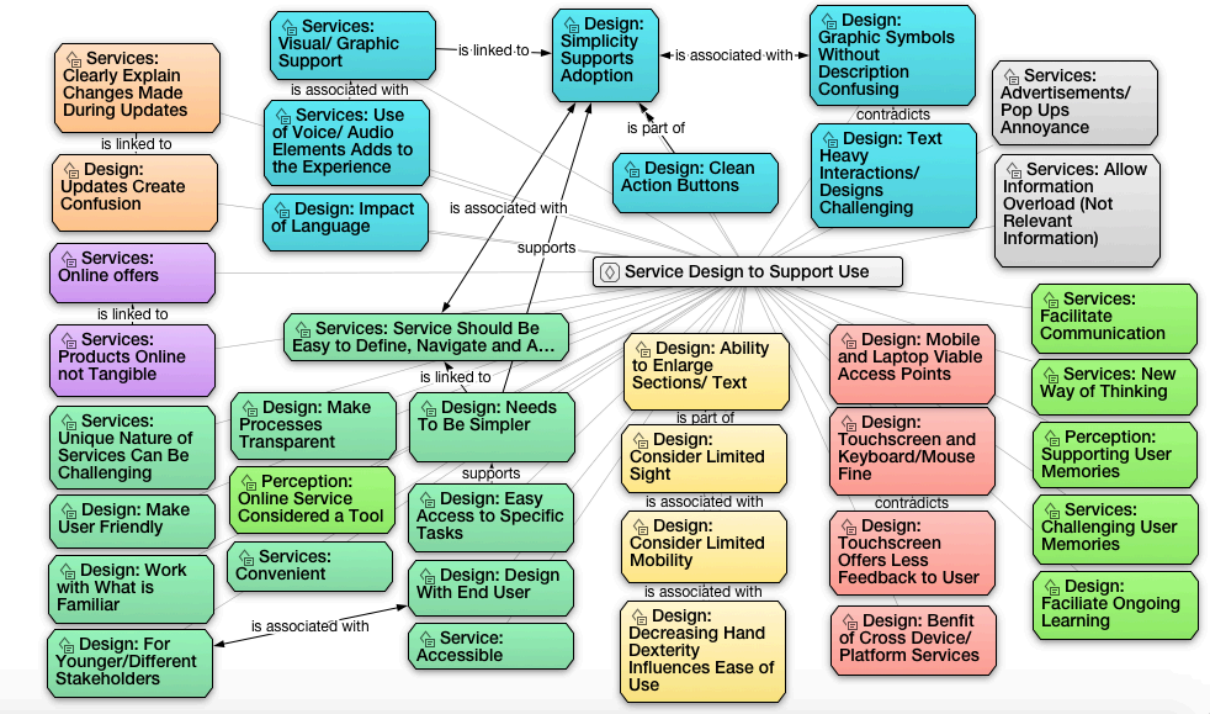


Figure 4.10: Design to Support Use Network[67]

According to interviewed participants, the key design element that supports adoption is simplicity. Online service design that includes clear action buttons and a strong graphics style of communication is easier to navigate. This does not suggest graphics or symbols being used without description or contextual relevance, as these were identified as confusing. Mainly, a level of personal customisation of design elements would support faster adoption. These elements would include the ability to enlarge text (considering limited sight) and design that considers the effect of decreased dexterity, as well as limited mobility. The use of audio and voice prompts was identified as an opportunity for development.

Participants recognised the value of online engagement, such as special offers at retailers, but were also concerned with the lack of tangible engagement with products. As online services strive for uniqueness and differentiation through design, types of interaction required across services can be challenging. Ageing users urge service designers to work with what is familiar or contextually relevant. Currently, they feel that many online offerings speak mostly to different, younger stakeholders:

> *"It's just, you know, bring it back into line with what it should be doing. Good for all generations, not just one generation." – Victoria*
> *"By making it a bit more of an 'aid' it can be a lot more user-friendly. If it's advertised as an aid, to anybody, and not as something to be frightened*

[67] A larger version of the network view is included as Appendix O.

of. I was so scared I was going to delete everything by just touching 'Delete'." - Victoria

The benefit of online engagement is understood by ageing users as it offers the individual the opportunity to become a lifelong learner, explore new ways of thinking, as well as facilitating communication. To support online service adoption among ageing users, services need to be easy to define, navigate and access. The design implication of these findings is discussed in more detail in Chapter Six.

4.5 Conclusion

The open coding process saw the transcripts of interviews being coded line-by-line and saved as part of a hermeneutic unit in Atlas.ti. Following each interview, the quotations and codes of the previous data analysis session were reconsidered and reviewed. The iterative process continued through the facilitation of two workshops and the capturing of both workshop transcripts and workshop materials. As no new concepts emerged from the final workshop coding exercise, findings were considered in a more focused manner. The end of focused coding resulted in a series of Atlas.ti networks, consisting of multiple codes, each linked to numerous quotations. The networked views represent the culmination of multiple analysis cycles and emerge as the key components for the *grounded theory*.

The theoretical coding processes documented in Chapter Five facilitate the final conceptualisation of findings into a theoretical construct, moving beyond observation and description. This process is supported by Glaser's theoretical families.[68] The emerging core categories are considered in line with literature to establish whether the core categories and emerging concepts can be considered theoretically saturated. Following the review of literature and a final theoretical coding process, one is able to initiate the construction of the resulting *grounded theory*. In addition to the theoretical construct, the applied findings from the research analysis are collated and described in Chapter Six. These include practical interface considerations and user requirements that inform engaging online service design. The focus on exploring both the applied and theoretical impact of the study speaks to the dual responsibility of design research as described by Barab and Squire (2004:6). In this dual responsibility, design research should yield actionable and context-appropriate information to inform a design solution, as well as a theoretical contribution to the body of knowledge. In this manner, the resources spent conducting design research contribute to a larger understanding of any given phenomena, instead of merely representing a fraction of what could have been understood (Disessa & Cobb, 2004).

[68] The theoretical code (TC) families are explored in more detail in Chapter Three.

Chapter Five
Grounding the Theory

Chapter Content

5.1 Introduction to Literature as Data

Following the focused coding process a number of core categories emerged. Each category represented a number of key elements, grounded in observation or shared user perspectives. These core categories represented the first stage of moving towards a theoretical explanation for the phenomena observed. The next phase in the CoGT process requires a reconstruction of the concepts and data that were analyses and 'fragmented' during the open and focused coding process. The process of *grounded theory* construction relies on the review of the 'formal and concept' relationships between categories and the codes they represent (Bohm, 2004:72). In classic *grounded theory*, the review of literature is traditionally reserved until theory has emerged from the data (Heath, 2006). In line with this, Chapter Two consists of a review of literature that explores the larger context in which this study is located, but does not delve specifically into the topic. Heath and Cowley (2004:143) urge the researcher to refrain from focused reading until the theory is 'sufficiently developed' to prevent the literature from influencing the direction of the final theory.

As this study employed a constructivist *grounded theory* approach guidance was taken from Charmaz as to when literature should be considered. She states that different approaches are acceptable - based on the context of the study – and that the researcher should "give earlier works their due" (Charmaz, 2006:165). When summarising Charmaz's perspective on the timing of literature reviewed it was noted that:

> She believes reviewing the literature helps to identify gaps in extant works, place the research in context, refine, extend or revise existing theories, and to 'weave the discussion' in the light of earlier works (Alemu *et al*., 2015: 526).

The flexibility suggested by Charmaz must be driven by the context of the study. Consequently, the review of literature related to the topic was initiated during the theoretical coding process. The review was an iterative process throughout theory development.

5.2 Exploring Emerging Code Groups Through Literature

Theoretical saturation, as described by Strauss and Corbin, is the point at which new data does not result in new themes or categories emerging (1990). This point in a grounded study implies that the core categories that have emerged are fully developed and complete (within the context of the study). The saturation of an emerging theory draws on the theoretical sampling within a project. *Grounded theory* authors offer a number of perspectives on theoretical saturation (Glaser & Strauss, 1967:65; Morse, 1995). A key shared perspective is the need for rigorous and continued data analysis and reflection (Hyde, 2003:48; Bowen, 2008). Constructivist approaches to GT recognise that the

processing of data, and reflection on emerging theoretical concepts, is a "mutual creation of knowledge by the viewer and the viewed" (Charmaz, 2000:510). Throughout the research process, one goal was clear – to formulate a substantive theory that is grounded in the data from which it emerges. The emergent nature of theory has caused a rift between Glaser (1992), who supports theory emerging directly from data, and Strauss, whose subsequent body of work imposes a more structured approach on questioning and interrogation of data in line with reconstructed models.

In order to establish theoretical saturation, literature was reviewed in line with emerging core categories. The review aimed to explore the legitimacy of core categories, and to provide another opportunity to review data against emerging patterns in literature.

5.2.1 Digital context

Within the ageing user group that does have access to online services, not all individuals are actively participating. Historically, the aged have been categorised as last to adopt new technologies, products or services (Gilly & Zeithaml, 1985:353). The ageing population face a number of challenges as they advance in years, which may impact the adoption of new technologies. Many elderly people experience, at least to some degree, physical, social and mental decline. 'Cognitive ageing' refers to the decline of brain processes and critical decision-making that contribute to the efficiency of information processing (Paas, Tabbers & Van Gerven, 2006:142). These aspects, among others, impact on the willingness of the ageing population to explore and adopt online services. Eastman and Iyer (2006:58) comment that those who consider themselves novices, or lack confidence in their own abilities, may have less confidence in their ability to use and engage with new technologies. Added to this, many designers and developers stereotype the elderly as non-internet (and non-computer) users (Weinscheck, 2006).

It is the task of researchers, designers and developers to understand the perceptions of the elderly with regard to interacting with technology, in order to offer effective and accessible online services. As companies expand further into digital mediums, "…[with] their online service offerings, managers must recognize that the interface exists to serve the customers, so their design must be matched to market needs and TR" (Massey, Khatri and Montoya-Weiss, 2007:277). Technology readiness (TR) refers to a 'multidimensional psychographic construct' that allows one to segment, and define the segments, of online users based on their beliefs regarding technology - whether positive or negative (Massey et al., 2007:279). The 2010 'Web Accessibility Initiative: Ageing Education and Harmonisation' (WAI-AGE) European Commission project identified an overlap between the accessibility requirements of users with disabilities and the elderly. However, their findings did not consider the emotional and psychological aspects that may be connected to the non-use of online services by ageing individuals. As the ageing population grows this becomes an activity of economic opportunity as much as a social necessity.

Ageing users view the Internet as a vast tool, and digital services allow access to both

convenience and information. The Internet, and most digital services, were not designed specifically with ageing users in mind. Technologies and innovations specifically designed for an ageing community have been referred to as *gerontechnologies* (Sixsmith & Gutman, 2013; Peine, Faulkner, Jæger & Moors, 2015:2). Another definition offered by Iffländer (in Yang, Miao & Shen, 2015:570) is 'age-based innovations' that are defined as products and services specifically designed to acknowledge the needs of older users. Irrespective of the assigned title, these products and services focus on enabling an ageing community to remain independent, and contribute to a greater sense of wellbeing (including increased social engagement). These innovations speak to the growing awareness among policy makers and industry alike that persuading the elderly to engage with online services makes business sense. Peine et al. (2015:2) succinctly define the value of gerontechnologies:

> They are not only seen as a potential solution to the problems and challenges associated with ageing; they are also perceived to have a considerable potential to open new market opportunities for innovative companies and scientific enterprise, and to provide learning opportunities, new experiences, enablement or simply fun for older persons. Gerontechnological innovations are embedded in a "triple-win narrative", where policy makers, innovators and older persons are said to equally benefit from scientific and technological innovation. So far, however, the realization of this triple-win has remained disappointing[69].

Reasons for the non-realisation of the 'triple-win narrative' could be as fundamental as challenges around access and affordability. These were noted by a number of participants throughout the study. The inability to participate online, or with various gerontechnologies, implies that the ageing community will not benefit from services specifically designed to alleviate isolation and feelings of loneliness (Peterson & Prasad, 2011). Another concerning factor is the perceived growing chasm between an increasing ageing community facing various challenges when needing to access online services, and the support, government and civic services migrating to digital platforms and forms of interaction.

Participants clearly stated that data costs were not considered an essential cost. Many of the research projects and studies that promote *gerontechnologies* to increase autonomy and wellbeing were located in a European (Easy Life Laboratory in Denmark; ISISEMD[70] in Denmark; LIFE 2.0 in Denmark, Italy, Finland and Spain) and Japanese (i-Japan Strategy, 2009; e-Japan Priority Policy Program, 2006) context. In comparison to these countries, South Africa struggles with the quality of Internet access offered to citizens, speed of connections and high cost (Pejovic et al., 2012:2469).

Even once issues relating to access are addressed, the migration of the ageing community to online platforms will not be a simple exercise. Understanding the digital context of the ageing community is complex, and researchers and designers are cautioned not to view

[69] Gassmann &Keupp, 2009; Kohlbacher & Hang, 2011; Sixsmith, 2013; Östlund, 2011; Botero & Hyysalo, 2013
[70] IntelligentSystem for Independent Living and SElf-care of Seniors with cognitive problems or Mild Dementia

the elderly as a homogenous user group (Joshi & Bratteteig, 2016:7). Not only should one acknowledge the cultural, economic and social nuances of the user group, but also the inherent attitudes and perceptions towards technology (ibid). This creates a challenge when trying to define shared digital context in order to form a group of older stakeholders with whom to design (Brandt, Binder, Malmborg & Sokoler, 2010). Literature relating to the definition of the ageing digital context did not yield new insights into data collected and analysed. The difficulties mentioned in literature, pertaining specifically to the diverse nature of the digital context noted among the ageing community, were apparent in the study. Factors noted in this study, that impact user engagement and willingness to interact, relate to personal perception, emotional responses and how each individual views his or her own ability to learn and master new technology. It is crucial to build acknowledgement of the digital context of the elderly into new theory and practice as it defines the manner in which ageing users approach new services – and informs their fundamental disposition to engage.

5.2.2 Cognition and learning

Diverse learning networks were noted in the study. When new skills, ways of working and ways of learning are introduced, users must adapt their cognitive understanding in order to engage with the process. Cognitive ability plays a role not only in an ageing user's willingness to engage, but also in long-term usage. Olphert and Damodaran (2013:11) hypothesise that the difficulties which ageing users face online may be due to the complexity of technology combined with the cognitive load required to engage actively.

During this project, participants noted the 'different' way in which one had to think when engaging with online services - as Victoria remarked:

> *"Well, you see how it is done and at first it is difficult. Once you know where everything is then it's at your fingertips, but the first time is always a bit more difficult… [needs] a new way of thinking."*

Some participants also shared their fear that learning a new way of engaging may negatively affect their ability to communicate and think in more traditional forms: such as writing by hand. Throughout the study conflicting views were noted around the perceived support that digital engagement offers cognitive abilities - some preferring manual methods to learn and 'keep the brain active', and others having the exact same experience with digital interaction. One factor that may contribute to conflicting views is the perceived lack of support and learning opportunities mentioned by participants. In other projects it was established that almost 50% of ageing respondents had taught themselves how to engage digitally (Eastman & Iyer, 2004:214).

Being self-taught, in the case of ageing users, may negatively affect their own perceptions of their actual ability and decrease their satisfaction with their own online abilities (ibid).

External learning experiences can take the form of classes or demonstration sessions with a peer or family member. In this study, participants mentioned another learning scenario, with external individuals (such as technical assistants at shops). The engagement with others resulted in mutual learning during which the ageing individuals expanded their knowledge and skill base, while those they interacted with developed a keener understanding of the challenges and opportunities that ageing presents. During the learning experience an 'aha moment' represents the resolution of a problem and that learning has occurred (Joshi & Bratteteig, 2016:26). These moments within this study often coincided with participants acknowledging that they were the drivers of their own digital destiny, and that engagement online depended on their willingness to participate and learn.

The ageing participants who took part in this study appeared keen to participate, which mirrors findings by Obi, Ishmatova and Iwasaki (2013:56):

> Aside from services addressing health and safety concerns, senior people have a natural desire for participation, for being active members of society, and for having their importance to society tangibly confirmed. To address this need and enable social and political integration of senior people, central and local governments should ensure genuine access to information, and work to bring citizens closer to administration, service delivery, decision and policy-making.

The willingness to learn and engage among participants in this study was clear, but the physical decrease in cognitive ability cannot be ignored. As physical power and energy decrease with age so, too, do mental energy, the 'psychological energy that enables cognitive operation to be performed' and cognitive performance (Craik & Byrd, 1982:192; Salthouse & Babcock, 1991; Li, Lindenberger, Hommel, Aschersleben, Prinz & Baltes, 2004). The ability to harness cognitive power to complete tasks relating to online services hinges on the individual's willingness to be interested and engage. This view could influence not only the learning ability and agility of ageing individuals but speak directly to the views of a growing community of older workers (Hennekam, 2015: 1123):

> The stereotype that we (older workers) are not good with technology is present. Well, there might be some truth in there, but everyone can learn. I think that keeping up with the digital developments is the most pressing issue for older workers. If one manages to be as knowledgeable on this front as the youngsters, one's career can still progress. (Female, 56 years)… Learning new things might make me go places, but I do it because I have to, not because I want to. So yes, my career is still progressing, but all I want is being valued for what I already have and can. This constant push of more and better and different will finally push me away from the labor force (Male, 58 years)

A growing number of ageing individuals work either full time or part time, depending on the state of the economy (Tongren, 1988; Tinker, 2014:162). Participants indicated that they realised that they would have to engage online at some point in the future, but not all saw this as a positive or beneficial development. A pessimistic attitude towards

technology and online services makes elderly users less likely to engage, and many ageing individuals will not use the Internet on their own Modahl (2000:xxi).

The benefit of online engagement was especially noted with regard to the ability to communicate with family and loved ones who live further away (Guynn, 2002). Trocchia and Janda (2000:607) state that older individuals who perceived the Internet as a tool to 'strengthen social bonds' and foster communication were more likely to engage online. Participants also highlighted the catalyst of communication needs during a crisis or emergency.

When discussing the cognitive ability and the learning contexts of ageing individuals it is crucial to acknowledge the possible impact of emotional responses on engagement. Many participants noted that they explore online services independently and teach themselves, often feeling unsure about the next steps, or information required by the service. The independent learning trend observed among participants in this study was significant and should impact on how 'information' and 'help' functions are presented. How ageing individuals feel about online engagement and the Internet could directly hinder their adoption (Lenhart, 2000; Modahl, 2000; Lee & Coughlin, 2015).

5.2.3 Emotive response to online interaction

Both positive and negative emotions were observed when participants discussed engaging with online services. One of the key emotional triggers noted by participants was that they often felt 'forced' to engage with new technologies and online services. The sense of frustration that they felt was heightened by the fact that their immediate network either could not, or chose not to, offer support and tutelage. These early reactions to the use of an online service can influence the way that older users experience the technology as a whole. In a study of ageing users in Finland, researchers found that adoption of new technology is influenced by both the socio-cultural environment in which users find themselves and the emotional reaction they experience when encountering the technology (Suopajärvi, 2014). An initial negative reaction to engaging with online services can also be the result of the ageing user's perception of their own ability. The common view and resulting discourse around older users not being confident, or being an 'inept ICT user', can frame their own view of their ability negatively (Peine et al., 2015:5). This perception of ability may manifest and contribute to a resistance to using online services, even though it possibly contradicts the ways in which users engage with technology daily. It must be acknowledged that personal context and interest differ greatly and, as such, many ageing users actively explore and embrace online services. In a study by Joshi and Bratteteig (2016:27) a participant commented "…by participating in this process I want to debunk the myth that all elderly people are afraid of new technology".

Participants in the study highlighted that they felt nervous when they resisted using new online services. The feeling was driven by a fear of being 'left behind'. The perceptions of

interviewed participants seem to contradict the findings of Peine et al. (2015) in that they highlighted that they were fearful of their own lack of knowledge. Their hesitation to engage fully was not shaped by the perceptions of others regarding their ability, but rather by their own lack of confidence to engage independently. They felt disappointed with themselves when they did not grasp a required action or failed to complete an activity successfully. Online business transactions have been noted as specifically challenging in both the primary findings and literature (Kuhlmeier & Knight, 2005; Reisenwitz, Iyer, Kuhlmeier & Eastman, 2007:408). One participant in the study revealed that she downplayed her abilities because it meant that others would complete the tasks for her. All participants noted that they were fearful and nervous of cybercrime, heightened by their lack of understanding of how online services work. Financial and retail services were mentioned as being specifically stressful to navigate and understand. Regular updates and the changing design of user-interface design added to the stress felt by users. Error messages and pop-ups have been found to make older users more nervous (Saranow, 2004). A contributing factor to this reaction may be the lack of engagement from a younger age onwards. Older users in essence must learn how to engage online, and understand 'terms and concepts from scratch' (Reisenwitz et al., 2007: 408).

The feeling of 'completion' or a sense of goal achievement may reduce engagement. Olphert and Damodaran (2013:13) state in their study that participants may view engagement with technology as task-based. They refer to an ageing female user who used a computer to complete her memoirs and stopped using it once they were complete as she felt she had nothing left to do on it. The view that computers and online services serve as a tool was noted in this study:

> *"Older people want to feel confident. It's that reality, that computers have become so vast, so important in a lot of people's lives that they have lost the ability to see it as an aid."* - Victoria

Olphert and Damodaran's (2013) observation that completing a task acted as an obstacle to sustained engagement was not noted with participants in this study. In contrast, the on-going opportunities that online engagement offers were well understood. Feeling more connected with friends and family, alleviating loneliness, as well as feeling informed and empowered were regarded positive features of online engagement, as illustrated by comments from participants:

> *"Necessary tool for communicating, for knowledge. Don't think we realise how much it [technology] is part of our lives." – Discussion during workshop 1, Group 2.*

> *"If you don't know how to use a computer and you don't know how to use Skype, how are you going to communicate?" – Victoria*

Some participants admitted that they felt alienated by the digital world and that they did not understand the ultra-connectedness of the modern world. In many cases, fear of this unknown and fear of their own lack of confidence had kept them offline. A candid confession from one participant highlighted the internal struggle that ageing users face. Many understand the potential benefit and need to engage online, but do not, for a variety of reasons:

> *"But I suppose - I mean - I know how to use it. I can go into Google and get information, but... maybe I'm too lazy? I must be frank with you that it can be that I'm just too lazy. Everybody else can do it [for me] so why should I do it? I mean, that's not how it should be. Because one of these days and I'll probably go to an old age home and then I won't have someone helping me. So I should do something about it".* – Hellet

The emotional reaction of participants in this study proved to be interlaced throughout the online experience. An array of positive emotions, such as pride and joy, were noted throughout the study, often linked to successfully navigating an engagement or completing a task online independently. These emotions related to a sense of clarity and control over the process, which were found to be catalysts for more engaged participation. Confusion and a perceived lack of control, however, resulted in frustration and increased distrust of the service as a whole. The willingness to engage and achieving a sustained level of engagement is grounded in the personal context of the ageing user in question.

5.2.4 User context

In 2010, Independent Age, associated with the Royal United Kingdom Beneficent Association, published findings related to the ageing population and usage of technology. The study highlighted that the use of technology could not only offer supportive systems, but help older individuals connect socially and contribute to their communities. The report highlighted the following four areas of contribution:

- participate in meaningful work and other activities (whether paid or on a voluntary basis),
- interact in new ways with family and friends,
- learn, develop skills and gather experience,
- share learning.

These activities will enable the elderly to share their knowledge, skills and philosophies with their communities (and other communities). Online services could also provide the ageing population with services and support structures. The percentage of older individuals is currently much higher in developed countries, but populations in developing countries are ageing more rapidly – allowing less time to adjust to the social and economic implications of a greater ageing population (Figure 5.1).

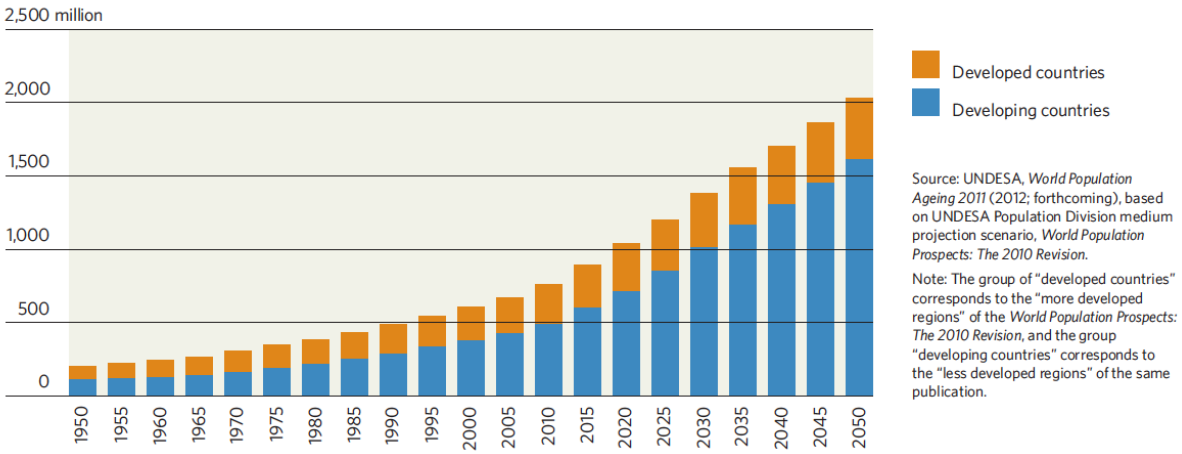


Figure 5.1: People Aged 60 or Over: World, Developed and Developing Countries, 1950-2050
Source: United Nations Population Fund and HelpAge International, 2012

The economic context of developing countries may create challenges to meet the demands of older individuals. Issues, such as depression and loneliness, often experienced within the ageing population may not be priorities within this context:

> The immediate causes of social isolation are varied and depend on individual circumstances. A scattered family, the death of a partner, a chronic health condition, diminishing sight or hearing are only some of the factors that can leave older people feeling alone. Whatever the causes, social isolation and loneliness take their toll on the quality of life of a significant proportion of our population (Independent Age, 2010:4).

Ageing users are often considered 'marginalized by developers and vendors' because they do not play an active role in the conceptualisation or design of online services and other technologies (Joshi & Bratteteig, 2016:27). Participants in this study acknowledged that they should play a greater role in becoming computer literate, to enable them to engage online with more confidence. They perceived the younger generations as more 'tech savvy' by nature because so much of their everyday life is facilitated through technology. This scenario results in immersed engagement and the perception that younger users are instinctively more computer literate. The willingness of ageing users to engage with online services was noted as a 'personal choice', informed by one's interest or level of skill. Trocchia and Janda (2000) discuss six themes that illustrate the differences between those ageing users who engage with online services and those who do not:

- The first theme refers to 'reference group affiliation' and links to their social group's perspective on the use of technology and their opinion of individuals who engage. This can mean that individuals who wish to engage online may face alienation from a social group that does not approve of the activity.
- The second theme is linked to the first and refers to the 'nature of social relations': ageing users who saw the potential for greater social connection through online services and technology would be more likely to engage.

- The third theme refers to 'technology schema', and the impact that previous experiences with online services and technology have had on the user's subsequent willingness to engage.
- The fourth theme refers to ageing users' 'resistance to change' and proposes that ageing individuals who are more comfortable with change are more likely to explore new technologies. Cognitive age can also impact on an individual's use of the Internet as those ageing users with a younger cognitive age use the Internet more often (Eastman & Iyer, 2005).
- The fifth theme explores the ageing user's 'perception of reality' and the need to engage in a physical manner. The need to touch, hold or examine an item physically before purchasing it, hinders online retail experiences.
- The sixth theme is linked to 'physical dexterity'. A decrease in physical dexterity and decreasing eyesight may negatively affect an ageing user's engagement online. The opposite of this is also true in that some ageing users prefer to shop or communicate online as their physical mobility is limited.

Of these six themes, five refer to the attitude and perceptions of ageing users and one to the physical action of using a device. The impact of ageing users' attitude towards online engagement cannot be overstated, and it is "the single most important determinant of personal computer buying and Internet use" (Modahl, 2000, p. xxi). The eventual need to explore online services was admitted by participants in this study who conceded that they would eventually need to engage online to benefit from the access it facilitates, such as information finding, retail, communication in case of emergencies and social engagement. The lower levels of engagement observed among participants does not represent a local situation, and lower levels of online engagement among older consumers have been perceived as a global challenge (Kumar, 2004).

> While many countries have met the 'first level digital divide' of problems of access, few have reached the 'second-level digital divide' of bringing on board senior citizens (Reisenwitz et al., 2007:408).

When reviewing Trocchia and Janda's (2000) themes in relation to findings from this study, the following key concepts emerge:

- Reference group affiliation: Many participants commented on the pressure from family (mainly children and grandchildren) to engage online. The need for this, however, was perceived as being more convenient for the younger generation, rather that necessarily a better communication option. Peer groups reflected different levels of proficiency with online services, with more proficient peers advocating and actively promoting the use of these. Peers who exhibited more negative emotions towards online services were more resistant to engaging online and questioned why anyone should need to.
- Nature of social relation: The ability to communicate with friends and family was a noted driver for engagement and represents a catalyst for many ageing

individuals. Although all participants in this study still enjoyed mobility they commented on the potential for online service to alleviate loneliness when one becomes immobile, as well as allowing one to be less reliant on others for basic goods and services (increased independence).

- Technology schema: The impact of previous experiences on ageing individuals' willingness to engage was apparent. Past experiences, positive or negative, contributed to a continuous perception evolution of value and usefulness.
- Resistance to change: Participants' resistance to change varied in the study. The benefit of and need to engage was noted by all, but many commented on the loss of a 'human connection' when communicating and engaging online. Resistance to change emerged as a complex element in the study, informed by personal context, cognitive and physical ability, views on social relationships, as well as emotional drivers.
- Perception of reality: The need to engage physically with items before purchasing was noted by participants[71]. The need for 'real' social interaction, such as hearing someone's voice when calling and seeing physical handwriting was also mentioned. The participants did, however, exhibit a clear understanding that online interaction was necessary in a modern context, even if they were not comfortable with this reality:

> *"I like to pick up the phone and talk to someone. It is social. I like going down to the bank and talking to someone. Face to face... maybe I'm too lazy? I must be frank with you that it can be that I'm just too lazy. I mean that's not how it should be. Because one of these days - and I'll probably go to an old age home - and then I won't have someone helping me. So, I should do something about it." – Hellet*

- Physical dexterity: Participants did not agree on the most convenient solution to access online services. Some preferred their tablet or mobile phone, while others noted problems while working on smaller screens and preferred working on a desktop with keyboard and mouse.

Acknowledging the unique personal context of an ageing user is a key factor in facilitating online engagement. The impetus to engage, the perceived value of online engagement and the design characteristics of an enabling environment must all be considered.

5.2.5 Perceived benefits

In 1999 ageing citizens were identified as one of the fastest-growing user groups on the internet (Russel & Schofield, 1999). However, this statement must be placed into context because, even though adults over 55 represented one of the fastest growing user groups

[71] Most specifically by Victoria.

at that time, only 5% of this age group went online regularly (Russell, 1999). The percentage of users in the online world has grown exponentially since then. The Pew Research Centre (PRC) estimates that Internet use among American adults over 65 has risen from 14% in 2000 to approximately 64% in 2016 (Pew Research Centre, 2016). Although the PRC statistics reflect only American usage, the number of ageing users globally has increased, and statistics from November 2014 calculated active online adults aged 55 and above to be 12.7% of all global Internet users (Statista, 2017).

The rise of online activity among ageing users is linked to their perception of online services as tools and support for everyday activities. In the context of an 'everyday tool' online services can offer users a clear value propositions. Digital technologies and online services play a major role in addressing the so-called 'burden of care' often associated with an ageing population (Olphert & Damodaran, 2013:3). Participants stated that online access could benefit an individual by allowing access to emergency services, could lessen feelings of loneliness and isolation, and could benefit individuals with limited mobility. Access and support provided through technology and online services could extend an ageing individual's ability to age-in-place. Ageing-in-place refers to the ability to stay in one's own home even though various physical, cognitive or social capacities decline with age (Yang, et al., 2015: 569).

Ageing-in-place is a major benefit as ageing individuals often find comfort in known surroundings. The value of online services extends from allowing individuals to age in their own home to encouraging social connections and increasing their mental stimulus (Eastman & Iyer, 2004:211). One of the most serious challenges faced by the elderly is loneliness, which is a significant predictor of Internet use (Suparna, 2000; Ceyhan & Ceyhan, 2008). Bouzaabia, Bouzaabia and Capatina (2016:66) noted: "The Internet provides an ideal social environment for lonely people, and especially for elderly, to interact with others." The benefits of engaging online were noted by participants, but the perception was that online interactions should support existing physical activities, and not be a replacement for those activities. For example, e-mailing could support communication with friends and family further away, but it did not replace the perceived need for a conversation via a telephone (or mobile phone), or a physical letter or postcard. Porter & Donthu (2006:1002) call into question the level of motivation ageing individuals will have to engage online, as their social circles are smaller and their communication requirements may not need the vast network that the Internet facilitates. This perception, however, seems to shift as participants become more confident in using technology, and many who were more active online praised the convenience and immediacy that online interactions offered. Those who were less active online (based on a self-assessed level) noted a need to explore online services by themselves in order to learn:

"You must feel safe on the computer. I remember when my husband passed away. I felt, what do I do now? Many people say it's too difficult. I think this is nonsense, anyone can learn." - Cordelia

Various models, such as the technology acceptance model (TAM), suggest that perceived value and usefulness influence an individual's attitude toward technology and the willingness to engage (Davis, Bagozzi & Warshaw, 1989). If the technology being explored is very complex, such as the Internet, a vast amount of new knowledge must be gained in order to engage successfully, which influences how likely one is to adopt the new technology (Rogers, 1995). In order to encourage meaningful online engagement, the value proposition must be clear and relevant to ageing users. This is congruent with findings from studies focused on ageing individuals engaging with technology to creative innovative new service solutions (Rogers, Paay, Brereton, Vaisutis, Marsden & Vetere, 2014:3921) and engaging with social media (Hutto, Bell, Farmer, Fausset, Harley, Nguyen & Fain, 2015:82)

5.2.6 Nature of user interaction

Once the perceived value of the interaction is high enough for an ageing user to engage, even though he or she may have negative perceptions, the nature of the interaction space and platform may still impact continued engagement. The various emotional aspects that constitute user experience among many ageing users have been explored in previous sections. In many cases the emotions noted included frustration at one's own inability to understand and successfully navigate an online service, the fear of the unknown, fear of cyber-crimes, and feelings of frustration when forced by family or community members to engage in online. These emotional reactions form part of the human experience of an online interaction. It is important to note that the digital interaction or online service itself, and the design of this interaction, may also influence the user experience - as well as the process through which the user learns to navigate the interaction.

From an economical perspective, it is crucial to consider the global growing ageing community within our technological society (Eastman & Iyer, 2004: 209). If not considered during the conceptualisation and design of online services, it can be hypothesised that ageing users who do not feel confident online, would cease to use the services that could possibly improve support of their everyday activities (Olphert & Damodaran, 2013:7). This has been discussed in previous studies, leading researchers to define a 'fourth digital divide', which is not characterised by a lack of access or skill but rather by a lack of clear motivation or interest (ibid).

A lack of understanding specific user needs can have a major impact on the innovation of various technologies that can support ageing-in-place (AiP), and everyday activities of an ageing individual (Piau, Campo, Rumeau, Vellas, & Nourhashémi, 2014). This understanding must include a review of human factors that consider an individual's

limitations, his or her capabilities as well as personal and cultural contexts (Ni, García-Hernando & De la Cruz, 2015).

> Only when the real needs of the elderly are correctly understood by innovators, fully specified in AiP digitalization, together with stakeholders' inclusion in the innovation process and proper consideration of human factors and other contextual factors… can then ensure the success of AiP implementation (Yang et al., 2015:571).

To encourage continued engagement among ageing users who can benefit from online services, the nature of their online interaction, as well as the process of learning how to engage, must be considered. This aspect of user interaction can be related to *usability* - the characteristics of the system and how easily the system can be used, considering the abilities, skills, perceptions and attitudes of the user. One of the usability factors that relate to the challenges noted by participants is how easy the system is to learn and remember (Barnard, Bradley, Hodgson & Lloyd, 2013:1718). Participants noted three main learning spheres in this study: the first is a learning sphere mediated by a family member, the second a learning sphere mediated by an individual external to the family (community member, friend or technician), as well as a third sphere in which learning is facilitated by personal exploration. Family members (often children and grandchildren) are important partners in the learning process (Lüders & Brandtzæg 2014:190).

The user interaction detailed by participants highlights a number of challenging points throughout their engagement with an online service. Issues encountered during the user interaction included a perceived lack of system feedback (manifesting in error messages that did not make sense, confusion around whether an item had been selected or not, and similar scenarios). When users encounter a system error they may attribute that error to the system or to themselves. If they believe they were at fault they may lose confidence in the system and their ability to navigate it successfully (Barnard et al., 2013:1718). Tactile feedback, such as audio and haptic, may be beneficial for older users as it gives immediate feedback when the product or service is in use (Page, 2014:67). The 'Help' function would normally be consulted in these situations. However, participants commented that the help function was sometimes more confusing and generally too complex to navigate (often requiring the user to know a keyword or phrase to search the help section).

Another challenge noted was that some services alter slightly (visually, as well as the required interaction) across platforms (for example, Internet banking services accessed from a desktop computer and from a tablet). In the modern world many individuals own multiple devices and use them interchangeably to achieve everyday goals (Levin, 2014:vii). The nature of the devices differs greatly, from touchscreen tablets to desktop computers with human interface devices (HIDs), such as a mouse and keyboard, which completely changes the user experience (Ropponen, 2016:27). The challenge of navigating services across devices is not an experience that only the ageing user faces.

The need to create more holistic experiences across disciplines, which places people at the centre of the development, is being explored:

> … I like to introduce a new ecosystem framework for designing multiple-device experiences – one that focuses on context. The root of this framework is the realization that along with different devices people's needs, behaviours, usage patterns, and settings also change en route to their goals (Levin, 2014: viii).

Information overload was another challenge to confident interaction identified by users. Mai (2016:124) discusses the nature of information overload in our modern world through the work of Wurman (1989)[72] stating:

> It is not merely the huge amount of information that we perceive in our environment… but also an accompanying feeling of being unable to keep up, no matter what strategies we employ.

Similar to the challenges associated with working across devices, the impact of information overload is not only felt by ageing users. Ageing users may, however, be less prepared to deal with the strain and perceived stress associated with information overload in the form of communication load and Internet multitasking (Carrier, Cheever, Rosen, Benitez & Chang, 2009; Reinecke, Aufenanger, Beutel, Dreier, Quiring, Stark, Wölfling & Müller, 2017). A key factor in addressing information overload is focusing on the process options of a system and not the content – allowing users to filter out the information they feel is not relevant (Hiltz & Turoff, 1985:684). This option does require the user to feel confident enough to adapt his or her interaction space, as well as a system design that supports use and learning.

5.2.7 Design to support use

It is not only the design of the system that needs to support interaction and learning, but also the design of interfaces and interactions. Decreased physical mobility, eyesight and cognitive processing may also impact on the quality of life of older individuals. Without continued support from family, friends or the community these individuals may not be able to complete basic daily tasks, such as buying groceries or paying a bill. The direct effect of this is a loss of independence. Technology could offer alternative solutions to these challenges through increased socialisation (social media and communication applications) and online retail and commercial services. Before these options can be understood, the usage and perceptions of the ageing population in relation to technology and online services must be explored to identify possible barriers to participation, as well as evaluate active online ageing users' willingness to engage.

The online market for an ageing population, and its integration into the 'IT society', has been an area of research interest for a long period, but has not yielded many insights into

[72] Wurman, R.S., 1989. *Information Anxiety*. Doubleday.

user-driven design in collaboration with older users (Östlund et al., 2015:82). This may be influenced by how ageing users are viewed by both the service and goods providers, as well as the developers of technological solutions. The definitions of 'visitor' and 'native' user groups of the online world, as presented by White and Le Cornu (2011:4), place ageing users in the 'visitors' group. This categorisation draws from Prensky's (2001) review of *digital natives* and *digital immigrants*. As members of the 'visitors' group, ageing online users are defined by their task and goal driven approach – seeing the online world as a platform to perform necessary tasks in an efficient manner. These online users need to see a tangible benefit to their engagement in order to continue use. The influence of age on the likelihood of engaging with technology is less extreme than once imagined (Helsper & Eynon, 2010) but the nature of, and influences on, the engagement of an older individual has been noted.

The applied practice of designing for ageing users and creating more accessible design has received much attention from various projects and researchers over the past decades (Curren et al., 2007; Czaja & Lee, 2007b; Sanchez-Gordon & Luján-Mora, 2013; Díaz-Bossini & Moreno, 2014; Abascal, Barbosa, Nicolle & Zaphiris, 2016; Schmutz, Sonderegger & Sauer, 2016)[73]. It is not the goal of this study to propose new, or evaluate established, design criteria for accessibility. However, since the subject permeates much of the discussion around engagement, the key elements highlighted by participants are discussed here. Overwhelmingly, participants stressed the need for design elements that favour simplicity; however, this may not be an easily generalisable standard. One of the primary reasons for ending one's use of online services has been described as 'excessive complexity of the technology' (Olphert & Damodaran, 2013:9).

Campbell (2015) provides an applied perspective to design elements that influence adoption and use among ageing users, drawing from project and professional experience with this user group. His findings fall into nine design categories which include: vision, hearing, motor control, device use, experience with technology, relationships, life stage, memory (cognition), attention (cognition), decision making (cognition). Although not presented as a finite list of considerations, the focus areas identified by Campbell speak to findings from this study. It is important to note the interplay between factors highlighted in the 'User Context' section and aspects of design discussed in the follow sections.

5.2.7.1 Vision, hearing and motor control

Participants said that they preferred clear action buttons and a simple style of communication. From a design perspective, this does not suggest the use of graphics or symbols without clear description, as these were confusing to some users. The size of

[73] Besides individual researchers, various projects have investigated accessibility from an ageing perspective, including the 'Web Accessibility Initiative: Ageing Education and Harmonisation (WAI-AGE)' - a European Commission IST Specific Support Action project, among others.

fonts, contracting colours, animation or movement as part of the layout of the designs, and the use of image-based text backgrounds were considered problematic. This compares to findings by Campbell (2015) that suggest presbyopia (the hardening of the eye lens as one ages) plays a crucial role in the ability of ageing users to read smaller text online more comfortably. Campbell's suggestions for design considerations is included in Table 5.1. Users with declining sight may need to be able to enlarge the text on web pages, which can prove difficult when text is embedded within graphics (Curran, Walters & Robinson, 2007: 447). Being able to distinguish between colours also becomes more challenging as individuals age and shades of blue may appear more faded. Settings to make text size and colour more accessible is often available through the 'accessibility' settings, but these are not always easy to locate if one is not confident or technically proficient. Henry, Abou-Zahra and Brewer (2014:21) caution designers to consider the following:

> Research shows that some people who would benefit from such features do not consider themselves to have disabilities and do not want to use features labelled as accessibility, particularly people with impairments due to ageing.

Similar to vision, one's hearing may also decline as one ages. This should also be a consideration as participants identified audio and voice prompts as an opportunity for development during the workshops. If a key function of the online engagement is audio based, it may benefit interaction if the audio is supported by optional text (Curran et al., 2007: 448).

Table 5.1: Design Considerations: Vision, Hearing and Motor Control

Consideration	Key Lessons for Digital Design
Vision	* Avoid font sizes smaller than 16 pixels (depending, of course, on device, viewing distance, line height etc.). * Let people adjust text size themselves. * Pay particular attention to contrast ratios with text. * Avoid blue for important interface elements. * Always test your product using screen readers.
Hearing	* Provide subtitles when video or audio content is fundamental to the user experience.
Motor Control	* Reduce the distance between interface elements that are likely to be used in sequence (such as form fields), but make sure they are at least 2mm apart. * Buttons on touch interfaces should be at least 9.6mm diagonally (for example, 44 × 44 pixels on an iPad) for ages up to 70, and larger for older people. * Interface elements to be clicked with a mouse (such as forms and buttons) should be at least 11mm diagonally.

Source: Campbell, 2015.

Campbell (2015) encourages the consideration of limited mobility, along with a possible decline in visual and audio competencies. Individuals who are ageing may face mobility challenges that are extensive, such as difficulties with walking or ascending a flight of

stairs, or fine motor control. A decline in fine motor skills can affect the use of computer input devices such as a keyboard and mouse, as well as managing removable devices (Curran et al., 2007:448). This scenario also influences other interaction types, such as the use of touch screens. In order to address issues of accessibility, researchers and developers have constructed numerous guidelines and frameworks.

5.2.7.2 Device use and experience with technology

One of the most serious challenges which ageing users face today is simply to adjust to the modern hyper-connected world (Ordonez, Yassuda & Cachioni, 2011:218). Ageing users have been stereotyped as technophobes, or as simply not interested in engaging online (Neves & Amaro, 2012). This perspective is not true of the entire ageing community, and studies have shown that the elderly are able and willing to engage with technology (Malta, 2008). Using devices and online services does pose a number of challenges to ageing users, including limited experience with devices, limited experience with online services, or a lack of interest (Czaja & Lee, 2007). Practical device design usage required context. Campbell (2015) noted that participants in their study described mobile phones as "annoying" and "fiddly", sometimes not engaging with the device for long periods of time and ignoring SMSs entirely. A study in Germany and Spain reported that elderly participants preferred to work with touchscreen tablets, which have larger screens (Burkhard & Koch, 2012).

In some cases online services strive for uniqueness and differentiation through their design and types of interaction required. This diversity can prove challenging for older individuals to learn and navigate. Working with what is familiar or contextually relevant may support engagement and a positive experience with the device and online services (Table 5.2). It is crucial to work collaboratively with ageing users to create products, services and learning material that speak to them. This way of designing is critical to improve the engagement of ageing users (Czaja & Lee, 2007b).

Table 5.2: Design Considerations: Device Use and Experience with Technology

Consideration	Key Lessons for Digital Design
Device Use	* Avoid small-screen devices (i.e. phones). * Do not rely on SMSs to convey important information.
Experience	* Do not make assumptions about prior knowledge. * Interrogate all parts of your design for usability, even the parts you did not create.

Source: Campbell, 2015.

5.2.7.3 Relationships and life stage

Participants noted that communication and interaction online could feel 'cold' or impersonal. This view is influenced by, among other aspects, the nature of relationships that older individuals have and the stage of their life. Relationships traditionally become

fewer as one ages, as friends and family members pass away or move away. Technology can play a role in keeping ageing individuals connected, and even connecting them with new people. This benefit can be overlooked when the perceptions of ageing users are considered:

> *"I have three real friends and I prefer phoning them and speaking to them directly. It was a time when I did not want to use Facebook, when I did not understand the need to, but my grandchildren got me into it. Today my grandchildren told me that I know more than most people my age."* – Marie

The view that physical communication is preferable was prevalent in this study, but the need to embrace other methods to sustain relationships is important, especially as it can sustain relationships beyond issues around mobility and location (Campbell, 2015). The role that social media sites can play in facilitating sustained relationships is often challenged by the view that these methods of communication are 'banal and egotistical' (White & Le Cornu, 2011:4). Participants also noted that they perceived modern practice of 'broadcasting' information, and constantly needing to be connected, as problematic:

> *"Cell phones are okay but you see people sitting in restaurants with the children and everyone is on the phone. No one talks to each other. It's so much nicer to talk to each other. I don't understand it."* - Connie1

> *"I'm not really interested in reading everybody else's news. If I want to know your news I'll ask you about it."* - Fred

When designing user interactions for online services it is thus crucial to recognise that individuals have different expectations, influenced by the stage of life in which they find themselves and how they define relationships (Table 5.3). Life stage does not imply a focus on age as an indicator, as there are other non-age related indicators that frame one's life stage. These can include: functional age, perceived age, social age and cognitive age (Neves & Amaro, 2012). Social age as an indicator frames various life experiences including retirement, losing a spouse, etc. As a result, when designing to include ageing users it is not possible to conceptualise the service from a single perspective. For example, one could say that online social services may benefit ageing users as they encourage and facilitate communication, but if the user does not believe the communication style is valuable or appropriate the potential benefit may be lost.

Table 5.3: Design Considerations: Relationships and Life Stage

Consideration	Key Lessons for Digital Design
Relationships	* Enable connection with a smaller, more important group of people (not a big, undifferentiated social

	network). * Do not overemphasise security and privacy controls when trusted people are involved. * Be sensitive to issues of isolation.
Life Stage	* Beware of content or functionality that implicitly assumes someone is young or at a certain stage in life.

Source: Campbell, 2015.

5.2.7.4 Cognition: Memory, attention and decision making

The ageing process affects mainly different memory types. Memory associated with 'procedural memory' can remain unaffected later in life. Short-term memory, on the other hand, can suffer greatly as one ages (Neves & Amaro, 2012). This implies that ageing users may remember the process of completing a task but may not be able to combine that with what they have recently learned to master new services or interfaces (Campbell, 2015). It is not possible to view all ageing users as homogenous: besides personal and contextual differences the ageing process affects everyone differently. The decline in cognition that one experiences as one ages is linked to "a decline in the so-called *fluid intelligence*" (Czaja & Lee, 2007b). The concept of general fluid intelligence has been defined as the ability to solve new problems without having previously acquired the information necessary to solve these new problems (Jaeggi et al., 2008). Fluid intelligence is an important factor in the learning process and includes various memory types, cognition and concentration. Decline in these factors can lead to difficulties when encountering new problems and learning new skills. As problem solving and continuous learning are key components to successful online engagement, ageing users - with declining fluid intelligence - may struggle when trying to acquire new technological skills (Czaja & Lee, 2007).

Various cognitive skills are used when engaging online (Ordonez et al., 2011:217). These include long-term memory, short-term memory, executive functions, the ability to search within a text and graphic environment, information-processing, as well as identifying elements that require attention. These cognitive skills are described in Table 5.4.

Table 5.4: Cognitive Skills that are Mobilized when Using the Internet

Cognitive skill	Matching operation
Long-term (procedural) memory	Remembering the appropriate procedure to launch a browser
Short-term or working memory	Keep track of already attended to information and already performed actions
Executive functions	Structuring necessary actions in the correct order
Visual search	Finding relevant information cues on a Web page
Information processing	Evaluate which information on a Web page is relevant
Attention	Focus on relevant cues on a Web page and ignore irrelevant cues

Source: Slegers, Van Boxtell, & Joles, 2009, quoted in Ordonez et al., 2011:217

The challenges noted, with regard to cognitive decline, do not imply that ageing users cannot successfully engage and master online services and experiences. Designers have

observed elderly individuals and have found them to be persistent, thorough, methodical and focused when engaging online (Campbell, 2015). During design projects, ageing users have been described as cautious decision makers – drawing from prior knowledge as well as expert opinion. Design considerations (Table 5.5) could enable a more engaging online interaction through considered tasks, acknowledging varied cognitive abilities among users and making the process more transparent (and traceable). Studies suggest that learning new technologies could enhance the cognitive abilities of ageing users (Ordonez et al., 2011:218).

Table 5.5: Design Considerations: Cognition

Consideration	Key Lessons for Digital Design
Memory	* Introduce product features gradually over time to prevent cognitive overload. * Avoid splitting tasks across multiple screens if they require memory of previous actions. * During longer tasks, give clear feedback on progress and reminders of goals. * Provide reminders and alerts as cues for habitual actions.
Attention	* Do not be afraid of long-form text and deep content. * Allow for greater time intervals in interactions (for example, server timeouts, inactivity warnings). * Avoid dividing users' attention between multiple tasks or parts of the screen.
Decision Making	* Prioritise shortcuts to previous choices ahead of new alternatives. * Information framed as expert opinion may be more persuasive (but do not abuse this bias).

Source: Campbell, 2015.

Slegers, Van Boxtell and Joles (2009) found no long term benefit on the cognitive measures among ageing individuals who attended a brief training session followed by 12 months of unsupported computer use (with an Internet connection). These findings contradict those of another 2009 study in which older individuals took part in a facilitated learning experience, focusing on Internet searching. Findings from this study indicate that searching for information on the Internet impacts cognitive functioning (Small, Moody, Siddarth & Bookheimer, 2009). The process of actively searching the Internet activated participants' prefrontal cortex (Ordonez et al., 2011:217). The level of focused engagement with and facilitation of the learning process may have impacted the findings. The possible benefit of online engagement on cognitive function requires further investigation.

In Chapter Six, the framework presented by Cambell (2015) and the cognitive skills mobilised by Internet use (Slegers et al., 2009) are adapted to reflect the findings regarding participants in the South African context (explored in Chapter Two). The emerging framework represents the applied findings of this study and contributes towards a contextually relevant online service user interface for engaging ageing users.

5.3 Theoretical Coding and Saturation

As the focused coding process concluded, no new concepts were emerging. To further gauge the comprehensiveness of the final core concepts, current literature, projects and

professional texts were reviewed. As these did not yield new concepts to investigate, saturation was established.

> Saturation is not seeing the same pattern over and over again. It is the conceptualization of comparisons of these incidents which yield different properties of the pattern, until no new properties of the pattern emerge. This yields the conceptual density that when integrated into hypotheses make up the body of the generated grounded theory with theoretical completeness. (Glaser, 2001:191)

The final phase of theory construction documented in this thesis included a critical reflection on whether saturation had been reached, as well as the process of theoretical coding using Glaser's *theoretical coding families* (a full list of coding families compiled by Hernandez, 2009:62-66).

5.3.1 Saturation

Establishing saturation in a *grounded theory* study can be a revelation and a fear. As no new concepts emerge from continued data review, and memos became repetitive, the researcher began to suspect saturation. For a novice grounded theorist there is a lack of certainty as to when saturation could be reached. Glaser and Strauss (1967:40) acknowledge the ongoing process of theory construction and evaluation, noting that saturation can only be viewed as a "pause in the never-ending process of generating theory". After reviewing the emerging core categories against academic and professional literature, no new nuances, changes or questions emerged. Memos became more repetitive, confirming an already established concept rather than facilitating an investigation into new connections or concepts. This speaks to the original definition of saturation as proposed by Glaser and Straus, stating that saturation is in principle the point in a *grounded theory* study where sampling stops and the emergent core categories are considered suitably comprehensive to inform an emerging theory. This is not to say that saturation presents a fully comprehensive knowledge of all factors in an omnipotent manner. Rather it acknowledges the nuances of context, time and new emerging factors (whether from future literature, data sets of feedback) and the changing effect this may have on the *grounded theory* (Glaser, 1998).

One way to review saturation is the *interchangeability of indices,* which implies that once saturation has been reached, the emerging concepts would be able to accommodate any new empirical data (Glaser 1998). In this study, that point had been reached prior to the start of the second workshop. All new data gathered from the second workshop, and the resulting memos, contributed variations and deeper insights but did not alter the core categories. The final assessment of saturation and the final process in theory construction was achieved through theoretical coding, enabled by Glaser's *coding families*.

5.3.2 Glaser's coding families

The final coding process - theoretical coding - enabled the construction of a cohesive theory from the core categories. Glaser referred to this process as weaving the 'fractured story back together' (Glaser, 1978:72). This process also offered a final opportunity to analyse of data against core categories, and review the relationship between core categories. The original set of coding families was published in 1979, with subsequent coding families added in 1998 and 2005 (Table 3.7). Glaser has clearly stated that the coding families are meant as a departure point for establishing theoretical relationships, and not as a prescriptive and all-inclusive list (Hernandez, 2009:55). Coding families evolve, overlap and inform each other.

The key throughout the process, as with *grounded theory* as a process, is to let the data drive the analysis and the emerging construct. Charmaz has discussed the benefit of working with coding families and notes that they could "hone your work with a sharp analytic edge" (Charmaz, 2006:64). She also cautions the researcher to not obsess over making the data 'fit' a single coding family, as the resulting theory will be warped. Some theoretical concepts may be considered subordinates within a coding family, even though they represent a unique theoretical construct. There are also a number of 'conceptual families' still missing from Glaser's list (Charmaz, 2006:66).

The first step in the theoretical coding process was identifying the coding families that did not speak to the nature of the data collected. These coding families were removed from the coding review. The remaining coding families were each explored in relation to the emerging concepts and the relationships between them. The coding families considered at this point in the process included: The 6 C's, Means-Goal Family, The Basics Family, Boundary Family and the Causal Family. The process of analysis was initially mediated by paper-based explorations, using post-it notes.

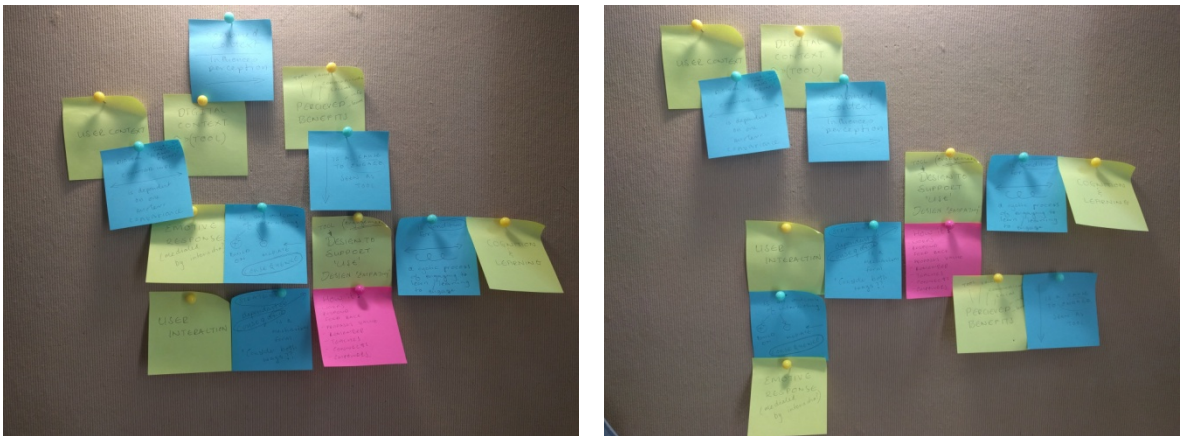


Figure 5.2: Paper Exploration of Relationships.

Core categories and the relationships between them were mapped in different ways to explore possible relationships. This method allowed for open exploration (Figure 5.2).

From this exploration, the following coding families, or concepts within a coding families, were identified within theoretical relationships (Table 5.6).

Table 5.6: Glaser's Coding Families Reviewed during Theoretical Coding

	Glaser, 1979		Glaser, 1998		Glaser, 2005
	The 6 Cs	**Means-Goal Family**	**The Basics Family**	**Boundary Family**	**Causal Family**
Defined relationships among core categories.	Yes	Yes	No	Yes	No
Relationship types present.	Causes, Consequences, Covariance, Contexts, Conditions	Goal	-	Confidence Limit	-
Phrases that define relationships.	Context: 'is the context for' Cause: 'is the cause of'; 'is the cause for' Condition: 'is the condition for' Covariance: 'is dependent on'; 'leads to' Consequence: 'is the result of'	Goal: 'is the goal of', 'is the goal reached'	-	Confidence Limit: 'forces an evaluation of'	-

Source: Original list from Hernandez (2009:62-66)

Once the relationships had been identified, and the paper mapping of the emerging theory was complete, the resulting framework was visualised as a network using Atlas.ti (Figure 5.3). The network provided the initial collapse of category silos, and represents the process of restructuring the theory from the core categories. Once the network had been established, a final process of data analysis and theoretical coding was initiated. As part of this process the original core category networks were evaluated against the emerging theoretical construct.

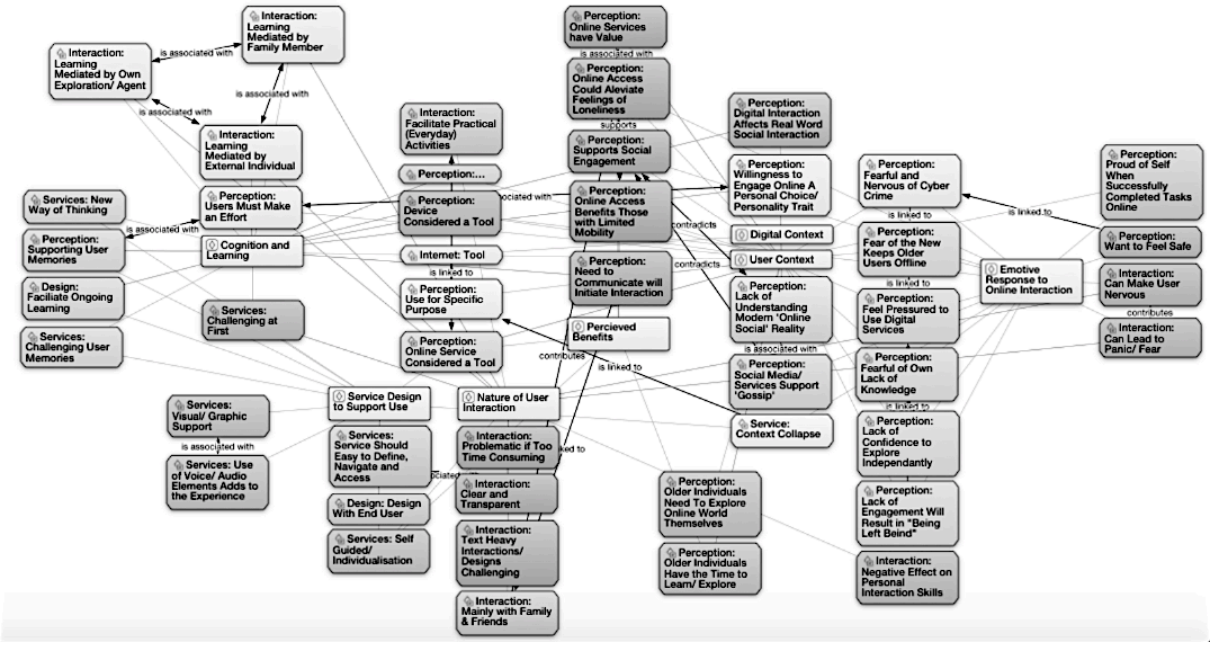


Figure 5.3: Emerging Relationships.

The emerging network was too dense to highlight the relationships among the core categories, and as a result a simplified table of the resulting relationships was created

(Table 5.7). The table format shows more clearly the various relationships present, between core categories and the resulting complexity.

Table 5.7: Complex Theoretical Relationships

Core Categories	Relationship 1	Relationship 2	Relationship 3	Relationship 4	Relationship 5
Perceived Benefits	…are the cause for **User Interaction.**	…are dependent on **User Context.**	…are dependent on **Digital Context.**	…are the goal reached re **Cognition & Learning.**	
User Interaction	… is the goal of **Perceived Benefits.**	…is the cause of **Emotional Response.**	…is the result of **Design to Support Use.**	…forces an evaluation of **Design to Support Use.**	
Design to Support Use	…is the condition for **Perceived Benefits.**	…is a component of **User Interaction.**	…is the cause of **Emotional Response.**	…forces an evaluation of **Cognition & Learning.**	
Emotional Response	…is the result of **User Interaction.**	…is the result of **Cognition & Learning.**	…forces an evaluation of **Perceived Benefits.**		
Cognition & Learning	…is the cause of **Emotional Response.**	…is the goal of **User Interaction.**	…forces an evaluation of **User Context.**	…is the condition for **User Interaction**.	
User Context	…is the context for **Perceived Benefits**.	…is the context for **Digital Context.**	…is the result of **User Interaction.**	…is the result of **Cognition & Learning.**	…forces an evaluation of **Digital Context.**
Digital Context	…is dependent on **User Interaction.**	…is dependent on **Emotional Response.**	…is dependent on **Cognition & Learning.**	-…is dependent on **User Context.**	…forces an evaluation of **Perceived Benefits.**

Source: Adapted from the original coding family relationships, collated in Hernandez (2009:62-66)

The final data analysis process reviewed the relevance and structure of core categories, and data, in light of the emerging relationships. The key finding from the theoretical coding process is discussed in 5.3.3 Emerging Theoretical Constructs.

5.3.3 Emerging theoretical constructs

As the relationships among core categories, and the components of these categories, were analysed it was found that they revolved around three main central process points (Figure 5.4). The first of these points refers to the *decision to interact*, which represents the point at which a user connects to and engages with an online service. Categories that influenced this decision include 'perceived benefits' and the 'digital context' of the user. Digital context provides the perception of relevance, as well as the confidence to engage, while the perceived benefits act as a catalyst. The user perceptions that inform these categories are not set, and evolve with every instant that the user engages with online services.

The second point refers to the outcome of the interaction, which represents the user's experience of the design of the services, the emotional reaction the user experienced during the interaction, the level of cognition experienced during the interaction, and the resulting learning process. The core categories that speak directly to this point include 'user interaction', 'designed to support use', 'emotional response' and 'cognition and learning'.

The third and final point is the culmination of the entire experience. The emotional experience, and the resulting learning process, requires users to redefine their own user context. As the user context evolves the established digital context of each user evolves, which will, in turn, influence future decisions to interact. The importance of reflection as part of a process is discussed, in detail, by Schön (1987) who defined *reflection-in-action* as the learning process that occurs when one reflects while busy with a specific task, and *reflection-on-action,* during which the process as a whole is evaluated and the impact on future engagement is established. Schön's work influences not only the reflection aspect the emerging theory, but also the process of decision making based on reflection and the sum of past experiences. These aspects thus include the *decision to interact*, as well as the outcome of an interaction being viewed through the lens of experience. Schön (1987:54) describes this when he discussed properties of thinking and *knowing-in-action*:

> In some cases, we were once aware of the understandings which were subsequently internalized in our feeling for the stuff of action. In other cases, we may never have been aware of them. In both cases, however, we are usually unable to describe the knowing which our action reveals

Central to the evolving theory is the holistic user experience facilitated through design, from the perspective of an ageing user. The influence of emotional responses and the unique challenges that ageing users face (with regard to understanding actions required and learning how to engage) define the nuances of the emerging theory.

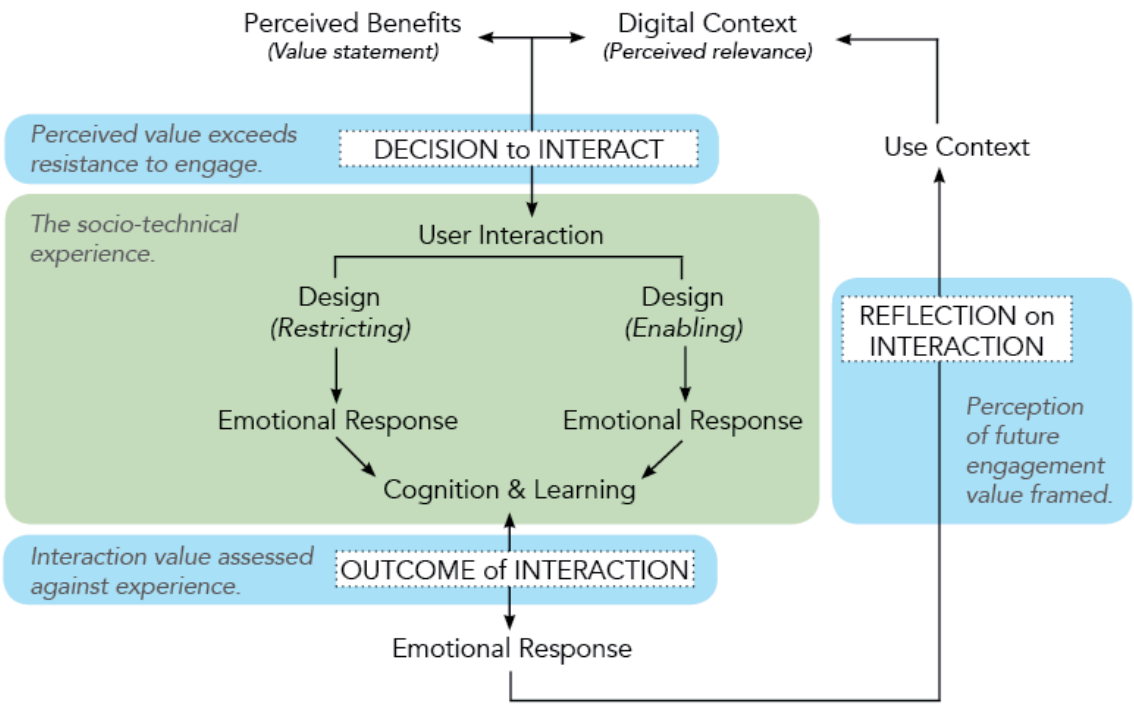


Figure 5.4: Emerging Theoretical Construct

To establish theoretical saturation, the emerging theoretical construct was reviewed for a final time, looking back at core categories and, in a number of cases, going back to the data. During this process memos from both the focused and theoretical coding phases were compared to emerging concepts. These memos were handwritten – captured during analysis processes (Figure 5.5) – as well as voice clips. From this analysis, the theory construct evolved slightly – bringing into focus the dual nature of a 'digital' user within the ageing user group. The final theory is presented in Figure 5.6 and is discussed in the next section, *5.4 Ageing User Decision-Determined Engagement (AUDDE*).

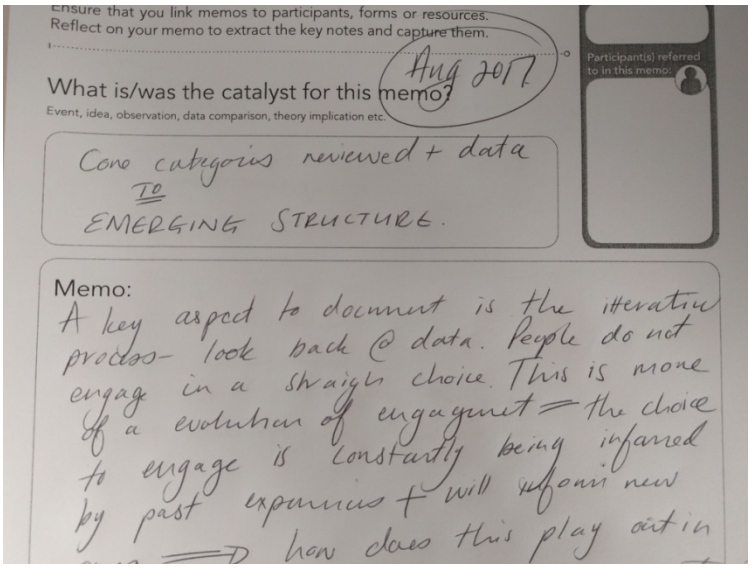


Figure 5.5: Handwritten Theoretical Memo

5.4 Ageing User Decision-Determined Engagement (AUDDE)

The term *cyber-seniors* refers to two emerging groups of ageing users: the first is that of the 'technology lovers' (who engage willingly, and are fascinated by technology) and the second is that of the 'technology users' (Gregor, Newell & Zajicek, 2002). Technology users see technology as a tool to achieve a specific goal. Participants who took part in this study were overwhelmingly technology users[74]. From the research a *grounded theory* emerged, highlighting the decision-determined engagement that characterised the ageing technology users within this study. During theory construction three key-points within the interaction were identified: *Decision to Interact, Outcome of Interaction* and *Reflection on Interaction.* These key points emerged as constructs which link core categories together and represent relationships between core categories. Even though the naming may suggest that these are new or additional core categories, they are in fact not.

The theory proposes an iterative process in the decision-making cycle. When ageing users decide whether to engage with an online service, or not, two main factors form the basis

[74] From the participant group only 1 individual could be defined as a technology lover; all other participants commented on the 'tool' nature of online services, or their ability to 'help you do something'.

for their ultimate decision. These factors are defined as *perceived benefits*, and *online user context*. For a user to engage the perceived benefits must outweigh any hesitation that forms part of the online user context. The perceived benefits of an online service must be made clear through a value statement. This value statement could be found in the form of an advertisement, but among the ageing will more likely be word-of-mouth. Family members and friends are the most likely candidates to share a value statement for an online service. Once the user is aware of the perceived benefit and value that an engagement may have, the decision to interact is dependent on the level of resistance within their user context. The online user context is shaped by two spheres of influence: the *social context* and *use context*.

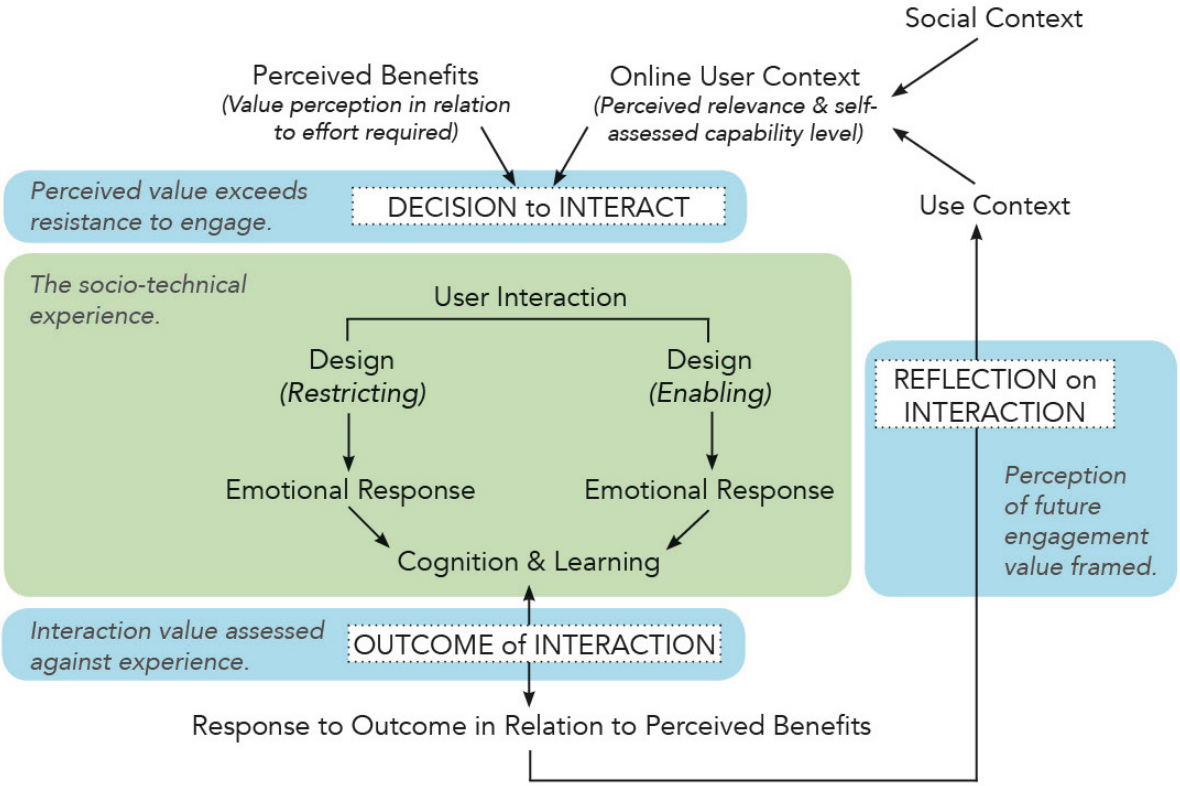


Figure 5.6: Theory of AUDDE (Ageing User Decision-Determined Engagement)

5.4.1 Social and Use Context: Framing the Decision to Interact

The first sphere of influence that impacts the decision to engage is the user's *social context*. Here the social context refers to the perceptions of the ageing individual's social group, communities of interest, and communities of practice with regard to engaging online. Among the observed ageing community resistance towards online engagement, and other technologies, was evident. This disregard for the potential benefits of engagement becomes part of the individual's technological milieu and influences his or her understanding of the value that the engagement may offer. Within these social constructs the ageing individual may feel pressured to share the communal peer point of view of his or her social groups. Although not a universal influence, the social context of the user potentially plays an important part in their decision to engage. As ageing individuals often have a set group of individuals with whom they socialise, the social

context of the user can be considered fixed. For the social context of the group to change a number of individuals within the group must instigate an assessment of the commonly held views in order to renegotiate the communal perspective. The 'use context' of an individual, or individuals, could be the catalyst for a review of perceptions held by such a social community. Another aspect of the social context is the role of individual family members or friends.

The view of individual family members or friends has a similar ability to shape the perspective of an ageing individual. It is not only their general attitude towards technology that can be an influence, but also the manner in which they communicate the value of specific online services, their willingness to act as facilitator and mentor to the ageing individual, and their own behaviour with regard to technology. The networked society has led to a greater connected society that spends more time on devices. This phenomenon, and the rise of social networking as a primary method of social interaction, is not appealing to an ageing target group. Those who do engage with sites, such as Facebook, do so to accomplish a specific task. Ageing users who feel forced to accept (or purchase) devices, or engage online, transfer that resentment to the interaction space. A lack of support from the individual who initiated the use of a device or online service results in feelings of frustration on the part of the ageing user. Depending on the latter's disposition this can either be a catalyst for self-experimentation and renewed determination to complete the task or for dismay if not successful. The emotional and social influences on the willingness of an individual to interact with an online service are crucial to potential engagement. Equally crucial is the emerging, and constantly evolving, context of use.

The use context of an ageing individual is informed by every online interaction they have had, and may even include a broader range of technological interactions. Every interaction contributes to an individual's perception of ease of use, cognitive demand, convenience and overall advantage. In this way, the use context is constantly evolving, and informs the current user context. It is the aspect of service interaction that can create a positive perception of online engagement among users. This influences the willingness of the individual to engage in future. The context of use is formed through a process that occurs when the user has decided to interact, and revolves around two process points: the *outcome of the interaction* and *reflection on interaction*.

The outcome of the interaction is a process of evaluation that the user completes at the end of a task. The task does not have to be completed successfully, nor even completed at all, for the outcome of the interaction to be evaluated. The design of online services plays a pivotal role in user interaction. Services that take into account different levels of physical ability, and focus on enabling simple and specific tasks, are of greater value to ageing users. Design should focus on accessibility as a standard, instead of requiring users to find and set accessibility options (often in complex sub-menus). Design considerations

that acknowledge physical ability, and contribute to more universally[75] designed services, include the use of colour, backgrounds and animations, simplified navigation, avoidance of visual clutter, consideration of font and font size, and a reflection on the impact of advisements and pop-ups on the interaction between user and interface. The safety of a user online is a critical emotional driver. Online service interactions that may seem commonplace, such as inquiring whether the user would like the service to remember their username and password, can elicit feelings of unease, suspicion and doubt. Ageing users experience a heightened concern regarding these issues as they have a keen awareness of their limited ability to navigate the online service and identify potential risks. It has, however, also been noted that in some cases the users' view that they are less equipped to navigate an online service, or identify cyber threats, is an incorrect assessment of their ability (often informed by a lack of self-confidence and influenced by their social context).

5.4.2 Design, Emotion and Cognition: Driving the Interaction Experience

Design choices that create an enabling experience elicit a positive emotional response from users. These emotions include pride in one's ability to complete the task unaided, a heightened sense of accomplishment and joy. Given the nature of the activity, the completion of the task may also elicit a sense of relief (for example, when an individual with limited physical mobility successfully pays an account online and does not have to struggle to do so in person). Design that restricts task completion elicits feelings of frustration and confusion. The emotional reaction to a task can often permeate the entire interaction. If an ageing user, for example, struggles to log on to a specific service, their initial feeling of minor annoyance can be aggravated by subsequent challenges. The emotional reactions experienced throughout the interaction affirm or challenge perceptions which the user had before. A positive experience may challenge a personal resistance to engage, or strengthen previous beliefs that engagement has value. A negative experience may call into question previous perceptions relating to the value of engaging, or reinforce previous resistance to engagement.

Linked to the emotional experience of ageing users while interacting with an online service, is the cognitive experience and the potential for learning. Ageing individuals are critically aware, in most cases, of their own cognitive decline[76]. This theory draws from the definition of cognitive function as "an individual's perceptions, memory, thinking, reasoning and awareness" (O'Regan, Cronin, & Kenny, 2011:157). Both physical and cognitive decline are key markers of the ageing process; however, both manifest in varying degrees and escalate differently among the ageing community. Online service design that offers guidance in the case of possible lapses in user memory, or provides a step-by-step task guide, supports the unpredictable nature of cognitive ability among this

[75] Referring to Universal Design (UD), also called design-for-all, design for access

[76] This statement refers to ageing individuals with normal cognitive capability, and who are not suffering from conditions such as dementia.

user group. If the interaction experience is one that pivots on high-level cognitive processes, such as complex problem solving and critical decision-making, an ageing user may struggle. Because cognitive decline is not a predicable variable, design decisions focus on providing services that take into consideration the wider possible audience (user group) instead of an "idealised average" (Kurniawan, 2006:vi). In design these elements include a review of jargon (such as 'cookies'), navigation of complex menu options and complex processes. Information search services are a key driver for engagement among ageing individuals, but their search strategies differ from those of younger user groups and can lead to unclear search results, or an information overload. With use, their ability to engage and respond to cognitive demands of online services improves (Czaja & Lee, 2012) and online interaction fosters learning.

The learning process for ageing users is mediated by either an external stakeholder (a friend, a family member or a professional encountered whilst seeking help) or self-exploration. These learning experiences may happen prior to engagement, or may take the form of coached support whilst completing the action. Vital to the learning process is whether the individual is intrinsically motivated (interested in learning because it will enable them to complete a task or solve a problem) or extrinsically motivated. Extrinsic motivation, such as being given a tablet or smartphone as a gift, or being told one will be 'left behind' if one does not engage, does not guarantee that the ageing individual will initiate learning to use the device or navigate the online service. Design that supports and scaffolds the interaction throughout the online experience provides an opportunity for learning and skills developments. These aspects result not only in an increased knowledge base for the user, but also a sense of achievement (which cycles back to an emotional response). How an ageing user interacts, the cognitive experience of the interaction, as well as the emotional consequences and resulting learning process, are all interwoven elements of an iterative cycle. A user may go through multiple cycles within this socio-technical experience, before reaching the end of the interaction.

5.4.3 Reflecting on the Value: Outcomes of the Interaction

The outcome of the interaction could be a successful task completion, an unsuccessful task completion or an interrupted task (ended prior to either a successful or unsuccessful task completion). Irrespective of the nature of the outcome, the experience of the interaction will result in the user's reflection on the perceived value expectation in relation to the interaction experience. This process will inform the *use context*. A user may conclude, after having reflected on the interaction, that his or her original expectation was met and that the value added was greater than the physical, emotional and cognitive input, reinforcing that engaging online was a positive endeavour. If the value perception is not met the individual may feel that the input required by the interaction was too great. There is a spectrum of reactions that the user may have between these two outcomes. For example, the task may have been completed successfully, and the user may believe the value added was greater than the input it required; however, the user may still resist future interactions. In this scenario, the user

reaction may be due to residual *angst* or doubts harking back to previous interactions, or a lack of confidence that future interaction will also be positive (or successful). The cyclic influence of expectation, interaction and experience can be noted in this situation. Renegotiated attitudes and perspectives, due to interactions completed, form part of the user's new online context.

The online user context is thus shaped by both the use context and the social context. Even though an individual's perceptions of part experiences are important for future engagements, those perceptions are also influenced by a shared social context. Engagement is, therefore, influenced by the perceptions of the individual, as well as the group, and is not a linear or fixed point. Rather, the process is a continuous negotiation of past experiences, values as defined by user needs and the perception of peers (or other influential figures).

5.5. Towards Formal Theory: Initial Evaluation

The AUDDE theory contributes to the design body of knowledge. Design, as a process, influences (and is influenced by) other fields, such as technology, business, policy development, social innovation and more. For this reason, the positioning of AUDDE is crucial to defining the contexts to which it relates. To reflect on the integrity and validity of AUDDE, as a *grounded theory*, four criteria are discussed throughout this chapter: fit, workability, relevance and modifiability. The four criteria were introduced in Chapter Three and reflect Glaser's (1978) original view on establishing validity, as well as those of subsequent authors (Lomborg & Kirkevold, 2003; Giske & Artinian, 2007). It is critical to state however that the philosophical position of constructivist validation does not require the formal validation of theory. In this study the validation process was considered as a final review of the emerging theory and a final opportunity to reflect on the theory construction, as well as the road ahead and the process through which AUDDE can contribute to formal theory. Charmaz does not restrict or prohibit the validation of theory, rather urging the researcher to reposnd to their dicipine and the context of the study (Charmaz, 2006: 182):

> Criteria for evaluating research depend on who forms them and what purposes he or she invokes. Glaser's {1978: 4-5) criteria of fit, work, relevance, and modifiability are particularly useful for thinking about how your constructed theory renders the data. Other important criteria take into account disciplinary, evidentiary, or aesthetic issues. Each is significant for your project Different disciplines adhere to different standards for the conduct of research and for acceptability of evidence.

The credibility of a qualitative study and theory can be reviewed in a number of ways. Elliott and Lazenbatt (2004:49) reviewed literature and collated the main criteria for assessing the quality of a qualitative study (Table 5.8). These criteria and methods of measuring have continued to be of interest to qualitative researchers and have led to re-evaluations of quality criteria (Souza & Silva, 2011).

Table 5.8: Criteria for Assessing Quality of Research (Qualitative)

1. Qualitative Criteria	*2. Universal Criteria*	*3. Original Grounded Theory Criteria*	*4. Strauss & Corbin's Grounded Theory Criteria*	*5. Charmaz' Criteria for Grounded Theory Studies*	*6. Communicative Validation*
Credibility Transferability Dependability Confirmability	Validity Relevance	Fit Work Relevance Modifiability	2 criteria sets: 1. Research process 2. Empirical grounding of findings	Credibility Originality Resonance Usefulness	Fit Comprehension Theoretical generalisation
From: Lincoln & Cuba, 1985	From: Hammersley, 1992	From: Glaser & Strauss, 1967	From: Strauss & Corbin, 1998; Corbin & Strauss, 1990	From: Charmaz, 2006	From: Souza & Silva, 2011

Source: 1-4. adapted from Elliott & Lazenbatt, 2004; 5. from Charmaz, 2006; 6. from Souza & Silva, 2011

In 'traditional' *grounded theory* the criteria used to evaluate the emerging theory are: fit, relevance, workability and modifiability (Glaser & Strauss, 1967), as introduced in Chapter Three. Much of the quality of a *grounded theory* is generated from a thorough process maintained during theory development, as Glaser and Strauss (1976:37) note: "focus on the emergence of categories solves the problems of fit, relevance, forcing, and richness". But do the traditional criteria proposed by Glaserian *grounded theory* offer the most suitable evaluation of theory quality and validity? The other qualitative criteria proposed by authors, including Guba and Lincoln (1994) and Hammersley (1992), propose viable alternatives. Crucial to this discussion is the process-driven nature of a *grounded theory* methodology, and the need to adhere to the process to be able to judge the emerging theory:

> …analysis of published grounded theory studies, identifies the methodological problems of researchers borrowing parts of grounded theory and not adhering to the critical components of this approach… some researchers carried out the data analysis at the end of the data collection while others failed to differentiate between theoretical and purposeful sampling. Whilst it is recognised that grounded theory methods can be used to analyse a variety of research from differing paradigms, research claiming to be a grounded theory study must follow specific grounded theory methodology (Elliott & Lazenbatt, 2004:49).

Taking note of the issues raised, the decision was made to return to *constructivist grounded theory* literature to establish a set of relevant criteria. Besides the separate criteria proposed by Charmaz (2006:182), she noted that the criteria of fit, work, relevance, and modifiability by Glaser (1978:4-5) "…are particularly useful for thinking about how your constructed theory renders the data." As Glaser's criteria provided a clear focus on the emerging theory, AUDDE was evaluated against this set of criteria. Charmaz' criteria for *grounded theory* studies will be applied to a structured reflection in Chapter Seven, to conclude the process and offer a final theoretical contribution. The main purpose of a grounded study is to generate a theory that "accounts for much of the

relevant" behaviour, and not a theory that provides a complete, holistic and enduring view (Glaser & Strauss, 1976:30). The reason for this is bound to the nature of qualitative research. Qualitative research is influenced by the perceptions, experiences and behaviours of individuals. As time and societal norms change, so do individuals. The theories concerning how individuals engage and interact thus evolve as well. The credibility of AUDDE and the findings of this qualitative study are evaluated against the criteria for a classic *grounded theory* study. The rigorous adherence to the grounded method is crucial to generate a theory that is grounded in data, and has emerged from saturated core categories. The number of participants in *grounded theory* is not predefined, and Glaser and Strauss (1967) proposed that meaningful research could come from a single participant, as long as the process had been followed, and the researcher could demonstrate saturation of categories from data collected and analyses.

This study featured a convenience sampling of 13 ageing individuals, who were interviewed (discussed in Chapter Four). All participants had access to online services, and all had used at least one online service (the regularity of their using such services varied, but was not a consideration within the delimitations of the study); thus the sample of the study qualified as appropriate. The interview data were supported by findings from two collaborative workshops (with 15 theoretically sampled participants taking part). Data gathered during these research activities yielded a great volume of rich information. Audio tracks of interviews were transcribed and listened to numerous times throughout data collection, and analyses to ensure emerging categories were grounded in participants' statements. Saturation was explored at data level (when no new codes emerged through constant comparative data analysis) and again at theoretical level (when the emerging theoretical constructs, literature and memos were compared and yielded no new variations).

The goal of a successful *grounded theory* is to provide an account of what was studied, through a rigorous process of data collection and analysis, and to focus on conceptual integration. The purpose of a *grounded theory* is not to provide a tested and verified solution, but rather to provide a conceptual framing of a phenomenon to which subsequent research can contribute.

5.5.1 Reflecting on AUDDE: Fit

The criterion of 'fit' refers to the alignment of the emerging theory to the data in which it is grounded. It requires a review of the core categories as well as the final theory. Core categories must also represent the data from which they were constructed. The 'fit' of data and core categories within the emerging theory speaks of internal validity. Glaser (1978) warns that assumptions and data 'forced to fit' into a category can invalidate a theory.

Within this study the fit between data, core categories and the emerging theory can be reviewed through two lenses: visualisation of the process and constant comparison with

data. Throughout the process of data analysis networks of relationships were constructed to visualise the emerging patterns in the data. Throughout this visualisation process data became 'trackable' building blocks, which one could see and track as core categories began to emerge. As data informed core categories - and, finally, theoretical constructs - the original data sets were continuously consulted. During the process of core category evaluation, the emerging core category of `cognition and learning' had been divided into two separate core categories, only to be 'refitted' as a single category when compared again with data. The constant comparative process that emerged is in line with grounded practice. The grounding of concepts as they emerged, to ensure relevance to data, ensured that the final theory remained connected to the data. Throughout the analysis process (and naming process) attention was paid to naming conventions, to retain the 'voice' of participants within codes and the emerging categories.

5.5.2 Reflecting on AUDDE: Relevance

Participants in the study should be able to recognise their significant concerns within the emerging categories and theory. Again, constant comparison during theoretical coding can assist in retaining the voice of participants. The researcher is confident that, through transparent analysis and delaying the subject-specific literature and theory review, the core categories identified represent the perceptions of the participants. However, to establish whether participants saw the relevance of the emerging theory it was decided to present the latter to one of the study participants, Victoria. Victoria was interviewed as part of the original data collection phase and contributed to one of the workshops. The session with Victoria to discuss the 'relevance' took the form of an unstructured discussion during which the research process and emerging theory were introduced after which Victoria shared her views. In order to explain how she understood the decision-driven process underpinning the emerging theory, Victoria referenced the process of booking an air ticket through an online travel service:

> *"Whatever difficulties you have, you get through them, you get to an outcome, you try it, you've learnt something… and your end result is an air ticket and you are happy about it. And that gives you more confidence to try it again. So, you go back and you say 'right, now this time I'm going to do it with less hassle and more positivity…' The second time, or third time is so much easier."* - Victoria

Victoria's comments clearly indicated an understanding of the iterative nature of the process. Her reference to being 'happy' about the outcome, and gaining confidence throughout the process, links to the emotional nature of interaction experiences. She also brings the concept of cognitive processing, and 'learning' into her description, and highlights it as a separate, important aspect: "Even if they change the design, you will watch and see, and you will learn by that, so it is a learning curve."

The value proposition in relation to expected effort as a catalyst to engagement was

discussed, and Victoria was asked whether she could 'see' her own experiences and perceptions in the emerging theory: "Ya, I can… Your emotional response is the same, you want to buy the tickets, you want to buy the products". This also highlighted the need to view the value proposition from an emotional perspective (which links to the concept of user 'need' or user 'desire'). When asked whether the emerging theory addressed this by representing engagement as a continuous decision making process, Victoria commented: "Yes…You have to overcome the difficulties." She explained that every person needed to decide for himself or herself whether they wanted to engage, and then overcome challenges.

5.5.3 Reflecting on AUDDE: Workability

The concept of workability relates to the theory's ability to account for the process-driven resolution of the participants' main concerns. Glaser (1978, 2001) describes workability as the emerging theory's capacity to explain *what* is happening, and define the process of *how* it is happening to anticipate future behaviour of participants. In this study AUDDE is presented as an engagement process. The process described in the emerging theory defines the participants' perceptions and concerns. The theory describes decision-driven engagement, which occurs when the user reviews the value proposed by online service engagement as greater then perceived effort of engaging. The theory goes on to outline the key decision points and influencing factors that impact user engagement. Within the proposed process the resolution to concerns noted in the study is defined through a continuous cycle of user decision-making. The elements that influence the cycle of decision-making are defined within the theory, as well as the context that influenced these elements.

5.5.4 Reflecting on AUDDE: Modifiability

A theory that is modifiable allows subsequent researchers to understand easily the process, as well as the emerging theory itself, in order to "modify or refine the theory as they collect and code new data" (Lowe & Tossey, 2017:115). In order to develop formal theory from substantive theories, such as AUDDE, it is crucial that one is able to review, analysis and edit the substantive theory as new data and literature become available. Grounded theories are not intended to be proven through testing and remain fixed; they are intended to be modified and evolved through constant future comparison (Glaser, 2003). The evolution of a theory can be facilitated through a wider sampling of participants that represent unique perspectives not considered in the development of the original theory. For AUDDE this could represent a wider sampling of participants from different cultural background or different countries. It could also represent a more focused analysis of specific elements within the sampled group - for example, an analysis of the role of gender.

As the theory describes the catalyst for, and process of, ageing users' engagement with online services, a discussion of the socio-technical implication is required. Within this setting, gaining insight into decision-driven engagement potentially offers insight valuable

for fields beyond service design, and may include user-interface design, interaction design and informatics. With this in mind it is proposed that the substantive theory development in this project can contribute to formal theory, if explored in relation to existing theory with regard to the phenomena of online engagement. A substantive theory has a 'close tie to the data and can be described as associated with a specific context' (Urquhart & Fernandez, 2013:226). When compared to existing research, models and frameworks, a substantive theory can be extended into a more formal theory, if it has relevant core categories with substantial conceptual grounding (Glaser, 1978). It is crucial to consider these perspectives in a structured manner (such as through *grounded theory*) to conceptualise formal theory and unified perspectives across disciplines. This process would involve a new cycle of coding of analysis.

As Glaser (2001:183) notes, the evolution of a theory through additional sampling cannot continue endlessly, and the research must at some point conclude its contribution. In response to Glaser's dictum the theory of Ageing User Decision-Driven Engagement responds to the criteria of fit, relevance, workability and modifiability during initial evaluatuon. Contributions from subsequent research, possible emerging from a range of disciplines, can expand the substantive theory in future studies.

5.6 Conclusion

It must be emphasised that the theory proposed is firmly grounded in the perceptions, and shared stories, of a specific group of ageing users living in Cape Town, South Africa. The relevance of this theory to ageing users' experiences outside of this geographic area must be verified. AUDDE is a contribution to the body of knowledge of design, and more specifically design for the user interface, website design and design for online services. It is hoped that this theory will drive further inquiries and online service design practices that acknowledge the needs of ageing users.

It is crucial to reflect on the position of this theory in relation to existing theories that explore engagement. Chapter Six will focus on this aspect by contextualising the ageing user as a social actor, within a socio-technical interaction. Discussed in Chapter Six is the relationship between the emerging AUDDE theory and Mäkelä and Fulton Suri's (2001) framework for defining user experience; Locke and Latham's (2002) Goal-Setting Theory; Venkatesh, Morris, Davis and Davis's (2003) Unified Theory of User Acceptance and Use of Technology; and, finally, Hassenzahl and Tractinsky's (2006) reframing of the definition of user experience. The goal of this discussion is not to propose that AUDDE can be positioned within the field of Informatics. Rather, it aims to acknowledge the researchers whose vast body of work, addressing similar questions around interaction and engagement, has driven this study. It also provides the opportunity to highlight a unique contribution of AUDDE - driven by a social design perspective: the focus on non-linear engagement, influenced by emotional user reactions and driven by continuous evaluation of the value proposition of the service against expected physical and cognitive input.

Chapter Six
Towards Designing for an Ageing Populations: South Africa

Chapter Content

6.1 Introduction to Design for Ageing Individuals

Although conceptualised as a theory of design, AUDDE has the potential to contribute to other socio-technical studies. This chapter explores the group-negotiated personas generated within the study, as a strategic tool within service design – referring to both the actual personas, as well as the process of developing them. From a *grounded theory* perspective, this activity showcases that participant voices were heard not only in data collection, but also in analysis. This process helps define the common perception of peer stakeholders (within the target group), and much can be learnt from engaging with recordings of the group discussion when analysing the personas' content. The social impact of group-defined personas offers designers the opportunity to 'listen in' on peer discussions, driven by participants themselves.

In this chapter the social aspect of interacting with online services is further explored and ageing users are defined as social actors (as defined by Lamb & Kling, 2003; Lamb, 2006). AUDDE offers insight into the 'socio' component of socio-technical interactions, and highlights the complexity that characterises decision-making and engagement during an online interaction. The various components of the interaction were introduced in Chapter Two, through the work of Whitworth (2006), and this view will be reviewed in relation to the emerging *grounded theory* and the quality criterion of relevance.

Finally, this chapter discusses the 'blurred' lines of disciplinary domains in user-centred design of online services and other socio-technical interactions. Focus is placed on four other models that include a number of social variables to explain usage behaviour, including gender, age, experience, social influence, and the behavioural intention. This also includes Mäkelä and Fulton Suri's (2001) model that defines experience as motivated action in a context, Locke and Latham's (2002) Goal-Setting Theory from industrial psychology, the Unified Theory of Acceptance and Use of Technology (Venkatesh et al., 2003), and Hassenzahl and Tractinsky's (2006) reframed definition of user interaction. The prominence of social considerations in acceptance models, originating from ICT and Informatics, as well as theories that explain human goal achievement and action-driven decision making, may highlight the 'blurring' of disciplinary boundaries in the quest to understand how individuals engage with technology - and why. This discussion concludes with a review of the relationship between AUDDE (with presented models) and theories as an indicator of modifiable validity.

6.2 Designing for the Ageing in a Socio-Technical Context

When reflecting on the emerging AUDDE theory, the complex nature of the networked society must be acknowledged. Knowledge and experience within the online and digital service realm transcend single disciplines to create service systems:

> Actual service systems can be described as complex socio-technical systems, being approached in an interdisciplinary vision that integrates business functions, technology and human resources, with the final aim of creating value and benefit through the generated services (Drăgoicea, eCunha & Pătraşcu, 2015:6329).

The complexities of service systems require that one acknowledge the system in which new knowledge emerges. In order to position AUDDE, and highlight possible connections with existing theories in order to establish validity through modifiability, the socio-technical context must be reconsidered. The criterion of modifiability allows one to establish the capacity of the theory to be reviewed, restructured and evolved through additional research and analysis. Reflecting on existing socio-technical models and frameworks, and how the emerging theory relates to these, speaks to the diverse range of future research implications. It is not the intention of this discussion to produce fully developed perspectives of possible crossover points, or to speculate on the evolution of the subjective theory to a formal theory. Instead, the following discussion aims only to introduce and indicate avenues for future research considerations, as an indicator of the theory's modifiability.

The socio-technical hierarchy, introduced in Chapter Two, influences this holistic view. Whitworth (2006) visualised socio-technical interaction as dependent on four hierarchical levels, each level becoming more complex and dependant on the levels below[77]. The *social* level is seen as the most complex, with the *cognitive* level just below it. The more technical levels of *information* and *mechanical* support these two levels, respectively. In AUDDE, the influence of both cognitive and social factors are prominent. These aspects are heavily influences by the emotional reactions that users experience when engaging with online services. Battarbee and Koskinen (2005) highlight three approaches to user experience, and the different roles that emotions plays, captured in Table 6.1.

Table 6.1: Approaches to User Experience

Factor	Measuring approach	Empathic approach	Pragmatist approach
Origin and application of approach.	'Used during development and testing.' 'Thus, the approach is narrow—the definition only includes those aspects of user experience that can be measured and, through measuring, understood and improved.'	'Designing for user experience begins with creating a rich, empathic understanding of the users' desired experiences and only then designing concepts and products to support them.'	'The pragmatist approach borrows much of its perspective from pragmatist philosophy (see Dewey 1934).' 'Recently, Forlizzi and Ford (2000) presented a model of user experience in interaction. This model is theoretical in nature, and shows that experiences are momentary constructions that grow from the interaction between people and their environment.'
Defining the experience.	'It builds on the notion that experiences can be measured via emotional reactions. The 'soft and emotional experiences' need to be translated into 'experience goals' relevant to each project and included in the testing of products and prototypes (Teague&	'The empathic approach also claims that experience is emotional in nature but that the kinds of experiences that products elicit should be connected to the needs, dreams and motivations of individuals (Dandavate et al., 1996; Black, 1998).'	Emotional [emotion] is part of every experience. 'Experience fluctuates between the states of cognition, subconsciousness and storytelling, depending on our actions and encounters in the world.'

[77] The four levels are included as Table 2.4.

	Whitney, 2002).'		
Role of emotion.	Emotions as driving forces of human conduct.	Emotions as driving forces of human conduct.	Accounts for the situated unity of action, emotion and thought in the individual in a theoretical way.

Source: Quoted from, Battarbee & Koskinen, 2005:6-7

From the analysis of various approaches to user experience, and the role that emotion plays, a crucial factor emerges: all three approaches reflect on the experience of a user as an individual (Battarbee & Koskinen, 2005:7). The social context, and how people construct meaning from interactions, is linked. In order to understand how individuals engage and interact with an online service (or product) their emotions must be viewed in relation to their material and social contexts (Batterbee, 2004:59). The lack of this consideration in the approaches discussed by Battarbee and Koskinen is not unique. "Despite the fundamentally social nature of life, most existing models intended to generate perspectives of users in design still focus on the individual" (Postma, Lauche & Stappers, 2012:30). In order to contextualise AUDDE within the design body of knowledge, and indicate possible future evolution of the theory, the social aspect of socio-technical interactions must be considered.

6.2.1 The 'social' factor in socio-technical interactions

The meta-design approach to socio-technical interaction provides a systematic review of both the technical and social systems that are at play during an interaction (Fischer & Herrmann, 2011:2). The technical systems contribute engineered interaction spaces that are designed to be anticipatable and reliable. The social systems are, in many ways, dependant on the technical systems and evolve throughout interaction encounters. The fast pace of technological development today requires that we endeavour to gain a greater understanding of social systems, in order to navigate new socio-technical interactions as they emerge (Maguire, 2014). End-users are social beings, who evolve and grow. As such it is impossible to define social value as a constant, and the social impact on interactions must be considered within the "more institutionalized traditions or regulations inside various user communities" (Miettinen, Rytilahti, Vuontisjärvi, Kuure & Rontti, 2015:44). Important to understanding socio-technical interactions is understanding that the technology and social context develop reciprocally (Lessard, 2014), as well as the 'value system' that these relationships represent (Mumford, 2006). The value system that Mumford refers to describes a relationship in which the needs and rights of both human and non-human systems are equal.

This equality does not imply a constant equal, but rather interdependence: a concurrent process of 'meaning-making' and 'action-taking' in relation to the system's capabilities and the user's competence (Vatrapu, 2010:114). Gibson (1979) refers to this duel process, as noted in a socio-technical system, as *affordance*. The interaction space within a socio-technical encounter can be defined as humans interacting with technology, and interacting with others using technology. From a theoretical perspective, this encounter is

defined through the awareness and enacting of affordances, as well as the role and purpose of intersubjectivity:

> Affordances are action-taking possibilities and meaning-making opportunities in a socio-technical system relative to actor competencies and system capabilities. Technological intersubjectivity refers to the production, projection and performance of identities and subjectivities in technology supported social relationships (Vatrapu, 2010:111).

In AUDDE the perceived value of the interaction is a crucial catalyst for engagement. Ageing users continuously make meaning of their experiences, which affects their current and future actions. Vatrapu's theoretical view of socio-technical interactions draws from both an ecological perspective (of perception and action) and a philosophical perspective (of intersubjectivity). The view of social importance, and an individual's 'perception of affordances' as a factor to future perceptions of use, resonates with the findings that underpin AUDDE (Vatrapu, 2010:116). The implication of a possible 'future resolution' speaks to the validity of AUDDE based on the criterion of workability.

In fields, such as Human-Centred Design (HDC), the role of the participant - and his or her context - is placed at the centre of the design exploration (Baxter & Sommerville, 2011:7). This practice is found in many other design approaches, such as Universal Design, Participatory Design and User-Centred Design, and methods such as co-design. The value of approaching a project from this perspective is gaining a clear understanding of a user's motivation, ability and need, as well as the way he or she naturally interacts with the surrounding world. As a driver for initial exploration of the social and individual contexts, one can view the user as a co-creator of the interaction experience. Technology, and the various manifestations that it facilitates, is thus a product generated within an interaction, but also the product of consumption. Understanding this duality is at the core of service design, as services are often consumed as they are delivered.

Designing a digital service requires that technology and humans are not placed on opposing sides, but rather that the relationship is viewed as interdependent and context specific. Designing a socio-technical solution from this departure point democratises the interaction and makes the end result more user-focused and more applicable to everyday life (Nascimento & Pólvora, 2013:33). Design, as a discipline, has evolved to support this complex exploration and offers socio-technical investigators a range of methods and knowledge relating to the practice of understanding the social and individual contexts (Norman & Stappers, 2015:86). This allows for a contextual view of the specific ICT user as a *social actor* within the interaction.

6.2.2 Framing of an ageing user as a social actor

Developments within the field of *social informatics* are briefly explored in Chapter Two, and outline the four main phases within the field. Since 2006 SI has diversified, with one approach viewing the user as a social actor. This perspective links to socio-technical views that describe the interaction as a 'dynamic interplay', which is grounded in cultural

representations and social contexts (Vatrapu, 2010:116). There is a need for frameworks and tools to assist both designers and developers in exploring the complexity of social influence, when conceptualising and realising online services:

> The suggestion has been made in the design research literature that design teams need to establish creative understanding of the social to develop products and services that delight users. However, most frameworks of user experience in design place the individual at the center and merely hint at the social, leaving design teams rather empty-handed, or at least ill-informed. Therefore, a theoretical framework is needed to sensitize designers toward the social in designing for user experience (Postma et al., 2012:31).

When defining the user as a social actor, Lamb and Kling (2003), as well as Lamb (2006), proposed a multidimensional view of a user, allowing for a structured analysis of the dimensions that contribute to the experience of a socio-technical interaction. These dimensions include: affiliations, environments, interactions, identities and temporalities (multidimensional view proposed by King and Lamb is tabulated in Table 6.2). This framework allows for a holistic examination of the complexity involved in ICT use, including factors that impact the user (Lamb, 2006:493). As an empirical model, the multidimensional view draws on institutional theory, structuration theory, and Actor Network Theory. The affiliation and environment dimensions speak to the relationship of individuals with their organisation. Dimensions pertaining to identity and interaction relate to how individuals within an organisation interact and how they project themselves, and the ICT they use within this context.

From the data gathered in this study, and the resulting AUDDE theory, a multidimensional view of an ageing user can be hypothesised. The view does not place the ageing user within a set organisation, but considers instead the more fluid nature of relationships which the user may have with multiple organisations. Lamb and Kling's framework provided a structured way in which to consider and describe the dimensions of an ageing user.

Table 6.2: Multidimensional View of Ageing User

Social Actor Dimension	Characteristics Relevant to Ageing User
Affiliations (Definition: organisational and professional relationships that connect an ageing user to industry, national and international networks)	Relationships are shaped by organisational affiliations. Relationships are fluid and range from once-off engagement, engagement continued as a result of interest, and restricted or time-based engagement.
	Relationships and related informational exchanges change with flows of capital, labour, and other resources.
Environments (Definition: stabilised, regulated and/or institutionalised practices, associations, and locations that circumscribe organisational action)	Environments may exert technical pressures on their members.
	Environmental dynamics vary.
	ICTs are part of the environment.
Interactions	Organisation members seek to communicate in legitimate ways.

(Definition: information, resources, and media of exchange that organisation members mobilise as they engage with members of affiliated organisations)	ICTs become part of the interaction process, as people transform and embed available informational resources into connections and interactions.
Identities (Definition: avowed presentations of the self and ascribed profiles of organisation members as individual and collective entities)	Identities have an ICT use component.
	ICTs can help construct identities.
Temporalities (Definition: socially constructed segmentations of time that shape interactions of an organisation member in response to the expectations of networked affiliates.)	Interactions are responsive to relational time constraints.
	ICTs reinforce (i.e. speed up) existing time constraints and precipitate interaction.

Source of Social Actor Dimensions: Lamb & King, 2003:213, with *Temporality* addition by Lamb, 2006

Ageing users, in their personal capacity, form part of numerous networks. Their affiliations are no longer necessarily related to an organisation that employs them (although many ageing individuals are still active within the workforce). Affiliations do still exist, though, and may take the form of recreational clubs, non-profit organisations, as well as health and wellbeing programmes. As health declines, more ageing individuals find themselves in communities of medical interest, such as medicinal trial groups and support groups for diabetes, cancer, etc. This is by no means the domain of only ageing individuals, but with natural declining health due to the ageing process, it is more prominent in this demographic. The exchange of information is a driver in ICT engagement within this dimension. Relationships with affiliates can range from fluid and easily disconnected (such as interest groups and recreational clubs) to time-based and more restraining ones (a chronic medication trial). Among affiliates, 'different kinds and degrees of connectedness' can be observed (Lamb, 2006:500). As many services move their functions online the capability of an ageing user may directly impact the formation of, and nature of, the relationship with an affiliate. Participants in this study noted their resistance to engaging with new organisations and affiliates that have only an online presence. For example, one participant commented that she loved the idea of using an online airline booking system, but was concerned about not having a physical outlet to visit should she run into problems.

Environmental dimensions that relate to an ageing user acknowledge the various networks of which the individual is a part, and the relating ICTs that enable or support these networks. In contradiction to Lamb's (2003) original definition of a social actor's environment as a representation of the organisation, ageing users are part of a number of dynamic environments shaped by their affiliations. Networks of family members across the globe were a key factor noted by participants in this study, and were included in the personas generated in the workshops. These networks are connected through technologies that include telephones, mobile connections, instant messaging services (such as WhatsApp), video based services (such as Skype) and, in a fewer cases, social media. Beyond communication, these networks are also supported by file sharing technologies. Each networked family environment and selected ICT solution is unique.

The family environment may exert pressure on an ageing individual to use specific technologies in order to engage because the type of technology is prevalent in this environment. An example of this noted in the study was a participant who had been given an iPad with FaceTime (Apple's video and audio calling service), as this was the service already being used within the family network. Ageing users also shape their own social environments. ICT and online services support greater participation in social environments when an individual faces, for example, mobility challenges. Ageing user social environments may include the use of social media, but are not dependent on them.

The prevalent ICT in an environment affects the interactions within that environment. Ageing users' desire to interact with their family network and social network will influence their choice to engage with ICT (as well as the type of ICT). Within these various environments the ageing user may develop a number of identities. These identities can vary from one affiliation to another. In the family network the ageing user's identity may be linked to a preference for physical communication instead of ICT mediated communication. Ageing users may also be associated with the identity of a novice technology user with limited skill and interest. Within a different environment, or affiliation, the ageing user may be perceived as very skilful with specific ICT. An example of this dual identity in this study is Victoria. She spoke of a lack of confidence with applications and technology when communicating with her family abroad. She felt frustrated when family members had to keep telling her how to answer or make a video call, and perceived herself as a perpetual novice in this context. However, within her role as a volunteer administrator she viewed herself as capable and skilled in using ICT. The ICT interaction, affiliation and environment directly form the identities that ageing users exhibit.

Interaction of ageing users with peers, social groups, family networks and other organisations is defined by different temporalities. In Lamb's (2006) definition of a social actor, the notion of temporalities relates to the demand of an organisation member to work and engage faster and more frequently (often mediated and enabled through ICT). Although this definition may not be relevant to the interactions of all ageing users, the concept of temporality does play a role in how ageing uses perceive ICT and engage with it. Ageing users noted a clear sense of disconnection with what they perceived as the 'always on' modern lifestyle.

> *"Some people walk around with their tablet or phone, and they can even have a conversation without having to look up... For me, it's become as I said just now, a relational problem." - Doll*

The perception among ageing participants, who took part in this project, is that technology and online services are 'tools'. As such the use of ICT is not seen as a continuous input in everyday activities, rather an activity that exists within set timeframes. An example of usage that speaks to this was one participant's practice of

leaving her mobile phone in a drawer and checking it at intervals during the day instead of carrying it with her. There was an acknowledgement among participants that online services do speed up activities and contribute to convenience by making tasks easier and faster (such as paying a bill, or banking online).

The multidimensional view of an ageing user informed by Lamb and Kling's (2003:2006) framework is not presented as a finalised view. It is merely a departure point in the framing of an ageing user, as a technology user, in a series of fluid affiliations. If users are framed as equal contributors to socio-technical interactions, they can become active actors in the conceptualisation and design of technology enabled products and services. The possibility of a formal evaluation of an ageing user in this way presents evidence that the AUDDE theory fulfils the validation criterion of modifiability.

6.2.3 Positioning AUDDE: The blurry lines of experience design

The modifiability of AUDDE can be reviewed through the potential links between the subjective theory, and existing frameworks and models from fields, such as ICT, UX (user experience design) and interface design among others. By means of the review of these types of connections, as well as future explorations within this context and additional research, AUDDE can contribute to a formal theory describing ageing user engagement. Explored from a qualitative perspective, AUDDE contributes a perspective of social and individual influence. The qualitative nature of the research directly influences the nature of the theory and the nature of the contribution. In design practice, the human story is what drives the process, but the human story today is also the story of technology, culture, beliefs, environment, governance and policy. In order to investigate fully the human context, and contribute meaningful products and services, designers must recognise the expertise of other disciplines, and consider their impact on the process of design.

Designing for engagement with online services intersects various disciplines, each with their own theory and relevant body of knowledge. Roto (2006:26) makes reference to this when defining user experience, stating that it is a consequence of a user's own personal context (including motivation, needs and predisposition), as well as the characteristics of the system and the context in which the interaction happens. The action of engaging is thus motivated at two levels, by at least two main drivers: *motivational level* needs and *action level* needs (Kankainen, 2002). In short, this indicates that motivational level needs relate to why an individual is completing the action, and the action level needs represent the process and system that allows for the completion of the action:

> … the motivational level of action is engaged with thinking about identity, roles, values and such, and that action level needs connect with usability and tasks (Batterbee, 2004: 48).

Ageing users are not traditionally key participants during the conceptualisation and

design process of online services. Ageing users can be considered marginalised for this reason: through a stereotype assigned by society that defines them as unable or uninterested in participating in the design of these services (Joshi & Bratteteig, 2016:27). This is concerning, as ageing individuals present a growing global market sector for technology use. An example of the global discussion concerning the elderly, and the role which technology can play, is the policy discussion around "welfare technology" - a Scandinavian context that refers to the restructuring of the welfare system in Nordic countries and a focus on additional IT infrastructure to support the system:

> Arguments that older people are among those who have the most to gain from IT development have been reproduced over the years in IT strategies on national and regional levels. As such, welfare technology policy is similar to the previous technology-driven trends that have characterized the emergence of modern elderly care as it refers to the aging society and technology, and the need to open up new business arenas and restructure the welfare state. In Sweden, for example, IT commissions have stressed that elderly people run the risk of being left behind but also that they should be politically prioritized to be included in the IT society (Östlund et al., 2015:84).

To design an online service experience for an ageing user, as for any user, his or her needs, motivations and capabilities must be considered. The social and emotional influences that contributed greatly to AUDDE, are key factors to consider in the design of a user experience as they inform the expectation one has (Batterbee, 2004:48). In order to conceptualise a formal theory of ageing online engagement the relationship between theories and frameworks from varying disciplines must be considered[78]. The existence of common research findings and theoretical components, between AUDDE and existing studies, proposes possible areas for future investigation and validates the future modifiability of the *grounded theory*. To highlight a few of the common theoretical components, reference will be made to four existing theories and frameworks from diverse disciplines.

6.2.3.1 Modifiability: the road to formal theory

The existing theories and frameworks that share common perspectives of findings with AUDDE originate in a variety of fields. Industrial psychology, technology adoption and user experience are only three. To highlight these critical avenues for future research towards formal theory, and to conclude the validity of AUDDE's modifiability, reference will briefly be made to Mäkelä and Fulton Suri's (2001) framework for defining user experience, Locke and Latham's (2002) Goal-Setting Theory, the Unified Theory of User Acceptance and Use of Technology (Venkatesh et al., 2003), and, finally, Hassenzahl and Tractinsky's (2006) reframing of the definition of user experience.

The field of user experience directly impacts the findings of this study, and, in turn, the emerging theory may offer insight into the experience of ageing users for future research and exploration in this field. Although a number of definitions for user experience have

[78] This forms part of the recommendation for future research discussed in Chapter Seven.

been presented in the last two decades, Mäkelä & Fulton Suri's (2001) description of user experience represents a human-focused perspective that acknowledges learning and reflection as part of the process (Figure 6.1).

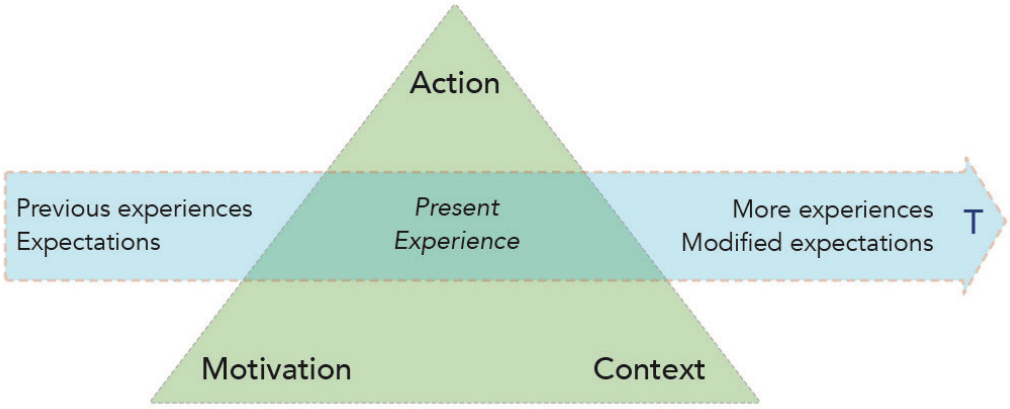


Figure 6.1: User Experience Definition
Source: Mäkelä & Fulton Suri, 2001

Their framework describes user experience within a service context as:

> …a result of a motivated action in a certain context. The user's previous experiences and expectations influence the present experience, and the present experience leads to more experiences and modified expectations (Väänänen-Vainio-Mattila, Väätäjä & Vaino, 2009: 125).

The iterative nature of user experience, with past and present experiences contributing to the future motivation and perceptions of value, is a critical shared theme in AUDDE and Mäkelä and Fulton Suri's definition. The key word to describe the interaction is *experience*, as it relates to more than just completing a task:

> We use the term 'co-experience' to describe experiences with products in terms of how the meanings of individual experiences emerge and change as they become part of social interaction (Battarbee & Koskinen, 2005:7).

The importance of motivation and action within the context of use is highlighted in the definition. One aspect that is only touched upon in this definition is the social context of an individual's meaning-making and motivation. An important contribution of this definition is time as a factor, within the experience journey (Batterbee, 2004:48). Experience changes over time as individuals overcome challenges, their motivations change and their context changes. This implies that experience is not a set variable, but rather a journey of discovery and learning, driven by an internal motivation. The elements explored in Mäkelä and Fulton Suri's definition do not present a contradicting view to the experiences of ageing users documented in this study. Instead, this study's findings and the emerging theory are supported by the definition, and go beyond it to indicate a more procedural view of the 'present experience' - and highlight the influence of social context on engagement.

Goal-Setting Theory (Locke & Latham, 2002), originally from the field of industrial psychology, places great value on the motivation to reach one's goal and explored the components that influence the process of engagement. In experience design, engaging with an online service is underpinned by a goal that the user would like to achieve. The theory draws from, and is consistent with, Bandure's Socio Cognitive Theory, in which human agency is constructed from four core properties: intentionality, forethought, self-reactiveness and self-reflectiveness (Bandure, 2008). These core properties speak to the agency that underpins human behaviour. Intentionality and forethought reflect the action plans which individuals make, the goals they set for themselves, as well as the anticipation of an outcome as a driver for the action. The properties of self-reactiveness and self-reflectiveness share a focus on the individual's learning and experience:

> Agents are not only planners and forethinkers… They adopt personal standards and monitor and regulate their actions by evaluative self-reactions. They do things that give them satisfaction and a sense of self-worth, and refrain from actions that bring self-censure… Through functional self-awareness they reflect on their personal efficacy, the soundness of their thoughts and actions, the meaning of their pursuits, and try to make corrective adjustments if necessary (Bandure, 2011:385).

The process and impact of understanding goal setting is relevant to any domain or action that is self-regulated (Locke & Latham, 2002:712). The focus of Goal-Setting Theory (GST) is on identifying and understanding the properties of a feasible goal. The theory (Figure 6.2) is relevant to studies of user communities, such as the ageing, which are considered technologically marginalised, as it aims to explain the components relating to reaching a goal – such as engaging successfully with an online service.

GST states that the goal core has a number of characteristics, including difficulty and the nature of the goal itself. Lumenburg (2011:4) defines *learning goals* as activities that the individual perceives as opportunities to learn, develop skills and competence through "mastering of a challenging situation", whereas *performance goals* are associated with seeking validation for task completion and may not result in personal knowledge growth. In AUDDE, cognitive processing and learning within the process of service engagement, is fundamental.

GST explores the mechanisms and moderators that impact performance in a user action. These include the goal importance and goal commitment. The importance and commitment which a user places on a goal can reflect the value perception in AUDDE. Feedback is an important part of successful goal completing, as it reveals progress through the process and allows for adjustment if needed (Locke & Latham, 2002:708).

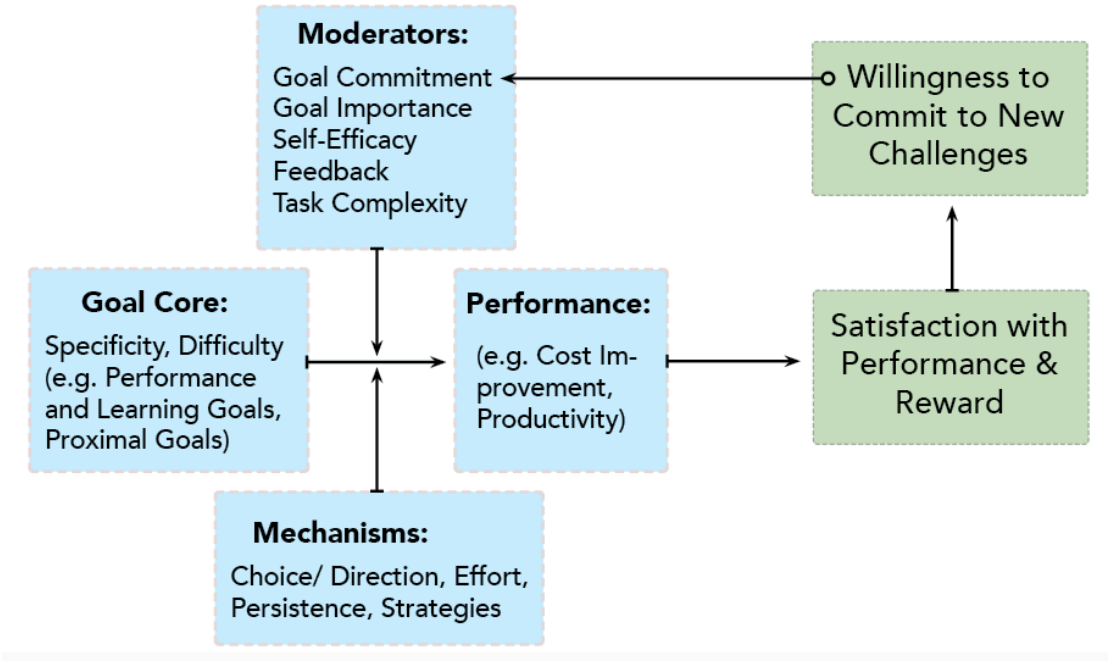


Figure 6.2: Essential Elements of Goal-Setting Theory and the High-Performance Cycle
Source: Locke & Latham, 2002:714

If users are not aware that they have made an error when engaging with an online service that could possibly impede or obstruct their progress, they cannot modify their approach. Feedback also provides reassurance if the user is successfully navigating the service. Motivation is a key component in GST (Locke & Latham, 2002:714). GST proposes that, once the action is complete, the individual reflects on the level of satisfaction he or she feels towards the goal (and the process of achieving it), which impacts his or her willingness to commit to future challenges. The impact of this reaction to a goal and the activities that facilitated the goal are compounded.

> For any given trial, exceeding the goal provides increasing satisfaction as the positive discrepancy grows, and not reaching the goal creates increasing dissatisfaction as the negative discrepancy grows (Locke & Latham, 2002:709).

The same continued evolution of perceived value of engagement, based on personal experience and social context, is present in AUDDE. The perceived engagement value that a user envisions is a catalyst for future use, and possible adoption of an online service.

There are a number of theories and models that aim to define and explain the use of technology. Samaradiwakara and Gunawardena (2014) completed a review of prominent technology use and acceptance theories including: Cognitive Dissonance Theory (CDT), Innovation Diffusion Theory (IDT), Task Technology Fit Model (TTF), Expectation-Disconfirmation Theory (EDT), Theory of Reasoned Action (TRA), Theory of Planned Behaviour (TPB), Social Cognitive Theory (SCT), Technology Acceptance Model (TAM), Model of PC Utilization (MPCU), Motivational Model (MM), Decomposed Theory of

Planned Behaviour (DTPB), Combined TAM and TPB (C-TAM-TPB), Technology Acceptance Model II (TAM2) and the Unified Theory of Acceptance and Use of Technology (UTAUT). Their findings identified UTAUT (Figure 6.3.) as one of the more comprehensive theories relating to "why users accept or reject a technology in a specific perspective" (Samaradiwakara & Gunawardena, 2014:32). The application of the theory in subsequent studies has been criticised; however, the theory itself has proved resilient (Dwivedi, Rana, Chen & Williams, 2011; Taiwo & Downe, 2013).

UTAUT presents a range of potential influences on the acceptance and use of technology. One of these influences is age - denoted as the only influence to affect all indicators of acceptance and use, including performance expectancy, effort expectancy, social influence and facilitating conditions. The reference to age as an influence on acceptance and use of technologies, such as online services, provides future research opportunities and scope for theories, such as AUDDE, which explores experiences of the ageing. The role of social influence is also a shared theoretical component of both UTAUT and AUDDE. Bandyopadhyay and Fraccastoro (2007:530) explored the social influences on acceptance and use (as defined by UTAUT) and found that the effect of societal influence was greatest among ageing females who had limited experience with the technology and felt pressurised to use it. Technology facilitates much of our communication and social relationships – resulting in a greater *technological intersubjectivity* as our "interactions with others and objects are increasingly informed by the logic of technology" (Vatrapu, 2009:697).

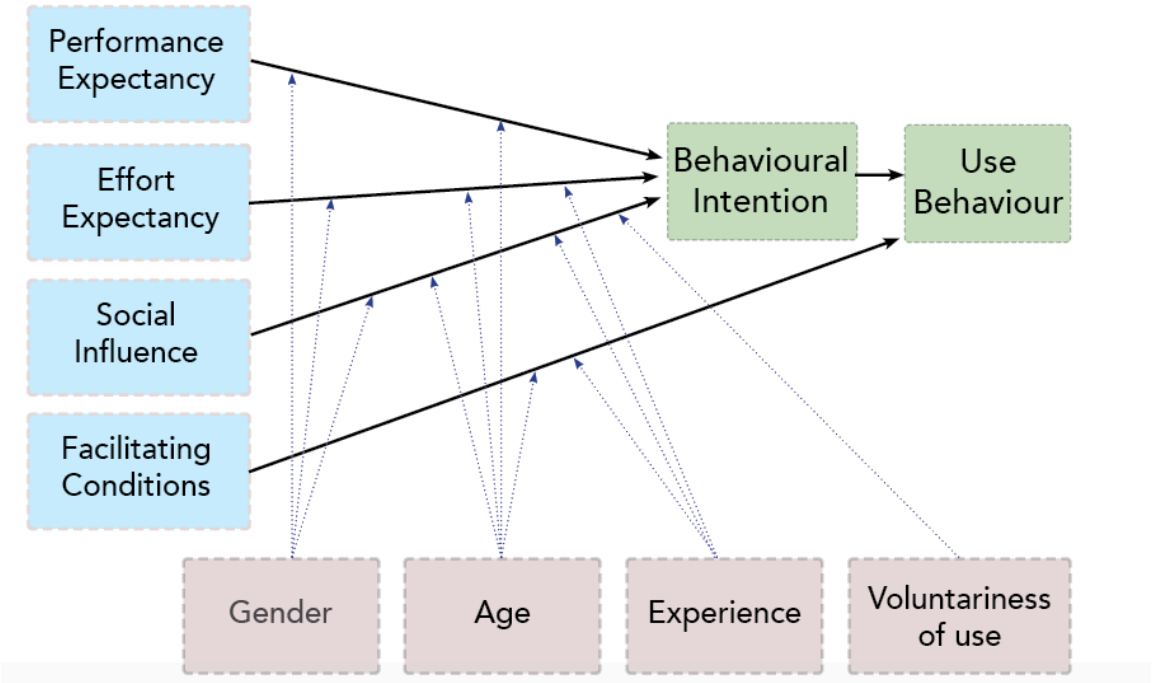


Figure 6.3: Unified Theory of Acceptance and Use of Technology
Source: Venkatesh, Morris, Davis & Davis, 2003

As our society and social relationships become more reliant on technology, the

relationship between technology and social influence becomes more critical to explore, as well as the role that culture plays in defining a user's intention to use a technology (Bandyopadhyay & Fraccastoro, 2007:522). As technologies develop and become more complex, use may become more challenging for specific user groups, and not for others (Samaradiwakara & Gunawardena, 2014:32). In UTAUT the experience of users is a key influence on indicators of acceptance and use. This imbalance may affect the trust that users have in technology (ibid). Technology acceptance and use of models, such as UTUAT and others, may present an opportunity for future research and the unification of substantive theories, such as AUDDE, into a more formal theory of acceptance and use among ageing users. With greater and deeper understanding on the part of researchers, the theories and models that define our engagement with technologies, such as online services, evolve. The definition of how humans experience technologies also evolves as a greater understanding of socio-technical nuance and experience emerges.

Hassenzahl and Tractinsky (2006) proposed an updated definition of user experience (UX). In their study, they highlight the contradiction that seems to surround UX – that both researchers and practitioners are keen to adopt the concept, but at the same time criticise it (and resulting models) as being vague and abstract. In their definition model of UX, three main components contribute to how users engage and experience online interactions: the emotional and affected influences, the experiential influences and influences beyond the instrumental (Figure 6.4):

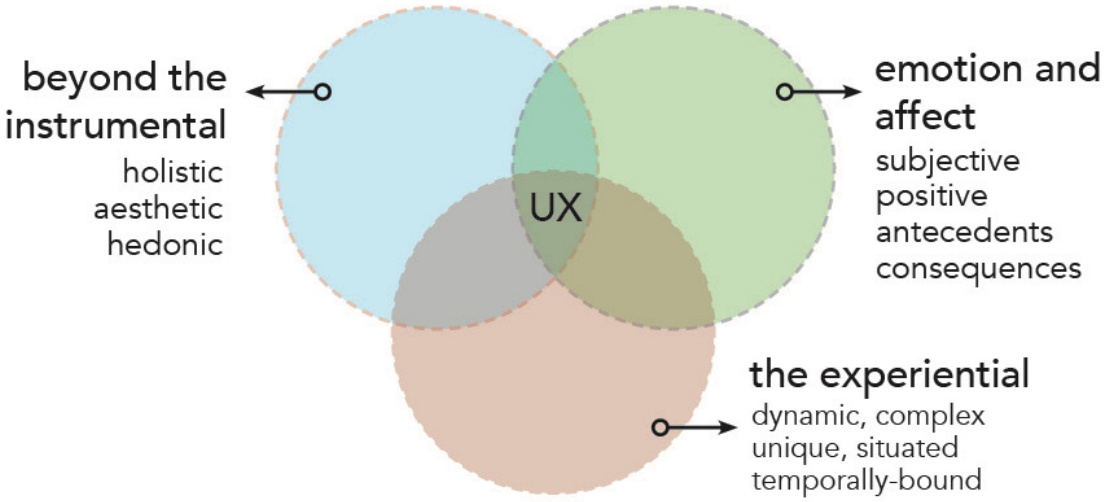


Figure 6.4: User Experience Definition
Source: adapted from Hassenzahl & Tractinsky, 2006:95

Within the proposed definition emotion reactions are considered subjective, and successful user experience should elicit positive emotional responses. The experience of interacting with technologies, such as online services, is dynamic and complex. Interaction considerations should include the 'pragmatic aspects' (i.e. the relationship between the interaction and expected behavioural goals), the 'hedonic aspect', which includes knowledge and skill building through the fulfilment of a user need, and, finally, identification and evocation (Hassenzahl & Tractinsky, 2006:92). Identification speaks to

the ability to express oneself through the interaction while evocation relates to self-maintenance and memories. The main focus of the proposed definition is a human perspective, a focus shared with past definitions, such as the one proposed by Mäkelä and Fulton Suri (2001):

> UX takes a 'human' perspective. It is interested in understanding the role of affect as an antecedent, a consequence and a mediator of technology use. In addition, it is rather focused on positive emotions. To prevent frustration and dissatisfaction had always been a core objective even of the most cognitively driven perspective on HCI (Hassenzahl & Tractinsky, 2006:93).

The reference to frustration and dissatisfaction is important to note, as participants in the present study noted these emotions in relation to their online experiences. It is thus important to identify the design elements that result in these experiences, and to investigate possible design variations that can include ageing users as *active* participants and users. Every experience represents the unique synthesis of a user's goals and expectations with an evolving emotional state from the starting point of the interaction to the end (Hassenzahl & Tractinsky, 2006:94).

6.3 Peer Perception of Users Context

The project explored the perceptions of ageing users as individuals through a range of interviews. Following the interviews, two group workshops were held to discover the view of the group. One of the activities during the workshop was the generation of a persona for what participants considered a characteristic peer. The group discussed their collective experiences and opinions before negotiating a single statement to capture in the persona template. Both the group discussion (captured via recording after gaining informed consent) and the resulting personas offer a unique insight into the perceptions of ageing online services users. Capturing the collective views of participants (as a persona), as well as the individual views from the discussion (audio recording), contributed to the fit and relevance criteria of the final theory as participants in this activity contributed to co-analysis of the context. The method complimented interviews completed earlier in the study: interviews allowed for the capture of unique perspectives and personal experiences while personas offered a more modular and universal perspective of an ageing user.

6.3.1 Co-created personas as a tool for context analysis

The persona activity was supported by an A2 printed persona canvas (right, Figure 6.5) on which the group could capture their ideas. The group was instructed to see the template merely as a departure point, and that categories could be changed or left out completely, depending on what they thought was relevant. The persona template contained three unique discussion areas: *Who is the person? How do they feel about technology?* and *How does the person engage and learn?* After the templates had been completed, they and

the post-its were converted into narrative personas (left, Figure 6.5). These narrative personas have been included as Appendix H.

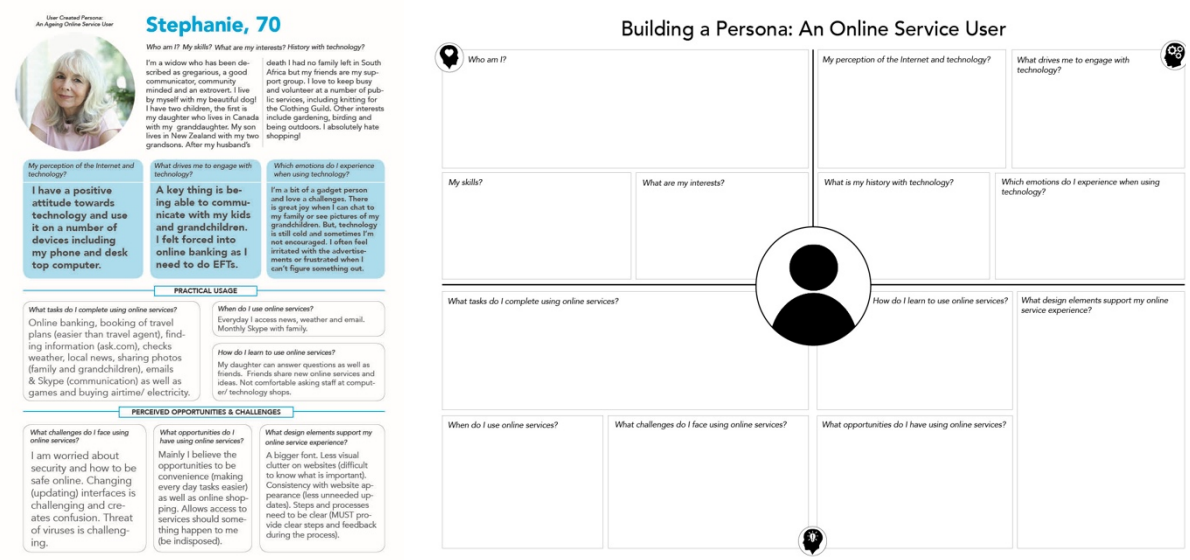


Figure 6.5: Example of Co-Created Personas[79] (left) and Provided Template (right)

Each discussion area contained a number of probing questions to act as catalysts for discussion. The questions included specific and open-ended questions. The collective commentary and group discussion revealed interesting similarities across the four personas created. The similarities began to reveal a shared, or at least generalised, context. Of the four personas created, only one was male. An interesting point that arose during discussions was the number of widowed women, and the collective perspective that more females were ageing alone (often after their spouse had died). All of the personas were single – three widowed and one divorced. All of the personas had children, and all of them had at least one child living abroad[80]. The personas all revealed socially active ageing individuals who had interests, hobbies and even part-time employment. The narrative descriptions of the four personas are detailed in Table 6.3.

Table 6.3: Persona Descriptions

Stephanie, aged 70	I'm a widow who has been described as gregarious, a good communicator, community-minded and an extrovert. I live by myself with my beautiful dog! I have two children; the first is my daughter who lives in Canada with my granddaughter. My son lives in New Zealand with my two grandsons. After my husband's death, I had no family left in South Africa, but my friends are my support group. I love to keep busy and volunteer at a number of public services, including knitting for the Clothing Guild. Other interests include gardening, birding and being outdoors. I absolutely hate shopping.
Astrid van Jaarsveld, aged 71	I'm a divorced woman living in Cape Town. I have a daughter (40) who lives in the UK and a son (38) who lives in Cape Town. I also have 3 grandchildren (two girls, aged 5 and 3, and a baby boy). I'm a social person and an extrovert who belongs to a book club and loves to travel. I used to be an administrator and still work part-time. I'm reasonably patient, good with numbers, and love handcraft, movies, brain games and cooking. I live by myself in a

[79] A4 versions of all personas are included as Appendix H (font size more appropriate for reading)
[80] Of the personas were the location of children and grandchildren were noted.

	cottage. I use basic office software and email in my working life, but went online more often when my children left home. Astrid is very interested in new technology.
Horatio, aged 74	I'm a 74-year young widower living in Cape Town. I'm not very active, but in good health. I'm semi-retired and would be happy to find wife number three. I have three children, one in Cape Town, one in London and one in Australia. Altogether I have 5 grand children and I don't have any pets. I still consult in the banking industry (my previous profession). I enjoy bowls, studying the financial markets, making models, collecting good whiskey and travelling. I have a working knowledge of technology, but will always see it as a tool.
Jenny Johnson, aged 75	My friends describe me as patient, organised, motivating, a good communicator and as a person's person. I enjoy watching sport, listening to music and reading. My musical taste includes playing the violin. I'm a widow with three children, a boy (50 years old) and two younger daughters (45 and 41). I am a teacher at heart and taught at high school level for many years. My main interests include cooking, gardening, photography and travel. I'm a comfortable leader and I'm self-driven. My experience with technology is rather limited.

The general perception regarding technology and online spaces was positive. Main drivers for this include the ability to communicate with friends and family members, access to information, sharing of photos and videos, reservation of tickets and banking services[81]. A number of key catalysts for engagement were shared across personas, clearly highlighting areas for possible online service development. The perception that technology is a 'tool' rather than a key component of everyday life was noted. Perceptions noted for each persona are included in Table 6.4.

Table 6.4: Persona Perceptions of Technology

	My perception of the Internet and technology?	*What drives me to engage with technology?*	*Which emotions do I experience when using technology?*
Stephanie, aged 70	• Positive attitude • Use it on a number of devices (phone and desk top computer)	• Communication (family) • Online banking (felt forced)	• Joy (being able to communicate with family) • Technology is 'cold' • Irritated (with advertisements) • Frustrated (when confused)
Astrid van Jaarsveld, aged 71	• An essential tool. • Scary in the beginning. • Use improves ease • Information overload • Prefers larger screen (desk top over tablet)	• Communication (family) • Online banking • Booking tickets • Information access • File sharing (incl. photos)	• Keen to explore • Love the convenience • Nervous, even fearful (especially with financial transactions)
Horatio, aged 74	• Inquisitive and curious • Happy with level of knowledge	• Communication (family) • Communication (work) • Information access	• Frustrated (slow con-nections**)**
Jenny Johnson, aged 75	• Challenging and informative. • Foreign (did not grow up with technology)	• Communication • Convenience • Fear (of being left behind)	• Joy (being able to communicate with family) • Worried, anxious • Impatient

The co-created personas offered a shared perspective, imbedded in the real experiences and 'voice' of participants. A key feature of discussion was the emotion that engagement elicited. The role of emotion in design is important as it is crucial to understanding the

[81] It is important to note that one persona felt pressured to use online banking services, as banks are perceived to be less inclined to facilitate face-to-face transactions (like EFT's).

experience. Emotions influence an individual's behaviour, and one negative experience can impact future engagements (Batterbee, 2004:52). This is true of face-to-face service interactions, as well as service experiences where the interactions are mediated by technology (Miettinen et al., 2015:46).

The session also provided a communal discussion object – the persona tool. Discussion transcripts offered a unique insight into the perceptions of participants. (Although a facilitator was present, the discussion was driven by participants.) The focus on maintaining these authentic views throughout the coding and theorising process, by continuously returning to the data, contributes to the validity of the *grounded theory*, through the criterion of relevance. Transcripts captured moments of brutal honesty and shared fears, but also reflect an optimism and interest among individuals who view themselves as partial-users or non-users of online services.

6.3.2 Strategic possibilities of this method in Service Design

Personas are used in many different design and ICT related fields. Nielsen (2013) describes the four main persona types that she identified from literature, namely: goal-directed persona (Cooper, 1999), the role-based persona (Grudin & Pruitt, 2002), the engaging persona (Sønderstrup-Andersen, 2007) and fiction-based personas. The fiction-based persona is the only method that does not ground the persona in data or research, instead focusing on the assumptions and description of the designer. The goal-directed, role-based and engaging personas all have unique elements, but share the objective of providing designers (and other stakeholders) with accessible 'user' perspectives, needs, goals and challenges to be considered during the process. A key function of personas is to help designers not to introduce their own assumptions or goals into a project, but instead to focus on the user (Floyd, Jones & Twidale, 2008). The value created is thus focused on the individuals intended to use the service, and not the design team.

From the development of personas one can define the value proposition that a user desires. The critical role of value perceptions as a catalyst for engagement has been explored in the previous chapter. Within *service design* practice the importance, and complexity, of value within the experience of a service is highlighted:

> Service design is about value co-creation. Creating additional value with a service design approach is one of the main motivations for using a service design process. In service design, value is co-created together with customers who want to personalize their use experience. It is clear that service design plays a strategic role in the co-creation of value (Miettinen, Jylkäs, Tikkanen & Jeminen, 2016:448-449).

The participatory manner of creating personas, which was used in this project, offers an opportunity to generate, moderate, analyse and distil user information into a co-created persona within a single research engagement. Through this process perceptions and

experiences can be extracted, but remain 'in the voice' of the individuals who contributed. The corresponding recording of user discussions allows the designer (or other interested party) a glimpse into the process of data analysis within the group. A co-design activity changes the relationships "between individuals and communities, creating more collaborative relationships" (Miettinen et al., 2016:463). This collaboration encourages users to share their real experiences with designers. Through an authentic dialogue with users, online services that relate to the social needs of users can be conceptualised, and attention can be paid to how these services 'fit' into the everyday activities of users (Postma et al., 2012:33). Besides framing the users' decisions, the audio recording used as part of the method, provides additional insights and may reveal service opportunities beyond the ones driving the current investigation.

In product and service design practice one still finds a focus on usability tests, completed towards the later stages of the design process, instead of incorporating the complexity of actual user needs and perceptions in earlier collaborative activities (Miettinen et al., 2015: 40). This practice is changing as a new generation of researchers is "anxiously taking all these complicated and holistic aspects of experience as objects of research through the disciplines of semiotics, phenomenology, and hermeneutics" (ibid). This shift allows for the exploration of the influence and nature of social interactions. Social interactions enable individuals to explore, make sense of, and share their interpretation of the meaning of technology in their lives:

> In interaction, people evaluate their experiences and identify entities of experience that are significant for sharing. These are created into custom-made interpretations according to the interests of the others or otherwise taking into account the gist of what has been previously communicated (Batterbee, 2004: 84).

The designer in this activity is then a collaborator with users (listening, facilitating, capturing and realising) and does not represent a 'field expert' (Miettinen et al., 2015:31). The persona tool facilitates a more strategic sampling of user perspectives that inform current design projects, but may also allude to future opportunities.

6.4 Engaging Experiences: Online Service Design for Ageing Users

Meta-design as an approach focuses on 'objectives, techniques and processes to allow users to act as designers' (Fischer & Herrmann, 2011:1). The approach thus facilitates a process through which complexity can be addressed. It does not offer fixed solutions, but rather an opportunity for stakeholders to collaborate and develop contextually relevant solutions. During the interviews and workshops, participants shared not only perceptions and experiences but also ideas and comments on practical design interventions to make online services more engaging for ageing users.

The need to address users' concerns and make experiences with technology more

accessible and appealing is not a new consideration. Usability, as it applies to computers and software development, has its origins in the 1980's. As more companies began to issue computers to employees for work practice, the need to make processes and activities understandable to the average individual became crucial (Mosier & Smith, 1986). Software design during this period did not, however, acknowledge the challenges that users would face and often developed software products that were difficult to use (Ropohl, 1999:70). As software engineers realised that their products were being used by an array of individuals, with varying degrees of computer literacy, a focus on usability became vital. Key publications during 1980's, and the first computer-human interface conference (1983), focused on establishing early parameters of use and endeavoured to understand the psychological impact of working on computers (Card, Newell & Moran, 1983; Gould & Lewis, 1985; Spencer, 1985; Mosier & Smith, 1986; Rubinstein & Hersh, 1987). During this period usability focused on the degree of practical usability of a software product and interactive system, not on how well the solution addressed contextual use issues. This gave rise to the evolution of two distinct perspectives of usability - that of feature-based usability and that of contextual usability.

Feature-based usability relies on the system to provide feedback to the user. This feedback ensures that the user understands what is happening and that he or she is supported by the system to respond to system prompts when required. Contextual usability is grounded in the interaction, and relationship, between the user and the system. The context of the user, and the context of use, both play a role in evaluating the product fit. Various evaluations have been developed to test both scenarios, and have also evolved into distinct methodologies: one evaluating the system through empirical data generated by system itself (based on actual use), and the second that evaluates the user interacting with the system (Vermeeren, Law, Roto, Obrist, Hoonhout & Väänänen-Vainio-Mattila, 2010:522)

Various methods have been used since the 1980's to evaluate usability, such as Nielsen's *heuristic evaluation*, which was very popular in the 1990's (Nielsen & Molich, 1990). The method uses a small test group to evaluate the interface of software against predefined usability principles (Table 6.5). In 1998 usability was included in ISO standard 9241 pt11[82], which defines usability as the "extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use" (ISO 9241). The definition draws from the earlier work of Shackel (1990). The focus on context of use and satisfaction established the groundwork for design practice that acknowledges the interaction between the user and technology.

[82] ISO 9241-11:1998 Ergonomic requirements for office work with visual display terminals (VDTs) -- Part 11: Guidance on usability

Table 6.5: Nielsen's Usability Heuristics

Usability Principle	Comment
Visibility of system status	The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.
Match between system and the real world	The system should speak the user's language with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.
User control and freedom	Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. Supports 'undo' and 'redo'.
Consistency and standards	Users should not have to wonder whether different words, situations, or actions mean the same thing.
Error prevention	Even better than good error messages is a careful design, which prevents a problem from occurring in the first place. Either eliminate error-prone conditions or check for them and present users with a confirmation option before they commit to the action.
Recognition rather than recall	Minimise the user's memory load by making objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.
Flexibility and efficiency of use	Accelerators - unseen by the novice user - may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.
Aesthetic and minimalist design	Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.
Help users recognise, diagnose, and recover from errors	Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.
Help and documentation	Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.

Source: Nielsen 1994a; Nielsen, 1994b

Throughout the 1990's various usability-testing methods were developed, many representing a growing shift towards understanding the complexity of socio-technical

interactions. Today methods used to explore the human experience of systems and software are numerous and include Co-discover, Contextual Laddering, Emotion card, Immersion, Living Labs and Interviews (AllAboutUX, 2016). Since the late 1990's publications and research extensively explore the human experience, and the term *user experience* has been defined (Fleming & Koman, 1998; Krug, 2005; Albert & Tullis, 2013). This focus is the foundation for the 2010 revision of ISO 9241-110 that defines user experience as "a person's perceptions and responses that result from the use and/or anticipated use of a product, system or service" (Vermeeren et al., 2010:521). Design for the human experience has become a key component of various design approaches, producing physical and digital artefacts, as well as services.

With the increase in services being offered online, the need to understand and acknowledge the human experience becomes critical. From findings documented during the interviews and workshops a number of practical design principles emerged. In order to structure the findings, Nielsen's *usability heuristics* were referred to as an organisational framework (Table 6.6). The principles presented are thus directly pulled from the research data. Added to the original findings from this study, were elements highlighted in literature sources[83]. Nielsen's criteria are not elevated or presented as the only, or most recognised, usability framework, rather it presented a logical and appropriate framework to organise what was found in the data. Additional elements included in Table 6.6 were referenced by participants during interviews and group discussions during the workshop, not tested against Nielsen's principles.

Table 6.6: Principles to Engage Ageing Users

Nielsen's Usability Principle	Engage Ageing Users on Online Service Interfaces
Visibility of system status *Keep users informed.* *Give appropriate feedback.*	• Browsers' auto-complete function caused concern. • Browsers' remembering passwords and usernames caused concern. • Clearly describe need for software update and process. • Allow users to remove sensitive information (such as credit card details) or clearly communicate that the information has not been saved. • The interface must clearly acknowledge that an action has been initiated (i.e. a button was clicked). • During longer tasks, give clear feedback on progress and reminders of goals (Campbell, 2015). • There should be differentiation between visited and unvisited links (Zaphiris, Kurniawan & Ghiawadwala, 2007:64).

[83] The principles and design requirements extracted from literature are referenced to indicate the original source. Unreferenced entries were identified during primary research activities and data analysis.

	• Introduce product features gradually over time to prevent cognitive overload (Campbell, 2015).
Match between system and the real world *Uses language, phrases and concepts familiar to the user. Follow real-world conventions.* *Making information appear in a natural and logical order.*	• Work with what is familiar or contextually relevant. • Avoid gimmicky and trendy interaction designs. • Focus on logical progression. • Use wordings that suit older adults' semantic field (Barros, Leitão & Ribeiro, 2014:376) • Ageing users many not complete tasks as quickly as other users; so allow for greater time intervals in interactions, i.e. server timeouts, inactivity warnings (Campbell, 2015).
User control and freedom *Allows for an "emergency exit".* *Supports 'undo' and 'redo'.*	• Reassure users when completing an action (confirms that user will not automatically 'delete' everything with a single action). • Clearly communicate ability and method of returning to a previous step.
Consistency and standards *Words, situations, or actions must mean the same thing.*	• Diversity across platforms is challenging for older individuals to learn and navigate. • Short-term memory can suffer with age, and users may remember the process of completing a task, but may not be able to adapt and apply that skill to master new services for interfaces. • Maintain interface consistency when updating software versions (Phiriyapokanon, 2011:31).
Recognition rather than recall *Minimise the user's memory load.* *The user should not have to remember information.*	• Provide reminders and alerts as cues for habitual actions. • Audio promotes can support memory of past actions. • Assigning a colour to a specific action type of function throughout an online service encounter may support use. • Avoid splitting tasks across multiple screens if they require memory of previous actions (Campbell, 2015). • Don't make assumptions about prior knowledge (Campbell, 2015).
Flexibility and efficiency of use *The system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.*	• The ability to personalise services offers added value. • Provide users with shortcuts to actions which they perform regularly. • Easy customisation of most used actions within the service aids in reducing information overload.

	• Make 'accessibility settings' easy to identify and navigate (specifically focus on how to adjust text size and colour). • Text size 14 (~5mm on 72 dpi screen) or higher, using sans-serif fonts - avoid using decorative fonts (Phiriyapokanon, 2011:25). • Reduce the distance between interface elements that are likely to be used in sequence (such as form fields), ensure they are at least 2mm apart (Campbell, 2015). • The touch sensitive area/size of button should be 16.5 mm to 19.05 mm (Phiriyapokanon, 2011: 25). • Interface elements to be clicked with a mouse (such as forms and buttons) should be at least 11mm diagonally (Campbell, 2015). • Avoid using the scroll bar (Phiriyapokanon, 2011:25).
Aesthetic and minimalist design *Remove irrelevant or rarely needed information.*	• Participants preferred clear action buttons. • Language referring to actions required must refrain from using technical jargon and must be simple. • Graphic symbols must be easy to understand. • Provide text backup for graphic symbols to ensure clarity of communication. • Ensure sufficient contrast between text and background. • Clearly display action buttons. • Avoid images on backgrounds (decreases visibility). • Avoid animations (decreases visibility). • Background should not be white (Zaphiris et al., 2007:64). • Not all content should be in colour (Zaphiris et al., 2007:64). • Avoid blue colours on interface elements (Campbell, 2015). • Coloured text on coloured background should be avoided (Zaphiris et al., 2007:64). • Simplify the structure of tasks in order to reduce the cognitive load associated with short-term memory and problem solving (Reason, 1990). • Clearly detail the steps required for an action-sequence (Ordonez et al., 2011:217).
Help users recognise, diagnose, and recover from errors *Error messages should be expressed in plain*	• Detail an error in clear, simple language. • Suggest possible reasons for the user's having

language. Suggest a solution.	encountered an error (support independent learning). • Reassure the user that the error will be resolved once the message is acknowledged, or clearly explain if a more serious error requires attention. • Add additional information to help users resolve errors. • Clearly indicate in plain language when the system has made an error to reduce stress experienced by a user – let the system 'take the blame' (Reason, 1990). • The 'Undo' facility must be easy to use or recognise (Phiriyapokanon, 2011:25).
Help and documentation *Information should be easy to search, focus on the user's task, list concrete steps to be carried out, and not be too long.*	• Participants noted that the 'help' function is often too complex to navigate and they lack confidence with traditional troubleshooting. • Information overload is challenging for ageing users; present the most likely solutions first. • Reduce the usage of error messages as much as possible (Phiriyapokanon, 2011:25).

6.6 Conclusion

This chapter focused on successfully validating the emerging theory, AUDDE, against Glaser's criteria. By means of the analysis the relevance, fit and workability of the substantive theory was established. A range of established theories from both design and IS were introduced to showcase the modifiability of AUDDE. The introduction of Mäkelä and Fulton Suri's (2001) model, that defines experience as motivated action in a context, Locke and Latham's (2002) Goal-Setting Theory from industrial psychology, the Unified Theory of Acceptance and Use of Technology (Venkatesh et al., 2003), and Hassenzahl and Tractinsky's (2006) reframed definition of user interaction, does not present a finite list of theories which share conceptual elements with AUDDE, nor are they explored in great detail. The intention of the introduction of these theories merely aims to showcase the *potential* for comparison and future study, thus establishing the modifiability of the emerging theory. A key similarity in all the introduced theories - and AUDDE - is the focus on both the system (technological component) and the human, and their complex relationship that emerges through engagement.

The relationship reflects the information system levels which Whitworth (2006:533)[84] discussed to express the intricacy of a socio-technical system. In this view a socio-technical system consists of various layers of levels, each dependent on the one below (explored in Chapter 2). AUDDE speaks to the *social* and *cognitive* levels of Whitworth's

[84] This is discussed in section 2.4 Understanding the Networked Society, Chapter Two.

(2006) socio-technical system – not as separate layers, but rather as a continuously negotiated interaction space. *Social* considerations include: 'Norms, culture, laws, zeitgeist, sanctions, roles', while *cognitive* speaks to 'semantics, attitudes, beliefs, opinions, ideas, morals'. This level of intertwined interaction is influenced by, and, in turn, influences the subsequent level, *information* (including elements, such as 'software programs, data, bandwidth, memory, processing').

AUDDE does not aim to be a formal explanation of the context, but rather a contribution to be built upon in order to understand how ageing users engage online. Interaction and engagement cannot be defined solely from a system perspective, or the user's perspective, as it is a complex interplay between the two. The ageing user is a social actor within the space of the interaction. In order to facilitate engagement, the design of online services, and the systems that enable them, must be considered. The benefits of technology to the ageing user move beyond mere convenience, allowing individuals to age-in-place and live independently for longer, even though they may be struggling with mobility or suffering physical decline.

> Aging is an inevitable biological process. Although aging effects cannot be reversed, the aging pace in declining functions can be mitigated by human factors and understanding how human and computer interaction works (Rivera-Nivar & Pomales-Garcia, 2010:958).

The perceptions of ageing users, explored through the emerging substantive theory detailed in this chapter, informs practical design elements that can make an interaction more engaging. The heightened engagement is influenced by emotional responses, an acknowledgement of different life stages and a design that supports changing cognitive ability. When designed in collaboration with ageing users, online service interfaces can support engagement, instead of hindering it. Design considerations range from the very practical, such as avoiding blue shades on interfaces and being careful not to place action buttons too close to one another, to more systems-focused elements. System considerations include the focus on stepped action sequences with clear guidelines on how to proceed (and reverse steps) as well as a redesign of error messages and their content. Engagement and continued use are beneficial to both the ageing individual, as well as the service provider (whether the provider is a commercial entity, a retailer, a civic body or an organisation focused on supporting the health and wellbeing of ageing individuals).

Chapter Seven builds on the discussion of applied contributions from this chapter. It also reviews the theoretical findings in line with criteria defined by Charmaz, which is crucial as the *grounded theory* method applied in this study is Charmaz's *constructivist grounded theory*. The chapter also explores the methodological implications of and contributions to *grounded theory* through the lens of design research. Finally, by exploring the findings of this study in line with the original research questions, the findings of the study are concluded and future research is recommended.

Chapter Seven
Conclusion: Theory, Method and Contribution

Chapter Content

7.1 Introduction

This chapter aims to collate and describe the contributions of the study, as well as present key conclusions. Contributions include a summative theory that defines the nature of ageing users' engagement with digital services, as well as a description of the digital context which these individuals experience (from a South African perspective). In order to establish whether the findings of this study respond to the original research questions (detailed in Chapter 1), they are restated in this chapter, and serve as a framework to summarise findings. The chapter also summarises practical and applied findings that relate to the practice of service design and design in general. This includes a review of methods and tools to be used within the service design framework, as well as practical design considerations for more accessible online and digital service environments. At the core of this study is the interaction between the ageing user and the service design research.

The profound role that the end-user plays in the design of an online service cannot be overstated, and is heavily influenced by the context of the user. The participants in this study represent a spectrum of online service proficiency, from novice to experienced online service users, over 65 years of age. The key factor that influenced eligibility was that participants had to have access to online services, either via a private or shared device. Early work by Holstein and Mitzen (2001:100) influenced how the researcher approached working with ageing participants: viewing them as individuals who do not need to be 'rescued', as individuals who still play an active role in society (making them a viable target group for product and service innovations), and, finally, as active agents of change within their own lives and contexts.

Finally, the chapter outlines future research opportunities and reflects on the learning process experienced during the completion of the study.

7.2 Grounded Theory and the Practice of Service Design

The use of *constructivist grounded theory* as the methodology for this study resulted in a complex and iterative cycle of data collection and analysis. The implication of such a way of researching is that it can be very complex and time consuming (Bartlett & Payne, 1997, in McKenzie et al., 1997). In order to assist with the documenting of qualitative findings and data analysis, *Atlas.ti* was used as a supportive software. The study followed a traditional grounded method in that the theory emerged from the data and patterns within the data (Glaser, 1992:4). Formulation of the theory was not influenced by pre-existing frameworks, theories or academic perspectives until the new substantive theory began to emerge.

The process of research was thus one of open investigation and meticulous documentation. Ideas, experiences, perceptions and observations were all considered when engaging with the participants. The same manner of interaction is advocated in service design – acknowledging the end-user and making him or her a collaborator in the service design process (Bradwell & Marr, 2017:13). Charmaz (2006:67) encourages the *grounded theory* researcher to acknowledge any preconceived ideas or assumptions – a condition that is also present within service design processes and context exploration. Both *grounded theory* and service design encourage the researcher to engage openly and meaningfully with findings to gain a "…deeper level of understanding" (Charmaz, 2006:70). In order to highlight the possible areas of correlation and interdependent development, both the applied findings (relating to methods and tools) and theoretical findings (moving from practice to theory) must be considered.

7.2.1 Methods and tools relevant to design

During the workshops a number of methods and tools were utilised. These included interviews and a group persona tool (discussed in Chapter Six, section 6.4.1 Co-created personas as a tool for context analysis) which offers service design practitioners the ability to gain group-consensus through discussion, documented on a paper template with supporting audio discussion. Personas offer designers the opportunity to focus on the input of users, without imposing their own assumptions - consciously or subconsciously – on the final design (Floyd et al, 2008). In the context of service design, personas facilitate a co-creation of value and a process to document the needs and expectations of users, such as personalisation of service experiences (Miettinen et al, 2016:448).

Within the study, the collaborative persona template allowed for a user-driven conversation, which allowed participants to drive the investigation and change the traditional researcher-designer-participant relationship. Giving ownership of the activity to the participants encouraged them to share more freely. The main attributes that define the group persona tool used in this study, are:

- A focus on facilitating engagement and discussion among participants in a user-driven activity;
- Providing a range of physical materials (notes, pens and a single large persona template) to capture and support the discussion as it unfolds;
- The participatory generation, in-situ moderation and analysis of user information within a single research engagement;
- Perceptions and experiences of users being captured in their own words;
- The corresponding audio recording allowing the designer and researcher to revisit the discussion and trace how experiences were captured and perceptions distilled during the discussion.
- The corresponding audio recording may provide additional insights or reveal service opportunities beyond the ones driving the current investigation.

The group persona tool represents a service design tool, reimagined in order to engage with participants in a *grounded theory* study, and to encourage discussion as a form of gathering research data. The benefit for *grounded theory* studies is the participatory aspect: engaging tools and methods that encourage involvement. The benefit of grounded theory practice for fields, such as design, is the ability to generate theory through practice – contributing to the design body of knowledge.

7.2.2 Data analysis to promote theory from practice

Friedman (2003:513) refers to science as ideas and observations organised into theory. Part of theory construction, in the view of Friedman, is a systematic analysis of what was observed and learned throughout the process (ibid). In design, exploration and observation are traditionally guided by the context of the proposed product or service, or facilitated through a set of narrow requirements. The applied nature of design research is often focused on creating a solution, or improvement, to a specific situation. In order to formulate theory from design research a structured, methodical process must be implemented to help explain the observed phenomena (McNeil, 1993). If theory is to be generated from design practice, these processes must be crafted and applied from the very beginning of the process in order to ensure that controlled standards are in place. The resources required to develop a service of artefacts (physical and digital) can be immense, and can yield a more valuable solution if the process contributed to both the theoretical body of knowledge, as well as to the practical solution (Barab & Squire, 2004). The contribution of theory to design fields does not only represent current contexts and knowledge, but also provides a theoretical legacy upon which new theories can be constructed.

This study generated a substantive theory which speaks to two bodies of knowledge. The first is gerontology, in that the study documents and proposes a theory for online engagement among ageing individuals. The study thus documents the contexts, perceptions and experiences of ageing participants. AUDDE contributes significantly to the service design body of knowledge in that it explored how a target segment locates, interacts and responds to online services, and provided a theoretical position to make these experiences more engaging. Given that the ageing population presents a financially viable market segment there is room for service development within this space.

> The changing demographics and the aging of the population are affecting the age composition of consumer markets. This in turn, creates opportunities and challenges for organizations serving consumer markets (Moschis, 2003:525).

The *grounded theory* method explored in this study could provide service design researchers with a systematic approach to documenting, reviewing and analysing data generated throughout the research period in order to formulate substantive (as well as formal) theory. *Constructed grounded theory* in particular offers design a suitable theory-

generating method as it acknowledges that meaning is created through the interaction of researcher and research participant (Charmaz, 2008:2009). The process of completing a *grounded theory* process, as explored and experienced through the completion of this study, provides the following opportunities to service design researchers:

- A systematic method to document observations and other research data: As processed data, the findings from one research activity can be made available to future projects, where and when appropriate.
- Memos provide an opportunity for continuous interpretation and analysis throughout the process. By providing a separate tool (a memo) to explore assumptions, meaning and interpretation, the original documented data can stay in the 'voice' of participants, allowing researches to return to the 'raw' findings. Memos captured in-situ allow for the immediate capture of 'gut feels' and rough design considerations without compromising the user perceptions and experiences being shared at the time.
- The process of coding (open and focused) provides a method to explore a vast amount of qualitative findings and extract key focus areas. The coding process allows all knowledge gathered to be included in the analysis. The key focus areas enable the researcher to gain a greater understanding of the context explored and may inform possible service design concepts.
- Waiting for research saturation before concluding the analysis process ensures that the researcher has not missed possibly unique and vital information.
- Theoretical coding facilitates the emergence of a *grounded theory*.
- By organising the analysis of findings in a systematic process one can review decisions and 'move backwards' to change design direction if needed.
- Emerging theories can be shared and developed in future studies, providing a platform for ongoing development and a greater understanding.

The opportunities indicated above will allow for duel outcomes of the service design research phases: knowledge and requirements to inform the creation of a practical design solution, as well as theory. The following challenges must be considered when endeavouring to construct theory from service design practice using a *grounded theory* methodology:

- The grounded approach requires commitment from the service design researcher(s) and a familiarity with the *grounded theory* methodology.
- For the emerging theory to be valid, saturation must be reached prior to final theory construction. This would require a design research study to engage with participants until saturation. Depending on the number of participants required, it may have time and financial implications.
- To ensure findings are viable for analysis they must be clearly documented, securely stored and fully processed.

- Manual coding is possible, but given the possible amount of data generated assisting software may be required (this would have time, financial and skill-based implications).
- Additional time must be allocated to the design research process to allow for coding and theory development.

7.3 Contributions of the Study

In order to conclude the study, it is imperative to revisit the original research questions. Stated in Chapter One, the research questions aimed to explore the perceptions and experiences of ageing individuals online, as well as the larger context in which these interactions occur. Throughout the chapters these questions were explored and answered, as indicated below:

7.3.1.1 The online service interaction of an ageing individual

Research Question: What are the constructs, propositions and definitions that explain the online service interaction of an ageing individual within a socio-technical context?
Discussion: The theory addressing these is introduced in Chapter Five, *5.5 Ageing User Decision-Determined Engagement (AUDDE)* and is concluded in section *7.3.2 Unique theoretical and applied contribution of the study.*

AUDDE as a substantive theory explores the context and process of ageing users engaging online. The theory defined engagement among the ageing participants as a cyclic process of ascertaining the value of online service engagement against the perceived effort of doing so. The theory proposes a three-phase model of engagement which places emphasis on continuous learning, reflection and critical decision-making. The implication is that ageing users do not simply adopt, or use an online service. Instead their willingness to engage is grounded in a personal and social understanding of value, informed by past experiences.

7.3.1.2 Constructing theory using a service design thinking approach

Research Question: How can theory be constructed through participation of the target group, using a service design thinking approach?
Discussion: The influence of a service design approach in the development of research tools is detailed in Chapter Six, *6.4 Peer Perception of Users Context.*

The importance of participant participation cannot be overstated. In order to capture participants' perceptions, and formulate a substantive theory from these, it was crucial to place emphasis on the development of research techniques and tools that encourage participation. In fields of design such as user interaction, product design, visual communication and service design it is imperative that the concerns and needs of the end users and other relevant stakeholders are present throughout the design process. This

practice safeguards that the end result meets the needs of end-users, well taking into account the logistics of those involved in delivering the design solution. Service design thinking offers the design practitioner a critical approach to review decisions made during the service design process, and support in selecting methods that encourage user participation.

This study, however, focused on the development of theory and not a practical service solution. Service design methods proved to be successful within the *constructivist grounded theory* approach, as they placed the individual at the centre of the research activity. The persona method was adapted for this study to facilitate group discussion and allowed participants to share their views verbally, as well as captured in a physical artefact (the group persona produced during the research workshops). This element allowed the individual views of participants to be considered as a single narrative, as well as part of a larger narrative. Niehaves (2007) proposed that understanding is achieved when one considered independent forms of meaning, as well as the whole of which they may form a part.

The service design thinking approach facilitated the realization of Klein and Myers' (1999) principles for an interpretive study, in that it allowed for a critical reflection on the social and historical background of the research setting. The approach also allowed the researcher to capture different interpretations among participants and to allow multiple narratives. Throughout this study, emphasis was placed on capturing the real views of ageing individuals, and endeavouring to keep their voices heard in the final outcomes (whether the outcome was theoretical or practical).

7.3.1.3 Design characteristics of an online service for an ageing user

Research Question: What are the design characteristics of an online service suitable for an ageing population?

Discussion: The design implications are detailed in Chapter Six, *6.5 Engaging Experiences: Online Service Design for Ageing Users,* and is concluded in section *7.3.2 Unique theoretical and applied contribution of the study*

From a practical perspective, the greatest needs noted were ones that require a methodical and systematic approach to the design of interfaces. In order to meet the needs of individuals will progressive cognitive decline, online services must refrain from what is fashionable and trendy, instead concentrating on building a more focused process of engagement across services and devices. If an individual feels confident in the online activity they are engaged with they are more likely to successfully navigate a problem when encountered. From a purely design perspective the influence of visual impairment and declining dexterity must be considered across of a range of design elements; including active buttons, text and imagery.

The safety and security of an individual online should also be considered as a design challenge. For some users, the auto-complete function or a service remembering usernames and passwords causes concern. Online services should clearly communicate safety information and safety features should be accessible. Error messages should help even a novice user to understand the possible causes in clear language – avoiding jargon.

In addition to the contributions mentioned above, the study explored (through literature) the context of online service use in Chapter Two. To summarise the contributions of the study, the key insights gained will be highlighted and restated.

7.3.2 The online service context explored

Discussed in Chapter Two, the initial review of literature aimed to explore and define elements that influence the problem context. Our networked society allows us to connect, work and communicate across continents and time zones (Castells, 2014). The online world offers the user the ability to engage with civic organisations, healthcare providers, retailers and many other services. Every user chooses how he or she would like to engage, whether cautiously or freely, or somewhere in the middle (Christodoulides et al., 2011). Ageing users also require technological solutions, such as online services, that respond to their needs instead of only contributing to more unfulfilled expectations (Östlund et al., 2015:89).

Once relevant online services are available the user may still face a challenge when trying to gain access. To benefit from the online world one must have access, as well as the ability to engage meaningfully. A set of key points emerged from literature during the process of defining the context in which this research project is positioned. The emerging components relate to the larger digital context within South Africa, and do not relate specifically to the ageing user group.

- In order to foster economic equality, democracy, economic growth and social mobility the digital divide must be closed, granting cost-effective and reliable access to all (Tolbert & McNeal, 2007; Miniwatts, 2015).
- South Africa has experienced substantial growth in IP connected devices from 2000 to 2017. However, infrastructure and cost of access to online services is problematic in many contexts - rural areas facing the most significant challenge (CISCO, 2015; Miniwatts, 2017).
- Access to online services within South Africa often happens through a mobile device as the infrastructure is more expansive (Effective Measure Report, 2016).
- Access often happens through shared devices, or shared spaces (such as libraries and internet cafes) which impacts the level of user comfort and confidence to engage (Johnson et al, 2012:2469).
- How individuals engage online cannot be understood exclusively from the human (or machine) perspective, but must be considered as an interconnected relationship - socio-technical interaction (Nascimento & Pólvora, 2013:33).

- It is important to consider the complexity of the design of the interaction and interface as part of the development of an online service, as this represents the touchpoint between the technology and the user (Norman & Stappers, 2015).
- Access alone is not the only challenge to online engagement, as individual assumptions, preferences and literacy also influence one's decision to engage (Norman & Stappers, 2015).
- Technological solution designs must actively include the end-user in the process as a co-creator of the solution; for example, meta-design approaches, service-dominant logic, service design approach (Fischer & Herrmann, 2011).
- Solutions must relate to real-world needs and lived experiences of end-users (Fischer & Herrmann, 2011).

7.3.3 Unique theoretical and applied contribution of the study

The study contributes to both the practical requirements for an engaging online service for ageing individuals, as well as a theory that describes the decision-driven engagement of ageing online service users. The study is underpinned by a focus on active engagement between participant and the researcher.

In Chapter Six a comprehensive table (Table 6.7: Principles to Engage Ageing Users) highlights the practical design elements observed and noted throughout the study, as well as design criteria highlighted by other authors. The design principles were organised using Nielsen's (1994) usability criteria in order to collate findings in a logical manner (the criteria were not used in the research to identify the principles, rather merely as an organisational construct). The practical design considerations highlighted in this study, include[85]:

Visibility of system status

- Browsers' auto-complete function caused concern.
- Browsers' remembering passwords and usernames caused concern.
- Clearly describe the need for software updates and processes.
- Allow users to remove sensitive information (such as credit card details) or clearly communicate that the information has not been saved.
- The interface must clearly acknowledge that an action has been initiated (i.e. a button was clicked).

Match between system and the real world

- Work with what is familiar or contextually relevant.
- Avoid gimmicky and trendy interaction designs - focus on logical progression.

User control and freedom

- Reassure users when completing an action (confirms that user will not automatically

[85] The design guidelines presented here are not presented as unique insights, as many have also been identified previously. The defining characteristic is that the criteria must have been observed within this study, through primary research engagement.

'delete' everything with a single action).
- Clearly communicate ability and method of returning to a previous step.

Consistency and standards
- Diversity across platform is challenging for older individuals to learn and navigate.
- Short-term memory can suffer with age, and users may remember an earlier process of completing a task but may not be able to adapt that knowledge/skill in order to master new services for interfaces.

Recognition rather than recall
- Provide reminders and alerts as cues for habitual actions.
- Audio promotes can support memory of past actions.
- Assigning a colour to a specific action type of function throughout an online service encounter may support use.

Flexibility and efficiency of use
- The ability to personalise services offers added value.
- Provide users with shortcuts to actions they perform regularly.
- Easy customisation of the most used actions within the service aids in reducing information overload.
- Make 'accessibility settings' easy to identify and navigate (specifically focus on how to adjust text size and colour).

Aesthetic and minimalist design
- Participants preferred clear action buttons.
- Language referring to actions required must refrain from using technical jargon and must be simple.
- Graphic symbols must be easy to understand.
- Provide text backup for graphic symbols to ensure clarity of communication.
- Ensure sufficient contrast between text and background.
- Clearly display action buttons.
- Avoid images on backgrounds (decreases visibility).
- Avoid animations (decreases visibility).

Help users recognise, diagnose, and recover from errors
- Detail errors in clear, simple language.
- Suggest possible reasons for users' encountering an error (support independent learning).
- Reassure users that the error will be resolved once the message is acknowledged, or clearly explain if a more serious error requires attention.
- Offer additional information to help a user resolve an error.

Help and documentation

- Participants noted that the 'help' function is often too complex to navigate and they lack confidence with traditional troubleshooting.
- Information overload is challenging for ageing users; present most likely solutions first.

The principles defined as action points provide online service and interface designers with practical elements to consider. These findings were noted throughout the study, as data were gathered for theory construction. As the data were coded, especially in the open coding process, the applied findings became apparent. As directed by the *grounded theory* method, the applied findings were considered along with more emotional and experience-driven findings in the coding process. This study documented the emergence of the Ageing User Decision-Determined Engagement (AUDDE) theory, through open, focused and theoretical coding.

AUDDE has been discussed and evaluated using the criteria defined by Glaser and Strauss (1967). The unique perspective and contribution of AUDDE is to view engagement not as a linear model of acceptance followed by use, but rather as a complex iterative process of negotiated engagement, in which the willingness to engage in future interactions is influenced by various past experiences. Past experiences can refer to both previous online services experiences, as well as social influence. In order to reflect on the key contributions of AUDDE, the visualisation in Figure 5.7 is included again:

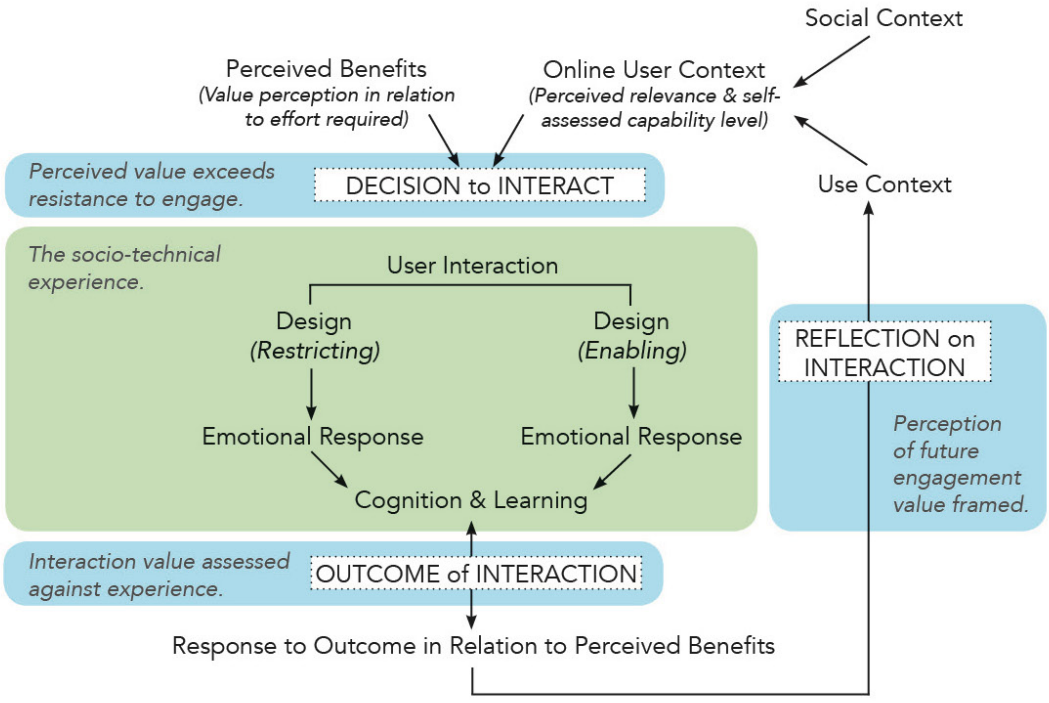


Figure 5.7: Theory of AUDDE (Ageing User Decision-Determined Engagement)

AUDDE is a substantive 'working-theory' with transferable elements – meaning that elements of the context can be used in future studies given that they share 'similar characteristics to the context under study' (Dwivedi, 2009:55). AUDDE explores the context and process of ageing users engaging online. The theory defines a cyclic process of meaning-making, review and the personal evaluation of perceived benefits. The process moves through three distinct phases: *decision to interact*, *outcome of interaction* and *reflection on interaction*. These phases are influenced by a number of factors and are constructed with layered decision points. The key findings, presented as contributions within the emerging theory, are detailed below using the three phases as a presentation framework.

Decision to interact

The decision to interact is shaped by two main factors: online user context and the perceived benefits. The online user context refers to the personal perception that the ageing user has toward engaging with online services. Their context is shaped by their past experiences online – referred to as *use context*. These experiences could have been successful and pleasant (possibly building personal confidence), successful but unpleasant (indicating a sense of frustration experienced even though the objective was reached) or successful. If unsuccessful, the inability to reach one's objective may overshadow a pleasant experience. The stated nature of experiences cannot be defined as clear and definite, rather representing a continuum of emotion and reactions. Every time an ageing user interacts with an online service he or she evaluates the ease of use, cognitive demands, convenience and overall advantage, as well as various individual emotional requirements, such as feeling safe online and feeling rewarded for completing a task successfully.

Besides the personal experience with online service use, ageing users' context is also shaped by social (and peer) perception of technology. The attitude of friends and family members towards specific online services, or online engagement in general, has a significant impact on the likeliness of ageing individuals to engage online and their assessment of their own capability. Another catalyst role for engagement, within an ageing individual's social circle, is that of the mentor and facilitator. For a user to engage with online services the perceived value of the engagement must be greater than the level of resistance within his or her user context.

Outcome of interaction

The context of use is informed by the individual experience during the next two phases: the *outcome of the interaction* and *reflection on interaction*. When engaging with an online service, the user is faced with a service that enables or restricts engagement through its design. Design that supports and enables interaction takes into account different levels of physical ability, acknowledges possible cognitive limitations (such as memory), focuses on user safety, and concentrates on enabling simple and specific tasks. Design that restricts engagement is linked to emotion triggers, such as feelings of

frustration and confusion, while interacting. Examples of these include having multiple steps to an outcome or task, with no clear indication of the final number of steps, or no ability to review the steps already completed (requires memory), text that is difficult to read, as well as actions 'hidden' in pictograms or icons (for example, an 'add new' button that appears as a plus sign). Many of the design elements that may appear challenging at first can, however, be mastered with time and continued use. Nevertheless, the emotional impact of the initial challenge, or frustration, may influence future experiences and reinforce resistance to future engagement.

Besides the impact of emotional reactions to the design of online service interaction, there is the cognitive experience and the potential for learning. If an online experience requires high-level cognitive processes, such as complex problem solving, some aging users may struggle. This is also true of design solutions that make excessive use of jargon (such as 'cookies') and include complex navigation menus. The decline of cognitive ability (as well as physical ability) is not a standard, pre-defined variable, and as such it is beneficial to design for the wider ageing user group and not an "idealised average" (Kurniawan, 2006:vi). While completing tasks, and engaging online, the user learns new skills and expands his or her ability to navigate online services.

The learning process is fluid throughout the experience and can be mediated by either an external stakeholder (a friend, a family member or a professional encountered whilst seeking help) or +through self-exploration. Every part of the interaction is an opportunity for the user to grow and learn, and can be leveraged to elicit a sense of achievement (and motivation for future interaction).

Reflection on interaction

At the end of the interaction (whether successful, unsuccessful or interrupted) users evaluate their experience in line with their expectations prior to engagement and how valuable they perceived the interaction to be. The reflection process includes an evaluation of the practical outcome (was the goal of the interaction met?), as well as the emotional outcome (feeling proud of achievement, having learnt something new, feeling unsafe during the interaction, feeling frustrated at not finding the button, etc.). The final outcome of the reflection process will influence the use context of the interaction, which directly impacts the constantly evolving user context.

When considered as a cyclic process of expectation, interaction, experience and evaluation, AUDDE represents a departure point for future investigation into online service interaction among ageing users (as well as other specific target user groups). The validity of AUDDE as a substantive theory is detailed in Chapter Six, in line with the criteria set out by Glaser (1978:4-5). Even though this is a constructivist grounded study, the criteria set out by Glaser and Strauss for traditional *grounded theory* studies provide a clear and methodologically sound evaluation method. In order to conclude the validity discussion, it is also important to review briefly the emerging theory in relation to the

criteria set out by Charmaz (2006), specifically for *constructed grounded theory* studies.

7.3.4 Charmaz' criteria for *grounded theory* studies

AUDDE is a *grounded theory* which, in this study, has been informed by the perceptions and experiences of ageing users, living in Cape Town, South Africa. The theory is substantive, implying that it relates to a specific observation, within a specific context. The theory is thus transferable to other context to enable future understanding and research. It is hoped that AUDDE can inspire further studies into online service design practices, which seek to address the needs of ageing users. The theory is not yet a formal, generalisable theory. In order to conclude the discussion of AUDDE's validity and whether is represents a valuable contribution, the following observation by Charmaz (2006:183) was considered:

> A strong combination of originality and credibility increases resonance, usefulness, and the subsequent value of the contribution. A claim to making a scholarly contribution requires a careful study of relevant literatures, including those that go beyond disciplinary boundaries, and a clear positioning of your grounded theory… When born from reasoned reflections and principled convictions, a grounded theory that conceptualizes and conveys what is meaningful about a substantive area can make a valuable contribution.

Charmaz (2006:182) formulates a range of questions which the researcher could ask when considering the originality, credibility, resonance and usefulness of an emerging theory. These questions provided the opportunity for a final reflection on the validity and scholarly contribution of AUDDE.

Credibility

- This study's credibility is grounded in the immersed nature of the research activities and process, and that the researcher gained intimate familiarity with the research topic.
- To ensure that sufficient data were considered, the saturation point in the study was carefully monitored and evaluated.
- Many participants shared their experiences in two different research activities allowing for greater depth in the findings. Participants thus also had the opportunity to reflect on their initial comments prior to joining a second session in which they could share their thoughts again.
- Systematic comparisons were drawn between observations and findings from the interviews, and subsequent research activities. Constant comparison between the original findings and the emerging categories was a critical part of the data analysis process.
- The process of formulating the emerging theory is documented in great detail, highlighting each step of data abstraction and analysis. In this way, the process allowed the data to drive the final theory construction, and there are strong links between the original data and the final argument (and theory) put forward.

- The entire process, including abstraction steps, is discussed and provides the reader with a clear understanding of the process. The transparent documentation of the process will enable the reader to form an independent assessment.

Originality

- The emerging categories presented in this study offer new insights into the factors that determine engaged participation with online services among ageing users.
- The study provides a more detailed understand of, and a conceptual rendering of ageing online service users' experiences. It provides a unique approach as it aimed to explore the emotional and experiential factors that underpin one's willingness to engage, and not only those relating to physical accessibility.
- The study provides both theoretical and social contributions. The theoretical significance is that AUDDE is the first substantive theory to explore online engagement among ageing users. Although limited now as a substantive theory, the study provides a methodological framework for others to explore this under-researched topic and contribute towards formal theory. The social significance refers to a greater understanding of the emotional experiences of ageing individuals when interacting online. The study also highlights the critical role of social factors, such as peer perception and family support, in the learning process and willingness to engage.
- Findings from the study extend current models and theories that represent factors impacting technology adoption, online service usage and continued engagement, by framing engagement as an iterative process driven by decision points which are shaped by personal and social factors. The study also contributes to the practice of online service design by providing key insights from ageing users.

Resonance

- The resonance of the study can be defined through the fullness of the studied experience. From the core categories established in the study the entire user experience is documented. This is evident when reviewing that holistic nature of the core categories, such as *Digital Context, Cognition and Learning, Emotive Response to Online Interaction, User Context, Perceived Benefit* and *Design to Support Use.*
- Although not included in this study the findings do acknowledge that ageing users indicated other individuals and institutions that influence their perceptions and engagement. These include peers, family members, as well as local technical specialists (often at retail stores) and technical assistants from businesses offering the online service (for example, bank employees who assist with online banking queries). As the focus of this study was on the personal socio-technical experience of the elderly, these connects were noted but not viewed as potential research participants[86].
- AUDDE was presented to a research participant, Victoria, to gain feedback on how she viewed the emerging theory and the core categories which informed the substantive

[86] This point is further explored in section 7.5.1 Recommendations for future studies.

theory. Through this post-theory construction interview it was established that the research participant could 'see' her ideas and perceptions represented in the final theory, and that the final core categories (which underpin the *grounded theory*) mirror the discussions she had had with fellow research participants during one of the workshops.

Usefulness

- The study provides substantive theory that offers insight into creating more engaging online services for ageing individuals. Given the physical decline experienced during one's later years, online services provide an option for those experiencing limited mobility. Online social network services may also provide the opportunity to connect socially and alleviate loneliness among ageing individuals. Finally, online services could offer ageing individuals a platform to share their knowledge and skill with a wider audience (for altruistic reasons, or for profit). For these reasons the emerging theory, and supporting findings, contribute to the improvement of everyday online experiences of aging users.
- The analytical categories developed in the study contribute to a range of generic processes. Although the study focused on ageing individuals, the iterative nature detailed in the emerging theory may describe the nature of interaction beyond the demographics of this study. Generic considerations, such as feeling motivated through recognition of achievement, form part of many digital experiences (for example, in games). Findings relating to emotional responses, such as fear that one is not safe online and frustration when the system does not communicate clearly when an error occurs, again represent generalisable aspects.
- The emerging theory can be of use in future studies by providing research methods, as well as a substantive theory to transfer to additional research contexts. The ability of AUDDE to inform future research is explained in detail in Chapter Six, 6.3.3 Positioning AUDDE: The blurry lines of experience design.
- AUDDE contributes theoretically and practically to the experiential body of knowledge in Service Design, focused on online service delivery. Methodologically, the study contributes to the larger Design body of knowledge as a major discussion thread throughout the study is the possibility (and practical method) of producing theory though design practice in the various fields of design.

Through this *grounded theory* study, it was possible to discover and interrogate new findings, which contribute to the knowledge in the field. It is, however, pertinent to acknowledge the overall limitations of the study.

7.4 Limitations of the Study

The current project is significant as it provides insight into ageing users' engagement with online services, as well as explores the opportunities to develop theory from within

service design practice. However, limitations should be considered when examining the findings and contributions of this study.

A purposeful sampling technique was used to recruit participants, and an added limitation was imposed as participants needed to have access to either a personal or shared device. As the stakeholder organisation in the study was SAFSA (discussed in Chapter One), their members originally constituted the pool of possible participants. However, after the initial round of interviews participants suggested additional individuals and they were invited to take part. The level of digital literacy of participants was not a key consideration in this study. As face-to-face interviews and observations were a major research method, participants were selected from the greater Cape Town metropolitan area. Participants represented both genders and a diverse age range. Only two racial-ethnic groups formed part of the study, and a focus on greater cultural diversity during sampling could be addressed in future studies.

While the findings of the study and the emerging theory cannot be described as the experience of *all* ageing users online, AUDDE does represent a clear understanding of what the participants in *this* study shared and how their insights may support future research. Participants commented on other individuals who played a role in their interaction and engagement with online services, such as family members, friends and support staff at retail outlets. This study did not include the experiences and perceptions of these individuals; however, adding these 'voices' to the data set may provide a broader understanding of the context and highlight additional focus areas. When generalising the emerging substantive theory, it is critical to keep these limitations in mind.

The emerging theory was informed by the challenges, perceptions and strategies of ageing users in order to review engagement. The main goal was to establish how these individuals could be engaged more by online services. The study did not, however, place emphasis on early-adopters and technology enthusiasts, rather aiming to explore a more generalised scenario.

An additional limitation involves the initial round of interviews. Participants were asked to discuss their perceptions and experiences, but many struggled to verbalise their complex interactions with online services and their reactions to these interactions. At times, participants grew frustrated with themselves during the interviews as they felt they did not communicate their views succinctly. The participant workshops allowed individuals who were interviewed to discuss their experiences with peers, and through this discussion some participants found their voice and shared more precise and detailed opinions. There were, however, a small number of individuals who were interviewed, but did not attend the workshops, and in these cases the data from their interviews may not have been as revealing or concise.

Finally, as this study was a qualitative exploration one must consider the possible impact of researcher bias. The interview process, workshops, data analysis and theory construction were completed by the researcher. Given the immergence of the researcher in the process, it is possible that subconsciously the researcher's bias may have influenced the emerging theory. In order to address this, additional workshop facilitators were included in the oversight of the workshops, as well as in the process of reviewing transcripts from the sessions.

7.5 Future Research

This study represents an investigation into the online experiences of a unique demographic group, as well as an exploration of *grounded theory* methods by a design researcher. The experience yielded a substantive theory, practical guidelines for use by online service designers, as well as initial insights into the opportunities which *grounded theory* practice may present design researchers. From this study a number of possible future research opportunities emerged.

7.5.1 Recommendations for future studies

South Africa is a diverse country with many different cultures and language groups. AUDDE was informed by findings from a set geographic pool of participants, and data collection was halted once saturation was confirmed. In order to move from a substantive to a formal theory it is critical to explore the findings from a much larger participant pool, focused on obtaining saturated findings from different geographical, racial and cultural groups.

During the interviews and workshops participants identified a number of individuals and organisations which they saw as relevant to their general socio-technical context. These included peers (such as peer mentors, or contributors to the overall perception of online services within the social group), family members and external technical specialists located in retail stores or in businesses offering the online service. In order to gain a complete understanding of the context it is recommended to engage with these individuals to document their experiences, thus deepening our understanding of this phenomenon.

Although this project focused on gathering perceptions and experiences a number of practical design principles did emerged. This study however, did not focus on documenting the number of participants who noted any individual design principle, or the hierarchy of importance. In order to explore the impact of the practical design of online service interfaces it is suggested that the known criteria be explored with a larger audience to define both the qualitative experience with the design principles, as well as the quantitative prevalence of preference among the various segments of the target audience. Segments within the ageing user group may include novice users, early

adopters, and could be further segmented into gender, age, race and culture. It is also important to review the experiences across device platforms as preferences and experiences may vary.

The exploration of practical design principles could also offer a participatory design opportunity to co-design online services with ageing users. The process could reveal not only more of what is already known, but allow for additional principles and practical guidelines to enable emersion. In addition, the participatory sessions may also reveal new services relevant to the ageing community.

Methodologically, this thesis represents the application of *constructivist grounded theory* by a design researcher. The qualitative and user-focused nature of design was aligned with *constructivist grounded t*heory and resulted in a more diverse, engaging and visualised study. The possibility of developing theory through service design practice, using the grounded method, is established by the successful completion of this study. Yet, how this would work in practice must be further explored. Additional visualised tools for data collection and systematic grounded analysis will be mutually beneficial to service design and *grounded theory* studies. Thus, in theory and practice, this methodology represents the early steps towards a new grounded service design methodology, focused on finding practical solutions to our everyday challenges and theorising about these phenomena in order to deepen our knowledge and understanding.

7.6 Autobiographical Reflection

As I would imagine it may well be experienced by all candidates, starting their doctoral research, I was terrified at the beginning of this research journey. As a designer, I am used to working with complexity, and in the 'fuzzy greyness' of human experiences – yet, the idea of having to produce innovative academic contributions seemed daunting. When trying to define an area to investigate I decided to explore my own context, and the everyday encounters that surprised, excited, confused or intrigued me. As a result, I enjoyed many lively conversations with friends and colleagues. One theme stood out in conversations with many separate individuals: the perception which people held that their parents disliked new technology, and in some cases refused to engage with new technology. It was often stated, with feelings of disappointment and frustration, that after a technological device had been gifted to the ageing individual in question, he or she showed little to no interest in it.

One tends to buy into the stereotype of ageing individuals as technophobes or simply not being interested in technology, and I was no different. This concept intrigued me as the ageing community, in my mind, could benefit greatly from new evolving technologies. Innovative healthcare options, as well as new communication methods, seemed particularly suited to the ageing community, allowing them to age in their own homes.

When I began to explore literature and studies focused on technology solutions created for ageing individuals I was surprised to find that the main focus seemed to be technology - exploring the potential benefits of the artefact or service, as well as finding a solution that could be implemented within an ageing community. What I struggled to ascertain from the studies was what would motivate ageing individuals to engage with the technology, or how it would fit into their every lived experience.

As my thoughts began to give way to research questions I started to search for an appropriate methodology. I had already explored a number of design-driven methodologies when a conversation with my supervisor led me to investigate *grounded theory*. With further reading, the grounded method began to anchor my ideas. The method and context of the study would co-evolve as my proposal started to take shape. As I began my research journey I was both nervous and excited: nervous, as I was new to *grounded theory* and would work with participants very different from myself; excited to gain new understanding and insight. Throughout the project I would continue experiencing both excitement and nervousness.

Looking back, I consider working with ageing participants one of the most rewarding aspects of the project. I have learnt that ageing individuals are not the fragile, incapable or insecure technology users that many imagine them to be. Their hesitation and caution, when engaging online, spring from very real concerns about safety online, and their resistance to engagement is often the result of not having access to on-going support and opportunities to learn. Working with older people has also made me a better researcher in practice. For my first interview, I had everything planned – the timing, how I would document the session, and roughly what we would talk about. In reality, I spent the first hour listening to stories about family, looking at photos, helping to adjust air-conditioning levels and inspecting the desktop computer station. I realised, as I sat having tea from the 'good' cups, that the story I wanted to explore was the story of people, and that this story would require me to make time and listen more than anything else. Individuals were excited to share their thoughts and learn new things. My assumptions were challenged when I realised that ageing individuals have a very real understanding of how the world has changed, and that they needed to change with it - even if they had no desire to do so. This study has taught me to be a resilient researcher, well prepared but not afraid to change course mid-way when things take a different direction. As a designer, I now have a much deeper understanding of what it means to work *with* people, and the benefit of a truly participatory practice is clear.

Working with aging individual has also been a challenge. I interviewed participants in the environment of their choosing with many selecting to be interviewed at home. I have spoken to people in their tiny rooms in an old age home with no one left in the world, leaving me feeling heartbroken. I have spoken to people living in thriving communities, looking forward to their children's next visit and bowls over the weekend. Researching in these circumstances required an empathetic research practice, nevertheless distancing

myself from personal involvement outside the scope of my study. As much as I would have loved to contact the children and grandchildren of participants, to let them know how much a phone call would alleviate their parents' or grandparents' loneliness, it would be crossing a line. This also required a very open and honest discussion of intentions upfront, to ensure the expectations of participants were not more that I could commit to. The differences in context, living conditions and attitudes among participants in this study were monumental, and I believe this enriched the study as a whole. I walk away from this experience a more empathetic researcher, a more aware designer and a *grounded theory* enthusiast.

7.6.1 Working with a *Constructivist Grounded Theory* method

Working with *grounded theory* was a profoundly exciting experience. The methodology has a long history, with exceptionally well-defined protocols that where reassuring and daunting at the same time. The mantra that 'all is data', as well as the focus on iterative analysis, spoke to me as a designer. The need to 'check back' constantly with the data, and to ensure developments were grounded, provided a mental safety-net as core categories and the final theory began to emerge. The experience was, however, not without bouts of blind panic.

Creating the various research tools was an exciting experience, supported by my design background. The need for a grounded researcher continually to adapt and evolve the research tool speaks directly to design practice, which promotes contextual awareness and agile practice. I am very keen to explore further the possibility of qualitative design-based methods for grounded studies.

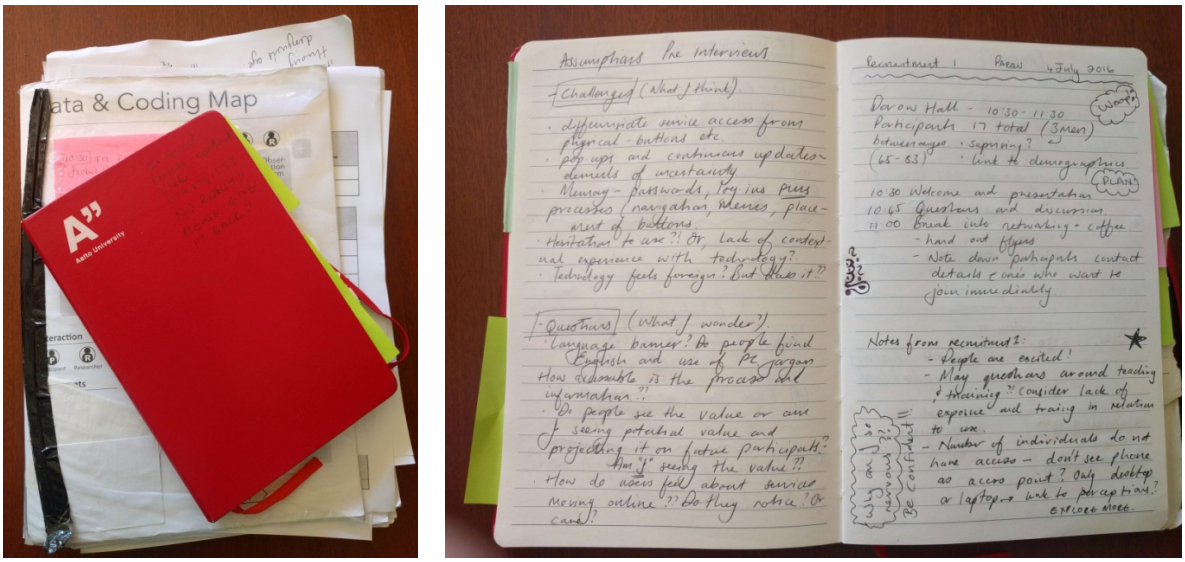


Figure 7.1: Handwritten notes and memos

Throughout the open coding phase I felt overwhelmed by the number of codes forming. I kept wondering whether I was doing it right. The feeling began to subside when new codes became less frequent. The open coding process, which happened at the same time as data collection, took much longer than I had anticipated. It was not just the research, transcription and coding that took time, but also the reflection on what was emerging, writing memos to document what I was seeing (often by hand) and taking time out to make sense of it all. I do not believe that this phase should be rushed and, looking back, I am happy that I took the additional time. By the time I entered the focused and theoretical coding phases I had accepted the fact that to gain meaningful insights the process is 'done, when it is done'. Instead of being focused on predefined timelines, I had to learn to trust the process. It is imperative that researcher understand the time required to conduct a meaningful grounded study.

Coding also required me to engage with *Atlas.ti* which I had never used before. Luckily, I had access to the software and training through the institution. I am not sure how one would manually code the body of work generated in a doctorate, and I would encourage grounded researchers to engage with qualitative software options, if available, to support their data analysis (and management).

7.7 Concluding Summary

The impetus for the research was to gain an understanding of the factors that impact the engagement of ageing users with online services. This study presents a unique theoretical contribution to the fields of gerontology and service design. In addition to the substantive theory developed, titled AUDDE (Ageing User Decision-Determined Engagement), the study yielded applied design insights. A *constructivist grounded theory* method was selected, and in practice the study focused on the process and guidelines defined by Charmaz (2006). The study does, however, acknowledge the original authors of the methodology, Glaser and Stauss (1967), and refers to their seminal work throughout its course. Socio-technical contexts and discussions are included to help explain the phenomena observed, and a reviewed socio-technical perspective of ageing users is proposed: namely, ageing users as social ageing actors within a socio-technical interaction. The study is relevant to those who would like to conduct grounded studies within design, as well as those wanting to create engaging online services for ageing individuals.

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Appendices

Appendix A: Formatting Template

Format protocols

Headings:	Avenir Book	Bold	14pt	Title case
	Single line space after heading		Left aligned	
Sub-headings:	Avenir Book	Bold	14pt	Sentence case
	No line space after sub heading			Left aligned
Body text:	Calibri	Justified	12pt	1.15 line spacing
Footnotes:	Times New Roman	Left Aligned	8pt	
Indented quotations:	Calibri	Justified	10pt	1.15 line spacing
Bullet points:	Round dot (level 1)			
Numbering:				
In-text Ref (Harvard)	(Surname, Year: pg)	'&' used for (in-text)	'And' used as when part of sentence.	et.al. for more than 3 authors (first instance all authors cited)
Capitalisation:	Grounded Theory = discipline	grounded theory = process/ method		

Figures & Tables Layout

Avenir Book	9pt	Indicator in bold.	Central	Title Case (for title)

	Life Expectancy at Birth (years)			
	Both Sexes 1970	Both Sexes 2013*	Males 2013*	Females 2013*
WORLD	58	71	69	73
MORE DEVELOPED	71	79	75	82
LESS DEVELOPED	55	69	67	71
LESS DEVELOPED (EXCL. CHINA)	51	67	65	69
LEAST DEVELOPED	44	61	60	62
AFRICA	45	59	58	60
SOUTHERN AFRICA	53	59	57	60
Botswana	55	47	48	47
Lesotho	49	44	42	45
Namibia	53	64	62	67
South Africa	53	60	58	61
Swaziland	48	49	50	49

Figure 1.1: Estimate Life Expectancy from 1970 to 2013
Source: Population Reference Bureau, 2014: 13 & 14

Table 1.1: Research Question and Objectives

Research Problem: The benefits of online services to an ageing population is potentially significant, yet some individuals within this demographic choose to not engage.

Source: Produced by author, 2015

Appendix B Referencing Template

The Cape Peninsula University of Technology traditionally uses an adapted version of the Harvard referencing system. The basic conventions are outlined in the university's guide, *Research and The Harvard Method of Bibliographic Citation: A Research Writing and Style Guide for Postgraduate Students*, by Prof Liz van Aswegen, Research Directorate, November 2010. This study used in-text referencing, supported by a 'List of References' (a bibliography is not included). Below is a statement of referencing conventions, as used in this dissertation:

Format for reference to a source in-text:

- Anderson (1987:73) – surname of author as part of the text.
- (Anderson, 1989:73) – reference to content alone.
- (Len, 1989a:73) (Len, 1989b:73) – where an author has more than one publication in the same year.
- (Anderson, 1989) – reference to main theme of publication/ electronic reference
- (Anderson & Jones, 1989:73) – two authors.
- (Smith, Johns & Jones, 1989:73) first instance of use, followed by (Smith et al*.,* 1989:73) – multiple authors.
- (Jones, 2001; Jones 2003; Smith, 2012) – authors organised by year of publication in list.

Conventions for reference listed in the List of References:

- In List of References 'and' used for multiple authors.
- All authors listed in List of References (no use of *et al.*)
- Titles of articles are in *sentence case*.
- Titles of journal and books are in *title case.*
- Shortened forms of counties used, i.e. USA and UK.
- Date of copyright/ publication provided for electronic sources, as well as date of initial access.
- Copyright holder used as author for electronic resource, where no author is indicated.
- Titles of sources represented in their original dialect convention (UK or USA English)

Format for most used references, listed in the List of References:

Book:

- Albert, W. and Tullis, T. (Eds.) 2013. *Measuring the User Experience: Collecting, Analyzing, and Presenting Usability Metrics*. USA: Newnes
- Brunner, H. 1972. *Hieroglyphic Writing: The Egyptian Legacy*. (3rd ed). Oxford: Oxford University Press
- Johnson, D. W. and Johnson, R. T. 2004. Cooperation and the use of technology. In Jonassen, D.H. (Ed.) *Handbook of Educational Communications and Technology.* (2nd ed.) USA: Taylor & Francis: 785-812

Journal Article:

- Baxter, G., and Sommerville, I. 2011. Socio-technical systems: From design methods to systems engineering. *Interacting with Computers*. 23(1):4-17

Online Resource:

- Carlson, D. 2009. *The online timeline: a capsule history of online news and information systems.* [Online] Available: http://iml.jou.ufl.edu/carlson/1970s.shtml [26 April 2016]

Conference Proceedings:

- Homid, S. 2007. Interaction design and service design: expanding a comparison of design disciplines. In *Design Inquiries, Proceedings of the 2nd Nordes Conference*, Stockholm, 27-30 May 2007. University of Arts, Crafts and Design: 1-8

Appendix C: Consent Template

Form 1b: To be completed by researcher.

Consent Form

Participant Code: Date:

You are invited to participate in a research study conducted by Vikki du Preez, from the Faculty of Informatics and Design, at the Cape Peninsula University of Technology (CPUT).

I hope to learn about **your perceptions and experiences with online services**. Research activities will include interviews and workshops. These form part of my DTech: Design study. The time and aim or each session will be communicated in a short introduction and you will be able to decide whether you would like to participate. Taking part is completely voluntary and you welcome to stop participating whenever you like. Any information that is obtained in connection with this study will remain confidential and comments in text will be linked to a pseudonym of your choosing.

If you have any questions about the study or the research activities, please feel free to contact me at servicedesignforall@gmail.com or on +27 79 874 1593.

Session

This section includes information about our session today and asks permission to use any photographs or videos that feature you, as well as comment you made during the session.

Date and Time: 17 October 2016

Activities: Interactive workshop

Permission to use media, quotes and materials

Tick all appropriate boxes:

If a box it not ticked it means you do not give consent for these materials to be used.

- ☐ I give consent for **photographs** of me, taken in today's session to be used in academic publications and activities.
- ☐ I give consent for **video** of me, taken in today's session to be used in academic publications and activities.
- ☐ I give consent for any **quotes** I made today, to be used in academic publications and activities.
- ☐ I give consent for any **workshop materials** I contributed to today, to be used in academic publications and activities.

Your signature indicates that you have read and understand the information provided above, that you willingly agree to participate, that you understand that you may withdraw your consent at any time.

Name: _____ Age: _____

Signature: _____ Date: _____

Thank you for taking the time to learn more about my project. Please do not hesitate to contact me should you need any additional information. This project is supervised by Prof R. de la Harpe, Cape Peninsula University of Technology (delaharper@cput.ac.za).

Appendix D: Participant Information and Coding Form

Form 1: To be completed with the participant.

Participant Coding & Information

Participant Code:

Pseudonym:

Research Activity:

Date:

Full Name: _____

Gender: _____ Cell Number: _____

E-mail: _____

Age _____

Step 1: Talk about the project ☐ *tick if completed*

Introduce the project, yourself and the goals of the study. Talk about why you are doing this and what excites you about the project. Explain what the participant can expect and what research activities you hope they will participate in. Give the participant a description of the study to keep.

Step 2: Talk about the person ☐ *tick if completed*

Ask the participant if they have any questions or concerns. Note down any that they may have and answer their questions.

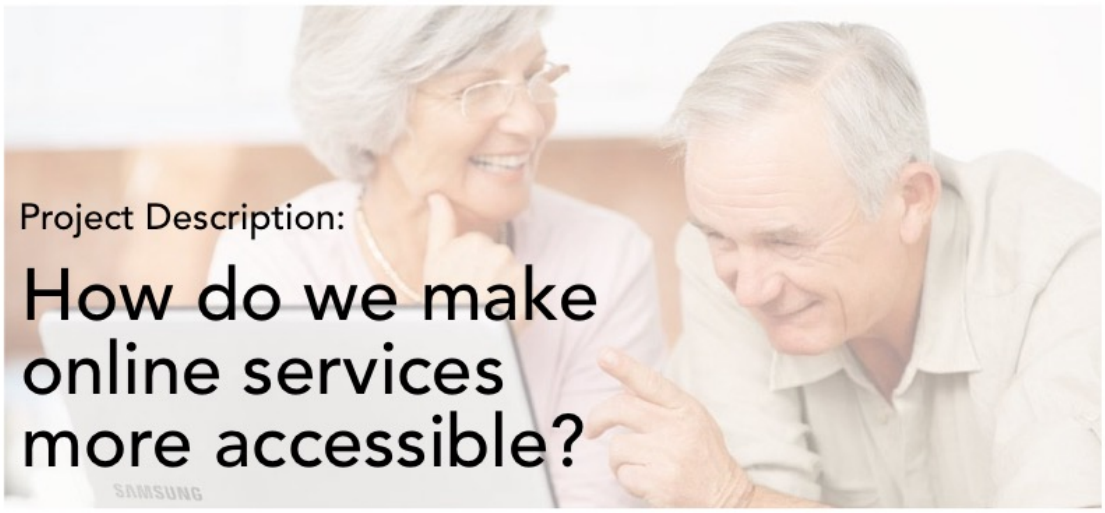
Step 3: Talk about the process ☐ *tick if completed*

Introduce the research activity. Explain any tools that you will be using. Let the participant know the approximate length of the activity. Restate that all activities are voluntary and that they are able to stop participating at any point during the session.

Step 4: Talk about the protocol ☐ *tick if completed*

Introduce the ethics process and consent form. Walk participant through the form. Note down any concerns and how you addressed them.

Appendix E: Project Information Page



Project Description:

How do we make online services more accessible?

AIM OF THE STUDY

The aim of this study is to explore the perceptions of ageing individuals with regards to online services, to identify

COSTS & RISKS

There are no costs involved. Participants will not be reimbursed for activities or their participation. The study poses no danger, and there is no risk in taking part.

ACTIVITIES

Interviews & User Diary - I would love to hear about your experiences with online services, and talk about how these services may affect your every day activities. For interviews I will meet you where you are most comfortable.
A workshop (if you would like to join) - analysing design elements of online services, and imagining services that would work for you!

My name is Vikki du Preez, and I am currently registered for a DTech qualification at the Cape Peninsula University of Technology. The study is titled: ***Online service design: A socio-technical perspective to engage an ageing population.***

CONTACT DETAILS
Email: servicedesignforall@gmail.com
Cell: 079 874 1593

The study: *Online service design: A socio-technical perspective to engage an ageing population,* is registered at the Cape Peninsula University of Technology and is supervised by Prof R. de la Harpe (delaharper@cput.ac.za)

Appendix F: Likert Scale Questionnaire

To be completed by the participant.

General Context Form

Participant Code: Date:

1. Digital Interaction

	strongly agree	agree	unsure	disagree	strongly disagree
I feel confident using a computer.	◯	◯	◯	◯	◯
I feel confident accessing information on the Internet.	◯	◯	◯	◯	◯
I feel confident communicating via the Internet (email).	◯	◯	◯	◯	◯
I feel confident communicating via the Internet (video).	◯	◯	◯	◯	◯
I feel confident buying items or services over the Internet.	◯	◯	◯	◯	◯
I'm able to read information on the screen easily.	◯	◯	◯	◯	◯
I see the potential in learning how to use websites and applications.	◯	◯	◯	◯	◯

2. Mobility

	strongly agree	agree	unsure	disagree	strongly disagree
I am happy walking and standing for an hour.	◯	◯	◯	◯	◯
I struggle with using small buttons and equipment.	◯	◯	◯	◯	◯

3. Financial Impact

	strongly agree	agree	unsure	disagree	strongly disagree
I'm willing to pay a R100 a month to be able to access the Internet if it will help me.	◯	◯	◯	◯	◯
I'm willing to pay more than R100 a month to be able to access the Internet if it will help me.	◯	◯	◯	◯	◯

Notes:

Appendix G: Workshop Programmes

Workshop Title: "Making Online Services Work for Me"

Date and Time

Monday 17 October 2016, 9:00 – 14:00

Workshop Outline and Content

The workshop will consist of the following elements:

9:00 – 9:30 | Facilitators Set Up

Room set up:
2/3 groups of participants (dependent on numbers). Chairs can be around tables
1 separate table with 2 chairs for facilitators.
Screen with projector
***Coffee/Tea ready at 9:30

9:30 – 10:00 | Hello!

Informal introduction of participants, with coffee and tea.
Introducing the team.
Introducing participant consent form.

10:00 – 11:00 | That thing called the 'Internet'.

Brief Introduction to the Internet and how it has changes social and financial ways of engagement (15min)
Introduction to 4 different devices and services: Apple (Macbook & iPad), Android (Samsung tablet) and Windows (Laptop) and opportunity for participants to look/ try the devices (45min)

11:00 – 11:30 | Introducing Service Design and Personas

Introduction to Service Design as a way of shaping services to the needs of users (10min)
Introduce the persona as a key tool in the development of digital/ online services (persona and user scenarios) (10min)
***Mid morning Coffee/Tea ready at 11:30

11:45 – 13:00 | Building a Persona, Grounded in User Experiences.

Participants in small groups (pairs) build a user persona with assistance by facilitator.
Use scenarios discussed during the session and recoded by facilitator.

13:00 – 13:20 | Sharing Our Personas

The personas are shared and participants can comment and 'vote' for aspects of the personas that they believe work well/ are representative of a user.

13:20 – 13:30| Consent and Thank You's

Securing/ checking final consent given by participants – check that they are still happy to be included in the study now that they have finished the session.

***Finger snacks ready at 13:30

13:30 – 14:00 | Relaxing, Snacking and Help Session

Participants enjoy snacks and have an opportunity to ask more questions about their own online experiences.
Troubleshooting opportunity with technical facilitator and user facilitators.

14:00 | End

Workshop Title: "Online Services That Work for Me"

Date and Time

Wednesday 23 October 2016, 9:00 – 14:00
Proposed venue: Community Hall at Tyger Villas, Old Oak Road, Kenridge.

Workshop Outline and Content

The workshop will consist of the following elements:

9:00 – 9:30 | Facilitators Set Up
Room set up: Groups of 4 participants (dependant on numbers). Chairs placed around tables in pods.
1 separate table with 3 chairs for facilitators.
Surface to project on?
Catering and beverages set up for morning session/ welcoming.
***Coffee/Tea ready at 9:30 as participants arrive

9:30 – 10:00 | Hello!
Informal introduction of participants, with coffee and tea.
Introducing the team of facilitators and goal of session. Introducing participant consent form.

10:00 – 11:00 | That thing called the 'Internet'.
Brief Introduction to the Internet and how it has changes social and financial ways of engagement (15min)
Introduction to 4 different devices and services: Apple (Macbook & iPad), Android (Samsung tablet) and Windows (Laptop) and opportunity for participants to look/ try the devices (45min)

11:00 – 11:30 | Introducing Service Design and Personas
Introduction to Service Design as a way of shaping services to the needs of users (10min)
Introduce personas as tools in the development of digital/ online services (persona and user scenarios) (10min)
***Mid morning Coffee/Tea break at 11:30

11:45 – 13:00 | Building a Persona, Grounded in User Experiences.
Participants in small groups (pairs) build a user persona with assistance by facilitator.
Use scenarios discussed during the session and recoded by facilitator.

13:00 – 13:20 | Sharing Our Personas
The personas are shared and participants can comment and 'vote' for aspects of the personas that they believe work well/ are most representative of a user.

13:20 – 13:30| Consent and Thank You's
Securing/ checking final consent given by participants – check that they are still happy to be included in the study now that they have finished the session.

***Finger snacks ready at 13:30

13:30 – 14:30 | Relaxing, Snacking and Help Session
Participants enjoy snacks and have an opportunity to ask more questions about their own online experiences.
Troubleshooting opportunity with facilitators.

14:30 | End

Appendix H: Co-created Personas

User Created Persona:
An Ageing Online Service User

Stephanie, 70

Who am I? My skills? What are my interests? History with technology?

I'm a widow who has been described as gregarious, a good communicator, community minded and an extrovert. I live by myself with my beautiful dog! I have two children, the first is my daughter who lives in Canada with my granddaughter. My son lives in New Zealand with my two grandsons. After my husband's death I had no family left in South Africa but my friends are my support group. I love to keep busy and volunteer at a number of public services, including knitting for the Clothing Guild. Other interests include gardening, birding and being outdoors. I absolutely hate shopping!

My perception of the Internet and technology?

I have a positive attitude towards technology and use it on a number of devices including my phone and desk top computer.

What drives me to engage with technology?

A key thing is being able to communicate with my kids and grandchildren. I felt forced into online banking as I need to do EFTs.

Which emotions do I experience when using technology?

I'm a bit of a gadget person and love a challenges. There is great joy when I can chat to my family or see pictures of my grandchildren. But, technology is still cold and sometimes I'm not encouraged. I often feel irritated with the advertisements or frustrated when I can't figure something out.

PRACTICAL USAGE

What tasks do I complete using online services?

Online banking, booking of travel plans (easier than travel agent), finding information (ask.com), checks weather, local news, sharing photos (family and grandchildren), emails & Skype (communication) as well as games and buying airtime/ electricity.

When do I use online services?

Everyday I access news, weather and email. Monthly Skype with family.

How do I learn to use online services?

My daughter can answer questions as well as friends. Friends share new online services and ideas. Not comfortable asking staff at computer/ technology shops.

PERCEIVED OPPORTUNITIES & CHALLENGES

What challenges do I face using online services?

I am worried about security and how to be safe online. Changing (updating) interfaces is challenging and creates confusion. Threat of viruses is challenging.

What opportunities do I have using online services?

Mainly I believe the opportunities to be convenience (making every day tasks easier) as well as online shopping. Allows access to services should something happen to me (be indisposed).

What design elements support my online service experience?

A bigger font. Less visual clutter on websites (difficult to know what is important). Consistency with website appearance (less unneeded updates). Steps and processes need to be clear (MUST provide clear steps and feedback during the process).

User Created Persona:
An Ageing Online Service User

Astrid van Jaarsveld, 71

Who am I? My skills? What are my interests? History with technology?

Astrid is a divorced woman living in Cape Town. She has a daughter (40) who lives in the UK and a son (38) who lives in Cape Town. Astrid also has 3 grandchildren (two girls ages 5 and 3, and a baby boy). She is a social person and an extrovert who belongs to a book club and loves to travel. Astrid used to be an administrator and still works part time. She is reasonably patient. She is good with numbers, and loves handcraft, movies, brain games and cooking. Astrid lives by herself in a cottage. She used basic office software and email in her working life, but went online more when her children left home. Astrid is very interested in new technology.

My perception of the Internet and technology?

An essential tool. Scary in the beginning but easier if you use it often. There is just "too much information!" Prefers to access the Internet from a desk top - the size of a tablet is a problem.

What drives me to engage with technology?

Communication with family is a key driver. Banking. Booking tickets, the convenience. Information and news being accessible. Sharing made easy: photos and file transfers.

Which emotions do I experience when using technology?

Keen to explore and love the convenience, but I'm nervous, even fearful. Especially with financial transactions.

PRACTICAL USAGE

What tasks do I complete using online services?

Online banking, YouTube, online shopping (Takealot, Loot), social media (Facebook, family and friends), online communication (Face Time and Skype).

When do I use online services?

Daily for work and pleasure/communication.

How do I learn to use online services?

My son can help me, but my daughter isn't too tech savvy. Mostly I learn by trial and error. You need a very patient person to help you.

PERCEIVED OPPORTUNITIES & CHALLENGES

What challenges do I face using online services?

I am worried about security, and how to be safe online. Having to constantly change my passwords and user names for online services is challenging.

What opportunities do I have using online services?

I love the idea that so many different devices can talk to each other: P.C., iPad, smart phone, printer, scanner and copier, etc. All the different devices means that I have many opportunities.

What design elements support my online service experience?

Some of the key design elements that support my online activities: simplicity, unfussy design, size of text and font (san serif for clarity), colour (high level contrast), simple language, and use of audio support.

User Created Persona:
An Ageing Online Service User

Horatio, 74

Who am I? My skills? What are my interests? History with technology?

I'm a 74 year young widower living in Cape Town. I'm not very active but in good health. I'm semi-retired and will be happy to find wife number three. I have three children, one in Cape Town, one in London and one is in Australia. All together I have 5 grandchildren, I don't have any pets. I still consult in the banking industry (my previous profession). I enjoy bowls, studying the financial markets, making models, collecting good whiskey and travelling. I have a working knowledge of technology but will always see it as a tool.

My perception of the Internet and technology?

I'm inquisitive and sometimes I'm curious but I'm happy with my current level of knowledge.

What drives me to engage with technology?

I enjoy being able to access information and maintain my work connections through email and online correspondence. I also enjoy being able to stay in contact with my children.

Which emotions do I experience when using technology?

I get extremely frustrated with slow connections.

PRACTICAL USAGE

What tasks do I complete using online services?

I'm okay with technology but it is not a focus for me. I use it as a tool. Mainly I check the markets, buy and sell stocks online, email, online tax and online banking.

When do I use online services?

Daily, first thing in the morning and last thing at night.

How do I learn to use online services?

When I'm stuck I ask someone around me; my children or grandchildren or a more tech savvy younger bank colleague.

PERCEIVED OPPORTUNITIES & CHALLENGES

What challenges do I face using online services?

I don't really see any challenge to not understanding technology. I live in a bit of a bubble. Sometimes the speed of my connection is annoying.

What opportunities do I have using online services?

I enjoy finding information about my hobbies, staying informed and planning travelling. I'm learning Skype and social media to connect with my family. I may even try online dating!

What design elements support my online service experience?

My biggest problem is too many small, unexplained symbols and codes as buttons. Explain things more clearly, or design things in a way that I can easily find more information or an explanation - maybe even in audio form.

User Created Persona:
An Ageing Online Service User

Jenny Johnson, 75

Who am I? My skills? What are my interests? History with technology?

My friends describe me as patient, organised, motivating, a good communicator and as a person's person. I enjoy watching sport, listening to music and reading. My musical taste includes playing the violin. I'm a widow with three children, a boy (50 years old) and two younger daughters (45 and 41). I am a teacher at heart and taught high school for many years. My main interests include cooking, gardening, photography and travel. I'm a comfortable leader and I'm self driven. My experience with technology is rather limited.

My perception of the Internet and technology?

I see the online space as challenging and informative. It is a bit strange sometimes as I did not grow up with technology and all it can offer.

What drives me to engage with technology?

Communication and convenience are the main drivers. A key thing though is that I'm afraid to be left behind. This is the way the world is going and I need to grow with it.

Which emotions do I experience when using technology?

Happy when technology allows me to see and connect with my family overseas. Exited at the prospect! Sometimes the experience makes me worried, anxious and impatient.

PRACTICAL USAGE

What tasks do I complete using online services?

Online banking, research via search engines (Google), email, online communication (Skype), travel services and booking, videos (how to do things) and shopping online.

When do I use online services?

Daily, generally in the late afternoon and evening.

How do I learn to use online services?

When in doubt I phone a friend. Mainly I learn through trial and error. I would love to attend more workshops. Repetition is key to learning.

PERCEIVED OPPORTUNITIES & CHALLENGES

What challenges do I face using online services?

I'm uncertain sometimes about what I should do - linked to a lack of knowledge. Sometimes the size of the keyboard and font visibility is a problem.

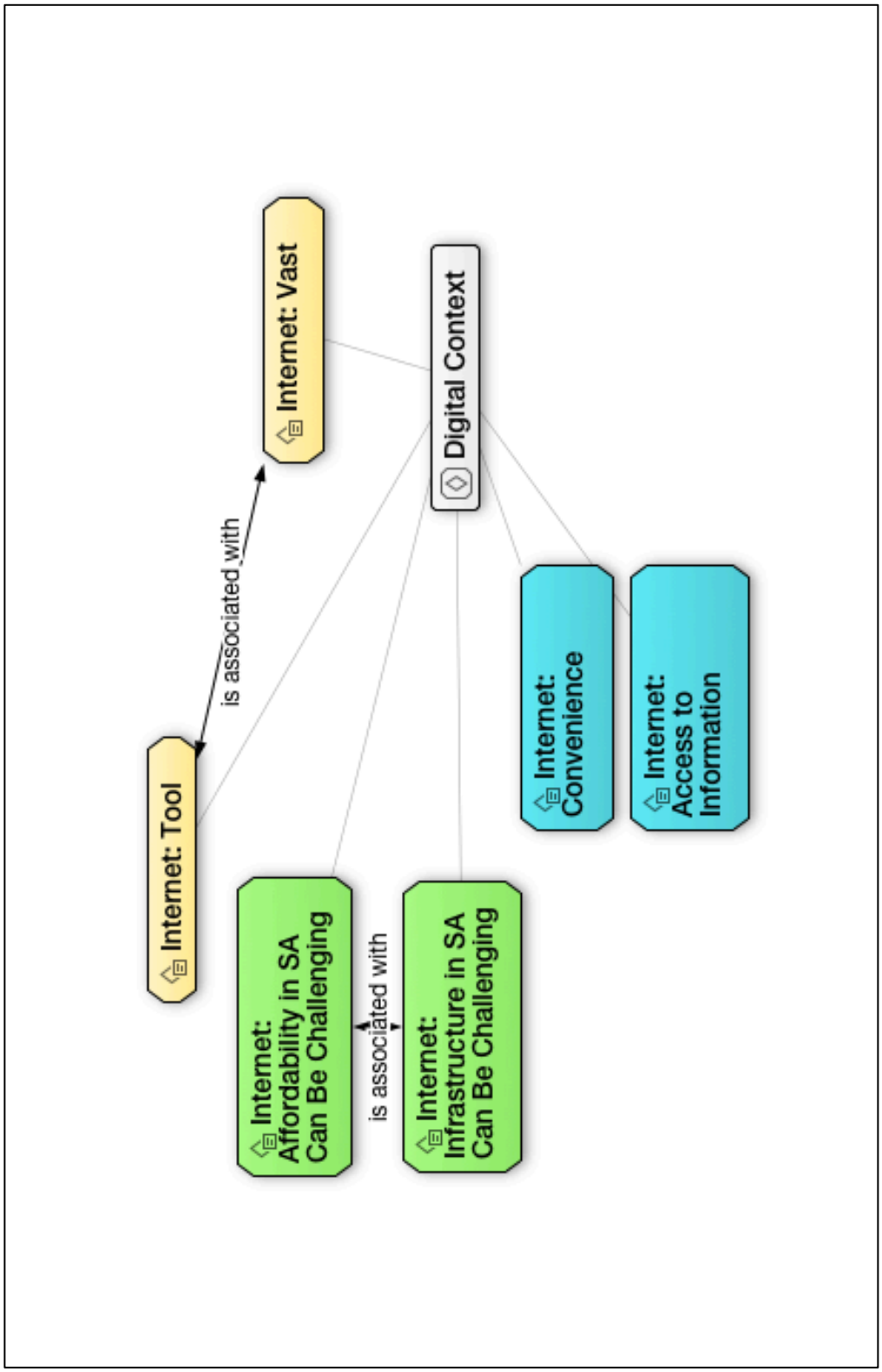
What opportunities do I have using online services?

Online access allows me to live and work more conveniently: shopping, banking, research, communication, administration and video communication (Skype).

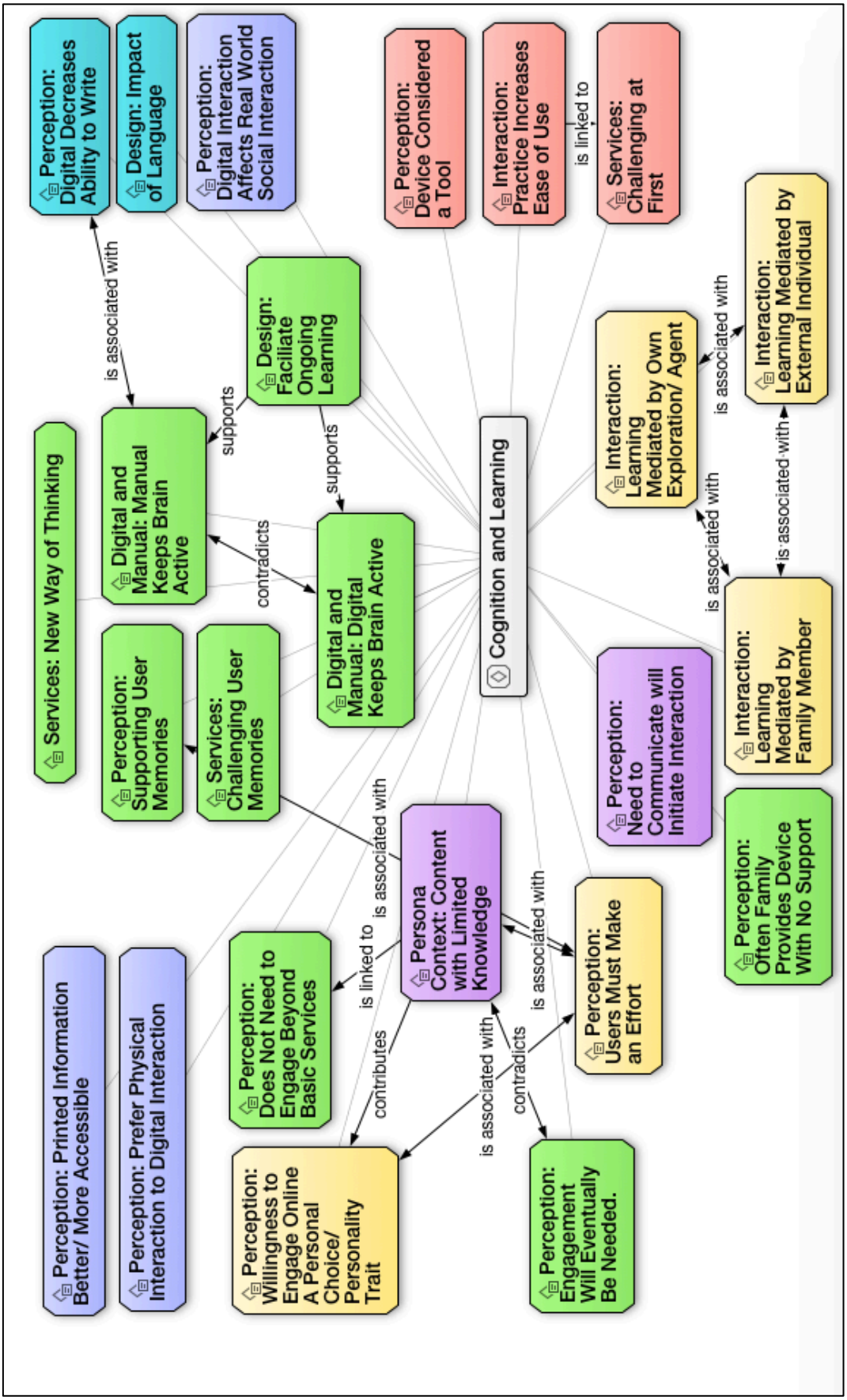
What design elements support my online service experience?

Some of the key design elements that support my online activities: large text, clear highlighting, distinct colours, better guidelines as to why systems change (e.g. banking).

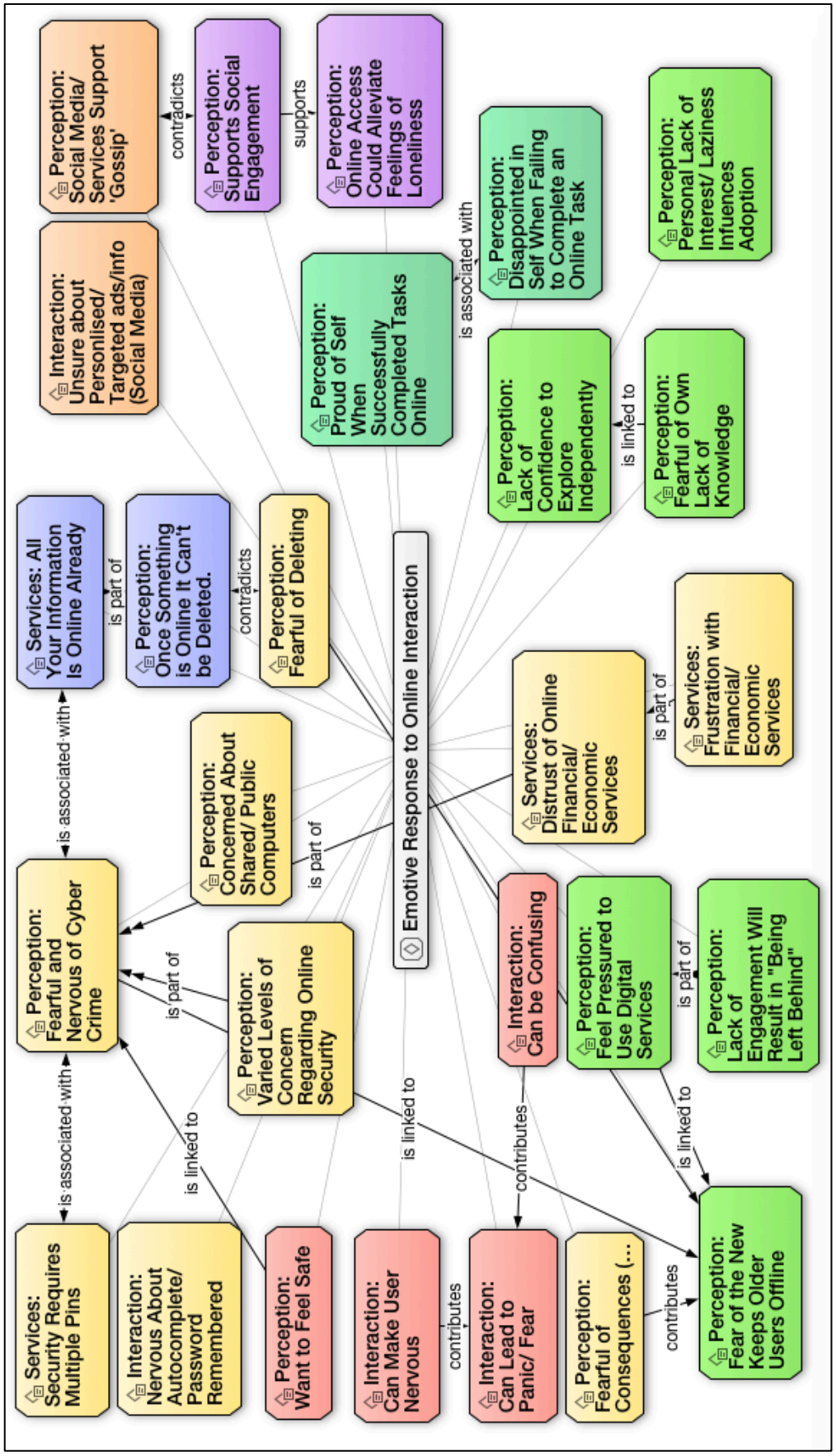
Appendix I: Network View: Digital Context



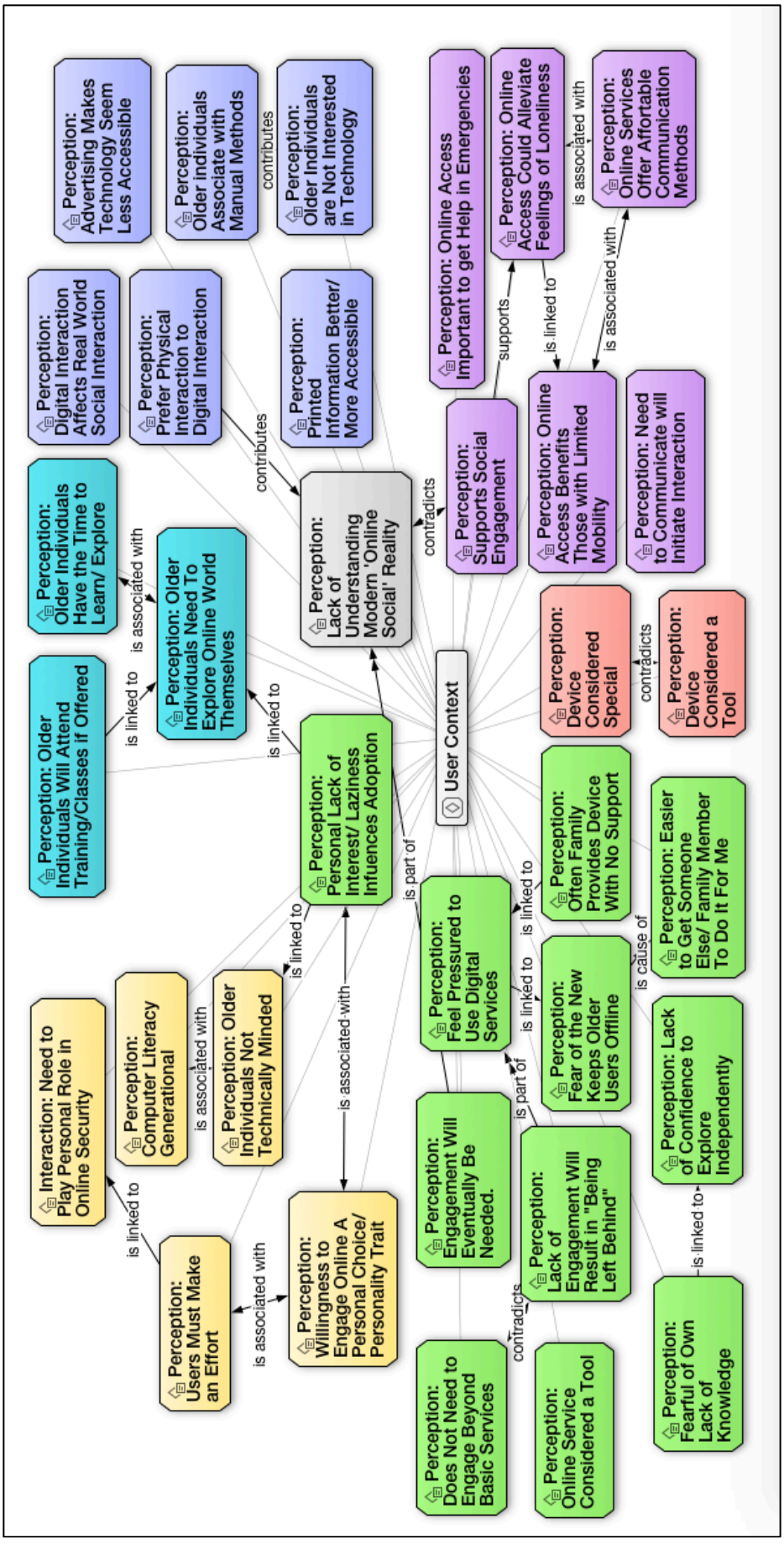
Appendix J: Network View: Cognition & Learning



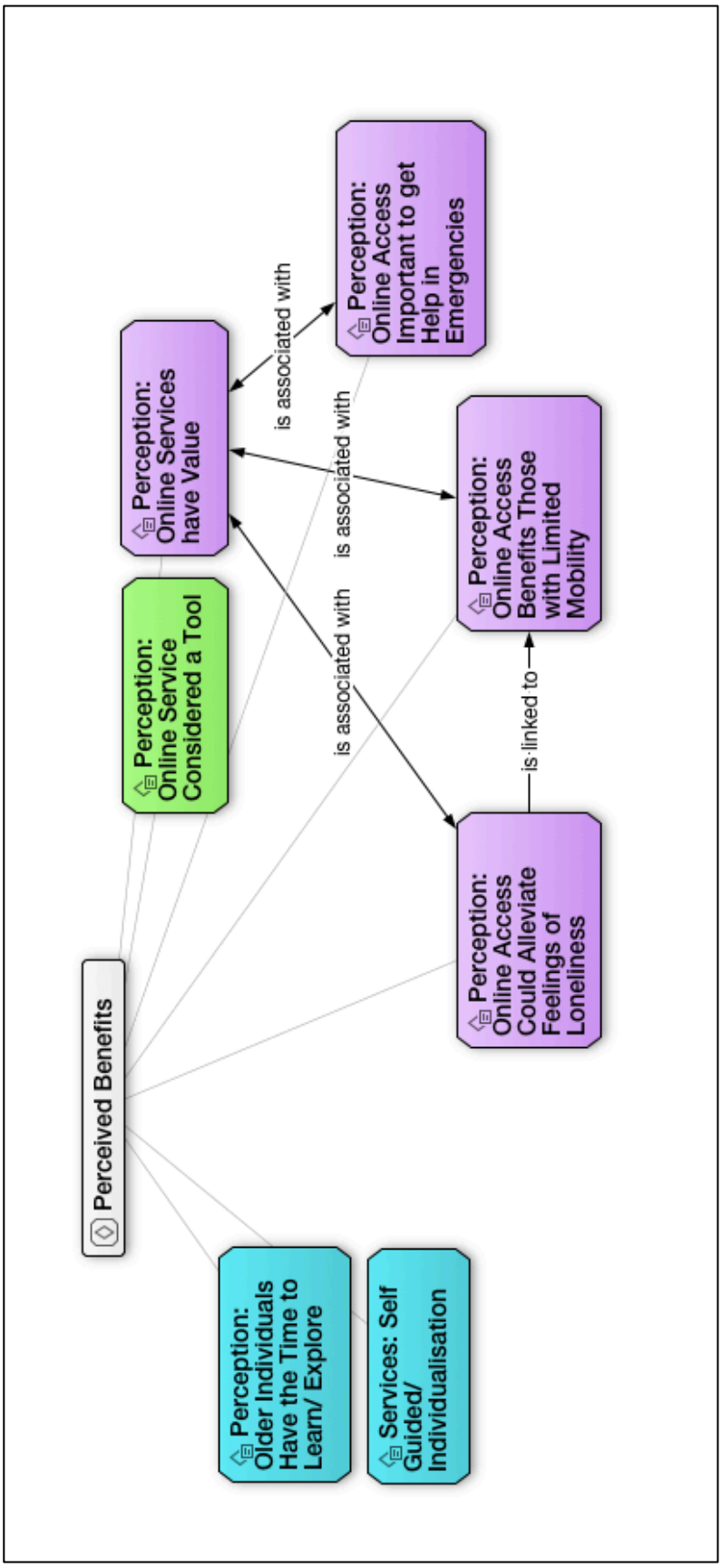
Appendix K: Network View: Emotive Response to Online Interaction



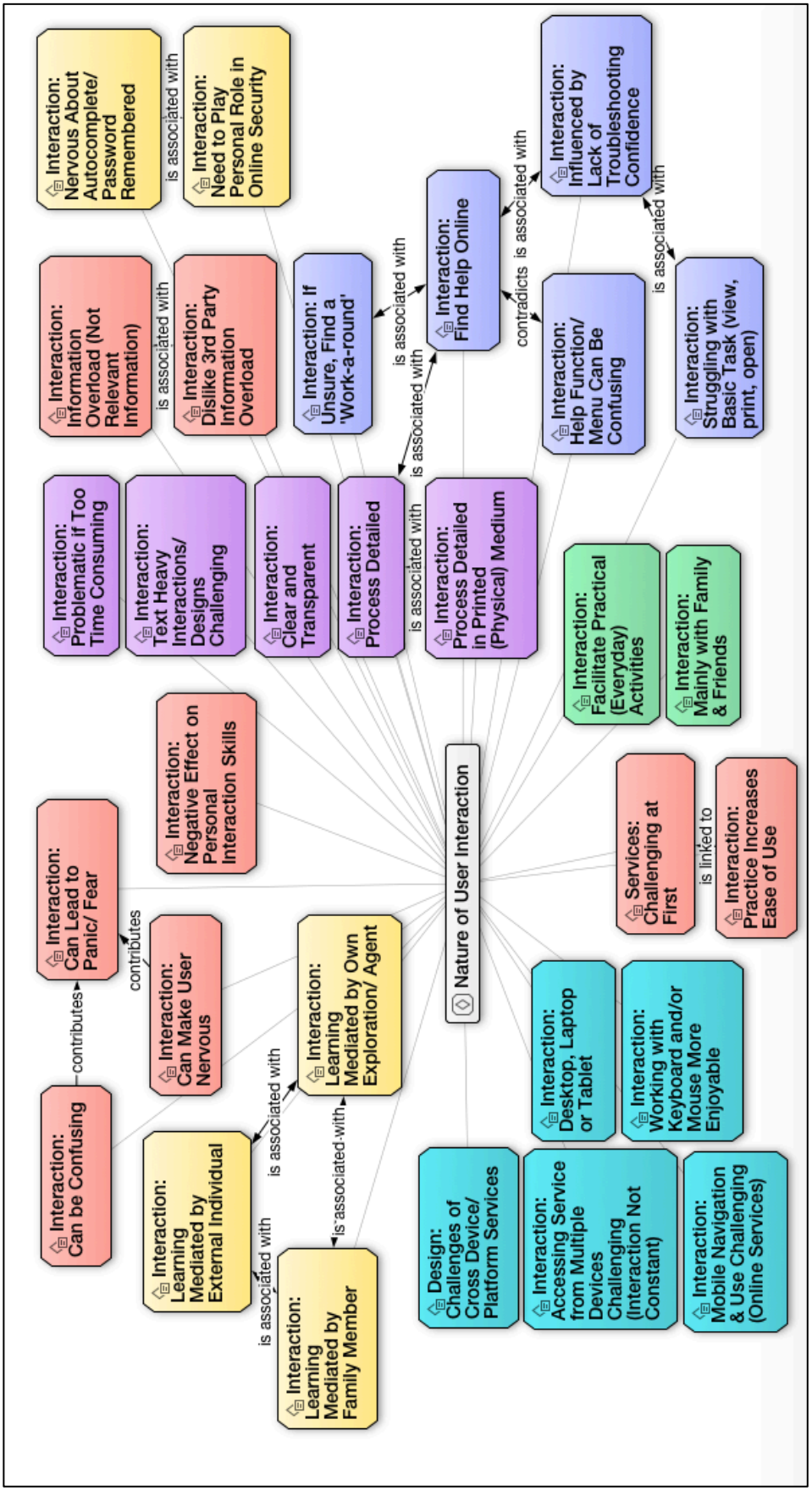
Appendix L: Network View: User Context



Appendix M: Network View: Perceived Benefits



Appendix N: Network View: Nature of User Interaction



Appendix O: Network View: Design to Support Use